

**Study
Report
98-07**

Analysis of Emerging Digital and Back-up Training Requirements

Laura A. Ford, Roy Campbell, and Robert Cobb
Human Resources Research Organization

19981007 014



**United States Army Research Institute
for the Behavioral and Social Sciences**

August 1998

Approved for public release; distribution is unlimited.

DTIC QUALITY INSPECTED 3

**U.S. Army Research Institute
for the Behavioral and Social Sciences**

A Directorate of the U.S. Total Army Personnel Command

**EDGAR M. JOHNSON
Director**

Research accomplished under contract
for the Department of the Army

Human Resources Research Organization

Technical Review by

Carl W. Lickteig, Armored Forces Research Unit
Margaret S. Salter, Infantry Forces Research Unit

NOTICES

DISTRIBUTION: Primary distribution of this Study Report has been made by ARI. Please address correspondence concerning distribution of reports to: U.S. Army Research Institute for the Behavioral and Social Sciences, Attn: TAPC-ARI-PO, 5001 Eisenhower Ave., Alexandria, VA 22333-5600.

FINAL DISPOSITION: This Study Report may be destroyed when it is no longer needed. Please do not return it to the U.S. Army Research for the Behavioral and Social Sciences.

NOTE: The findings in this Study Report are not to be construed as an official Department of the Army position, unless so designated by other authorized documents.

REPORT DOCUMENTATION PAGE

1. REPORT DATE (dd-mm-yy) August 1998			2. REPORT TYPE Final		3. DATES COVERED (from... to) August 1996 - May 1998	
4. TITLE AND SUBTITLE Analysis of Emerging Digital and Back-up Training Requirements					5a. CONTRACT OR GRANT NUMBER DASW01-94-D-0011	
					5b. PROGRAM ELEMENT NUMBER 465803	
6. AUTHOR(S) Laura A. Ford, Roy Campbell, and Robert Cobb (Human Resources Research Organization)					5c. PROJECT NUMBER D730	
					5d. TASK NUMBER 2135	
					5e. WORK UNIT NUMBER H01	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Human Resource Research Organization (HumRRO) 66 Canal Center Plaza, Suite 400 Alexandria, VA 22314					8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) U.S. Army Research Institute for the Behavioral and Social Sciences TAPC-ARI-IK 5001 Eisenhower Avenue Alexandria, VA 22333-5600					10. MONITOR ACRONYM ARI	
					11. MONITOR REPORT NUMBER Study Report 98-07	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.						
13. SUPPLEMENTARY NOTES Contracting Officer's Representative: Dr. Barbara Black						
14. ABSTRACT (Maximum 200 words): Digitization is the future of the Army. However, along with digitization come training and personnel implications. This report discusses training issues associated with digitization, specifically those that address a need to train and maintain back-up along with digital skills. Back-up skills are the individual and collective skills required when digital systems are degraded or unavailable. The study focused on the digital M1A2 Abrams Main Battle training program as an exemplar. Lessons learned about digital and back-up training requirements should be applied in the M2A3 training program. The study investigated issues that are applicable to a wide range of digital applications and training conditions. The study examined individual and collective tasks that support tank operations and found both digital and back-up tasks to be poorly defined, particularly in collective performance. A method for analysis is described and analytic results reported. The study also outlines the current state of training armor and infantry soldiers and the impact that increased digitization may have on training pipelines. The study employed a series of expert groups to define issues and formulate recommendations. These groups included users, developers, researchers, and trainers with a wide spectrum of experience and viewpoints. Expert group results are reported and include 15 primary issues and accompanying recommendations.						
15. SUBJECT TERMS digital, digitization, back-up, infantry, armor, CMF 11, CMF 19, BC 11, BC 12						
16. REPORT Unclassified			17. ABSTRACT Unclassified		18. THIS PAGE Unclassified	
19. LIMITATION OF ABSTRACT Unlimited			20. NUMBER OF PAGES 253		21. RESPONSIBLE PERSON (Name and Telephone Number) Dr. Barbara Black, Contracting Officer's Representative	

Study Report 98-07

Analysis of Emerging Digital and Back-up Training Requirements

Laura A. Ford, Roy Campbell, and Robert Cobb
Human Resources Research Organization

Armored Forces Research Unit
Barbara A. Black, Chief

U.S. Army Research Institute for the Behavioral and Social Sciences
5001 Eisenhower Avenue, Alexandria, Virginia 22333-5600

August 1998

Army Project Number
2O465803D730

Personnel and Training
Analysis Activities

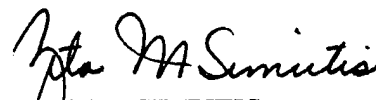
Approved for public release; distribution is unlimited.

FOREWORD

A primary mission of the Armored Forces Research Unit of the United States (U.S.) Army Research Institute for the Behavioral and Social Sciences is to gather and analyze data on training and personnel that will provide the Army with timely information on which to base future planning and policy making. Acting on a request from Headquarters, Department of the Army, this study was sponsored by the Department of the Army's Director of Personnel Technologies (formerly MANPRINT). A Memorandum of Record between the Office of the Deputy Chief of Staff for Personnel, the U.S. Total Army Personnel Command, the Training and Doctrine Command (TRADOC) System Managers for the Bradley Fighting Vehicle System and the Abrams Tank System, and the U.S. Army Research Institute supported this effort. This study was conducted under Science and Technology Task 2135, "Back-up Training Requirements for the Digitized Battlefield."

This Study Report discusses the outcome of an evaluation that examined the impact of digitization on training the force. The study, which focused on digitization from two different perspectives, found that an integral part of training the digital force is the inclusion of back-up training requirements. Back-up skills are the individual and collective skills required when digital systems are degraded or unavailable. One aspect of the study was to examine the overall impact of digitization on the Army. The primary analysis from this perspective addressed the armor and infantry systems and how the impacts of digital and back-up requirements are projected for these communities. The other aspect of the study focused on a specific digital system, the M1A2 Abrams Main Battle Tank. This analysis revealed that digital applications in the M1A2 system are poorly defined, particularly in collective tasks, and that back-up training requirements were not included as an indispensable component of digitization. The study also identified major issues that must be addressed if training and personnel considerations are to balance technological advances that typify digital applications.

In accordance with the Director of Personnel Technology's guidance, the Army can use this report to identify and resolve significant personnel and training issues associated with digitization. Early identification and resolution of these issues is essential to minimize long-term program costs and avoid potential roadblocks to implementation.


ZITA M. SIMUTIS
Technical Director

ANALYSIS OF EMERGING DIGITAL AND BACK-UP TRAINING REQUIREMENTS

EXECUTIVE SUMMARY

Study Requirement:

Acting on a request from the Department of the Army under the sponsorship of the Director of Personnel Technologies, the United States Army Research Institute for the Behavioral and Social Sciences conducted a study to identify the training issues associated with digitization, specifically those that address the need to train and maintain back-up skills along with digital skills. Back-up skills are the individual and collective skills required when digital systems are degraded or unavailable. The study focused on the digital M1A2 Abrams Main Battle training program as an exemplar. Lessons learned about digital and back-up training requirements should be applied in the M2A3 training program.

Procedure:

The study used two approaches to define the issues. The first was to explore the current status of digital and back-up training using the M1A2 and the existing training pipelines. The second was to employ a series of expert groups to identify wider issues dealing with policy and future requirements.

Findings:

The detailed investigation of the M1A2 training system revealed that back-up requirements have not been incorporated into the analysis of digital performance. Moreover, digital performance, particularly at the collective task level, is not fully defined. The study found that only one-third of back-up requirements could be met by applying "conventional" tasks that already exist in the task inventory.

The input and recommendations of the expert groups resulted in the identification of 15 primary issues associated with the digitization of the battlefield. These digital and back-up issues are those that warrant high-level Army attention and are generalizable to a wide range of digital systems.

The examination of the armor and infantry pipelines revealed that, despite drawdowns and distance learning initiatives, the institutional and resident instruction continue to play a significant role in preparing soldiers. The analysis revealed that soldier performance domains are growing. Most instructional blocks already exceed Training and Doctrine Command (TRADOC) recommendations. And this is the situation before any significant digital and back-up requirements have been imposed.

Utilization of Findings:

The purpose of this report is to identify and resolve significant personnel and training issues associated with digitization. There are at least three audiences for this study. First are the decision makers in the Army leadership, such as the Office of the Deputy Chief of Staff for Operations or TRADOC, who must frame and institute policy in skill requirements and training programs. Leadership may use the outcomes to minimize the impact associated with digitization (long-term cost and potential roadblocks for implementation) while ensuring that readiness is maintained. Another report produced for this study, *Issues and Recommendations: Training the Digital Force*, (Campbell, Ford, Shaler & Cobb, in preparation) specifically addresses this first audience. A second audience for the study comprises training developers who must make decisions about skill definitions, training materials and media, and training preparation and support. The third audience consists of combat and force developers: those responsible for compatibility, interoperability, integration, and adherence to standards for Army development.

Results of this study were briefed and provided to the Armor and Infantry schools, and Forces Command (FORSCOM), TRADOC, and the Office of the Deputy Chief of Staff for Personnel.

ANALYSIS OF EMERGING DIGITAL AND BACK-UP TRAINING REQUIREMENTS

CONTENTS

	Page
Chapter 1. Introduction	1
Study Overview	1
Digitized Training Impacts	2
Exemplar Digital System	3
Study Application	4
Study Method	5
Report Organization	6
Chapter 2. Digital Force Training Issues and Recommendations	7
Digital Training Issues Definition Groups	7
Recommendations Group	8
Issues and Recommendations for Digital and Back-Up Training	9
Operational Concepts and Development Issues	9
Institutional Issues	18
Unit Issues	22
Training Pillar Issues	24
Strategic Analysis Issues	25
Summary	28
Chapter 3. Digital and Back-Up Requirements Analysis for the M1A2	31
Defining the Digital Performance Domain	32
Individual Tasks	33
Leader Tasks	33
Crew Tasks	34
Platoon Tasks	34
Platoon Battle Drills	34
Company/Team Tasks	35
Battalion/Task Force Tasks	35
Summary: The M1A2 Digital Domain	36
Performance Type Taxonomy	36
Back-Up Requirements Analysis	37
Back-Up Requirements for Individual Tasks	38
Back-Up Analysis Results for Individual Tasks	43
Back-Up Requirements for Leader, Crew, and Collective Tasks	44
Back-Up Analysis Results for Leader, Crew, and Collective Tasks	47
Summary	48

CONTENTS

	Page
Chapter 4. The Effects of Digital and Back-Up Requirements on the Tank and Mechanized Infantry Training Pipelines.....	51
Effect of Digital and Back-Up Requirements on the Pipeline Models.....	53
Back-Up Training is Not Part of the Digital Model	53
The Pipeline Must Support Many Systems and Many Capabilities	54
The Full Domain of Digital Performance is Not Yet Defined	54
Most Back-Up Requirements Are Not Defined	54
Back-Up Skill Requirements May Double Performance Requirements.....	55
Pipeline Conclusions and Recommendations.....	55
Apply Study Findings to the Tank Pipeline.....	55
Apply Study Method to Other Systems	56
Address New Back-Up Tasks as High Priority	56
Determine the Proper Mix and Sequence for Training Digital and Back-Up Skills	56
Explore Alternatives to the Existing Training Paradigm.....	56
References	59
APPENDIX A. Selected Comments From the Digital Back-Up Training Recommendations Work Group.....	A-1
B. M1A2 Digital Task Domain.....	B-1
C. Digital Descriptions for Individual M1A2 Tasks.....	C-1
D. Back-Up Descriptions for Individual Digital Tasks by Type: Conventional, Repair/Replace System, Workaround.....	D-1
E. Individual Digital Tasks by Performance Type.....	E-1
F. Back-Up Descriptions for Individual Digital Tasks by Performance Type	F-1
G. Performance Types for Leader, Crew, and Collective Digital Tasks.....	G-1
H. Training Pipelines for Tank and Mechanized Infantry Soldiers.....	H-1
I. Acronym List.....	I-1

LIST OF TABLES

Table 1.	Individual Digital Tasks with Conventional Back-Up Requirements.....	39
2.	Examples of Conventional Back-Up Tasks for Digital Tasks	40
3.	Individual Digital Tasks with Workaround Back-Up Requirements.....	41
4.	Individual Digital Tasks with Repair/Replace System Back-Up Requirements.....	42
5.	Number of Individual Digital Tasks in Each Performance Type	43

CONTENTS (continued)

	Page
6. Breakout of Performance Type by Back-Up Requirement Categories	44

LIST OF FIGURES

Figure 1. Study Request Memorandum from the Office of the Deputy Chief of Staff for Personnel.	2
2. The study method used to examine the effects of digitization on digital and back-up training requirements.	6
3. The iterative process for documenting digital training needs and identifying back-up skills for degraded digital tasks and functions.	7
4. Detailed example of back-up training requirements analysis recommended for all digital tasks.	11
5. Increasing system effectiveness.	14
6. Detailed recommendation for facilitating crosstalk and feedback among digital units.	17
7. A model of an exportable tool that allows unit trainers to utilize existing training exercises or tailor exercises according to specific training needs.	21
8. An illustration of how the performance types of a leader task (see Appendix G) are used to facilitate the identification of the supporting individual digital tasks and corresponding back-up requirements (see Appendix F).	46
9. The procedure for identification of back-up requirements for leader, crew, and collective digital tasks.	47
10. Matrix of the most prevalent back-up performance types by echelon.	48

ANALYSIS OF EMERGING DIGITAL AND BACK-UP TRAINING REQUIREMENTS

Chapter 1. Introduction

The United States (U.S.) Army has made a substantial investment and a strong institutional commitment to unleash the emerging power of the microprocessor to provide significant advantages on the battlefield. The areas of command and control, situational awareness, target acquisition and identification, and improved system lethality--all have been affected and influenced by the new found power of the microprocessor. This entire effort has come under the heading of "digitization." Digitization is defined as "the application of information technologies to acquire, exchange, and employ timely battlefield information throughout the entire battlespace" (Army Digitization Office, 1997). The expectation is that by applying digital technologies and the appropriate tactics, situational awareness will increase, decision-making time will decrease, and force efforts will be massed. The impact of digitization will affect the way the Army operates: the way soldiers perform individual and collective tasks, and the way missions are accomplished.

The need to address personnel and training issues as a part of digitization was established by the Department of the Army and articulated by the Director of Personnel Technologies (formerly Manpower and Personnel Integration [MANPRINT]). The focus of the Director's request was the need to acknowledge the requirement to train and maintain conventional skills to back-up degraded digital capabilities while also training digital skills. The Director suggested that the "early identification of issues is essential to minimize long-term program costs and avoid potential roadblocks to implementation" (see Figure 1).

The U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) responded to the DA request by directing that a study be conducted. The study focused on the requirement to train and maintain "back-up" skills, in addition to training and maintaining "digital" skills. Back-up skills are the individual and collective skills required when digital systems are degraded (e.g., using map and compass to determine location when the positioning system cannot) or unavailable (e.g., using analog radio to communicate when digital and nondigital forces are combined). It was established by ARI that the outcome of the study should be the identification of significant digital and back-up training issues along with recommendations or solutions. A separate report, *Issues and Recommendations: Training the Digital Force* (Campbell, Ford, Shaler, & Cobb, in preparation), was prepared to highlight and describe these issues. However, the issues are also discussed in this report.

Study Overview

The scope of the study is expressed in four areas: 1) the impact of digitization on training, 2) the M1A2 as an exemplar in obtaining early estimates of digital and back-up training requirements, 3) the application of findings and discoveries, 4) the method used to conduct the study for its application to other digital systems. Although integrated with other tasks and requirements, identification of these four essential elements helped define the goals, purpose, problems, and approach of the study. This overview is organized into sections that address each area of inquiry. The last section describes the organization of the report.

**(Excerpted Request from Department of Army Personnel Technologies
Director Memorandum)**

ISSUE: Impact of concept for back-up modes of operation for the digitized battlefield.

DESCRIPTION: Digitization of the battlefield will lead to the automation or functional reorganization of many tasks which are currently performed through manual or personnel-intensive means. This will simplify the demands on the individual soldier, but will increase dependency on the system to accomplish a wide variety of tasks. The changes in skill demands associated with this evolution in task structure may have significant implications for personnel skill requirements and for training. However, the need for effective back-up modes of operation may require operators to maintain proficiency in existing methods of task accomplishment. Of concern here is the impact of personnel skill requirements, training pipelines, and proficiency training requirements. Is it reasonable to assume that this wider array of skills can be attained and maintained within the scope of existing resources or must we consider alternative operational or technological solutions?

This analysis would address current and projected task requirements given planned digitization (especially for appliqué-based solutions). These requirements would then be examined and assessed in light of MOS [Military Occupational Specialty] skill demands and training approaches. The results of the analysis would be the basis for recommendations regarding modified skill requirements, training programs, and other solution sets, as required. If the analysis identifies significant issues which require further investigation, follow-up efforts would be pursued to conduct in-depth analyses to resolve them.

IMPACT/BENEFIT: Results of this analysis would provide a systematic basis for identifying and resolving (either through additional research or recommended implementation strategies) significant personnel and training issues associated with digitization. Early identification of these issues is essential to minimize long-term program costs and avoid potential roadblocks to implementation.

Figure 1. Study Request Memorandum from the Office of the Deputy Chief of Staff for Personnel.

Digitized Training Impacts

The introduction of digitization affects both skill requirements and how they are trained and maintained. As with the introduction of any new system, soldiers must be trained to proficiency in order to take best advantage of digital technology. Although digitization will replace many manual tasks with digital tasks and functions, there is still the requirement for soldier-in-the-loop performance. Therefore, the skill requirements for soldiers operating in the digital environment must be determined. Once digital skill requirements are known, soldiers must then acquire and maintain these skills. This is not a small undertaking. Digital skills will encompass tasks ranging from operation of digital devices to application of new tactics, techniques, and procedures (TTP) that incorporate digital capabilities into force employment. But even when all digital skill requirements are identified, soldiers will not be ready to operate successfully in a degraded mode

if back-up skills are not trained and maintained. For the foreseeable future, there are two primary reasons why digital and back-up skills are an integral requirement.

First of all, digital units will be operating with nondigital units, or units of varying digital capabilities, for many years to come. Operations must be conducted and missions accomplished by the forces we have available. While digitization will change and enhance performance in the areas of reporting, navigation, fire distribution, and situational awareness, the conversion to all-digital task forces is not likely in the near future. Soldiers will have to be trained to operate in a mixed-force environment for some time to come. Secondly, technology fails and countermeasures are always present. Therefore, soldiers must be trained to perform tasks both manually (back-up) and digitally. "The soldier must understand why he is pushing a button and what is happening. The manual means of computing fire missions, placing units on overlays, etc., is cumbersome, but a needed skill when the power goes off" (Training and Doctrine Command [TRADOC], 1995, p. 17).

The identification and training of digital and back-up skills have implications on all three of the Army's training pillars: institutional training, unit training, and self-development. Institutional training is any training conducted at and administered by a TRADOC school. Currently, this includes all initial entry training (IET), all components of the noncommissioned officer education system (NCOES) such as the basic and advanced noncommissioned officer courses (BNCOC and ANCOC), all components of the officer education system, and all functional courses which are taught on-site at the schools such as commander's courses, master gunner training, and specialized leader courses. For purposes of this study it included only regularly scheduled courses, not one-time only training such as new equipment training (NET).

Unit training is any training conducted at the unit, utilizing primarily unit resources, and scheduled under unit control. Currently, almost all unit training is directly in support of the operational mission of a given unit.

Self-development training is training or education that individuals initiate and conduct on their own. Traditionally, this has included such activities as reading a book, taking an extension course, or going to college. However, for purposes of this study, we limit self-development to activities directly related to Army job requirements.

So far, digitization has had little impact on these training pillars force-wide. The Army's lead digital units, however, report major impacts on unit training (see Appendix A). As the domain of digital and back-up skill requirements grow and evolve, so too will the pillars have to evolve to keep pace with these dynamic conditions.

Exemplar Digital System

The initial request from Personnel Technologies established a need for identifying and resolving personnel and training issues associated with digitization and, further, that the analyses identify significant issues requiring complex solutions. Implicit in the request was that complex solutions require early identification and subsequently, must be brought to the attention of Army decision makers early in the decision-making process. Although Personnel Technologies did not

limit the problem to a particular digital application, the request recognized the need to identify general back-up requirements to digital skills as an overall concern for the conventional-to-digital transition.

The ARI approach to this study was to identify and examine back-up training issues by utilizing two digitized systems as examples: the M1A2 Abrams Main Battle Tank (MBT), which is a fielded system, and the M2A3 Bradley Fighting Vehicle (BFV), which is a system currently in development with unit fielding scheduled to begin in the year 2000.

Because the M1A2 is a fielded system, a thorough analysis of its training program provided the most logical avenue of investigation. As a digital vehicle which has been through operational testing and evaluation and has been in the hands of troops since mid-1995, there are concerns that have already been explored or uncovered by the M1A2 program. On the contrary, the M2A3 is in its infancy in terms of the system development and training development. Therefore, the M1A2 became the principal system for examination. The M1A2 program was used to identify digital training implications so that methods and lessons learned from this study can be applied to training development issues of the M2A3 and other emerging digital systems.

Study Application

The outcomes that result from the analysis of the M1A2 system can be applied to the M2A3 (Bradley) system. As indicated, the M2A3 is trailing the M1A2 effort by about five years. While it is recognized that there will be many differences between these two systems and their employment on the battlefield, there are also many similarities and we foresee the commonality of many of the training implications. For instance, the documentation of degraded modes of operation and the identification of back-up skills for the M1A2 should identify like concerns and requirements for the M2A3 system. Iterative application of the techniques and findings from the M1A2 phase of the study to the M2A3 serves two purposes. First, it identifies information that can be directly utilized by the community responsible for the M2A3. Second, it allows for the application of the M1A2 methodology and lessons learned to a system that is in an earlier stage of development.

Within the next twenty years, digital systems will proliferate, including reconnaissance, command post, fire support, aircraft, and joint operations systems. Moreover, earlier systems like the M1A2 will be supplemented by digital advances such as the M1A2 System Enhancement Program (SEP) tanks and appliqué-based systems. In other words, the need for application and refinement of this effort will continue. The findings of this study identify training problems that impact the skills and training structure Army-wide and are generalizable to many other digital applications.

The approach to the study involved both the specific (armor and infantry application) and the larger implications, Army-wide, of digitization and changes to training. One of the stated purposes of the effort was to recommend follow-on efforts which require in-depth study or which may have far-reaching training implications. Therefore, in the training arena there are two primary audiences for this study. The first audience is comprised of decision makers in Army

leadership, such as the Office of the Deputy Chief of Staff for Plans or those at the TRADOC level, who must frame and institute policies and changes in skill requirements, training programs, or other solutions. The decision makers at this leadership level may use the outcomes to minimize the impact associated with digitization (long-term cost and potential roadblocks for implementation) while ensuring that readiness is maintained. A separate report, *Issues and Recommendations: Training the Digital Force* (Campbell, Ford, Shaler, & Cobb, in preparation), was prepared for this audience.

The other audience is training developers, most immediately for armor and infantry, who must make decisions about skill definitions, training materials and media, and training preparation and support. The training development audience also includes those individuals responsible for:

- Identifying training requirements (i.e., job, performance and task domains),
- Developing training materials (i.e., doctrine, military training programs, and training support packages), and
- Providing training (institutional, unit, and self-development).

The specific findings documented in this effort may be used to direct the needs assessment for existing training programs or to identify new avenues of study. In addition, the lessons learned from the application of the methodology used in this study may be adapted by those developing training programs for new systems or implementing changes to existing systems as needs arise.

Study Method

As illustrated in Figure 2, the study used a multi-phase approach to investigate the effects of digitization on training: examination of existing program documentation and collection of input from experts.

Defining how digitization affects training the force necessitated an assessment of needs and the capabilities of the existing training base, and the identification of new skill requirements for all levels of performance. The existing armor training base was examined to determine if training has been affected by the addition of digital and back-up requirements. This process included documentation of the present training programs for soldiers and leaders; a thorough review of existing M1A2 digital tasks, both individual and collective; and a determination of the back-up requirements, individual and collective, that are necessary when M1A2 digital systems cannot be fully utilized.

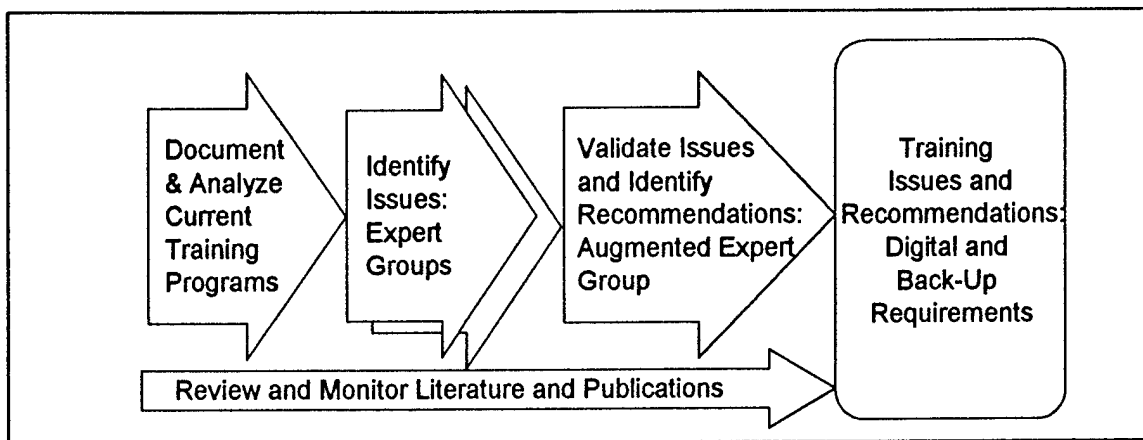


Figure 2. The study method used to examine the effects of digitization on digital and back-up training requirements.

Throughout this study current literature and publications were reviewed. Topics monitored included Army training, future plans (e.g., Army Distance Learning Plan), digital experiments (e.g., Advanced Warfighting Experiment [AWE]), and additional digital system developments. Several issues and problem areas were identified as a result of these reviews.

However, the majority of the discussion points in this report focus on strategic level digital and back-up training issues. These issues were identified in the course of expert group discussions involving individuals who were in positions closely affiliated with training or had experience in digital operations. The method used to elicit input from the expert groups is discussed in detail later in the report.

Report Organization

This report represents the findings of the study. The remaining discussions and data are organized into three main chapters and numerous appendixes:

1. *Digital Force Issues and Recommendations* - a major component of the study was to determine the impact of digitization on training the force. This chapter presents the method used to gather and analyze information and describes the results of the effort.
2. *Digital and Back-Up Requirements Analysis for the M1A2* - describes the method used to examine existing armor tasks for digital and back-up components and presents the results of the analysis.
3. *Effect of Digital and Back-Up Requirements on the Tank and Mechanized Infantry Training Pipelines* - examines the issue of how digitization will affect institutional and unit training components for enlisted, noncommissioned officers (NCOs), and officers.
4. *Appendixes* - presents data from the expert group meetings, data from the digital and back-up task analysis, and summaries of officer and enlisted personnel training programs in a series of appendixes.

Chapter 2. Digital Force Training Issues and Recommendations

The identification of training issues relevant to emerging digital systems was one of the goals of this study. To do this, we initiated an iterative process of issue identification through a series of activities that focused on the identification of existing issues that lead to new avenues of investigation (see Figure 3). Two of the activities are self-explanatory: information was collected, and then analyzed and evaluated. The third activity in this process was to assemble representatives and leaders, with an array of training and operational backgrounds, to participate in a *Digital Training Issues Definition* group. Discussion points, questions, and suggestions from the Issue Definition Groups were used to formulate issue statements that were then researched and analyzed by our staff.

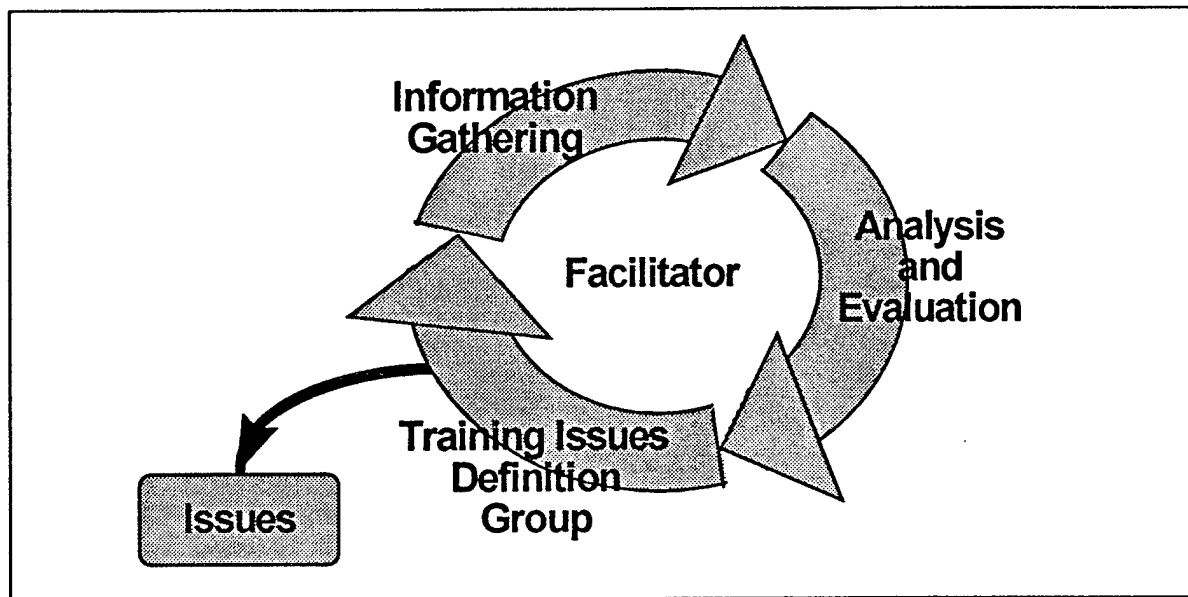


Figure 3. The iterative process for documenting digital training needs and identifying back-up skills for degraded digital tasks and functions.

The experts that were assembled for the group discussion sessions were made up of individuals from military, government and civilian organizations. A retired Army senior officer, knowledgeable of the Army educational system and digital systems, was used to facilitate the group discussions. The facilitator's main role was to lead and encourage representatives from training and digital arenas to identify existing and potential training problems and recommend innovative solutions.

Digital Training Issues Definition Groups

As information from the armor and infantry school was being gathered, it became apparent that there was little documentation available on digital and back-up training. Hence, the group discussion became the main avenue for identifying digital training issues. The expert groups

provided strategic level input from individuals who were in or had recently been in positions closely affiliated with training or digital operations.

Before each group meeting, the facilitator and study staff outlined general areas for discussion and the expected output. The group participants were sent issue topics along with relevant information that had been gathered and analyzed prior to the meeting. The purpose of the initial Digital Training Issues Definition group was threefold: 1) to chronicle undocumented information based on participants' knowledge and experiences with digital training; 2) to define issues at a level appropriate to the attention and focus of the Army leadership; 3) to identify new issues, ones not included in the outline sent to the participants.

The first group met at Fort Knox in November 1996. The participants included experts in areas such as digital training and operations, institutional training, unit training, Army doctrine and trends. Training analysts from the staff recorded the group proceedings and informed the facilitator of areas that warranted further discussion. The result of the first Issue Definition Group meeting was a preliminary list of issue statements. The issue statements were supported by experiential input from the group. The staff analysts then researched the issue areas to ensure that the input was in line with Army training doctrine and policies. Training alternatives were also studied to begin the process of identifying recommendations. Once the issues and possible alternatives had been researched by the staff, a second group was organized to supplement, fortify and validate these issue topics.

The second group met at Fort Benning in April 1997. Again, participants included military and civilian experts in the areas listed above, although their backgrounds were primarily in infantry rather than armor. Participants received "read-ahead" packages that included the issues that had been identified by the Fort Knox Issue Definition Group and an outline of the goals to be accomplished in their discussion group. The Fort Benning meeting was key in identifying issues that would prove to apply to digital systems in general, not just armor.

Recommendations Group

Once digital and back-up issues had been defined a third group of experts was assembled to validate the digital and back-up issues and recommend solutions. This group was similar in composition to the first two groups, representing backgrounds in both armor and infantry operations, digital operations, Army doctrinal matters, and institutional and unit training. Additionally, the group was expanded to include targeted expertise in training technologies, distance learning, skill retention, and learning theory. The group included representatives from TRADOC, the Defense Advanced Research Projects Agency, the U.S. Army Armor Center (USAARMC) and Infantry Center, 1st Cavalry Division, the M1A2 NET team, Force XXI Training Program, the Institute for Defense Analysis, and ARI. Meeting for two days in July 1997, the group discussed each issue and the associated indicators and provided the input used to formulate the recommendations contained in this report.

All of the sessions were tape recorded. In addition, the participants were asked to fill out a workbook that outlined each issue that had been identified in previous group sessions. The issues were accompanied by specific questions that were designed to elicit supplementary input from

these experts. It was believed that some participants would be more likely to address sensitive or controversial training issues in a written format versus a large group setting. The participants were informed that their workbook comments would be used to supplement the study. These written comments are found in Appendix A. Specific comments are not identified by name.

Issues and Recommendations for Digital and Back-Up Training

The issues and recommendations suggested by the groups were researched, synthesized, and refined by the study staff. Fifteen primary issues associated with the digitization of the battlefield were identified. These digital and back-up issues are those that warrant high level Army attention and are generalizable to a wide range of digital systems. The 15 issues were organized into the following categories:

- Operational Concepts and Developmental Issues - addresses six issues arising from the introduction of digitized units into Army operations and the resulting requirement for back-up training.
- Institutional Issues - focuses on two issues facing institutional training as digital and back-up skill requirements emerge.
- Unit Issues - presents two issues regarding units' new role in training the digital Army.
- Training Pillar Issues - addresses two issues that need to be considered as the Army redefines the institutional, unit, and self-development pillars.
- Strategic Analysis Issues - describes three analytic areas associated with digitization that require further analysis.

Each issue is accompanied by specific recommendations. Because the selected issues were complex, most of the recommendations address broad policy decisions. However, the expert groups also recognized the need to make recommendations that could have an immediate discernible impact. Therefore, three examples of detailed, practical recommendations were included.

Operational Concepts and Development Issues

The introduction of additional digitized units into Army operations will have a significant effect on how the Army fights and develops its doctrine and training strategies for many years to come. Much has already been discovered; much more will be learned in the future. One thing is clear: The "old ways" of doing business will not fit in the digital Army. The study identified six particular issues that highlight this area.

The Army has not addressed back-up as a significant training issue. With the introduction of digitization, there has been a tendency to think of changes in training only in terms of how to operate new equipment or software in its fully operational mode. But the requirements need to be expanded to consider back-up skills. Equipment reliability and the prospect of operating with mixed forces dictate that training back-up skills will be a requirement for the foreseeable future. Yet, this is an area currently without a comprehensive training strategy. As capabilities and technologies change, the characteristics of back-up training will also change. For example,

training requirements may well evolve from manual back-up techniques to redundant digital systems.

The Army cannot assume that learning and retraining of back-up tasks will just "be there." Such an assumption is unwarranted. There must exist a coherent training strategy. The problem will be exacerbated as digital systems proliferate and "digital soldiers" become the norm. From their earliest Army training digital soldiers will be oriented to perform in a digital mode, but they may never, in peacetime, widely experience and internalize performance in a non-digitized environment. Consider, for example, the soldier of the not too distant future who is skilled on navigating by satellite but has never had to rely on a topographic map, compass, and terrain association as the basis for navigation. These nondigital skills, if they are deemed important for battlefield success, must be addressed during peacetime training.

Even among soldiers who have learned the back-up modes of performance, but who operate in a digital mode, there is a problem with skill retention and retraining. The back-up skills that soldiers currently have will erode as the requirements are performed with less frequency. One of the participants in the initial digital operations AWE (Desert Hammer) observed: "Our soldiers can learn digital proficiency but require continual emphasis on default proficiency. Soldiers default to their comfort zone in times of high stress" (Edwards, 1995, p. 13).

Recommendation. Digital and back-up training must go hand-in-hand. Back-up analysis must become part of the mindset of decision makers from conceptualization of digital systems through implementation. Back-up consideration must be integrated into:

- Procurement and development processes
- Doctrine development
- Task analysis (individual and collective)--See the example of back-up requirements analysis for the M1A2 in Figure 4
- Training development

Training Requirements Analysis

A methodology was developed to identify the back-up training requirements for soldiers operating in M1A2 units. The process utilized existing tasks that were analyzed to identify:

- Digital performance requirements
- Digital systems used to accomplish the task
- Back-up requirements when digital systems are degraded or cannot be used

By examining aspects of M1A2 digital performance requirements, the performance skills necessary to operate the M1A2 in degraded modes were identified. The following example illustrates an application of the methodology to an individual/crew task.

Individual/Crew--M1A2 Task

171-126-1130 Send and Receive Tactical Reports/Overlays on the Commander's Integrated Display (CID)

Digital performance requirements:

The CID and Intervehicular Information System (IVIS) are used to prepare, send, and receive tactical reports and overlays. The Position Navigation (POSNAV) provides automated grid locations to the reports and overlays.

Digital systems used:^a

X	CID		CITV		GCDP
X	IVIS		DID	X	POSNAV

Back-Up requirements:

If POSNAV is inoperable the reports and overlays can be utilized if the commander manually inputs grid locations. Position can be obtained from the Precision Lightweight Global Positioning System Receiver (PLGR) or another vehicle. If the radios are inoperable digital reports/overlays can be prepared on the CID but cannot be sent digitally nor can they be received. In this case, reports and overlays have to be constructed and sent in conventional manner (paper and acetate). The conventional tasks include:

- 171-121-4051 Prepare a Situation Report/Status Report
- 171-123-4001 Prepare a Platoon Fire Plan
- 171-126-1042 Prepare a Sketch Range Card
- 01-5700.01-0001 Communicate on a Tactical Radio
- 051-196-3009 Prepare a Route Reconnaissance Overlay
- 061-283-1002 Locate a Target by Grid Coordinates
- 071-329-1002 Determine the Grid Coordinates of a Point on a Military Map
- 071-329-1019 Use a Map Overlay
- 081-831-0101 Request Medical Evacuation
- 171-121-4053 Plan an Armor/Scout Platoon Tactical Roadmarch
- 301-348-1050 Report Information of Potential Intelligence Value.

^a Intervehicular Information System (IVIS), Commander's Independent Thermal Viewer (CITV), Driver's Integrated Display (DID), Gunner's Control Display Panel (GCDP), Position Navigation (POSNAV).

Figure 4. Detailed example of back-up training requirements analysis recommended for all digital tasks.

Training development is outpaced by digital systems development. A dominant characteristic of information age technology is how rapidly it changes. Hardware and software are evolving at a pace heretofore unknown in the military equipment and systems acquisition cycle. Colonel Tom Metz from the TRADOC Experimental Force (EXFOR) Coordination Cell stated it most clearly: "In the industrial age you were able to describe an end state, and over a long period of time you were able to achieve it in a very sequential way. In the information age, on the other hand, you don't necessarily know what the end state will be because you're learning so much through the process. We can't decide to buy a system for a 20-year life span because the hardware and software turnover is at 20 times the 20-year life span" (Caldwell, 1997).

The development of training for new systems is currently dependent on the Army Life Cycle Model (LCM), which "... outlines the life cycle of the Army acquisition system and materiel concept investigation, through development and acquisition, until ultimate phase out and disposal. Materiel acquisition initiates training requirements" (DA, 1995a, p. IV-3-3). This acquisition model is based on a series of discrete and sequential steps that culminate with a final, fielded product. Throughout the acquisition process, TRADOC proponents are responsible for ensuring that training developers provide input and that the input is considered early in the acquisition cycle. This process implies a fixed endpoint in acquisition. However, the time-consuming process of "bending metal" is no longer necessary to change the functionality of a system. New software alters system capabilities, and in turn training requirements, in a fraction of the time required to manufacture a system in the industrial age. The fixed endpoint of acquisition is being replaced by one of continuous development. The LCM cannot accommodate the fast-paced, continually changing environment of digital technology.

Compounding compressed development times is the fact that programs that have been put in place to maximize performance of soldier-machine systems, such as MANPRINT, are not always being utilized appropriately. Proponent agency training developers are supposed to "be involved in the training aspects of MANPRINT during systems development" (DA, 1995a, p. IV-3-3). Yet, many times these requirements are waived and compromised for new systems to be developed rapidly on tight budgets.

At least one program has been initiated to speed up the materiel acquisition process. The Warfighter Rapid Acquisition Program (WRAP) was designed to accelerate the acquisition process for new pieces of military equipment that show outstanding performance in experimental settings such as the AWE and Battle Lab activities ("AWE may lead to procurement review," 1997). Accelerated materiel acquisition is needed, but without a concentrated effort to match it with training development, the process will be self-defeating when the equipment reaches the troops.

Recommendations.

1. Critically review and revise the systems acquisition model to ensure it is compatible with the fast-paced, continuous development that is the trademark of information-age technology.

- Maximize creation of contractor, combat development, and training development teams in permanent relationships at the earliest possible point in the procurement process.
- Enforce adherence to existing and new requirements for training and procurement integration.
- Maximize the use of simulation focused on the early identification of training requirements

The Army does not have doctrine for fighting digitized units. The concepts of how to fight digital systems have been slow to evolve. In 1994, Colonel John Johnston, then Director of the Armor School, identified that "our basic fighting doctrine is changing. The fighting formations that we know today, especially in the defense, will likely change because digitization allows for the rapid movement and concentration of forces" (Johnston, 1994, p. 15). Almost four years later, little has been done to define digital fighting doctrine, to include integration of systems, degraded operations, and mixed forces operations.

One conclusion of the expert groups assembled for this study was that doctrinal advances have not been made because the approach has been to retrofit digital operations into current doctrine without considering the full capability or potential of the digital systems. The true exploitation of digital systems will come only when developers rethink how digital systems can significantly increase operational effectiveness. So far, digital "how to fight" doctrine is not keeping pace with the capabilities of the new systems.

The graph in Figure 5 represents the potential increase in weapon system effectiveness with the introduction of doctrine that specifically addresses the capabilities that digital systems afford. Using conventional doctrine for digital systems does little to increase operational effectiveness.

Initial concepts of small unit operations, company and task force, were first put forth in special text and supplemental material publications in December 1995 (U.S. Army Armor School [USAARMS], 1995b) and January 1996 (USAARMS, 1996), respectively. These manuals contain many theoretical generalizations of how units should fight but are short on particulars. Relatively little has been done to update them.

The techniques of fighting in a degraded digital mode (back-up) are also lacking in digital doctrine. An analysis of back-up requirements specifically considered the potential impact of these requirements on collective tasks. Looking at the Army Training and Evaluation Program-Mission Training Plan (ARTEP-MTP) for tank platoon through battalion/task force operations, the study identified back-up implications for all of the ARTEP-MTP tasks. Doctrine writers need to be aware that all collective tasks in the digital domain need to be analyzed for back-up training requirements.

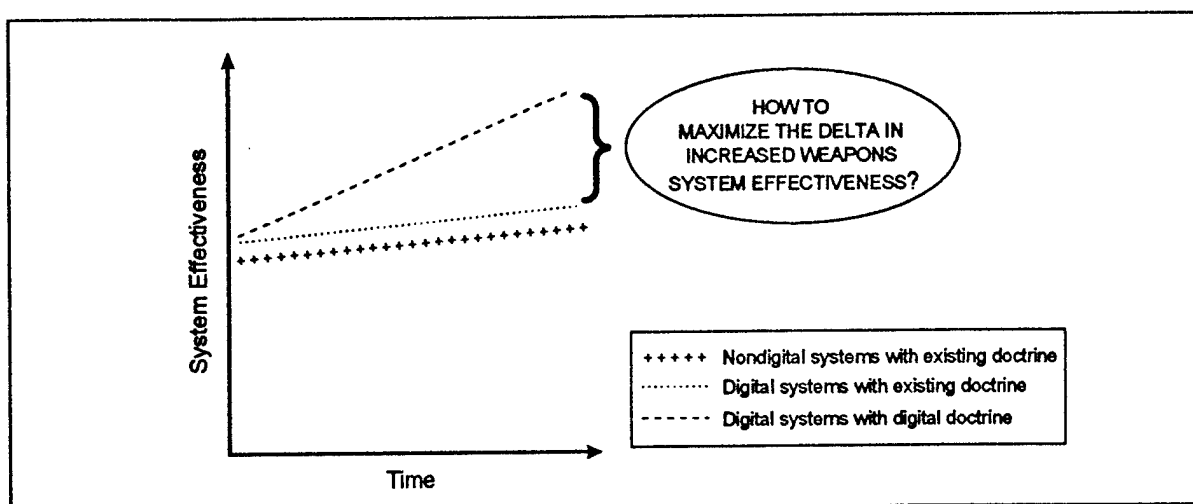


Figure 5: Increasing system effectiveness.

Developers of future doctrine need to consider that digital systems will affect how units fight. Some collective functions may be eliminated and new ones added: virtually all aspects of operations are subject to revision.

Recommendation. To maximize the full capabilities of digital systems:

- Ensure that doctrine development positions are filled by personnel with experience in digital and back-up operations.
- Address the concept of fighting doctrine very early in the acquisition process.
- Increase the use of simulation and simulators to first push the doctrinal envelope, and then to proof fighting doctrine.
- Discipline the existing system to ensure doctrine and training are fielded at the same time as the digital systems.

Doctrine publication cannot keep step with digitization. Despite advances made by making Army publications available over the Internet and by issuing editions on compact disk-read only memory (CD-ROM), the Army publication process is still essentially a paper-based production system. The cited advances speed up distribution but not production. Soldiers must have reliable, accurate, approved, and proven materials with which to work, but the rapidly changing needs of the digital environment cannot be accommodated by today's Army publication model.

The current Army method of conveying information to users has remained essentially unchanged since World War II. It involves a series of technical manuals (TM) for equipment operation, field manuals (FM) for operational guidance, and soldier training publications (STP) for critical task descriptions and individual training guidance. Training support packages (TSPs) have been initiated in recent years to provide exportable materials that integrate training products, materials, and management for accomplishing critical training requirements. The common basis of all of these products is that they must conform to the development requirements of TRADOC Regulation 350-70 (DA, 1995a) which prescribes a very proceduralized life cycle for product development.

All documentation is subject to lengthy production and priority constraints under the Army-wide Doctrinal and Training Literature Program (ADTLP) for printing and product management. The result is less-than-timely literature. For example, the current official version of the ARTEP 71-2 MTP (DA, 1988) carries a publication date of October 1988. The STP, which define the critical skill domains for individual soldiers and their leaders, are equally affected--the STP (DA, 1989) for the 19K armor crewman is dated November 1989.

In the field of digital systems and operations, one year old operating systems are often outdated. In the case of the M1A2, there have been five software "drops" during the period from June 1995 (when the first tank was issued to a using unit) and June 1997. As systems proliferate and integrate, soldiers will be faced with the situation where change will be constant instead of cyclical and forecasted. Training requirements cannot be supported by the existing publication model.

Recommendations.

1. Review and revise the existing model of documentation so that it can effectively and efficiently provide information to users in the digital Army.
2. Increase use of outsourcing, including systems contractors, to expedite the production and delivery of information.
3. Resource and maximize the use of information technologies and electronic media in the development, production, and distribution of information.

Digital units are learning; crosstalk and feedback among units is lagging. The Army's move to digitization is characterized by an increasing variety of systems, each developed and fielded independently. Because of low initial purchases or limited basis of issue, many of these systems are fielded in relatively low numbers. Units that have received new systems have adapted to their capabilities and, in effect, developed a pragmatic doctrine for employment. But this rich source of information is not being used to full advantage.

In mid-1995 the first M1A2 tanks were issued to units at Fort Hood, Texas. Equipment issue was accompanied by a NET but with minimal operational and employment guidance. What followed was a true discovery learning period on the part of M1A2 units. As units experiment and gain experience with digital operations, they discover, and solve, many problems. These learning experiences range from equipment operation to tactics to back-up procedures. While some of these procedures are being incorporated into unit standard operating procedure (SOP), most became just a way of doing business. This knowledge is limited to a core group of mostly junior officers and NCOs. Within units, officer and NCO professional development sessions serve to promulgate solutions. Outside of units, no similar mechanism for capturing this exists. Very few of these procedures, techniques, policies, tasks, and standards have been formalized. Fewer still have found their way back to the proponent institution charged with developing digital and back-up operational guidance.

Experience with the M1A2 is not unique in this regard. Anecdotal information out of the EXFOR AWE indicates many like instances of resourceful officers, NCOs, and operators developing innovative solutions to problems that systems developers did not even know existed. Examples cover the full range of performance such as button-pushing functions, overcoming system failures, and making entire operating systems work more effectively. Such experiences go far beyond the stated purposes of the experiments and beyond the formalized lessons learned that are often the cited outputs from these efforts. However, there is no formal mechanism established to systematically gather, analyze, generalize, and incorporate these experiences into a feedback process to other users. Notably, selected TRADOC schools have recently provided liaison personnel to gain from Fort Hood's digital experience.

Recommendations.

1. Institutionalize and formalize linkages between early fielding units and later fielding units. For example, develop and refine procedures with units fielding the M1A2 and pass the procedures on to units fielding the M2A3.
2. Formalize permanent linkages among units and proponents which will allow cross-feeding of digital operational discoveries. Such a system should provide for:
 - Information flow in and out.
 - Automatic periodic updates and notifications.
 - Universal access by users at all levels.
 - Free, informal information exchange in real time.
 - Monitoring and overwatch.
3. Establish a protected website on the Internet in order to operationalize linkages among units and proponents. A pilot program for such a website is contained in Figure 6.

This pilot program addresses the need for M1A2 tank units and the proponent schools to input and access information on digital and back-up skills. Users will share information and lessons learned in order to maintain the ability to successfully fight the M1A2 under all conditions.

Internet-Based Pilot Program	
This proposed information sharing effort will have wide follow-on applicability to other digital systems throughout the Army. This Army-wide applicability underscores the requirement for the pilot program to be jointly developed by the Armor Center and the Army Training Support Center. Periodic program reviews, with full user representation, will facilitate tailoring the program to fulfill user needs.	
Program Objectives	Operational Aspects
• Provide current, on-demand information about digital and back-up skills to and between M1A2 units and the Armor School. • Demonstrate that this application of Internet-based technology is viable, relevant, and responsive to the needs of the force.	• This website will provide a single point of entry for M1A2 units. • Internet access will be made readily available to all units, and sufficient to enable on-demand access from any location. • Security "firewalls" will be put in place to preclude inadvertent dissemination of classified or sensitive information.
This proposed system will be:	
• Controlled by the U.S. Army Armor Center (to maintain unity of effort). • Based on the utilization of the Internet as the delivery means. This technology will ensure that any computer platform available to M1A2 crews will be able to access and fully utilize the site.^a • Accessible 24 hours/day, 7 days/week. • Maintained by contractor personnel and supervised by an Armor Center proponent. • Focused on the M1A2 tank units stationed at Fort Hood, Texas initially.^b • Linked to other relevant websites; emphasis is on integration of and accessibility to the most current information.	• For safety reasons, the site will contain explicit cautions (e.g., to distinguish between "tips," doctrine, and standard operating procedure (SOP) items from other units). • The website will be a "PULL" site for users seeking information and a "PUSH" site for providing rapid updates to the force on new digital and back-up information (e.g., newly developed tactics, techniques, and procedures (TTPs)). • Direct users to the most effective venues for additional information on digital and/or back-up techniques (e.g., CD-ROM, on-line, and printed publications; on-line interactive sites, etc.). • The website will provide on-line access to subject matter experts (SMEs) and mentors who possess specific expertise.
^a Minimum computer system requirements must be specified, but a wide array of systems are fully compatible with web-based technology. ^b In the near future, the program will be expanded to include Fort Carson, Colorado (coincident with the fielding of the M1A2 Tank to the 3d Armored Cavalry Regiment).	

Figure 6. Detailed recommendation for facilitating crosstalk and feedback among digital units.

Proponent interaction is not effective. The armor and infantry communities are embarked on similar but differently timed efforts in the development and refinement of digital systems for the tank and infantry fighting vehicles. Because of habitual cross attachment requirements, no two systems share more operational commonality than these two. Although the design specifications for the M1A2 and the M2A3 stipulate engineering interoperability, the armor and infantry proponents have been slow to interface and share lessons learned on important aspects of training, how-to-fight doctrine, and back-up requirements.

The problem extends beyond the armor and infantry communities. There is a profusion of digital initiatives in various developmental and operational stages in the areas of fire support, intelligence, command and control, and combat service support. Not only will many of these systems eventually be required to interface, but there are many development, usage, and back-up problems that are being discovered independently and repeatedly.

The stovepipe operation of proponents is not the way to do business. A probable cause of this lack of informal coordination is the reduction in manpower and expertise at the individual proponents. However, it is exactly because of these reductions that it is essential to find an effective solution, without additional personnel demands. There is too much commonality in the digital future to allow stovepipe developments to predominate.

Recommendations.

1. Require formation of working groups of relevant proponent representatives focused on specific, shared issues (e.g., common back-up training requirements, common systems usage, common doctrinal publications).
2. Maximize use of modern information technologies and electronic media to facilitate shared development issues.

Institutional Issues

The system of service schools and proponents that evolved during the 40 years of cold war (and is embodied in the current TRADOC organization) served well a large, industrial age Army with a relatively clear strategic mission. Mainly because of resource constraints, that system is in the process of being dismantled and its mission redefined. What will emerge is not yet clear; much will be driven by changes in other spheres. There are two distinct digital and back-up issues that are identified with the institutional role in training soldiers.

Resident instruction must address digital and back-up training requirements. Just as resources are getting tighter, the Army is faced with increasing training demands generated by the advances in digitization. The transition to digital operations will be characterized by an assortment of digital, part-digital, and non-digital equipment. Rapid changes in technology also compound the institutions' instructional role. Since many institutional courses are traditionally equipment oriented, TRADOC must re-look the way it prepares its soldiers. Teaching multiple systems is an inefficient and expensive approach to the problem. Given that resources, particularly time, are an ever precious commodity, institutions must carefully analyze their missions and capabilities and determine how digital and back-up training will best take place.

The typical approach to specialized training needs has been to add institutional courses that deliver the required training. An example is the 40-hour add-on course for the M1A2 at skill level (SL) 1. While this course has fulfilled a very vital role in preparing soldiers to go to M1A2 units, it may not be the most responsive way to address unit needs for entry level soldiers. And add-on courses for low density systems are not a very cost-effective way to train soldiers. Unit training may be an alternative for all or part of this training.

At the same time, there are roles that only the institution can fulfill. Key aspects of "soldierization" can only be effectively instilled in individuals in the atmosphere of resident instruction. Many simulators and training devices only become cost-effective when they are centralized in high-use locations, rather than when they are dispersed and ineffectively utilized.

Computer skills training and understanding of systems will soon become a fundamental component of being a soldier. There is an underlying assumption that everyone under the age of 25 has these skills, but that may not prove to be the case. Increasingly, the institution may find itself in the role of teaching basic operating skills rather than focusing on equipment specific skills.

Recommendations.

1. Performance requirements for digital systems must be analyzed. Institutions must define the digital and back-up skill training requirements (e.g., examine the sequence and mix of training for digital skills and back-up skills).
2. Institutions must determine *which* soldiers should possess *what* digital and back-up skills. In other words, match skill needs with soldiers' future assignments.
3. Apply high transfer training strategies and procedures for computer literacy and hands-on skills.¹
4. The appropriate training environment (institution, unit, self-development) must be determined for learning the domain of digital and back-up skills. Criteria for making this determination must include such considerations as resources, system densities, skill retention factors, and system upgrade rates.

The institution's current role will be outmoded for the digital Army. Except for imparting soldierization skills at IET and where required by law, the institution is undergoing a fundamental change in its mission. Some of this is being dictated by the realities of budget and downsizing, but much is the result of the changing nature of the Army, typified by the impact of digitization. As the Army incorporates a larger variety of equipment (digital, non-digital, part-digital) into its force mix, the training of specific systems at a central location becomes a less efficient method of producing soldiers with the right skills at the right time. Also, because of the rapidity of systems development and upgrade, the present method of centralized training can only keep a small portion of soldiers current.

¹ Finley, D. L., Sanders, M. G., & Ryan, A. J., III. (1996). Application of training transfer principles in developing the high transfer training (HITT) methodology. Innovations in Education and Training International, 33, 4, pp. 232-239.

However, shifting course requirements from the institution to the unit will not be a simple solution. Units currently face a variety of missions conducted with a variable array of equipment and forces. This dynamic situation is likely to continue. Therefore, the entire concept of training needs to change from course-oriented to mission-based training focused on specific equipment. For example, future training events may need to focus on a specific deployment (e.g., Southwest Asia) for a particular mission (e.g., defense-urban combat) for particular equipment (e.g., SEP-conventional mix). Units will need institutional support and assistance if they are to successfully increase their training load.

Specifically, the requirement is for a wide variety of training tools for both individual and collective training. These tools should reside in "libraries" that can be quickly accessed by units, or can be quickly produced and dispatched to meet a particular training need. Materials must be complete, accurate, timely, and validated as effective. This is a substantial shift from the institution's current role and it cannot be met by simply converting existing courses to an export medium. The requirement is for tailorable training. Institutions will be required to radically rethink the way they do business to meet this need in the near future.

Recommendation. The primary mission of institutions must undergo a fundamental change in order to fulfill digital and back-up training requirements. The institutions must change from conductors of training to exporters of training.

- The training strategy must emphasize the exchange of information between units and the institution.
- Training must be mission-based and focus on specific equipment.
- The training must be developed by the institution (much of it under contract) and then exported to units. The TSP must allow units flexibility in its application. An example of how such training can be developed is detailed in Figure 7.

Commander's Integrated Training Tool (CITT)

The Program Manager and TRADOC Systems Manager for Combined Arms Tactical Trainer are exploring the structure and utility of a Commander's Integrated Training Tool (CITT) for the Close Combat Tactical Trainer (CCTT) simulation system. The CCTT provides combat vehicle simulator modules and workstations to train armor, armored cavalry, and mechanized infantry units. Emerging capabilities of CCTT include conventional and digital simulation elements. With the use of previously developed training support packages (TSPs), units can practice command and control, the decision-making process, and maneuver tasks at the platoon through battalion task force level.

As tools, techniques, and procedures unfold for CCTT training, a method is being developed to provide commanders and other unit trainers a way to effectively utilize these new training resources. The CITT tool should help ensure a proper balance of field and simulation training as prescribed by the Combined Arms Training Strategy (CATS).

CITT Features

The CITT is intended to enable commanders and unit trainers to make optimal use of CCTT. By means of PC-based or Internet-based tools, CITT will assist users in five ways:

- 1** Provide a gateway to CCTT information, including descriptions of CCTT functions and capabilities and access to PC-based training on CCTT workstations and manned modules
- 2** Provide a reference library of available exercises and associated TSPs that contains:
 - Identification of target training audience and specific tasks trained with each exercise
 - Specifications of time and support (personnel) requirements for each exercise
 - Description of the mission and major events contained in each exercise
 - Methods for downloading an appropriately configured TSP for conducting selected exercises
- 3** Provide methods for making modifications to existing exercises and associated TSPs:
 - Make "search-and-replace" changes to tailor unit designations, times, call signs, etc.
 - Assist the user to keep the TSP materials internally consistent by pointing out or flagging components that are affected by changes in locations, sectors, task organization, etc.
- 4** Provide guides and "wizards" to assist users in preparing new exercises and TSPs, with the ability to use selected components of existing TSPs as appropriate
- 5** Provide information to trainers on using CCTT for digital training

Figure 7. A model of an exportable tool that allows unit trainers to utilize existing training exercises or tailor exercises according to specific training needs.

Unit Issues

Units have habitually borne the bulk of the training load along with operational requirements. But the drawdown of forces coupled with ever changing geopolitical strategies and multi-echelon deployments have profoundly affected how units operate. Like institutions, units will have a new training role in the digital Army. Two specific issues are explored.

Units are not prepared for the added training load of digitization. A benefit of digitization is that it will lead to the automation of many tasks which are currently performed through manual or operator-intensive means. This should simplify the demands on the soldier. But that is the future--the transition period will have just the opposite effect. During this extended transition period, the mix of forces and equipment reliability issues will increase the domain of skills that soldiers will need in order to operate. Because of the differences in equipment and the rapid changes in technology, most of this training will fall in the unit sphere. Units traditionally have responsibility for some initial skill training, all sustainment training, and all collective training. That responsibility will not change, but the requirement for digital and back-up skills will alter the complexion of unit training.

Ever since the decentralization in the early 1970's, unit training has been marked by inefficiencies. These include lack of planning skills, insufficient training tools, poor organization of training, improper utilization of personnel, and irrelevant training content. The result is wasted training time. If the units are to pick up additional training requirements in the digital and back-up arena (and this is a foregone conclusion) then such inefficiencies must be identified and eliminated. The entire unit training strategy from the mission essential task list (METL) concept to mandatory classes to training management must be reevaluated and revised.

Shifting more training requirements to units must not be a patchwork approach nor can it be done without full realization of the areas where units are inherently weak. These include the areas of personnel turnover and shortages, lack of training design expertise, difficulty of integrating training with other activities, inexperience in training management, nonstandard and competing missions, and inflexibility in changing from current training models. The Army must accept that unit training loads are going to be increased and must find a way to accomplish this, without relying on a "more of the same" approach.

Recommendations.

1. Determine the most effective and efficient balance between the decentralized model of unit training and a more controlled approach.
2. Realistically appraise the preparation and delivery of unit training. Identify and provide the necessary training tools.
3. Develop more effective training links between units and institutions.

Units need soldier assessment capabilities. In the early 1980s, armor crewmen in SL 1 through 4 were responsible for 200 individual tasks (DA, 1982). In 1996, armor crewmen in the same SL had a task domain of 567 individual tasks (USAARMS, 1995a). Moreover, the earlier

list reflected operation on three different types of tanks while the 1996 list reflected primarily operation on the M1A1 tank. The digital soldier will be faced with an even more complex array of task requirements for digital and back-up operations on an increasingly wider array of equipment. How realistic is it to assume skill mastery on the current list, much less on an expanded and perhaps ill-defined list?

When soldiers are newly assigned to a unit there are generally two widespread approaches to assimilation. The first (often applied to officers and NCOs) is to assume that the soldier is more knowledgeable than he/she actually is. The second (often applied to junior enlisted) is to assume the soldier knows next to nothing. Very often, both approaches will be ongoing simultaneously within a unit. Both approaches are ineffective and inefficient.

Two needs are apparent. First, soldiers need to come to a unit with a profile that reflects their training, equipment and operational experience, and skills inventory and mastery. Old systems such as the Job Books were inaccurate and did not work. New systems such as the Army Company Information System (ACIS) need to reflect more than just formal training records. The profile must be accurate, descriptive, and easy to use and interpret by first level supervisors. Moreover, it must be specifically tailored to meet the expanding digital and back-up domain.

Secondly, units must have a quick, reliable internal assessment tool for digital and back-up skills. The model of the current Tank Crew Gunnery Skills Test (TCGST) is a start point because it is both standardized and current. A similar tool, customized to specific digital systems and operator levels, would provide units the capability for conducting initial and periodic assessments. Such an instrument or set of instruments must be reliable, current, standardized, and easily administered and scored. Unlike the TCGST, it may need to go beyond the assessment of discrete skills. An early experience of working in a digital environment led one Armor leader to observe: "Training with information systems increasingly demands innate intelligence and computer literacy, so that soldiers can accommodate changes, so they can handle rapid operations, and think on their feet. The M1A2 task force will place continuing emphasis on quality training of quality soldiers" (Nowowiejski, 1995, p. 24).

Recommendations.

1. Begin a pilot program that tracks M1A2 crewmen skills. A goal should be to adapt and apply the program to the M2A3. Such a program should:
 - Identify the realm of digital and back-up tasks.
 - Explore technology for recording and transmitting individual skills data.
 - Identify unit needs and uses of information.
 - Track personnel across assignments.
 - Evaluate the effectiveness of a tracking system.
2. Develop and pilot a digital and back-up skills test, based on the M1A2. Evaluate the concept and expand to other digital systems and applications.

Training Pillar Issues

Over the years, the Army training paradigm resulted in three pillars, each supporting an area of training. These included the two predominant areas of institutional training and unit training, and the less emphasized area of self-development training. The three areas will be redefined in the future, with much less distinctiveness. Our examination of digital and back-up requirements identified two training pillar issues that deserve attention.

There is no in-depth plan to integrate the training pillars. A shift of responsibilities and functions between the existing training pillars is a reality of Force XXI training. The Army Distance Learning Plan makes it clear that the goal is to deliver training on-demand, where and when it is needed. The plan states: "The three traditional training pillars (institutional, unit, and self-development training) will merge, placing greater emphasis on unit and self-development training" (DA, para. 1-6, 3 April 1996a). In other words, institutional-based training will decrease and units or learning center settings will pick up the slack. However, each of the existing pillars has fundamental characteristics that typify it. These characteristics must be considered during the development of training strategies and the assignment of responsibilities. A coordinated effort is necessary, otherwise the result may be chaotic.

As institutions cut back on their training, the effect will be a unilateral transfer of training responsibilities. However, there is currently no system in place to ensure that the merging of the pillars will be accomplished multilaterally, effectively, and responsibly. This is a high risk venture; if not properly integrated the outcome could be a breakdown in training of soldiers and units.

Where does the training for digital and back-up requirements fit into this merging training structure? The total impact of digital and back-up training requirements has not yet been fully felt, because digitization currently affects only a small part of the force and because some training requirements are not yet addressed (e.g., back-up requirements). But digital and back-up requirements must be included in any realignment of training responsibilities.

Recommendation. Develop a detailed plan for digital and back-up training that establishes policies and procedures for integrating self-development, unit, and institutional segments of training. Such a plan must:

- Establish authority and responsibility.
- Ensure compatibility between efforts.
- Require that the impact of transferring training from one pillar to another is evaluated.
- Direct that training effectiveness be the primary criteria for allocation of training.
- Maximize the use of electronic media.

There is no comprehensive self-development plan. Self-development is continuously cited as an integral part of the Force XXI training program and is specifically projected as a way for soldiers to acquire and maintain digital and back-up skills. However, the concept is undeveloped. There is no plan detailing how self-development training initiatives will be developed,

implemented, or evaluated. The Army Distance Learning Plan contains few references to self-development. For example, it states that "WARRIOR XXI is the institutional and self-development component of AT XXI" and that the "... (student) group consists of soldiers voluntarily pursuing self-development training and education" (DA, 1996a, paras. 1-9, 2-5). But there is no overarching strategy that specifies how this will work.

Historically, the Army's self-development pillar has not been robust. It consists of primarily independent, proponent-specific correspondence course programs, a reading list for junior officers, and a broad blanket inclusion of civilian education pursuits facilitated by Army endorsements and accessibility. The Army Correspondence Course Program (ACCP) has never been relied on for job skill acquisition and has had a distinct reserve component focus. The ACCP is primarily an adjunct to institutional courses, designed to "help bridge the training gap between resident courses, aiding in sustaining skills/knowledges" (DA, 1995a, p. VI-9-3). This is quite different from the role envisioned in the future where self-development will have a predominant place in acquisition and sustainment of digital and back-up skills.

Until the Army defines the role of self-development and develops a cohesive and comprehensive self-development strategy, any plans to take self-development beyond its current manifestation cannot succeed.

Recommendation. Define a self-development strategy that addresses digital and back-up issues. The strategy must address:

- How the content for self-development training will be determined.
- Who will develop, monitor, and manage self-development programs.
- Where the time for self-development training will come from.
- What incentives will be offered for soldiers to complete self-development programs.
- How digital and back-up skills and knowledge will be evaluated.

Strategic Analysis Issues

Examination of existing digital operations and generalization to a coming digital Army reflects a system that is potentially so pervasive that there is little in the Army that will not be affected by it. The issues run from the simple to the complex. While all issues require more detailed analysis than this study was intended to explore, there were three issues that are, in themselves, predominantly analytic problems.

Training will not solve all digital problems. Currently, the Army has no overall plan for what role training can best fill in the digital and back-up operational scheme. The current study was specifically directed at training and did not focus on non-training issues. But training as a solution will be effective only if applied in conjunction with other solutions and used in those areas where it is most effective. Training is too expensive, too cumbersome, and too unreliable to be the only approach considered.

This study did not address the compendium of non-training solutions. But during the course of pursuing the training issues, some related areas were identified. In the equipment field these include improved system reliability, system redundancy, and substitution of cheap digital systems as a link between full digital and manual back-up capabilities (e.g., precision lightweight global positioning system [GPS] receiver [PLGR]). In the personnel field, non-training solutions include improving personnel selection and classification, and revamping utilization and assignment policies. Finally, in the operational field is the requirement to determine risk assessment and risk tolerance for deferred or delayed training. Training should not be viewed as a sole solution to digital and back-up issues.

Recommendations.

1. Conduct analyses to determine where training is the most effective solution to digital and back-up problems. The role of training must be considered as only one of several possible solutions.
2. Explore other solution sets to be considered as adjuncts to training solutions. They should include the following six areas:
 - How should the personnel selection and classification system be used to match soldiers to digital jobs?
 - How should the personnel assignment system be refined to insure soldiers with digital skills are identified, stabilized, tracked, and assigned?
 - Which digital capabilities should be backed-up with redundant systems rather than with manual back-up skills?
 - What alternative technologies should be developed to replace manual back-up requirements?
 - What risks are acceptable if systems fail and no back-up is available?
 - What operational solutions--for example in changes to unit operations--can back-up digital performance?

Effects of distance learning on the Army are largely unknown. Distance learning has been proposed as the answer to many of the Army's training issues resulting from increasing training demands and decreasing resources. Yet a multitude of unanswered questions exist concerning distance learning and how this relatively untapped mode of training will be implemented. In the Army Distance Learning Plan, the definition of distance learning is "... the delivery of standardized individual, collective, and self-development training to soldiers and units at the right place and right time through the application of multiple means and technologies" (DA, 1996a, p. 1).

How current training will be transferred to distance learning modes remains to be determined. For instance, transferring lecture instruction, paper-based instruction, and hands-on instruction all require different strategies and resources. If distance learning is to become a primary resource for training digital and back-up requirements, then the Army must address some of the issues associated with this training environment. A sample of these questions are:

- What types of skills can be trained via distance learning and what skills must be trained in residence (e.g., cognitive skills, motor skills, psychomotor skills)?
- Who will be responsible for converting existing training programs to distance learning media?
- How will distance learning training be managed?
- Who will maintain the database (i.e., central database or proponent database)?
- How will student participation and evaluation be measured?
- What is the feasibility of updates for different media?
- How will the Army evaluate whether distance learning accommodates different types of learners (e.g., computer literate or not)?
- How will soldiers be motivated to use distance learning?
- How much time does it take to convert existing training materials to distance learning training?
- Is distance learning as effective as conventional training?
- How will updates to the distance learning programs be implemented?

Recommendation. Conduct a thorough assessment of distance learning implications:

- Include pilot trials to determine effectiveness of distance learning for different skills training.
- Establish and enforce the policy that distance learning decisions will be based on demonstrated training effectiveness in meeting standards and on cost savings.

Effects of skill decay on digital and back-up tasks are unknown. A research area with a high potential for payback concerns the skill decay characteristics of military tasks. While there have been some advances made in this area,² there are significant explorations that need to be undertaken. The potential for application is immense: If sustainment and retraining of tasks were based on known factors and conditions of decay and performance, the savings in training efficiencies would be significant ("PRACTICE", 1995, pp. 9-10). Moreover, the impact of skill decay on combat effectiveness and mission accomplishment is incalculable. There is currently inadequate information on which to base a training design for initial learning, sustainment, reinforcement, and retraining of digital and back-up skills.

Back-up skills by their very nature are a unique skill area. By definition they are sporadic, infrequent, isolated, and often occur under circumstances of stress. Even if the back-up task is the same as a manual task, the conditions for back-up performance, including the recognition of when it is necessary, can have a profound effect on recall and sustainment training. Moreover, human skills and modes, such as decision-making and voice communications, may set the

² Wisher, R. A., Sabol, M. A., Sukenik, H. K., & Kern, R. P. (June 1991). *Individual Ready Reserve (IRR) Call-up: Skill Decay* (Research Report 1595). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.

conditions for digital task performance. There is not currently an effective model of this type of behavior that fits the military setting.

Digital skills are a new area for the Army. To start with, there is no definition of digital skills or inventory of proficiencies or knowledges that are expected of soldiers in a digital environment. Anecdotal reports indicate that digital skills may require special treatment. An officer at a National Training Center (NTC) rotation for digital applications observed: "Digital skills are relatively perishable! Crews must practice continually to attain default proficiency" (Edwards, 1995, p.13). However, little empirical evidence has been obtained on learning, sustaining, and forgetting in the conditions under which the Army operates. While the advantages of digital operations are substantial, they can be negated if operator failures are frequent or at critical junctures.

Recommendation.

1. Pursue research to determine skill decay of both digital and back-up tasks with a focus on the operational conditions of employment. Develop models for maintaining proficiency, retraining, and relearning of digital and back-up skills. Skill retention effects should drive future training strategies for digital and back-up training.
2. Extend work on practical guides for retention training³ to digital skills and back-up skills for more efficient training management.

Summary

The effects of digitization are profound. Eventually, many tasks that once were done manually will be done automatically, with greater accuracy, and in a fraction of the time, than was ever envisioned a few years ago. But the move towards digitization is generating new skill demands and, consequently, the need for new training strategies and designs. Early identification of training and personnel issues is essential to ensure that long-term program costs are minimal and roadblocks to implementation of needed changes are avoided. To ensure a viable and productive transition to digitization, the Army must:

- **Develop a back-up training strategy.** Digital and back-up development must go hand in hand. Back-up requirements must be integrated into the process that derives digital training and digital strategies (see Figure 4).
- **Align the systems acquisition model with information age development.** Rapid changes are a trademark of digital technology. The acquisition model, and in particular those parts of it concerned with training identification and development, must match the speed and complexity with which technology evolves.

³ Wisher, R. A., Sabol, M. A., & Ozkaptan, H. R. (May 1996). *Retention of "Peace Support Operations" during Bosnia deployment: A basis for refresher training.* (ARI Special Report). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.

- **Develop digital doctrine to match digital technology.** New doctrine must be in place to guarantee that increases in capabilities are supported by appropriate doctrine. Soldiers must not be required to fight 21st century technology with 20th century doctrine.
- **Ensure that knowledge transfer matches digital developments.** The publications model of providing information to soldiers through TMs, FMs, ARTEP-MTP, etc., must be critically examined and eventually streamlined. The fast-paced changes that are predicted for digital development demand a publication system to match.
- **Improve information to and from the soldiers who make a difference.** Units that field new digital systems are gold mines of "how-to" information. Steps must be taken to institutionalize and formalize direct linkages between early fielding units and later fielding units. A pilot program to explore this should be a high priority to guarantee that a workable system is in place as digital systems proliferate (see Figure 6).
- **Eliminate stovepipe developments.** Digital capabilities cross traditional proponent venues. Where digital interests are shared, a pro-active program must be in place to make sure development efforts do not duplicate work being performed by others.
- **Define the institutional role in training digital skills.** Low density digital equipment and rapid changes in technology make it more difficult for institutions to teach system-specific skills in resident instruction modes. Analysis must identify what institutions should teach and how they should teach it.
- **Require institutions to export their training.** Mixes of digital, part digital, and non-digital forces will need corresponding mixes of training packages for individual, crew, and collective tasks. The demand for tailored training packages to be delivered in units must be met by the institutions (see Figure 7).
- **Improve unit efficiency to prepare for increased training loads brought on by digital and back-up requirements.** Unit training has to become both more effective and efficient to meet increased digital demands. The existing model of unit training must be critically scrutinized and revised to meet digital conditions.
- **Develop management and assessment tools for digital soldiers.** Digital soldiers of the 21st century need to be managed like aircraft crew soldiers of today are. Programs of evaluation, certification, tracking, and utilization need to follow.
- **Devise a plan to integrate the training pillars.** There will be increased mixing of institutional, unit, and self-development training activities. But this must be done carefully and according to a plan that insures the effects on soldiers are known and understood.
- **Develop a self-development strategy.** Self-development training has potential for enhancing the options available in the requirements to train digital skills. It also has some pitfalls. A plan must define how self-development will fit into the overall training scheme.
- **Consider non-training digital solutions.** Training as a solution to digital problems is only practical if considered as one of a range of options. Training must be combined with other solutions to be most effective.

- **Do not lose sight of goals when embracing distance learning as a training option.** Distance learning shows great promise to reduce training costs, standardize training, and increase training availability. But training effectiveness is still the primary criteria.
- **Study skill decay of digital and back-up tasks.** Little is known about skill retention, particularly in the digital area and under the conditions the Army applies digital and back-up skills. More knowledge will allow better informed sustainment and retraining strategies to be developed.

The issues and recommendations presented in this chapter were culled from the analysis of input from expert groups. These global recommendations address decision makers at high levels of Army leadership and apply to the development and utilization of all digital systems. However, the next chapter focuses on a specific digital system, the M1A2. By analyzing the existing task domain for this particular system, estimates of digital and back-up training requirements were determined. Similar application of the method used to examine the M1A2 digital tasks and their corresponding back-up requirements should be useful to armor training developers and training developers of emerging digital platforms, such as the M2A3.

Chapter 3. Digital and Back-Up Requirements Analysis for the M1A2

The digital systems of the M1A2 MBT replace many of the manual processes and procedures of the M1A1 tank. As long as the systems are operational, the skill demands on the individual soldier may be reduced. However, the need for effective *back-up* modes of operation require M1A2 operators to maintain proficiency in applicable conventional skills or learn new hybrid digital skills. Soldiers must maintain back-up skills to sustain fighting capability at those times when digital systems cannot be used (e.g., when digital systems are inoperable or when digital forces interface with nondigital forces). Currently, armor training literature does not address back-up training requirements.

The goal of this analysis was to identify the back-up training requirements for armor soldiers (branch code [BC] 12 and military occupational specialty [MOS] 19K) operating in M1A2 units. Using existing tasks that are defined and published by the Armor School, a method was developed to identify digital and back-up requirements for tasks ranging from individual through battalion-level collective. The method is a multi-phase process in which armor tasks are carefully assessed to determine how tasks can be accomplished utilizing the current digital systems of the M1A2 and conversely, how tasks would be accomplished if the digital capabilities could not be utilized. The application of this assessment process yielded several findings:

- The identification of the digital task domain for the M1A2,
- A taxonomy of performance or skill types associated with M1A2 digital capabilities,
- The identification of back-up requirements for individual and collective digital tasks,
- A classification scheme for back-up requirements,
- Areas of back-up that need further analysis and documentation.

By analyzing the digital aspects of M1A2 performance requirements, it was possible to identify areas of back-up requirements, and in some cases specific back-up tasks, necessary to operate the M1A2 in degraded modes.

The parameters and limitations of the analysis must be noted. First of all, the analysis utilized tasks that have been documented and published in Army training materials. Unfortunately, these tasks do not always reflect the full capabilities of the digital systems on the M1A2 because digitization has occurred and evolved so quickly. This is especially true in the realm of collective tasks. Collective task definitions (task steps and performance measures) tend to address digital capabilities at a global level, if at all. Also, task conditions and standards for M1, M1A1 and M1A2 units are identical even though situational awareness, navigation, and hunter-killer capabilities are far superior in the M1A2. Despite the limitations of existing tasks in terms of addressing these enhanced digital capabilities, the analysis was successful in identifying:

- The types of skills that need to be trained and maintained by digital soldiers,
- Existing tasks that can be used as back-up tasks, and

- Areas of back-up that need further analysis (because no documented tasks exist to describe a substantial amount of back-up performance needs).

Defining the Digital Performance Domain

Armor doctrine generally does not delineate tasks in terms of digital or nondigital performance. Before the requisite back-up requirements could be determined, the first step of the analysis required that the domain of M1A2 tasks relevant to digital performance be identified. The factors that differentiate digital performance (in this case, tasks performed in the M1A2 tank) from nondigital performance (those performed in the M1 or M1A1 tank) had to be identified. An extensive review of documented armor tasks was undertaken. The goal was to identify tasks that could be accomplished using digital systems.

Although M1A2 training is supported by task lists and other training documentation, we discovered that task definitions and related training doctrine (e.g., ARTEPs) that address digitization are in various stages of completeness--individual and crew tasks reference digital performance in more detail than collective tasks. The result was that digital usage had to be inferred for higher level collective tasks while other collective tasks (those addressing staff processes) were eliminated from the analysis because staffs do not operate in the M1A2.

The domain of armor tasks from which "digital tasks" were derived was quite large. It included all individual, leader, crew, and collective tasks for combat organizations from platoon through battalion/task force-level published by the USAARMC. The domain of digital tasks within this larger domain was identified using an expert judgment method that applied digital criteria. A task was designated as "digital" if any of the task steps or performance measures could be accomplished using one or more of the digital systems unique to the M1A2. These systems are:

- Commander's Integrated Display (CID),
- Intervehicular Information System (IVIS),
- Position Navigation (POSNAV) system,
- Commander's Independent Thermal Viewer (CITV),
- Gunner's Control Display Panel (GCDP),
- Driver's Integrated Display (DID).

Tasks *did not* have to have a specific reference to the usage of digital systems in their task steps or performance measures to be included, in fact many tasks made no reference to digital performance. However, if a task could be performed using one or more of these systems, then it was included in the digital domain. In the following sections are descriptions of the doctrinal sources, assessment procedure, and results of the digital assessment procedure.

Individual Tasks

Source. Individual tasks from the *CMF19/BC12 Master Task List* (USAARMS, 1995a) and a draft version of the *Fort Knox Supplemental Manual (FKSM) 17-25 Armor Master Task List* (USAARMC, 1997)⁴ were assessed to determine whether they had digital characteristics.

Assessment procedure. The *Armor Master Task List* (USAARMC, 1997) contains all of the tasks performed by BC12 (armor officer) and career management field (CMF) 19 soldiers. The CMF19 includes the MOS 19D (Cavalry Scout), 19E (Armor Crewman M60-Series), 19K (Armor Crewman M1/M1A1/M1A2), and 19Z (Armor Senior Sergeant). This analysis was limited to BC12 and MOS 19K. Starting with over 1400 task statements, tasks that were exclusively 19D, 19E, or 19Z were eliminated. Subject matter experts (SME), with extensive armor and/or M1A2 experience, conducted a detailed analysis of the remaining tasks. The following criteria were used to designate a task as "digital:"

- The task described procedures specific to operation of a digital system on the M1A2 (e.g., "Operate the CID on the M1A2 Tank").
- The behavior described in the task could be accomplished using one or more of the M1A2 digital systems. For example, reports sent via voice communication in an M1A1 can be sent digitally using the CID and IVIS in the M1A2.

For each task, draft versions of STP were used to review task details included as performance steps and measures (STP 17-19K1-SM [DA, 1996c], STP 17-19K2-SM [DA, 1996d], STP 17-19K3-SM [DA, 1996e], STP 17-19K4-SM [DA, 1996f]). Also, the *M1A2 Operator's Manual* (TM 9-2350-288-10-1 [DA, 1995b]) was used to validate procedural information regarding vehicle operation. With these references, a basic description was written for each task explaining how it could be accomplished digitally.

Results. Fifty-eight individual tasks were identified as digital (see Table B-1). In other words, there are 58 individual tasks that can be accomplished digitally by M1A2 operators. Digital descriptions for each task are provided in Appendix C.

Leader Tasks

Source. In *ARTEP 17-237-10-MTP Mission Training Plan for the Tank Platoon* (DA, 1996b) "leader tasks" are defined as individual tasks that platoon leaders and platoon sergeants perform in association with platoon collective tasks. Leader tasks are identified in Chapter 2 of *ARTEP 17-237-10-MTP*.

Assessment procedure. Analysts used the same criteria that was applied to individual tasks in order to determine which leader tasks were digital.

⁴ The FKSM 17-25 Armor Master Task List (USAARMC, 1997) was finalized and published after the task analysis had been completed.

Results. There were 62 leader tasks that could be accomplished digitally. Of these, 42 tasks are identified as platoon leader or platoon sergeant tasks and 20 were identified as officer tasks (see Table B-2).

Crew Tasks

Source. There are 31 crew tasks listed in the *ARTEP 17-237-10-MTP* (DA, 1996b).

Assessment procedure. In Appendix C of *ARTEP 17-237-10-MTP* (DA, 1996b) crew tasks are crosswalked to individual tasks. For each of these crew tasks, the individual tasks that support them are listed. Using these crosswalks, a crew task was designated as digital if it had one or more individual digital tasks supporting it.

Results. Out of 31 crew tasks, 29 had components that could be accomplished digitally (see Table B-3).

Platoon Tasks

Source. *ARTEP 17-237-10-MTP* (DA, 1996b) identifies 31 platoon-level collective tasks.

Assessment procedure. Collective tasks are made up of many "chunks of behavior": task steps and performance measures. For example in *ARTEP 17-237-10-MTP* (DA, 1996b), Task 17-3-0221: "Execute Actions on Contact" is broken down into nine task steps. Under each task step the performance behavior is defined further, with several performance measures per task step. A task analyst identified platoon tasks as digital by searching for task steps and performance measures that can be performed digitally. Sometimes there are specific references to digital utilization and in other tasks, there is no mention of digital performance. For example, a specific reference is made in a task step of 17-3-0221: "Sends contact report [voice/digital] to the commander." However, in another task (e.g., Task 17-3-2625: "Displace to a Successive/Alternate Position") digital communication is not specifically mentioned but could be used as a means to accomplish one of its performance measures ("Uses FM⁵ voice or visual signals to order the platoon to begin displacement"). Therefore, such tasks were also included in the M1A2 digital domain based on the judgment of an SME.

Results. It was determined that 100% of the 31 platoon tasks listed in the *ARTEP 17-237-10-MTP* (DA, 1996b) have components that could be accomplished digitally (see Table B-4).

Platoon Battle Drills

Source. There are seven platoon battle drills listed in Appendix A of *ARTEP 17-237-10-MTP* (DA, 1996b).

Assessment procedure. The criteria used for identifying digital platoon tasks were also used to identify digital battle drills.

⁵ frequency modulation

Results. It was determined that all of the seven platoon battle drills have digital components. The digital drills are listed in Table B-5.

Company/Team Tasks

Source. The final draft version of *ARTEP 71-1-MTP Mission Training Plan for the Tank and Mechanized Infantry Company and Company Team* (USAARMC, 1998) was used as the source for 39 company/team tasks.

Assessment procedure. The same criteria used for identifying digital platoon tasks and battle drills were used to identify digital company/team tasks.

Results. Of the 39 tasks listed in *ARTEP 71-1-MTP* (USAARMC, 1998), all but one could be accomplished digitally (see Table B-6). Task 71-2-0320: "Infiltrate/Exfiltrate" was not included in the digital domain because the conditions specify dismounted operations.

Battalion/Task Force Tasks

Sources. The primary source used to identify M1A2 tasks at the battalion task force-level was the *ARTEP 71-2-MTP The Tank and Mechanized Infantry Battalion Task Force* (DA, 1988). The Fort Knox Supplemental Manual, *FKSM 71-2-1 The Digitized Battalion Task Force* (USAARMS, 1995b), was also used as a reference for the digitized battalion task force. This manual outlines TTP for digitized units but it does not identify tasks.

Assessment procedure. The current *ARTEP 71-2-MTP* (DA, 1988) was published well before the first M1A2s were fielded. Therefore, none of the battalion tasks address digital capabilities. Also, battalion is the only echelon we examined that utilizes a staff to capture, process, and integrate information for the commander. To date, no digital means of processing information at staff level from M1A2 systems has been fielded. Much of the doctrinal literature that addresses the digitized battalion task force is in developmental stages or is incomplete. For instance, *FKSM 71-2-1* (USAARMS, 1995b) describes the digital battle command system (DBCS) as a lightweight computer unit capable of digital communication with higher or subordinate units and internal communications among the main command post (CP), tactical CP, and combat train CPs. The DBCS is also supposed to be capable of sending and receiving overlays. However, these digital "staff" capabilities are still at the conceptual or experimental stages.

Because there is no clearly defined doctrine from which to infer digital system utilization in the realm of staff processes, battalion tasks addressing staff performance were not considered for inclusion in the digital domain. However, many battalion tasks address maneuver operations that could involve the use of the M1A2 digital systems. Therefore, the criteria used to identify digital tasks specified the use of M1A2 digital systems.

Results. Of the 53 tasks listed in the *ARTEP 71-2-MTP* (DA, 1988), 33 tasks could be accomplished digitally (see Table B-7). For the most part, tasks not considered for inclusion

were those staff tasks associated with command and control (e.g., Operate Main CP, Establish a CP), intelligence (e.g., Perform S2 Operations), air defense (e.g., Perform Air Defense Operations), and combat service support (e.g., Operate Combat Trains CP).

Summary: The M1A2 Digital Domain

The M1A2 digital domain consists of 258 individual, leader, crew and collective tasks. Although the domain will evolve and grow as more is learned and documented about digital capabilities, these 258 tasks represent the current digital task domain for individual through battalion tasks (with the exceptions noted previously). It is highly likely that as users and analysts of the M1A2 discover new ways of accomplishing existing tasks or new ways of fighting and communicating, hybrid digital tasks will emerge and obsolete tasks will be dropped.

Identifying the domain of tasks that can be accomplished digitally was only the first step in completing this analysis. The next step was to identify back-up tasks. It is imperative that M1A2 soldiers are trained to accomplish tasks (at least critical ones) without the capabilities that digitization affords them because M1A2 units will have to interact with nondigital units and will also have to operate in situations when digital systems are degraded. Digital-to-nondigital interaction will be reality for the foreseeable future because the Army's inventory of vehicles, equipment, systems, and devices will contain a variety of capabilities ranging from completely digitized to completely manual. For example, out of the total inventory of approximately 7000 Army tanks in the year 2015, only 1079 will be M1A2 and M1A2 SEP tanks. Therefore, digital soldiers must maintain both digital skills and back-up skills. The probable affects of digitization (including back-up requirements) on the armor training pipeline are discussed in Chapter 4. A detailed inventory of the training pipelines for both armor and infantry is provided in Appendix H.

Once the digital task domain had been identified, it became apparent that specific areas of tank performance were affected by digitization. The recognition that digitization affects specific types of tank performance facilitated the identification of the back-up training requirements.

Performance Type Taxonomy

Digital systems on the M1A2 automate, enhance, or facilitate performance. By analyzing the skills involved in accomplishing the digital tasks, we discovered six basic areas of performance, or "performance type," that are affected by digitization:

1. *Communicate Information* - The exchange of information.
2. *Equipment Operation* - The "button-pushing" procedures used for operating an M1A2 digital system.
3. *Gunnery* - Acquiring and destroying targets with direct fire weapons.
4. *Maintenance (diagnostics only)* - The identification of vehicular faults.
5. *Navigation and Movement* - Locating a point or determining a course to a position and moving to that location.

6. *Situational Awareness* - Seeing and understanding battlefield information (friendly forces, enemy forces, terrain, or environment).

Actually, performance types are the same regardless of whether a task is being performed by a digital unit or nondigital unit. For example, in the M1A1 (nondigital), spot reports (SPOTREP) are sent using voice communication. In an M1A2, SPOTREPs are sent digitally using the IVIS and CID interface. The performance outcome (communication) is the same for both--it is the "how to" that is different.

By developing a taxonomy based on performance type, the identification of the corresponding back-up requirements is simplified--instead of analyzing each task step and performance measure that comprise a collective task and determining whether they are digital or not, it is quicker and less complicated to determine the performance type or types of the task. In other words, if a collective task has a communication requirement, for example, then it has a digital aspect because multiple individual digital tasks for communicating information have already been identified. In turn, the back-up requirements for the individual digital communication tasks were also identified. The specific role that performance type plays in the identification of back-up requirements is discussed in the following sections.

Back-Up Requirements Analysis

To date, the Army has not catalogued any tasks as "digital" or as "back-up." Although tasks exist in Army training materials that can serve as back-up tasks, none have been identified as such. Therefore, one purpose of this back-up requirements analysis was to identify documented tasks that can serve as back-up. Another purpose was to identify those back-up requirements that have not yet been documented.

An essential step in the process of identifying back-up requirements is to determine the circumstances in which they are needed. Digital systems on the M1A2 replace many conventional processes and procedures in the conduct of operational missions either by automating certain procedures or minimizing soldier interface. Intuitively, one might assume that if an M1A2 task cannot be accomplished digitally, then it would be performed the same as it would be in a nondigital tank. However, upon close analysis it was discovered that this back-up assumption is not true for the majority of tasks in the M1A2 digital domain.

If and when a digital system cannot be used, soldiers must find some other method of operation. There are many possible reasons for an M1A2 crew or unit to have to operate in a digitally-degraded mode:

- A digital system is not operating at full design capacity (e.g., digital reports are being received and transmitted too slowly).
- A partial digital failure occurs (e.g., IVIS reports can be received but they cannot be sent).
- A digital system becomes completely inoperable (e.g., a crew loses their POSNAV capability).

- A digital unit must interact with a nondigital unit. Even when all the digital systems in an M1A2 unit are functional, the unit still has to interact with nondigital units (e.g., combat support elements, M1A1 units, M2A2 elements). Hence, when nondigital and digital units operate together (e.g., mixed forces, cross-attached units) the digital units communicate in a nondigital mode--M1A2 units must revert to conventional communications in order to interact with the nondigital units.

An explicit definition for degraded mode was necessary to complete this step of the analysis because for each task in the M1A2 digital domain, a back-up requirement was to be identified and described, based on specific criteria. Unfortunately, little or no data are currently documented which detail the circumstances or probability of system degradation (i.e., Are some M1A2 digital systems more reliable than others?). Nor is there documentation of the levels or permutations of system degradation. For example: What is the probability of the DID and CID failing concurrently versus only the CID? Because these types of questions have not yet been answered, the parameters for operationalizing "degraded mode" were limited. For purposes of this analysis, the degraded mode means--*a digital function is totally inoperable or unavailable*. This definition was applied to whatever digital system grouping was required to accomplish a specific task. For example, if the CID and DID were required to accomplish a particular digital task, then the back-up requirement (degraded mode performance) was determined under the assumption that both the CID and DID were inoperable or unavailable.

Back-Up Requirements for Individual Tasks

Individual tasks are categorized into a single performance type. For instance, an individual task requires one to "communicate information" or "navigate and move" but not both. The scope of behavior addressed in leader tasks and collective tasks is more complex than individual tasks. Leader, crew, and collective tasks almost always fall under numerous performance types. The approach for identifying back-up requirements for individual tasks is described in this section and collective/leader requirements are discussed in the following section.

For every individual task in the digital M1A2 domain, back-up performance requirements were identified. When identifying the back-up requirements for a digital task, an analyst assumed only one condition: whatever digital system or systems are used to accomplish a particular task, the back-up requirements describe how to accomplish the task when the system(s) cannot be used. The back-up requirement descriptions for all of the individual M1A2 digital tasks identified in this analysis are found in Appendix D. Once the back-up requirements were determined, the characteristics of the requirements were grouped by similarity. Three types of back-up requirements resulted: Conventional, Workaround, or Repair/Replace System.

Conventional. "Conventional" back-up tasks are those documented in current Army training literature that can serve as an alternate method to accomplish a digital task when it cannot be performed digitally. The set of digital tasks that were identified as having Conventional back-up tasks are listed in Table 1. Two examples illustrated in Table 2 list the Conventional tasks that are required to back-up the corresponding digital tasks. See Appendix D for a complete listing of Conventional back-up tasks.

Table 1

Individual Digital Tasks with Conventional Back-Up Requirements

Task #	Task title
031-503-3005	Prepare and Send Nuclear, Biological, and Chemical (NBC) 1 Reports
061-283-1002	Locate a Target by Grid Coordinates
061-306-6005	Prepare/Submit Standard Shelling, Mortaring, and Bombing Report
071-326-5705	Establish an Observation Post
171-121-4030	Conduct Vehicle Tactical Navigation
171-121-4063	Supervise Local Security
171-121-4064	Prepare Logistical (LOGSTAT) Report
171-121-4065	Direct Vehicle Tactical Movement
171-122-3005	Engage Targets with the M240 Coax Machine Gun from the Commander's Weapon Station on an M1/M1A1/M1A2 Tank
171-126-1029	Prepare the Gunner's Station for Operation on an M1/M1A1/M1A2 Tank
171-126-1036	Engage Targets with the Main Gun from the Gunner's Station on an M1/M1A1/M1A2
171-126-1042	Prepare a Tank Sketch Card on an M1/M1A1/M1A2 Tank
171-126-1118	Direct Main Gun Misfire Procedures on an M1/M1A1/M1A2
171-126-1130	Send and Receive Tactical Reports/Overlays on the Commander's Integrated Display (CID) on an M1A2 Tank
171-126-1135	Operate the Gunner's Control and Display Panel on an M1A2 Tank
171-126-3001	Establish Silent Watch from an M1/M1A1/M1A2 Tank
171-126-3004	Engage Targets with the Main Gun from the Commander's Station on an M1/M1A1/M1A2 Tank
171-126-3009	Direct Machine Gun Engagements on an M1/M1A1/M1A2 Tank
171-126-3010	Direct Main Gun Engagements on an M1/M1A1/M1A2 Tank

Table 2

Examples of Conventional Back-Up Tasks for Digital Tasks

Digital Task: 171-121-4030	Conduct Vehicle Tactical Navigation
Conventional Back-Up Tasks:	
04-3303.01-0019	Use a Map Overlay
04-3303.02-0037	Navigate While Mounted
061-283-1002	Locate a Target by Grid Coordinates
071-329-1001	Identify Terrain Features on a Map
071-329-1005	Determine a Location on the Ground by Terrain Association
071-329-1011	Orient a Map Using a Compass
071-510-0001	Determine Azimuth Using a Protractor
071-510-0002	Compute Back Azimuths
171-121-4030	Conduct Vehicle Tactical Navigation
171-329-1019	Use a Map Overlay
Digital Task: 061-283-1002	Locate a Target by Grid Coordinates
Conventional Back-Up Task:	
061-283-1002	Locate a Target by Grid Coordinates

An important note is that for many Conventional back-ups, the digital task and the back-up task are one in the same, as in the second task in Table 2. The reason is that the classification of "digital task" was coined for this study. Existing tasks were classified as being digital whether or not there was reference to digital performance in the task description (if a task could be performed using a digital system, then it was included in the domain). Therefore, for a task such as 061-283-1002: "Locate a Target by Grid Coordinates" there is no published digital description⁶ but, its backup task is the conventional performance described in the current soldier manual *17-19K3-SM* (DA, 1996e).

Workaround. For many digital tasks, no documented task exists that would fulfill a back-up requirement. But, for each task in which a documented task or tasks could not be identified, an M1A2 SME described other ways, when feasible, to complete a digital task during system degradation. This was possible because some of the digital systems of the M1A2 have redundant functionality (e.g., waypoints can be entered on the CID when the DID fails). These type of back-up requirements were termed Workarounds.

⁶ The digital performance is described in Appendix C.

Some Workaround procedures are identified in technical manuals but most are not. The M1A2 digital tasks designated as having Workaround back-ups are listed in Table 3. The complete list of Workaround descriptions are found on pages D-8 through D-10 in Appendix D.

Table 3

Individual Digital Tasks with Workaround Back-Up Requirements

Task #	Task Title
171-121-4055	Employ Vehicular/Organic Smoke
171-126-1004	Perform Fuel Transfer Procedures on an M1/M1A1/M1A2 Tank
171-126-1008	Secure the Driver's Station on an M1/M1A1/M1A2 Tank
171-126-1009	Operate the AN/VVS-2 Night Vision Viewer in the Driver's Hatch on an M1/M1A1/M1A2 Tank
171-126-1051	Operate the Night Vision Viewer from the Loader's Hatch on an M1/M1A1/M1A2 Tank
171-126-1060	Prepare an M1/M1A1/M1A2 Tank for Powerpack Removal
171-126-1066	Troubleshoot the Nuclear, Biological, and Chemical (NBC) System
171-126-1067	Place the Nuclear, Biological, and Chemical (NBC) System into Operation on an M1A1/M1A2 Tank
171-126-1108	Perform Gunner's After Operations Checks and Services on an M1/M1A1/M1A2
171-126-1110	Troubleshoot the M1A2 Tank Using the Driver's Control Panel Warning and Caution Messages
171-126-1113	Operate the Commander's Integrated Display (CID) on an M1A2 Tank
171-126-1116	Boresight the Main Gun on an M1A2 Tank
171-126-1138	Perform Built-In-Tests on the Commander's Integrated Display (CID) on an M1A2 Tank
171-126-1139	Perform Diagnostics Mode Maintenance on Commander's Integrated Display (CID) on an M1A2 Tank
171-126-1140	Perform Built-In-Tests (BIT) on the Driver's Integrated Display (DID) on an M1A2 Tank
171-126-1141	Perform Diagnostics Mode Maintenance on Driver's Integrated Display (DID) on an M1A2 Tank
171-126-1143	Operate the Commander's Independent Thermal Viewer (CITV) on an M1A2 Tank
171-126-3003	Secure the Commander's Weapon Station on an M1/M1A1/M1A2 Tank

Repair/Replace system. Redundant functions do not exist for all digital systems. For some tasks, it was determined that a degraded digital system would have to be repaired or replaced in order for the task to be accomplished. For example, if the DID is inoperable on the M1A2, the engine cannot be started, and hence the task 171-126-1142: "Start/Stop the Engine on an M1A2 Tank" cannot be accomplished. The digital M1A2 tasks with these Repair/Replace System back-ups are listed in Table 4.

Table 4

Individual Digital Tasks with Repair/Replace System Back-Up Requirements

Task #	Task Title
171-122-1013	Zero the M240 Coax Machine Gun on an M1/M1A1/M1A2 Tank
171-126-1003	Slave Start an M1/M1A1/M1A2 Tank
171-126-1007	Prepare the Driver's Station for Operation on an M1/M1A1/M1A2 Tank
171-126-1011	Troubleshoot the AN/VVS-2 Night Vision Viewer on an M1/M1A1/M1A2 Tank
171-126-1013	Troubleshoot the Engine on an M1/M1A1/M1A2 Tank
171-126-1014	Troubleshoot the Transmission on an M1/M1A1/M1A2 Tank
171-126-1028	Fire an M250 Grenade Launcher on an M1/M1A1/M1A2 Tank
171-126-1102	Perform Driver's Before Operations Check and Services on an M1/M1A1/M1A2 Tank
171-126-1104	Perform Gunner's Before Operation Checks and Services on an M1/M1A1/M1A2
171-126-1105	Perform Tank Commander's Before Operations Checks and Services on an M1/M1A1/M1A2
171-126-1106	Perform Driver's After Operations Checks and Services on an M1/M1A1/M1A2
171-126-1111	Operate the Driver's Integrated Display (DID) on an M1A2 Tank
171-126-1114	Prepare the Commander's Station (CS) for Operation on an M1A2 Tank
171-126-1115	Troubleshoot the Fire Control System on an M1A2 Tank
171-126-1117	Perform Special Gunnery Checks on an M1A2 Tank
171-126-1136	Drive an M1A2 Tank
171-126-1137	Operate the Personnel Heater on an M1A2 Tank
171-126-1142	Start/Stop the Engine on an M1A2 Tank
171-126-1144	Prepare the Intervehicular System (IVIS) for Operation on the M1A2
171-126-1145	Prepare the Position Navigation System for Operation on an M1A2 Tank
171-131-2083	Perform Plumb and Synchronization on an M1A2 Tank Fire Control System

Back-Up Analysis Results for Individual Tasks

Back-up requirements, whether they have been defined in this study as Conventional, Repair/Replace System, or Workaround, are not documented as back-up tasks in Army training doctrine. In fact, for the majority of digital tasks, no back-up task descriptions exist. Although this analysis discovered that some digital tasks can be backed-up using existing *Armor Master Task List* (USAARMC, 1997) tasks, there are no instructions in these tasks that describes when, why, or how back-up tasks are applied. This report is the only source where specific back-up task information is documented. With that reminder, of the 58 individual tasks in the M1A2 digital domain, 33% have Conventional back-ups, 31% have Workaround back-ups, and 36% have Repair/Replace System back-ups. In other words, with the exception of this report, over two-thirds of digital tasks have no documented descriptions of what back-up behaviors are required (Repair/Replace System and Workaround).

The individual digital tasks were also categorized by performance type (Communicate Information, Equipment Operation, Gunnery, Maintenance [diagnostics only], Navigation and Movement, Situational Awareness). The list of digital tasks, by these categories, is found in Appendix E. The number of tasks in each of these categories is shown in Table 5. The highest number of digital tasks fall into the Equipment Operation and Maintenance categories, which suggests that learning and maintaining the skills necessary to operate and to diagnose problems on the digital systems should be a high priority effort. A substantial number of digital tasks also fall into the Gunnery and Communicate Information categories, with the fewest classified as Navigation and Movement or Situational Awareness. However, the small number of tasks in these last two categories may be misleading. Since the digital systems of the M1A2 provide capabilities not previously available, there may be few existing tasks that describe such performance. For instance, because of the advances in technology, the level of situational awareness that can be attained in the M1A2 (e.g., monitoring friendly vehicle locations beyond line of sight) cannot be approached conventionally in the M1 or M1A1. Therefore, tasks in current training materials probably do not fully describe this performance capability.

Table 5

Number of Individual Digital Tasks in Each Performance Type

Performance Type	# Digital Tasks
Communicate Information	7
Equipment Operation	16
Gunnery	11
Maintenance [Diagnostics only]	16
Navigation and Movement	4
Situational Awareness	4

It is also useful to look at performance types from the perspective of back-up requirements. Recall that the back-up requirements for digital tasks are categorized as Conventional,

Repair/Replace System, or Workaround. In Table 6, the percentage of the three back-up types is shown for each performance area. The performance areas of Communicate Information and Gunnery are supported by mostly conventional back-up requirements. For these categories, the majority of the back-up requirements are conventional tasks. This suggests that the back-up requirements for communicating information (at the individual task level) are documented in the *Armor Master Task List* (USAARMC, 1997) and only limited analysis needs to be done in this area. For example, training developers need to provide the links from digital communication tasks to the existing conventional back-up tasks. The same is true for the performance area of Gunnery.

Table 6

Breakout of Performance Type by Back-Up Requirement Categories

Performance Type	Back-Up Category		
	% Conventional	% Repair/Replace System	% Workaround
Communicate Information	86	14	0
Equipment Operation	6	44	50
Gunnery	73	18	9
Maintenance [diagnostics only]	0	56	44
Navigation and Movement	50	50	0
Situational Awareness	50	0	50

The opposite appears to be true for the other four performance type areas: Equipment Operation, Maintenance, Navigation and Movement, and Situational Awareness. For Equipment Operation, a digital task such as "Operate the DID on an M1A2 Tank" does not have a Conventional back-up task because the task is unique to the M1A2. Based on this analysis, 100% of Maintenance and 94% of the Equipment Operation tasks have Repair/Replace System or Workaround back-up requirements—areas that are undocumented in Army training literature. Therefore, a more extensive analysis must be conducted by training developers to identify and document the steps which need to be taken when Equipment Operation and Maintenance tasks must be performed in a degraded environment.

The level of analysis still needed for Navigation and Movement and Situational Awareness back-up requirements falls somewhere in the middle. Situational Awareness performance is difficult to back-up because the M1A2 technology provides a capability that cannot be easily trained--it allows one to "see" over great distances, in the dark, through smoke, and through cover and concealment. There may be no back-up steps that provide an equivalent capability.

Back-Up Requirements for Leader, Crew, and Collective Tasks

All of the leader and collective tasks in the digital domain were analyzed for performance content. The back-up analysis of collective digital tasks was treated differently from individual

tasks because collective tasks generally include a larger and more complex domain of behavior (some of it digital and some not) than individual tasks. For example, the successful performance of numerous individual tasks is necessary to accomplish the platoon-level task 17-3-2602: "Conduct Deliberate Occupation of a Platoon Battle Position." It has 15 task steps and 78 separate performance measures. At higher echelons, the tasks become even more complex. For battalion/task force-level tasks, numerous individual, leader, crew, platoon and company-level tasks must be performed, along with requirements unique to that particular task (the whole may be greater than the sum of its parts) to successfully accomplish the task. These factors made the identification of back-up requirements more complicated for the leader and collective tasks in the M1A2 digital domain.

To simplify the process, the performance type taxonomy was used to identify supporting digital and back-up requirements for each leader/collective task. Leader/collective tasks are generally characterized by multiple performance types. By identifying the performance types of each leader/collective task, the supporting digital and back-up requirements could be determined. First, through analysis of the behavior described in each task, the performance types were identified. Then, the taxonomy was utilized to determine the digital and back-up requirements that support each collective task. The performance types for the collective tasks are listed in Appendix G. There are separate tables for leader tasks (platoon sergeant/platoon leader in one and officer in another), crew tasks, platoon (one for tasks and another for drills), company/team tasks, and battalion/task force tasks. Appendix F lists the individual digital tasks and their corresponding back-up requirements for each performance type.

Figure 8 illustrates how to identify back-up requirements by linking collective tasks to their supporting individual tasks through the performance type taxonomy using the leader task "Control Techniques of Movement" as an example. This task has the performance types of Communicate Information, Navigation and Movement, and Gunnery. As shown in Figure 8, there are seven digital tasks that comprise the "Communicate Information" performance type. Of these seven, six have conventional back-ups. Our analysis estimated that 21 conventional tasks would have to be trained in order to back-up these six digital tasks. Therefore, the back-up domain for digital tasks is probably as large as or larger than the domain of individual digital tasks. The other digital task, "Prepare the IVIS for Operation on the M1A2," has a Repair/Replace System back-up requirement. As mentioned earlier, at least two-thirds of the back-up domain has not been defined in terms of documented task statements. The indication is that back-up requirements will more than double the number of individual tasks that must be trained to ensure back-up. Furthermore, future analyses may reveal new and unique collective back-up requirements (when collective doctrine catches up with current and projected digital capabilities—see pp. 15-16).

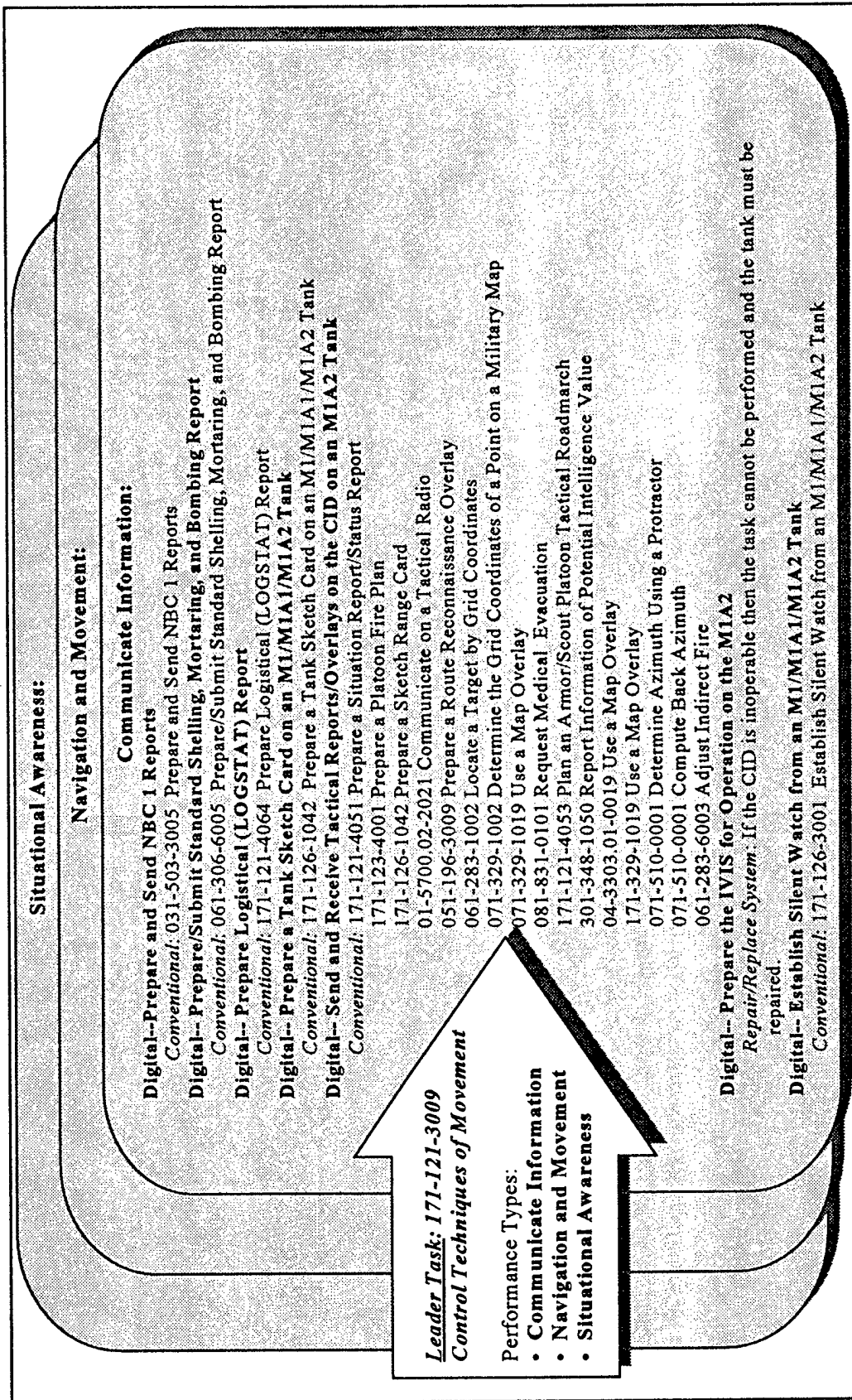


Figure 8. An illustration of how the performance types of a leader task (see Appendix G) are used to facilitate the identification of the supporting individual digital tasks and corresponding back-up requirements (see Appendix F).

Training analysts can use the performance type information provided in Appendixes F and G to identify the back-up requirements for any leader, crew, or collective task in the digital domain. The procedure is explained in Figure 9.

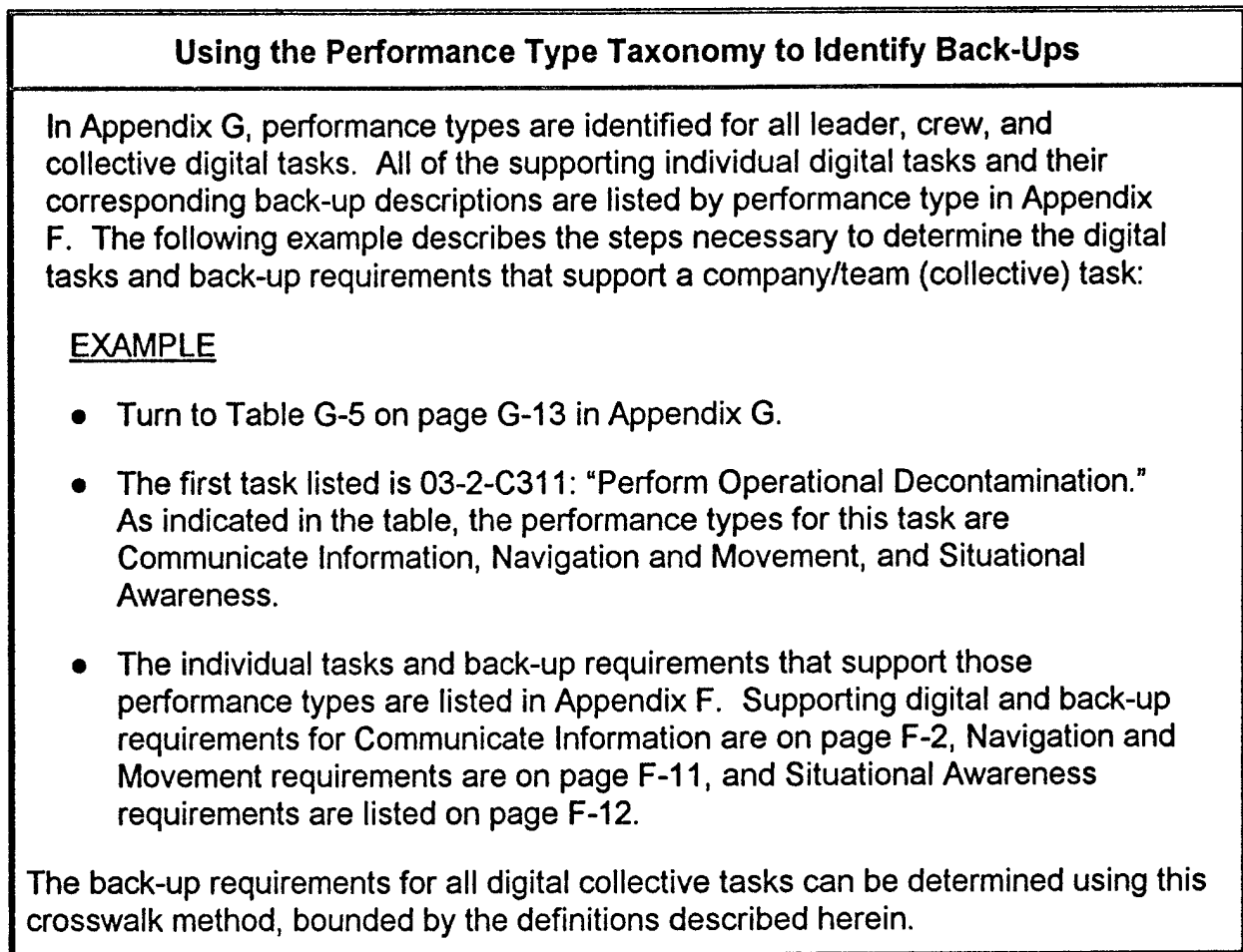


Figure 9. The procedure for identification of back-up requirements for leader, crew, and collective digital tasks.

Back-Up Analysis Results for Leader, Crew, and Collective Tasks

The back-up analysis of collective tasks in the M1A2 digital domain resulted in the identification of the back-up requirements that are necessary for M1A2 crews and units to sustain operations in a degraded environment. Below is a short summary of performance types for leader, crew, and collective tasks, by echelon.

- Of the 62 leader tasks in the digital domain, most of them had elements of Communicate Information, Navigation and Movement, and Situational Awareness. A third of these tasks had Gunnery aspects as well (see Table G-1, in Appendix G).

- Of the 29 digital crew tasks, 15 had elements of Communicate Information. However, a third of the tasks contained Navigation and Movement characteristics and one third addressed Equipment Operation performance (see Table G-2).
- All of the 38 platoon-level tasks and drills (see Tables G-3 and G-4, respectively) have requirements for Situational Awareness. All tasks except one have requirements to Communicate Information. All but three also have Navigation and Movement requirements.
- Of the 38 company-level tasks, all have components of Communicate Information. Thirty-five tasks include Navigation and Movement requirements, 34 have Situational Awareness requirements, and 20 have Gunnery (see Table G-5).
- All of the 33 battalion-level tasks have Communicate Information performance requirements, 28 have Navigation and Movement requirements, 28 have Situational Awareness requirements, and 20 have Gunnery requirements (see Table G-6).

Performance types were deemed “critical” if more than 50% of the tasks at each echelon fell into a specific performance type. The most critical performance types, in terms of back-up requirements, are those associated with communicating information, navigation, and situational awareness. For example, in Table G-2 (Appendix G), performance types are shown for digital crew tasks. Of the 29 crew tasks listed, 15 have the performance type Communicate Information (52%), while 6 have Gunnery (21%). Therefore, Communicate Information is critical at crew level. As seen in Figure 10, performance type criticality was determined at each echelon of tasks.

Performance Type	Echelon				
	Leader	Crew	Platoon	Company	Battalion
Communicate Information	✓	✓	✓	✓	✓
Gunnery				✓	✓
Navigation and Movement	✓		✓	✓	✓
Situational Awareness	✓		✓	✓	✓
Maintenance [diagnostics only]					
Equipment Operation					

Note: The ✓ denotes that the performance type is critical at that echelon. Criticality means that more than 50% of the tasks fell into that performance type area.

Figure 10. Matrix of the most prevalent back-up performance types by echelon.

Summary

This study has concluded that the Army has not yet adequately addressed the fact that soldiers need back-up skills to operate effectively on the battlefield when digital systems are

degraded. Although some work has been started in the documentation of digital armor tasks at individual and crew levels, task analyses at collective levels are still in their infancy. The tasks that do address digitization tend to lack sufficient detail. If digitization affects the situational awareness, speed, and efficiency in which armor units can operate, then tasks, task steps, and performance measures should reflect those capabilities. At present, they do not. Furthermore, no documentation exists for back-up requirements.

However, the present analysis provides M1A2 training developers with a great deal of useful data that can be applied to current training programs at the task level. Two-hundred and fifty eight digital tasks were identified in the M1A2 digital domain (individual through battalion-level). Of these tasks, it was determined that 58 individual tasks form the foundation for most collective digital tasks (see Appendix B). Back-up requirement descriptions for these 58 digital tasks were determined, some more definitively than others. Conventional back-up tasks are those that can be performed through manual or analog means. We identified Conventional tasks in existing doctrine that can serve as back-up for approximately 33% of the digital tasks. Repair/Replace System back-ups describe those tasks that cannot be accomplished until a degraded digital system is put in working order. Workarounds were so named because it was concluded that some digital tasks could be accomplished using redundant systems, when the primary digital systems are degraded (primary digital systems for each individual task are listed in Appendix C).

The majority of the back-up requirements (Workarounds and Repair/Replace System) are not documented in Army training literature, but preliminary descriptions are described herein. Training developers can use the descriptions provided for Repair/Replace System and Workaround back-up requirements in Appendix D to facilitate the production of doctrinal performance descriptions.

Another important finding is that the back-up requirements domain for the M1A2 is at least as large and probably larger than the domain of individual digital tasks. The ramification of this finding is that as the domain of tasks increase, course developers and unit trainers must prioritize time and training efforts so that the most pertinent tasks are trained.

The general findings suggest that the analysis method that was used to identify digital and back-up requirements is a viable one. Although every new digital system must be analyzed extensively to define new training requirements, much can be distilled from existing task definitions, especially for those vehicles (such as the M1A2) that have many of the same capabilities as previous versions (M1A1). Also, the method is not limited to a particular digital system. The main factor in the successful application of the method is for training analysts and subject matter experts to be extremely knowledgeable of digital system operation and employment at multiple echelons. Future training development for the M1A2 should include:

- An update of existing training doctrine identifying relevant tasks as digital or back-up. Back-up requirements for digital tasks should include directions to existing Conventional tasks that can serve as back-up when digital systems are degraded.

- A comprehensive needs assessment and task analysis for those tasks having Repair/Replace System and Workaround back-up requirements. This may also require an analysis of the probability of degraded modes for each digital system or subsystems.
- A risk assessment analysis for training back-up requirements. It is important that data be obtained on which back-up requirements must be trained and which ones can go untrained, based on the needed mission impact if the skill is not trained.

All new digital systems require a thorough task analysis. In addition, analyses must be undertaken to document the requisite back-up training. Future analyses may yield more complex results than this analysis because there are many levels of degradation that still need to be examined. Digital systems become degraded or cannot be used for many reasons: total system failures, partial system failures, enemy interference, mixed units, unit standing operating procedures. Only the first of these was addressed in the present analysis. When these circumstances occur, digital soldiers and digital units must be prepared to sustain fighting capability. Therefore, the skills needed to operate in degraded environments must be trained and maintained.

The integration of digital training has started with the addition of digital add-on courses in the armor training pipeline. The Infantry School has begun preliminary development of digital training as the digital M2A3 is scheduled for fielding in November 2000. However, training developers should not overlook the integration of back-up training into this educational system. The next chapter and Appendix H examines the enlisted and officer training pipelines for both armor and mechanized infantry. Courses that will be most affected by digital and back-up training requirements are identified and suggestions of how to integrate these requirements are discussed.

Chapter 4. The Effects of Digital and Back-Up Requirements on the Tank and Mechanized Infantry Training Pipelines

Soldier training is a combination of institutional (school) training and unit training, augmented by self-initiated training. The system that produces soldiers and leaders is called the *pipeline*. It is a planned, systematic approach to training that has served well in the past. But the demands and opportunities of information age operations require an examination of that pipeline in light of what is known or indicated about digital and back-up skill requirements. Soldier training will have to change to accommodate the digital age. New systems and new capabilities will require new tasks and new doctrine. Because new systems and new capabilities will require new tasks and doctrine, soldier training must change to accommodate the requirements of digitization.

The goal of this chapter is to identify those parts of the pipeline that will be most affected by digital and back-up training requirements, both long term and immediate impact. The tank pipeline will be discussed in the most specific terms because the study's task analysis focused on the effects of the existing digital M1A2. Fort Benning and the Infantry School should consider the discoveries about the M1A2 in light of the emerging requirements to begin developing tasks and training to support the M2A3.

Fort Knox has already incorporated several digital courses into its pipeline, but as the transition from conventional M1A1 tank to the digitized versions (M1A2, M1A2SEP, appliqué) continues, training programs must evolve at an equal pace. Furthermore, back-up requirements must be considered a priority for training. At present, many M1A2 soldiers may have experience in non-digital tanks and therefore may have retained some necessary conventional skills that are exercised when the digital systems are degraded. However, new soldiers may not be trained or have the opportunity to maintain certain conventional tasks such as those associated with navigation, communication, or situational awareness. Moreover, many back-up requirements are not conventional and have yet to be documented.

Detailed descriptions of both the tank and mechanized infantry pipelines are presented in Appendix H. Appendix H serves as a "snapshot" of each pipeline using data from one year to examine institutional and unit training. Based on the findings of the digital and back-up requirements analysis in the previous chapter, and the recommendations in this chapter, training developers and school administrators may find Appendix H useful in pinpointing specific tasks or courses that will most likely need to incorporate digital and back-up requirements.

The tank and mechanized infantry pipelines are separate pipelines but they operate in a similar manner. These similarities are summarized below for enlisted personnel and officers. The enlisted career pipelines consist of the following segments with the following goals:

- Initial entry training. For both tank soldiers and mechanized infantry soldiers, Army basic training and job qualification are combined into one station unit training (OSUT). The goal of OSUT is twofold: To turn civilians into soldiers and to train those soldiers to entry level proficiency to perform their first Army job.

- Primary Leadership Development Course. This training applies to soldiers who intend to make the Army a career. It generally occurs about the fourth year of military service. The goal of the Primary Leadership Development Course (PLDC) is to prepare soldiers to function as junior leaders in the NCO ranks. It is the only training in the tank and the mechanized infantry pipelines that is not job specific; all soldiers in all jobs receive the same training content in their PLDC.
- Basic Noncommissioned Officer Course. The BNCOC training generally occurs at about the sixth year of service. The goal of BNCOC is to prepare junior NCO crew members to be vehicle commanders of either tanks or infantry fighting vehicles.
- Advanced Noncommissioned Officer Course. Attendance at ANCOC will occur about the ninth year of service. The goal of ANCOC is prepare the tank or mechanized infantry vehicle commander to operate as a platoon sergeant of either a tank or a mechanized infantry platoon.

The officer training pipelines have different goals from enlisted but much of the technical content overlaps with what is taught in the enlisted pipelines:

- Precommissioning phase. Officers come from three sources: The Reserve Officers Training Program; the U.S. Army Military Academy (West Point); or from the enlisted ranks via direct commission or through Officer Candidate School. In all cases however, prior to being commissioned, they receive both acclimatization as soldiers and training in basic common military skillcraft tasks.
- Officer Basic Course. The first branch specific training the officer receives is at Officer Basic Course (OBC), generally attended immediately after reporting on active duty. The goal of OBC is to train second lieutenants to be platoon leaders. Unlike enlisted soldiers, officers are initially trained for a wider variety of assignments within their branch. Armor officers receive general training in both cavalry and tank platoon operations. Infantry officers receive general training in both mechanized and non-mechanized platoon operations. More specialized training based on initial assignments is then conducted in modular training as part of, or as an adjunct to, the OBC.
- Officer Advanced Course. At about the fourth year of service, active duty officers attend an Officer Advanced Course (OAC) course to prepare them for future assignments. The goal of OAC training is to prepare these officers to serve as company commanders of armor or infantry companies and to serve as battle captains on staffs at battalion and brigade level.

These formalized institutional training events are interspersed during assignment, duties, and training within tank or within mechanized infantry units. The importance of the training received in units cannot be overemphasized. It is in the unit that the soldier learns to apply the skills acquired in institutional training in a collective context. Units are also responsible for training a large number of skills not included or trained to standard in the institutional setting, and for sustaining all skills, no matter where they were initially acquired.

Also operating as part of the pipelines are a series of *functional courses*. Functional courses (which are institutional-based) are designed to provide training on subjects or skills that are not included in the "regular" pipeline. That is, only selected or designated soldiers attend the functional courses. Functional courses are significant when considering digital impacts because they are the means currently being used to conduct formalized training for tank soldiers passing through Fort Knox en route to M1A2 units. There are three primary functional courses currently in place to train M1A2 soldiers: an M1A2 add-on to OSUT; an M1A2 Tank Commanders Certification Course; and an M1A2 Master Gunner Transition Course. No similar situation exists at Fort Benning because the digital requirement has not yet been defined due to the later production schedule of the M2A3. However, a functional course--the Bradley Leaders Course--is in place and will likely be used for formalized M2A3 training when it becomes appropriate. Detailed discussions of these and other pertinent tank and mechanized infantry functional courses are included in Appendix H.

Effect of Digital and Back-Up Requirements on the Pipeline Models

The pipelines outlined above and detailed in Appendix H are not static. They are constantly adjusted (as exemplified by the M1A2 functional courses) to accommodate changes in equipment, missions, personnel, and procedures. Yet in the last 20 plus years, most changes have been comparatively minor. The discoveries and conclusions of this study are that the effects of digitization on the pipeline over the next 20 years are potentially major. To be sure, not all of these effects are yet fully understood and full implications will require more detailed analysis. However, the following challenges identified in this study must be addressed by those responsible for the tank and mechanized infantry pipelines.

Back-Up Training is Not Part of the Digital Model

Repeatedly, this study identified that there exists no recognition of back-up either as a performance requirement or a training requirement. Moreover, there is no requirement to perform back-up analysis as part of the process for determining digital performance. Some of the reasons for this are understandable, including the fact that the full realm of digital operations is still being discovered. However, one of the main reasons for this lack in the area of M1A2 analysis appears to be that the vast majority of M1A2 personnel to date have come to digital operations with a solid background in conventional tank operations. That will not always be the case in tank operations and will certainly not be the situation in M2A3 operations where crew members often convert from light infantry jobs to mechanized infantry at the E-5 and E-6 level.

This current period where soldiers transition from old systems to digital systems in units is also supported by NET teams. The pipelines must prepare for the time when fewer soldiers have conventional backgrounds and there are no NET teams to train units. Heretofore, concentration has only been on identifying digital requirements; no M1A2 functional course includes integration of back-up requirements. Back-up skills training will not work if it is done with a patchwork approach to fixing problems as they arise. The model approach is where digital and back-up are part of the same equation. In future training applications, back-up to digital will only have meaning if it is learned in conjunction with digital. The pipelines of the future will not be able to rely on conventional skills to just "be there."

The Pipeline Must Support Many Systems and Many Capabilities

If the Army had a fixed future date to go “all digital,” the impact on the training pipelines would be fairly clear and predictable. Such, of course, is not the case. The “Tank and Mechanized Infantry Weapon Systems” section on page H-6 discusses in detail the mix of embedded digital, appliqué digital, and non-digital systems that will typify the tank and mechanized infantry pipelines at least until 2015. Moreover, these systems will be phased in; each year the requirements will change.

Digital is also typified by the capacity to change rapidly through modifications to software. Although digital training may become a combination of system-specific and core digital skills training, the requirement to adapt to the latest in software drops must still be accounted for someplace in the pipeline. Rapid digital developments, for example in the area of systems reliability, will also affect the back-up requirements for digital performance. The end result is that the pipelines must support a mix of requirements of unprecedented complexity. Some of these requirements will be institutional; some will be unit; some will be self-development.

The Full Domain of Digital Performance is Not Yet Defined

As identified in the issues presented in Chapter 2 and in the study group workbook responses in Appendix A, the full capabilities of digital performance have not yet been incorporated into doctrine. Even digital performance that has been adopted into M1A2 units has not been translated into instructional pipeline requirements. Operational procedures are still being defined and many tasks, particularly collective and warfighting tasks, are yet to be documented.

Observations from expert group participants about the lack of digital doctrine were reinforced by the analysis of the existing M1A2 tasks. Primary focus for existing digital tasks is on the operation of the digital components of the tank (switchology). The result is that significant gaps exist in all levels of collective performance. As knowledge about digital functionality increases, the domain of digital-specific performance requirements will likewise increase. The content and coverage of the pipeline courses must correspondingly increase.

Most Back-Up Requirements Are Not Defined

It was hypothesized going into this study that almost all back-up requirements would consist of existing conventional tasks. That presumption was not supported based on the analysis of existing M1A2 tasks. Only 33% of the digital requirements can be backed-up by existing conventional tasks. The remaining 67% of the digital tasks require either a workaround (e.g., using a redundant digital system) or a system repair in order to back-up the digital performance.

It is important to point out that the procedures to accomplish workarounds or repairs are not specified. In other words, two-thirds of the back-up requirements for the M1A2 are not yet determined. Moreover, the study made some very restrictive assumptions (such as total system failure versus partial system degradation) and explored only existing, documented tasks. Different degradation assumptions may increase these requirements manifoldly.

Back-Up Skill Requirements May Double Performance Requirements

The M1A2 analysis identified more than 250 existing individual, crew, leader, and collective tasks that can be performed digitally. Further, the analysis identified that each digital task has one or more back-up behaviors associated with it. While there is some redundancy in both digital and back-up coverage, nonetheless the potential exists to vastly increase the training requirements in the pipelines.

This increase comes to existing pipelines that are currently fully loaded with requirements. The individual task list for mechanized infantry soldiers is at 465 tasks while the list for tank soldiers is at 565 tasks. The existing institutional courses where many of these tasks are learned already exceed the standard TRADOC specified 40 hour week for instructional hours between 10% and 150%. Moreover, there is increasing emphasis on reducing traditional institutional courses.

The model used for meeting training requirements for the M1A2 has been through add-on or functional courses. However, the increase in M1A2 training load requirements has been very gradual, starting at about 200 soldiers annually at the OSUT level. Add-on courses may not be as efficient when the annual M1A2 OSUT requirement approaches 600 as projected. Nor may an add-on functional model support the M2A3 which is being fielded at twice the rate of the M1A2 and which affects many more soldiers. Moreover, current digital functional courses do not include the back-up training requirement

Pipeline Conclusions and Recommendations

As one can gather from the data presented in this study, the training requirements brought on by digitization are rapidly increasing the demands of preparing the soldier to operate in this new environment. Strategies for reacting to these changes must evolve rapidly too. Of the challenges identified above, several will require long term solutions based on continued analysis and discovery. But there are actions that training developers can take now pending resolution of the more complex issues. The following sections summarize the steps training developers should pursue in approaching these challenges.

Apply Study Findings to the Tank Pipeline

The information in this study can be directly applied to existing tank training courses to identify the impact that adding digital and back-up skills requirements training will have on those courses. This is a two step process. Step one starts with the 58 individual and 200 leader, crew, and collective tasks that constitute the M1A2 digital domain. Using this list (as detailed in Appendix B), developers can compare with the tasks contained in course content lists to identify the effect that teaching the M1A2 will have on any given course. Tasks that match are potential candidates for M1A2 instruction.

Step two is to determine the back-up requirements for these tasks. This is done by following the procedure outlined in Figure 9. It is essential that both steps be performed. Back-up

requirements must be considered an integral part of the analysis process and all back-up requirements are potential training additions to the pipeline.

Apply Study Method to Other Systems

The M1A2 digital and back-up requirements list is not directly applicable to the M2A3, appliqué, or other systems that are under development and that will be included in the pipelines. But the method is. Replication of the method may require adjustments in the assumptions and parameters used in this study to fit the capabilities of the other systems. For example, appliqué may not have a vehicle diagnostic component. The performance type taxonomy detailed in the preceding analysis chapter should serve as the start point for applying the analysis method to other systems.

Address New Back-Up Tasks as High Priority

The study analysis determined that two-thirds of back-up requirements have no specified procedures. Highest priority development should be directed to identifying and documenting these requirements. As pointed out in Chapter 2 and Appendix A many of these procedures may have been identified in the Fort Hood M1A2 units, but the developers responsible for the pipeline have not yet incorporated them into their doctrine. Training developers responsible for including the M2A3, appliqué, and other systems into the pipelines need to address this requirement before fielding, not after.

Determine the Proper Mix and Sequence for Training Digital and Back-Up Skills

Back-up is a critical concept but soldiers who will be operating on digital systems need to be well grounded in digital operations in order to properly apply back-up procedures. Digital-based behavior must be inculcated so that it is automatic; soldiers should go to back-up only because there is no choice. Back-up procedures should not be learned as an option to digital operations. Soldiers must learn and apply back-up skills in a digital setting, otherwise it is not back-up. Even the conventional tasks that support back-up degraded M1A2 operations need to be learned in a digital context. Empirical examination is necessary to determine instructional sequencing of digital and back-up behaviors.

Although most back-up procedures will need to be taught in conjunction with digital procedures, some study respondents with experience in digital operations advocate assigning some back-up training as a unit responsibility (see Appendix A). Learning back-up procedures needs to be acquired in a context of soldiers operating digitally, not by "conventional" soldiers who happen to be operating in a digital environment.

Explore Alternatives to the Existing Training Paradigm

The challenges of digital and back-up training are formidable. Innovative ways must be explored and developed to meet them. This study spent considerable focus on this facet and Appendix A contains many thought-provoking ideas. Much of the consensus is to meet 21st

century requirements with 21st century capabilities. Some of the training approaches suggested include:

- Increased reliance on distance learning particularly for back-up skills and rapidly changing digital performance requirements.
- Use of the Internet and home pages to augment dissemination of digital and back-up skills performance information.
- Embedded operational training as part of digital equipment and software for both digital and back-up performance.
- Emphasis on reversing current problems to better utilize training time and resources by improving training management, materials, content, and preparation in both institutional and unit training.
- Streamline the process to better integrate the three training pillars of institutional, unit, and self-development training.

Not all of the areas identified by the expert groups concentrated on training solutions as the desired approach to digital and back-up skills. A sample of the non-training solutions suggested are:

- Conduct of risk assessment studies to determine the consequences of not training all back-up skills.
- Engineering of redundant systems to decrease the need for back-up skills.
- Increasing the reliability of digital systems.
- Changing the soldier classification and assignment system to improve utilization of soldiers who are trained in digital operations.

This study has documented a number of issues and solutions in the major areas of strategic training approaches, institutional training, unit training, the training pillars, and operational training concepts as they apply to digital and back-up requirements. Some of what is identified may be beyond the reach of the individual training developer to implement, but most are not beyond the capability to explore, adapt, and support within his or her own sphere.

References

- Army Digitization Office (September 1997). ADO Home Page [On-line], Available: <http://www.ado.army.mil/smrbook/sbgif2.htm>.
- "AWE may lead to procurement review" (1997). Jane's Military Exercise & Training Monitor, January-March, p. 4.
- Caldwell, J. (March 4, 1997). Release No.: 97-03-02, Ft Monroe, VA: TRADOC News Service.
- Campbell, R., Ford, L. A., Shaler, M., & Cobb, R. (in preparation). Issues and Recommendations: Training the Digital Force (ARI Special Report). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.
- Department of the Army (1982). FM 17-19E1/2/3/4: M48-M60 Armor Crewman Soldier's Manual. Washington, DC: U.S. Government Printing Office.
- Department of the Army (1988). ARTEP 71-2-MTP The Tank and Mechanized Infantry Battalion Task Force. Washington, DC: U.S. Government Printing Office.
- Department of the Army (1989). STP 17-19K1-SM Soldier's Manual, M1/M1A1 Abrams Armor Crewman, MOS 19K (Skill Level 1). Washington, DC: Headquarters.
- Department of the Army (1995a). TRADOC Regulation 350-70 Training Development Management, Process, and Products. Fort Monroe, VA: Headquarters, U.S. Army Training and Doctrine Command.
- Department of the Army (1995b). TM 9-2350-288-10-1 Operator's Manual for Tank Combat, Full-Track: 120-mm Gun, M1A2 (2350-01-328-5964) General Abrams. Washington, DC: Headquarters.
- Department of the Army (1996a). Army Distance Learning Plan. Fort Monroe, Virginia: Training Development and Analysis Directorate.
- Department of the Army (1996b). ARTEP 17-237-10-MTP Mission Training Plan for the Tank Platoon. Washington, DC: U.S. Government Printing Office.
- Department of the Army (1996c). STP 17-19K1-SM Soldier's Manual and Training Guide: 19K M1/M1A1/M1A2 Abrams Armor Crewman (Skill Level 1) (draft). Washington, DC: Headquarters.
- Department of the Army (1996d). STP 17-19K2-SM Soldier's Manual and Training Guide: 19K M1/M1A1/M1A2 Abrams Armor Crewman (Skill Level 2) (draft). Washington, DC: Headquarters.

- Department of the Army (1996e). STP 17-19K3-SM Soldier's Manual and Training Guide: 19K M1/M1A1/M1A2 Abrams Armor Crewman (Skill Level 3), (draft). Washington, DC: Headquarters.
- Department of the Army. (1996f). STP 17-19K4-SM Soldier's Manual and Training Guide: 19K M1/M1A1/M1A2 Abrams Armor Crewman (Skill Level 4), (draft). Washington, DC: Headquarters.
- Edwards, O. T, III. (1995). Digital battlefield training and insights of a user (NTC Rotation 94-07), Armor, May-June, p. 13.
- Finley, D. L., Sanders, M. G., & Ryan, A. J., III. (1996). Application of training transfer principles in developing the high transfer training (HITT) methodology. Innovations in Education and Training International, 33, 4, pp. 232-239.
- Johnston, J. C. (1994). The journey to Force XXI's mounted component, Armor, March-April, p. 15.
- Nowowiejski, D. A. (1995). Achieving digital destruction: Challenges for the M1A2 task force, Armor, January-February, p 24.
- "PRACTICE: The Foundation of Training." (Spring 1995). ARI Newsletter, pp. 9-10.
- Training and Doctrine Command. (1995). WARRIOR XXI, (draft version II). p. 17.
- U.S. Army Armor Center. (1997). Armor Master Task List, (draft). Fort Knox, Kentucky.
- U.S. Army Armor Center & School. (1998). ARTEP 71-1-MTP Mission Training Plan for the Tank and Mechanized Infantry Company and Company Team, (draft). Fort Knox, Kentucky.
- U.S. Army Armor School. (1995a). CMF19/BC12 Master Task List. Fort Knox, Kentucky: Headquarters, U.S. Army Armor School.
- U.S. Army Armor School. (1995b). FKSM 71-2-1 The Digitized Battalion Task Force. Fort Knox, Kentucky.
- U.S. Army Armor School. (1996). ST 71-1-1 Tactics, Techniques, and Procedures for the Digitized Company Team, Fort Knox, Kentucky.
- Wisher, R. A., Sabol, M. A., Sukenik, H. K., & Kern, R. P. (1991). Individual ready reserve (IRR) call-up: Skill decay (Research Report 1595). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.

Wisher, R. A., Sabol, M. & Ozkaptan, H. R. (May 1996). Retention of "Peace Support Operations" during Bosnia deployment: A basis for refresher training (ARI Special Report). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.

APPENDIX A

SELECTED COMMENTS FROM THE DIGITAL BACK-UP TRAINING RECOMMENDATIONS WORK GROUP

SELECTED COMMENTS FROM THE DIGITAL BACK-UP TRAINING
RECOMMENDATIONS WORK GROUP

CONTENTS

	Page
Overview	A-3
Institutional Training	A-5
Unit Training.....	A-12
Self-Development Training.....	A-23
Institutional, Unit, and Self-Development Training	A-29
Performance Analysis	A-31
Skill Decay Analysis	A-44
Distance Learning	A-47
Summary.....	A-59

Overview

In July 1997 a group of 15 persons with varied backgrounds in military, training, digital, research, and unit operations was assembled to provide input to defining the digital and back up problem areas and to help work towards solutions. This group met for two days, both in small group sessions and in joint sessions with other groups. This Workbook served to provide a framework for the group discussions. At the end of the two day session, participants were asked to complete the Workbook and return them to the study group. Eleven of the group responded.

Respondents possessed a variety of experiences and background. Three were active duty military. Three were retired colonels (O-6) with related training development jobs in industry, working on military contracts. Two were government employees in Research and Development (R&D). Current organizations of respondents included Training and Doctrine Command (TRADOC), Fort Hood's 1st Cavalry Division (and users of the M1A2 tank); Fort Knox Directorate of Force Development, the Army Research Institute, the Institute for Defense Analysis (IDA), Fort Knox's 1st Armor Training Brigade (ATB) (the trainers of one station unit training [OSUT] and the M1A2 K4 course), the Fort Knox Armor School (Task Analysis Branch), and the M1A2 New Equipment Training (NET) team. Past experiences of participants included a wide array of troop and command experience (from platoon through Assistant Division Commander) and multiple experiences in training development and delivery.

Much of the input from the workshop participants and the Workbooks was refined and included, directly or indirectly, in the report *Issues and Recommendations: Training the Digital Force* (Campbell, Ford, Shaler, & Cobb, in preparation). However, there was much interesting input that, for a variety of reasons, was not included in the report. Therefore, the data from the Workbooks are presented here. It has been edited for clarity and relevancy but otherwise is presented as the respondents wrote it. It is presented without comment, but with the hopes that it will stimulate thought and discussion in future thinking about the training issues surrounding digital and back-up.

The responses are presented anonymously. The written comments are presented within the context that they were addressed in the Workbook. Individual responses are bulleted. It should be noted that not everyone responded to every item.

TRAINING RECOMMENDATIONS WORK GROUP ISSUES WORKBOOK

CONTENTS: This workbook is organized around six major topic issues, each with a number of supporting sub-issues. There are a total of 21 sub-issues that you are asked to address. Please familiarize yourself with the entire contents before you start to address the questions. The six major topic issues are:

- Institutional Training
- Unit Training
- Self-Development Training
- Performance Analysis
- Skill Decay
- Distance Learning

PURPOSE: The primary goal of this working group is to produce viable recommendations that can serve as input to a report directed at Army decision makers. In order to do this, it is necessary to verify the issues that have been identified in previous efforts and to identify new issues, where necessary.

HOW TO USE: This workbook has been designed to accompany the discussion issues that will be addressed in your work group. **As each of these issues is addressed, please write down ideas, suggestions, disagreements, or examples that will lead the group to realistic and achievable recommendations.**

The final page is to be filled out after you have completed the rest of the workbook. What are your final recommendations for the issues that were addressed? Please provide contacts or sources for further follow-up by HumRRO.

NOTE: This workbook is your record of input to the project. We will collect your workbook at the end of Wednesday's session. If you are unable to turn in your workbook at that time, please send it to us at the address below.

HumRRO
295 West Lincoln Trail Boulevard
Radcliff, Kentucky 40160-9433
Phone: (502) 351-6088/FAX: (502) 351-3620

Name: _____
Organization: _____

INSTITUTIONAL TRAINING

ISSUE: The Army needs to identify what digital and back-up training is to be conducted in the institution and to what level of proficiency.

1. Based on contact hours, most courses are already exceeding TRADOC recommended levels of instructional hours. Analysis of digital performance and back-up requirements indicates that tasks will increase, not lessen.

will institutions need to add more instructional blocks for digital and back-up training? How much and in what courses or levels?

- This is a huge question beyond the knowledge of anyone in this group.
- Yes, most will substitute for analog instruction. Don't know if more time will be required.
- Yes, at some level digital training and elements of back-up will have to be added or substituted for other materials. How much will be determined by what training. But will have to add those minimum skills which are essential to meet the final performance goal of the course. In the Officer Basic Course it will have to be those digital skills which will allow the platoon leader who is going to a digitally equipped unit to be a sound platoon leader. Given the goals of the Officer Advanced Course, the skills would be the parallel skills to what is currently being taught. For example, developing a company order in IVIS should be substituted or added to basic develop a company order training. Contrary to the opinions of others I think we can add materials when we can justify it to leadership. I can't accept that the Army just has to accept cuts in its institutional base and Air Force continues to train pilots and justify those hours without too much difficulty. We just are poorer in justifying hours. Maybe it is because Congress doesn't ride in some of our tanks.
- The Army is in its infant stage of digital development. There may be an initial increase in training requirements, but believe it will level out and/or decrease over time, as digital becomes more of the norm and developers start building systems that are truly user friendly.
- Yes. In individual tasks the soldier need to be taught how to net onto a system - any system. In collective content soldiers need to learn how to interact with a tactical Internet. Training needed is actual stand-up computer based training. Officers must be included in this digital training. However, we can't just add more and more training; we must look for which tasks are more important.

INSTITUTIONAL TRAINING

- Institutional training must provide a "baseline" soldier to the unit, competent with basic soldier skills, using civilian digital skills adapted to the military environment and ethic. It is time we asked some hard questions: Do we need to break the paradigm of the 3 pillars of training? Re-define institutional training? Does institution train the fundamental digital tasks and let the unit train the back-up skills and tasks? What is the role of the institution?
- Can you realistically add any more institutional training? If not, what do you give up? Some would say to keep additional training in the unit. For much of the additional training we don't need a centralized school system. The school needs to develop packages of this training, but the institution is not responsible to train complete M1A2 operation and complete back-up skills course. The institution cannot be responsible for the complete 'greening' of individual soldiers. At Skill Level 10, the institution should probably be responsible to teach about 30-40% of skills needed. In Armor, it must be recognized that the focus of what training is being conducted has switched from Fort Knox to Fort Hood, because that is where the troops, equipment and experimentation are. What about other places besides Hood? How will they be trained when they get this new equipment. It also must be recognized that when training switches from the institution to the unit, there are real problems in standardization, up-to-date trainers, up-to-date information, and resources.
- Digital will have to add "new" instructional blocks. We must relook tasks - we need new task lists for the M1A2 - The M1A2 needs to be a separate track and not everyone needs to be M1A2 trained.
- We need to start with the following basic analysis requirements: Define base line entry level skills; define role of the institution; define backup training and how it relates to unit training. Perhaps the institutions train digital systems "full up" and the units train back up. "Graceful degradation" is a unit responsibility because it is based on unique systems and the tactics, techniques, and procedures (TTP) of a particular unit and its equipment. POI's for institutional courses need to train digital systems concurrent with non digital systems.

Given that most courses cannot add more instruction to existing program of instruction (POI), what are possible solutions for adding digital and back-up training to institutional courses?

- It should not be a "given" that this is the case. We do this continually and have done so for years. Substitute for existing "unneeded" topics and tasks currently in POIs (i.e., orientations, non-tested material).

INSTITUTIONAL TRAINING

- Adding or substituting can be done as hours of marginally productive instruction are improved.
- I have never been to an Army course that did not have about 50% waste. Let's not start with this assumption.
- Use embedded training in digital tools.
- Back-up training at the unit and the institution are equal to the fundamental soldier skills and fundamental digital skills. Separate M1A1 and M1A2 tasks at the institution.
- Get rid of stovepipes. How do you expand the intersection? Some different suggestions: (1) Get rid of the paradigm completely. (2) Tactical Internet is the wave of the future. (3) Build the individual training into the actual equipment.
- Use distance learning based on exportable packages from the school houses. Build in training programs to new systems; for example, use an IVIS-based self paced training program. Train all the backup digital tasks at the unit.
- Institute dual tracking POI so that basic instruction is being taught by the core POI. For example, in the basic courses, those officers/soldiers go to different track on specified days/hours to get trained on the M1A1. Otherwise they would be trained on the M1A2.

INSTITUTIONAL TRAINING

2. The Army is committed to reducing attendance time and costs at institutional training. The goal is at least a 20% reduction over 1995 levels by 2005.

what courses or types of institutional training will be affected the most?

- Functional training - the non MOS/BC producing courses will be affected. Also the knowledge courses such as Officer Advanced Course and ANCOC. Initial entry training such as OSUT and Officer Basic Courses should remain relatively untouched; ironic since these are the most expensive courses.
- Those which aren't required by law or which have been unresourced by TRADOC because they are non MOS or basic skill producing, e.g., scout platoon leaders, etc. That doesn't mean I think these are necessarily where the cuts ought to be taken. We pay the price daily for our OJT army.
- The real long ones and the 1 week classes that lend themselves to distance learning.
- Any course whose material can be trained through distance learning.
- Academic-based higher school levels.
- Drivers Trainer, TC3, PCC, AOB, AOAC (as designated for next unit).
- Tank Commanders Certification Courses. BMOC. Additional courses - not the basic and advanced course for officer and NCO. The reductions that are forced in fundamental and foundation courses need to be given the money savings from TDY reductions in all courses and need to apply this money towards distance learning to replace those fundamental course reductions.
- M1A1; drivers station; gunners station; TC station; navigation; maintenance; tactics, techniques & procedures

what effect will programmed reductions have on the requirement to train digital and back-up tasks?

- Will push out and eliminate all but the most critical backup tasks.
- They will go in the hopper with all the other tasks to compete for the limited time available. Some digital and back-up should have the opportunity to replace primary tasks if the consensus is that they are more important, likely to occur, critical when not done right, safety related, etc.

INSTITUTIONAL TRAINING

- We will have to use technology to increase training efficiencies.
- Train digital tasks in embedded mode wherever possible. Train fundamentals in the institution. Train back-up in units.
- Probably not much.
- Move more and more training to unit responsibility. Institutions will be less able to handle the load. More tasks will become "professional development".
- This is important! Any time cut from these courses must be restored as distance learning prior to soldiers going to the school house. The time "saved" by distance learning then should be utilized for digital training at the school houses.
- The effect is time! We must make POI's more efficient. One way to do this is by dual tracking classes whenever possible.

How should programmed reductions be changed to accommodate increased requirements for digital and back-up training?
--

- Substitute for, rather than add to existing instruction.
- Backup and digital should compete with other tasks on an even basis.
- Need to identify and include more of the institutional costs early in the analysis cycle and try to get some funds out of individual programs to support the institution training needs.
- Increase training developers relative to other functions being performed at Ft Knox.
- Obviously, we'd all like to see increases to allow better training; its doubtful that can be accommodated.
- With additional digital tasks now needed by the force, the schools will need to be plugged in to fill the training gaps.
- Add distributive training prior to resident attendance.

INSTITUTIONAL TRAINING

3. Institutions are generally low priority for new equipment and training devices, particularly high cost, low density digital systems.

How will this affect the training of digital and back-up requirements?

- Makes it harder to train. Causes faster than normal breakdowns through use. Makes bringing instructions up to speed harder. Causes a tendency to "talk about" rather than actual performance/demonstration/practice/and testing.
- I don't think if the Chief of Armor stood up (or was represented correctly at the fielding conferences where fielding priorities and allocations are decided) and made his case for institutional support, that it would be denied. It has to be a well scrubbed requirement without the, "I really need four so I'll ask for eight," approach to resourcing that has existed in the past.
- Traditionally this has been true because institutions do not identify their needs until after equipment has been in the field. Institutions need to identify and justify their needs early so they are included in initial BOI and AAO and in initial funding limits.
- Most digital and back-up training will have to be done in units.
- Significant impact...Army ODCSOPS must fix this problem. For example, the 1ATB has some SINCGARS in classrooms, but none in vehicles that let soldiers train on. If ICOM SINCGARS is only in classrooms, there is no linkage and this aspect of digital cannot be trained. (However, how many SL 10 soldiers are going to be responsible to operate digital systems? If the answer is "none", is it a problem?)
- 1. Tasks just aren't well trained; there are less resources to stretch further. 2. Need to go to simulation systems to substitute for actual systems. 3. Simulations need to be updated to accommodate advances in digital systems as they occur.
- It must first be decided what the institutions responsibilities are in the digital and back-up field versus the unit responsibilities and self-development responsibilities. Priorities of digital fielding of new equipment and knowledge must change to go to the institutions first because they will have the lead to develop all TSP for the unit and self-development training.
- Low density digital system must be taught at the unit. Higher density digital system are taught full up at the school house, with back-up training as a unit responsibility.

INSTITUTIONAL TRAINING

Other than changing fielding priorities, what are some solutions to the equipment shortage?

- Mockups, simulations, prototypes. Bring the students to the equipment, wherever that might be.
- Station a TOE unit at the same location as the school and share the equipment. Include training requirements in the initial buy strategy - don't make it an after thought.
- Virtual simulators, mock ups, etc., including software (CD ROM) packages that can be run on laptops and PCs.
- Simulation.
- Clearly define requirements. Look at emulators to replace actual equipment linkages.
- Use more simulations that are of varying levels of cost, fidelity, etc. Exact equipment is very expensive to buy and maintain. While simulations are initially expensive, they are easier to update and tweak if properly procured and maintained.
- Simulations. Need to look at new ways to get these simulators to the training bases early. It is not always necessary to have the full systems available. Look at the possibilities of using computer based systems and CD-ROM, which can teach functions of a new system without having the full system at the school houses.
- Provide more resources to the units. Require material developers to provide lesson plans and refined training development products with the fielded equipment, e.g. sustainment lesson plans at the completion of NET.

UNIT TRAINING

ISSUE: The Army needs to specify what digital and back-up training will be conducted in units.

1. With existing training and operational commitments, the unit plate is already full. Digital and back-up requirements will increase the demands on a unit's resources.

As more and more tasks are generated by digital and back-up operations, can the unit handle increased training and sustainment requirements?
--

- What choice do they have? They will reprioritize what they have to do, training only the most critical/relevant "critical" tasks; and do the best they can.
- NO, the unit's can't right now. YES, they can in the future. There are long held convictions that we use very little of the available training time in units because of the difficulty in preparing good training. If that can be solved, inefficient classes can be replaced with efficient training that can be done rapidly to create time for additional instruction.
- The units will have to do some of it because of the differences in types of equipment that exist between units.
- They become SOPs and drills.
- Yes, and this is probably most appropriate because a variety of systems and combinations drive unique SOPs...which are written at unit level.
- Units will have to pick up this training somewhere if the system is going to be effective. Perhaps some creative minds could figure how to build some of these tasks into existing training. Probably a better way is to assimilate digital into every day activities rather than trying to teach it separately.
- Better time management is required. Relook the time we waste on outdated tasks, do we need to do all those "mandatory" EO, Sexual harassment, Red Cross, ACS briefings? Can we do these briefings via the local post TV channels and save time during the training day for more important tasks?
- There is no other option. Well defined training strategies will make this requirement more efficient.

UNIT TRAINING

What recommendations would you suggest to the Army for units facing this increase in training demands?

- Try to relieve them from other outside commitments. Change CTC situation so the units going to places like the NTC train on their digital vehicles not on prestocked equipment like M1A1s. Stop pushing the bulk of individual training on to the unit to accomplish and let them concentrate on collective task applications.
- Change the personnel system. Stabilize personnel in units. We are inefficient partly because we're an OJT Army. Change the training system. Get out of the decentralized, sustainment training approach. Theoretically this is the best, but practically, it is not. Get a battalion strategy that doesn't make every battalion commander rethink the annual plan. Create some efficiencies by looking at major areas: battalion maintenance and maintenance training program, weapons maintenance, mechanical training programs, etc. Make the commanders' task one of carrying out training, not designing it.
- We need to start immersing our soldiers (at all levels) into the digital environment (both tactical and administratively). We also need to stop buying systems that soldiers won't use.
- Out source for training development and even administration to contractors. Increase knowledge of green suit and DA civilians on contracting. Insure green suitors know what "good training" is.
- Accept that we can't do 100% of requirements without 100% of resources. Time is probably the most critical resource.
- Spend some time defining a well suited training strategy that maximizes the use of simulations to prepare for field training. Solid, well thought out TSPs are needed that fit the strategy. Learning centers must be developed that expand to desks of the user and reinforce professional development.
- An example of how units waste time: In an average day, a unit has recall for lunch at 1130 and work formation at 1300. What would happen if a unit gave 30 minute lunch breaks (like most civilian operations do)? Make dining facilities available to all or bring the noon meal to where the soldiers are. Then take the hour saved and schedule an hour of distance learning.
- Provide units with a resourced, well defined training strategy backed up with well developed TSPs.

UNIT TRAINING

2. Unit training is currently commander driven based on a mission essential task list (METL). There is no standardization of training content. A possible solution to the digital and back-up training requirements is to standardize training in units.

Would a major modification to the current METL based training model work? How much of a standardization could be imposed?
--

- Do not think this is a good idea. The combined arms training strategy (CATS) mandates most unit training today. No good reason to change.
- I would test three levels, current, 50% standardized, 75% standardized. See how it comes out. METL based training has a theoretical appeal, however it doesn't work out well in practice for MOST people. Maybe a General Vouno says "Well, it worked great for me." My answer is, in part, "Well you're not the 25 percentile battalion commander. At least the promotion and selection boards said you were about the 99.95 percentile. Most of us slugs aren't as good as you were."
- Don't go there.
- It's a good idea in a perfect world. But its hard to find a "standard" mission NTC, OOTW, refugee control, fire fighting, etc.
- FM 25-100/25-101 is a good approach; it has been accepted in the system. My assessment is that you would have more problems changing it . You might just wind up with the same system with a new name. METL-based training works - keep it.
- Standardization - as much as we'd like to believe the standardization line, the variation is huge. Who could impose standardization and ensure it is enforced unit to unit, especially with a high rate of rotation among personnel?
- A change to METL based training would, in application, be minor - not major. Now we only get 1-2 days for real METL base tasks. A typical unit has only actually about 10 hours a week for METL tasks during time in garrison.
- Yes! The situation demands that we develop well defined training strategies linking systems, training devices, classes and situational training exercises.

UNIT TRAINING

what problems do you foresee if the current unit model is changed?

- Not as many as people seem to think. However, it creates a major problem if it only works or is applied to full up digital requirements. We've survived many changes in the past; from local to Army wide and this change could be adopted quite readily.
- Problems are perceptual, inertia, sacred cows, etc. It's hard to admit the need for a change to what has been endorsed by every general: "FM 25-100 and 25-101 form a solid basis for what we do as an Army. It worked for Desert Storm, it worked for me as a commander, etc."
- Commanders won't have the flexibility to tailor to their needs.
- Many of the tasks that are problematic are really not found in the higher level task identified in ASAT and SAT. Believe that much of the problem will be in TTPs. With digital systems, TTPs will vary drastically.
- None.
- The common problem will be one of a reluctance to change. Well defined training strategies with command emphasis is the fundamental solution to this challenge.

Could a standardized unit training model be implemented? How?

- CATS is working on this now. I still don't think it is a good idea.
- Yes, it could. It would take a long term approach and much effort. Believe it would have to be tested. But it should include at the same time, the personnel assignment changes, to stabilizing units.
- Don't believe it's possible.
- No.
- Only if there is rigor in the assessment phase. If soldiers are trained in a task or group of tasks and go to higher levels if trained, then probably would work okay. This requires a generalist approach...is that what the Army wants?
- I really don't know. But if done, it would be difficult to maintain.

UNIT TRAINING

- Have to redefine the bottom line, relook tasks and time management. Standardize meetings (e.g., the whole corps has training meetings on Tues. 1000-1130 instead of dozens of different training meetings that the same principals must attend).
- Yes, the model must be changed. With command emphasis, integration into the unit training schedule, it will work.

UNIT TRAINING

3. When newly assigned soldiers report into a unit, there is no systematic way of quickly assessing their digital and back-up skills.

Does the lack of a detailed record or the means of quickly conducting an assessment of skills cause problems in units? What problems?

- No. Travel time and leave, not to mention other schooling, between training and assignment cause decay problems already (i.e., certifying the guy at Knox does not always mean he will perform upon arrival).
- I don't think it really does. It looks like it ought to, but I don't think anybody gives someone a task or mission to do or decides not give them one based on what some individual training record says. If I know that soldiers coming from AIT haven't been trained in some area, I won't knowingly go against that, but in deciding whether or not to send PFC A or PFC B to do something, no. Knowledge in the field of the program expectations of certain course graduates is about the right level.
- Army Company Information System (ACIS) is a program that contains all the training records for every soldier. When a soldier leaves one unit he takes a disk with him to his new unit. Digital & back-up skills could be easily documented there.
- Yes, it causes problems. Units must go to the lowest proficiency as the start point.
- We have Tank Crew Gunnery Skills Test (TCGST); why can't we have a digital skills test based on skill level? Proponent schools could develop in accordance with the field requirements. Consider going back to Job Books.
- Yes - a problem: 1. Excess time spent playing 'stump the chump' to determine what is known or how well. 2. Assumption that newly assigned will learn by osmosis. 3. Ultimately, digital payoffs are not realized.
- Soldiers have a very detailed list of tasks they have been trained on but we don't use these as a "training" yardstick. If they could be available on a disc or data base, the commander can review and identify shortfalls.
- Yes, it is a problem and part of the problem is that units do not conduct "assessments" the same way. Currently, it is not done to any definable standard.

UNIT TRAINING

What do units need to know about the skills and experiences of new acquisitions?

- What courses they have attended and how long ago. Any special training received.
- Need a document (floppy disk) that describes exactly what tasks the soldier can perform.
- Nothing.
- Need to know what they can do and how well they can do it. Units need to know individuals' experiences in larger than individual settings, e.g., if taught or experienced in ways dissimilar to gaining unit, much time and energy is wasted.
- Units need to know about all tasks, but it must be standard across the force.
- Need to identify just the essential task to sustain proficiency. Probably should be based on identifying those tasks that decay the quickest.

What kinds of records or tests or other means could be used or developed to provide units with the information they need to know about newly assigned soldiers?

- Not sure. Where does the time, people, and equipment to do this come from?
- I don't think we need to do that. The Job Book is really kind of useless on an individual level. It works OK as a means of repeatedly conveying to the units the topics covered in school house.
- Records must be based on a clear delineation of what is to be trained in the institution, what belongs in the unit, and what will be self-development.
- Suggest someone talk to trainee student personnel/records at Knox AG and get their opinion.
- Use Job books along with some record of skill testing?
- Use a disc that includes all tasks; both individual and collective.
- Follow the UCFT model of gates and sustainment tasks

UNIT TRAINING

4. Distance learning, in which the training is provided at the soldier's location, is proposed as a means of training digital and back-up tasks.

How should units use this type of training if it were available?

- Match distance learning to individual needs. Don't use it (as they most certainly will) as block instruction. Try to train and certify soldiers before assignment.
- It has to be systematic. Provide time and supervision to get the most out of it. The idea that we give PFCs laptops and tell them they are responsible in their nonduty time to train themselves is irresponsible.
- Use PC based CD ROM and training embedded in virtual simulations.
- It should be an integral part of the formal training schedule.
- Distance learning does not link very well to hands-on tasks or to performance that involves equipment in the unit. All of the existing distance learning options such as computer based training (CBT), video, teleteaching, and correspondence courses are good for teaching theory but not for teaching skills that require hands-on application and practice.
- Units need to integrate this as much as possible. Staff practice could be done this way. Individual procedural familiarization could be done. A number of requirements exist to build optimal use in large scale simulation (virtual, live, and constructive).
- Build programs around common core tasks and tasks and skills required by many so we don't put effort into a very small group (audience) or on tasks only a few need.
- Units should use for officer and NCO professional development (OPD/NCOPD), sergeants time, and self-development times. These are scheduled weekly when in garrison.

What types of support will be required for this type of training? Will units be able to provide this support?

- Don't know, but suspect that they will use sister units.

UNIT TRAINING

- They will need not only the delivery means and physical requirements of the system, but also the classes, topics to go to for training have to be there. Units could be provided the physical requirements. TRADOC currently can't deliver the courses and topics in DL format.

UNIT TRAINING

- Units will need computers and time.
- Units will need computers (lap tops) and Internet capability. Equipment and access need to be provided down to the lowest level
- I don't think distance learning is a feasible alternative for training digital tasks.
- Units need a well designed system that includes intuitive interfaces, easily used training management system, usable feedback, and maintenance and support for updates.
- Need to provide unit learning labs that are digital based.
- Need to provide a training strategy which requires certification by ISGs, CSMs, CO commanders and Battalion Commanders. Support requirements should be minimized. Use Internet as the vehicle; the "Web TV" concept.

UNIT TRAINING

5. Digitized systems, non-digitized systems, and systems of different capabilities will be cross-attached during operations. Also, units will deploy to pre-positioned equipment different from their home station equipment.

How do units handle train up/train down as they use different equipment?

- It's catch as catch can; a big problem now which will get worse over time. ARI once developed train down packages for crews moving from one version of a tank to another. The instructor was vehicle commander.
- Right now they do a catch as catch can job. It wouldn't be hard to develop a POI and materials for the major anticipated conditions. Unit would dust it off and use it as needed.
- These will have to be determined on a case by case basis.
- Units will have to handle with SOPs, supported by a dedicated core of SMEs who have been trained and in turn train subordinates.
- Currently there is minimal structures provided to do this. 1Cav has a 'program' to meet that requirement, however, it is probably not as well structured and implemented as it could be.
- Institutions must provide the materials. Units use this prepared training as required.
- For programmed transitions, units need to develop a training strategy linked to the schedule. Units need off the shelf lesson plans for no notice implementation.

What problems will occur when digital units have to operate and communicate with non-digital units? What do units need to do to train to operate with digital or non-digital units during cross-attachment?

- Need to emphasize that the solution is not to "dumb down"; rather "smarten up" the non digital unit. Maybe develop "black boxes" that go with the digital unit to be given to non-digital to at least provide the fundamental communication links digitally.

UNIT TRAINING

- There are a wide range of answers to this. I asked the question of the A2 battalion commanders at the Armor Conference. They said it wasn't a problem for them. They just continued to operate with their brigade commander as they always have. I don't think that was a complete answer, but I think it is a solvable problem. Making the digital systems of the future compatible with the ATCCS systems at battalion is a start. Then addressing the likely configurations and recording the solutions which are developed in units. Give the NTC OPFOR a company of A2s and in six months they will have all the TTP you need on how to do it. Just send a recorder along with them for the ride.
- Current doctrine does not anticipate digital units being unable to operate in the analog world.
- Ask the 1st CD. My guess is that at the lower level they operate with the digital system internally and revert to non-digital at higher levels, for example when they interact with brigade.
- Units need to practice these situations, understand the problem, and know and practice their back-ups.
- Non-digital standard tasks need to be taught Army wide to all including digital units. Army needs to identify those essential common core tasks that are easy to train.
- C2 is the biggest challenge. TTP must be developed to train working with non digital units. This situation usually requires duplication of digital and analog tasks and products. Time becomes the biggest challenge for leaders.

SELF-DEVELOPMENT TRAINING

ISSUE: Self-development is emerging as an increasingly important and promising training pillar. It is envisioned as a means of making up for institutional and unit training shortfalls.

1. Training technology advancements will increase the availability of information, materials, and training in unprecedented amounts. One prediction is that the responsibility for acquiring digital and back-up skills will shift to the self-development program. What problems and possible solutions do you see in this approach? Consider the following areas:

Incentive to do self-development--

- Incentives should include job advancement, promotion, job certification, "Be all you can be," pride.
- We can use positive and negative incentives to self-development. If it is good and not an onerous addition, some soldiers will just do it. Positive strokes caused by unit awareness of progress will help. But the real reward will be making it good enough so that people can do their job more effectively, efficiently because of the training. I might even consider a self paced computer course, if I knew it would make my daily work easier, allow me to complete counseling statements more completely, write better OERs, etc.
- It's part of the job.
- It is a function of personal pride and ability to perform a task in the unit. If you fail because you didn't do mandatory self-development, you quickly get labeled.
- Personal integrity and desire to progress. Link it to career progression. Do we really need an incentive?
- Require it as part of the scheduled activities as part of the duty day. Link it to promotion points. Make it a requirement as part of the career skills.
- Make it a requirement of the MOS.

Time to do self-development:

- That is a big problem, but they will do it.

SELF-DEVELOPMENT TRAINING

- Self-development has to be a part of the complete picture. Time has to come from the right places. Placing it all in the individual's "personal" isn't right; taking it all right out of the heart of the training schedule isn't either. Trials with various units seems to be the only way to find out. Anecdotal information about the willingness and proclivity of different categories of soldiers to work on their own time are useless.
- At least for the critical tasks, it needs to be programmed in the training schedule.
- It needs to come during duty time. It needs to be a formal part of training schedule.
- Here again is the "hey" issue: "I work 0630-1900 5 days/week...1/2 day on Saturday - no time for SD at work." So let's get realistically serious.
- This can be included in daily schedules. Build it into Thursday staff training or Sergeant's Time. Build daily activities around this requirement.
- Make some of it part of duty day and some it home study. Offer options. Make sure it is self paced.
- Schedule it as part of the training schedule.

Development of materials and content:

- This will be a problem until we start developing multiple use training materials.
- Aye, there's the rub. Materials are far harder to develop when they are to be exported than when they are to be used by an expert deliverer. Witness the difficulty or writing up the exportable brigade and battalion staff training exercises compared to what we would have done if we could have written it for delivery by a certain instructional team with a fixed exercise director. It requires much more time and attention to detail. An instructor can tailor on the fly. A TSP has to be exactly - or nearly exactly - right at the start of the hour.
- Combine interactive PC based material with hands-on actual equipment time.
- It has to be done by the institution. But to get good timely products, it will have to be out sourced.
- Hey - "GIGO". Not sure the Army has the training developer expertise any more to do this. Most contractors lack the recent field experience. There must be a partnership that is mutually rewarding between the military and contract work.

SELF-DEVELOPMENT TRAINING

- The Army's capability to do this is missing right now. More needs to be made available from "off the shelf."
- This is a TRADOC and individual institution issue.
- It needs to be developed in the Institution for distribution over the Internet and Web TV with key leaders as facilitators/instructors.

Management of self-development training:

- Management needs to be done at three levels: Schools; Commander; NCO.
- Management at all levels is a problem. Think of the training records morass we have endured in units. Then there will be DA interest in the status of completion if these programs are a part of some professional development and promotion system. You could end up with a requirement for a major management and tracking system. Trying out alternatives is the answer.
- Use ACIS to record and track.
- Management is a leader responsibility.
- Great question!
- We need management from top down. Right now, what exists in self-development is not well managed nor well thought out.
- Unit commanders will be the managers, however, management requirements must be standardized by the school house.
- The managers will be the commanders at brigade, battalion, company and platoon.

Integration with hands-on practice or application:

- Watch this! This activity usually needs to be closely supervised. Also there are safety issues.
- This can either be hard or easy to do, depending on whether you are pro or con for this as a training alternative. Having it in the field as a complete system in a unit could make field practice feasible. If it is solely individual based, it would be hard. If the complete package is developed with a correct picture of the environment in which it would be used, this could be planned for. If it is not, then you could make it impossible to carry out the hands-on parts.

SELF-DEVELOPMENT TRAINING

- At some point in the learning, this becomes a "must".
- Integrate it with motor stables. Make it part of digital connectivity training.
- This is an absolute necessity. We must not minimize or shirk this requirement because it is going to be costly. Need to explore a COFT like approach. Can the Army afford digital learning centers at the individual posts? These would support individual only, or maybe collective task training. See this as an adjunct to SIMNET/CCTT centers.
- It will be difficult for individual to do this without structure of some sort provided to him or her. Equipment not always available and even when individual equipment is available, true digital needs to be linked with other systems to allow complete training..
- Provide a stepped training strategy that links the classroom, simulations and STX.

Media and availability:

- The Army needs to provide as many different capabilities as possible. Access needs to be as free as possible through multiple routes: Mail, Internet, VTC, TV tapes, etc.
- The physical stuff is probably the easiest part. We can buy computers pretty easily. The communications lines, access requirements, protections, etc., are harder. The stuff to have them connect to is the hardest part.
- Make it PC based CD-ROM.
- It needs to be embedded as part of the equipment and systems.
- Realities are that it will probably not be available on an individual basis, for all individuals, for some time.
- Use CD-ROM and the tactical Internet (T-Net)
- Provide laptops. Use Micro Soft products; they are the industry standard and most compatible with what units are using now. Use Web TV.

Impact on soldiers:

- It eats into their free and family time. May need to mandate duty study time periods. Or figure how to give time off awards for completion (e.g., a 4-day pass).

SELF-DEVELOPMENT TRAINING

- If you redesign the entire unit training system, this can be included. However if you try to append it to the current system, you run the risk of frustrating soldiers who are trying to participate, but work in units that don't really believe in it, or have a commander who has another vision of how to do it. ADD-ON isn't the way to go. Many, many examples of where add-on approaches have failed.
- The individual soldier will need time to do self-development.
- There will be little impact on the individual soldier.
- If done the same way as we fielded COFT and the PGT, it should be welcomed by the individual soldier.
- It is often difficult for individual to understand all factors involved in digital functioning, such as the integration and assimilation of the system or systems. Perhaps procedural ("button-pushing") tasks can be taught this way but that doesn't teach the true employment and advantages of digital systems.
- We need to make soldiers computer smart.
- We need better trained, more active participants in their self and professional development.

Impact on units:

- It gets them better/smarter soldiers. But a soldier who is doing self-development is cutting somewhere else.
- If it is a complete system, it can be made as natural as anything. For example, if I took a cohort of soldiers who had never worked under the old system and from the time they came into the Army, they used a complete, integrated new unit program with heavy self-development, they would think it was the norm and operate easily in it. The longer the population has been working under the previous system, usually the harder it is to get them to embrace the new system. Old Geezers like me keep remembering the way it was and attacking the new system rather than using it.
- Need to provide time and other resources to do this requirement.
- There will be little unit impact.

SELF-DEVELOPMENT TRAINING

- There will be mixed levels of understanding of the material within the unit. Mixed levels of capability to pass information on to others. System capability realized at lowest levels only.
- There will be demands for resources to support the systems. Units will face increased demands on time and unknown requirements to manage the programs.
- Units will benefit from a more efficient training methodology. They will also have better trained leaders.

Other:

- I believe this is the most critical training pillar for commander and staff training, certification, and preparation.
- Who needs this and at what level? Answer: All soldiers need access to the systems. Does everyone need a computer? Answer: No, but everyone needs to have availability to the systems.

INSTITUTIONAL, UNIT, AND SELF-DEVELOPMENT TRAINING

1. The pillars of self-development, institutional, and unit training can no longer be isolated, but must be integrated in a single coordinated effort to address the training problem. Shifting responsibilities from one area to the other cannot be done without considering the whole. Partial or stopgap training solutions must be reevaluated including the impact of shifting new responsibilities on each pillar.

Is the Army capable of making such a cross walk? what has to be done to insure such an approach is adhered to?

- Need to allow the pillars to overlap somewhat. Allow 2 or 3 ways to complete training, rather than just one, e.g., company command plus staff time plus distance learning = AOAC graduation credit..
- The Army can make such a transfer if it does it as part of a complete system overhaul. In the test unit, making sure they do it isn't much of a challenge. If it is decided to propagate throughout the remainder of the force, then the challenge begins. You probably have to have a phased approach and education: Professional course, PCC, commanders' conferences, edicts, etc.
- The answer right now is "No", the Army can't do it. Everyone needs to take off the parochial visors and develop what war fighters need.
- Institutional training is shifting to self-development and unit training. The Army needs to break out of the rigid adherence to the three pillars.
- Yes, they are capable. But priorities must be established and resources must be allocated at the institutions that cut across the DTLOMS so that as one changes, the rest change. The center of gravity is now at Ft Hood, TX, not at the institution.
- Perhaps the Army is capable, but the priority doesn't exist to do it. Need a change in attitude. Resources to carry out the requirement are limited.
- Ft Hood is the center for this action and the link back to the schools (principally Ft Knox) appears to be broken. TTP's and SOP's are being worked by the units, but this information is not coming back to Ft Knox. Can we bridge the gap between the units and the institution? How do we bring the knowledge from Hood back to Knox? With current reductions in people and money, contractor support appears to be only crosswalk resource available to tie in doctrine, equipment, and other unknown factors.

INSTITUTIONAL, UNIT, AND SELF-DEVELOPMENT TRAINING

- Yes! We must develop the approach. The foundation lies with the quality of the developed product and a well defined strategy. If it is embraced by the Army's leadership, we will execute the Chief of Staff's intent!

who in the Army should be integrating the pillars and overseeing the integrated training system?
--

- The CATS umbrella would appear to be a good place to start.
- Don't believe anyone is capable right now. It is a big job. Don't believe anyone is smart enough to do it now; especially across proponent stove pipes. CASCOT is trying; they are succeeding in some areas, failing in most. CAC has given up in disgust.
- The TRADOC Commander should be defining the overall approach. Proponents should be determining exactly what tasks are where. The old Max Thurman Functional Area Analyses and Reviews would help to present, review, and approve individual solutions and assure a balance across the force.
- The TRADOC Commander must reorganize TRADOC out of the stove pipe structure which now perpetuates the problem.
- The proponent Commandants.
- TRADOC is the one but it is bigger than DCS-T. Suggest the DCG be the focal point. It is bigger than DCSDOC, DCS-T, DCS-CD. It requires an integrated approach around a common vision/framework.
- TRADOC should, but...CAC might, but... Schools should have central focus on this from their interest. Not sure anything is being done right now, or planned.
- TRADOC should but do they have the resources? Can FORSCOM handle the change in mission?
- TRADOC needs to link with FORSCOM. This effort will require the entire Army to embrace and implement.

PERFORMANCE ANALYSIS

ISSUE: The Army needs comprehensive performance analysis of digital functions and operations to identify digital training requirements and their critical back-up requirements.

1. Digital capabilities will change rapidly. Training developers are not able to complete their required cycle and procedures before the new equipment or software drops are in the hands of the troops.

How should the acquisition and development cycle for systems be changed?
--

- Training Developers (TD) need to be involved at the beginning of the acquisition cycle. They need to influence the design for simplicity of use and training. Train how to fight; not switchology.
- Apply the "Usability Engineering" concept as described by Jake Nielsen.
- I don't think you treat them all alike under the same model. I think we need to look to the telecommunications and computer industries for examples. Looking to heavy equipment and weapons manufacturers is probably the wrong place for finding a model which deals with software intensive systems.
- The TRADOC Commander's black book #3 lays out a mechanism for change where all organizations involved in the development cycle come together early in the process. This is supposed to occur in the concept exploration phase; however, we have been unable to implement this process correctly, so far.
- Don't change the acquisition cycle. Acquisition of automation systems will continue to accelerate. Training development cycle has to change. If it does not, then training produced by "Institution" will be obsolete.
- System capabilities will change because a module or widget changes. See it as evolutionary. Get it "about right" and freeze the GICOD. Let software upgrades take the bulk of improvements in capability. Quit designing a new "box" every year.
- Systems like these "digital" information age systems can be developed concurrently with the platform that they will be included in. Example could have been M1A2. Training could have been included in the early design phases of the system so that the training package was available when system platform was fielded. What couldn't be embedded could be provided in a TADSS that would.
- Material developer must provide refined, usable, tactical training products already developed when they provide the system.

PERFORMANCE ANALYSIS

How should the training development cycle be changed?

- Speed it up. Accept 80% solutions due to rapid change. Stay flexible.
- I don't think one answer fits all. The new digital software, firm ware, and hardware seem to be able to be self taught on button pushing, etc. Integrating them into their warfighting roles seems to be the hard part. Simulation modeling seems to be a possible thrust. Finally, bring the Battle Labs on line as they were intended.
- TD needs to be involved early on (in the concept phase) and certainly no later than the ORD development phase. TD needs to help shape the material solution, not just build a training package to support a material solution.
- Must develop training as done with EXFOR training development under Col. Bob Westholm.
- When the Army and TRADOC get serious about Training Development, it will be fixed. It needs fixing but doesn't need to be changed.
- Training Development should be incorporated much earlier. Government requirement writers need to take more responsibility for their writing. Requirements need to be determined through simulation early on. Training can and should be part of the earliest development. It won't be until training developers and requirement writers get out of their offices.
- Training development should parallel the material development.
- Enforce "intuitive", ease-of-use design features into digital equipment. Emulate desktop features of Windows operating system where possible; this is what people can operate and are familiar with.

Who is responsible for ensuring that training requirements are identified during the design phase of new systems?

- I suspect it varies by school. At the Armor Center, there's a Systems Branch in the Training Development Division, DTDD, that has the responsibility.
- Technically, I believe the Combat Developers are supposed to do that. Believe they write the MANPRINT documents.
- The Program Manager (PM) and the TRADOC Systems Manager (TSM) for that development.

PERFORMANCE ANALYSIS

- The development system has assigned that responsibility. What needs to be done is to enforce the existing responsibilities and make sure they are resourced to do what is required of them. MANPRINT issue discussion is appropriate in this area. But, the people in MANPRINT right now aren't the people to see that it is done. The TSMs for major systems used to have to get the proponent to do his job to support the training development for the new system. Hold up a couple of IOTEs and ASARCs or DSARCs for training support packages and they'll get the message.
- TRADOC has to ensure the training requirements are specified.
- Need to stop thinking about things that are OBE (overtaken by events). Training developers must join material developers.
- At Fort Knox, it is the Directorate of Training and Doctrine Development (DTDD). Unfortunately they don't have the capabilities or the encouragement of the PM-PEOs to be serious about requirements with the Directorate of Combat Developments/Directorate of Force Development (DCD/DFD). But often the training is traded off for a better equipment fix. Concurrent development goes like this: Tinker → Requirements → Test → Fix (Tweak) → Field. System organization doctrine, TTP, TSP, soldier issues, all could have been done with proper attention paid to MANPRINT. But...MANPRINT is waived too easily and...
- The user and his proponent school are responsible.
- Every one! The contractor, the Army, the institution, and the unit.

PERFORMANCE ANALYSIS

2. The impact of digital systems on collective (unit) tasks has not been adequately analyzed.

Do you think collective tasks will change substantially with the increase of digital capabilities? In what ways?
--

- Collective operator/maintainer tasks (crew-level) will change significantly. But the amount of change will decrease as you move into higher-level tasks - pending changes to doctrine. Some folks at Fort Knox have talked about tactics changing because of digital capabilities. If true, that will drive changes in doctrine and, only then, impact on collective task analysis. The inclusion of doctrine in the equation is essential and cannot be ignored. Thus far, some pretty smart guys have written digital doctrine and Mission Training Plans (MTPs), but there really have been only minor revisions at platoon and above. Perhaps that's because it takes doctrine a long time to evolve in terms of describing "how we fight."
- Yes, there will be more fluid requirements, with more shifting of responsibility. There will be less one man, one action; more collaborative. Think we will see more crossing of traditional boundaries and stove pipes.
- No.
- Yes, collective tasks will change. The same functions will occur on the battlefield, but the processes for doing them will change. Maybe even some of the functions will change. But the fundamental requirements for situational awareness, requirements, decision process, direction, monitoring and adapting will still be there.
- Yes. Current use of digital systems have not achieved substantial results because we are only automating current functions. The true exploitation of digital systems will only come when we make the leap to how our warfighting processes can be changed.
- Doctrine stays relatively the same. TTP will change.
- Why would tasks change? Can see some TTP changes. I think we may be confusing automation of cognitively difficult tasks/stubby pencil drills with digitization.
- It depends really on the inter-activity with other systems. Could change how battlefield functions are conducted at virtually every echelon. Some tasks could be deleted across echelons. Time could be compressed drastically with increased capabilities.

PERFORMANCE ANALYSIS

- The pace of decision making will increase. There is now the risk of information overload. There will need to be a greater reliance on problem solving abilities.

will collective tasks be substantially changed by back-up requirements? How or why not?

- I doubt it. Workarounds and back-ups will still be focused on completing the original task/mission. Specific small tasks may be altered, but the focus will still be the same.
- No.
- How? Here I'm thinking about command and control tasks. I think ideally there would be a suite of solutions for performing a function. Sort of like the mission manual for a space mission. Primary solutions are..., back up are..., work arounds are..., etc.
- Possible. If one of the advantages of digitization turns out to be greater dispersion of direct fire platforms, then the back-up procedure of maneuvering in conjunction with physically seeing the next nearest platform could jeopardize the mission by leaving areas uncovered.
- No, at least not much.
- Don't know. Depends on how thorough the back-up is. Look at the space shuttle; it has redundant systems. The right answer might be increased redundancy, even if it means fewer platforms.
- We just don't have enough experience to know right now.
- It will mean more dependence on individual skills and communication between small units. There will be increased dependence on somebody knowing what best to do in a given situation.

what needs to be done to accurately document the effect of digital and back-up requirements on the way that the Army fights?

- We need to get TRAC and OPTEC recording work-arounds and back-ups. Also, might enlist OCs at the CMTCs. If we can afford it, and find the space, we should put observers with III Corps to cover both 1CD and EXFOR.

PERFORMANCE ANALYSIS

- Where it can be reasonably posited that the unit will have to operate without a digital system that it normally relies on, the graceful degradation approach should be captured in some doctrinal or TTP publication. If it is a likely occurrence, it could be included in the MTP just as other tasks are included. Right now we add NBC conditions as a major condition to be included in some tasks, not in others. Degraded mode could be addressed the same way.
- We need to capture the procedures being developed by real soldiers using the equipment and validate them in the school house for eventual inclusion in official training policy.
- Go to Fort Hood and watch the 4th ID and the 1st Cav
- If you don't synch the DTLOMS often and involve the user/soldier, you are wasting everyone's time. Got to break some rice bowls.
- Much could be done in simulation.
- Collect lessons learned from training exercises that inject digital failure. Catalog the remedies.

PERFORMANCE ANALYSIS

3. What mechanism needs to be in place to document digital and back-up requirements? What problems are anticipated in development of that documentation? Consider, as a minimum, the following:

Soldier's Manuals (SM):

- Let's back up and discuss these products as a whole. Digitally-driven changes in doctrine would be the first step. That would impact on TTPs, but I don't think there are TTP publishers anymore. They're integrated into doctrine and MTPs. The second step would be changing task analysis. In the TRADOC system, tasks drive the content of courses, Soldier's Manuals, TSPs, and school-developed SOPs. For back-up requirements, the task analysis would start with existing tasks: What back-up procedures are there already? What procedures can be integrated into existing tasks? Are there new tasks? Do existing tasks need to "point" to conventional tasks that can function as back-up procedures? Concurrently, changes to TMs need to be coordinated with the system PMs.
- No, Soldier's Manuals are too big already. Consider capturing the digital and back-up requirements in task inventories included in training POIs when the number of digital and back-up tasks reaches critical mass.
- All publications (SM, FM, TM, TTP, TSP, and even SOP) must go to a digitized (Smart Card) system.
- If the digital and back-up tasks are significant and their likelihood of occurring high enough, they should be in Soldiers' Manuals, FMs and TMs just like other tasks. We shouldn't leave it to the discovery and initiative of units. Give them some solutions and they then have the opportunity to improve or adapt those, but they shouldn't have to develop the base cases.
- Yes, we need electronic versions of Soldier's Manuals.
- Get on the ground at Hood and observe what is happening. Stop talking and get on with it.
- This is out of my area of expertise, but sometimes I think a good SOP is better than all of the publications we have in the field.
- I suspect performance accuracy and better awareness of the system's capabilities could be realized and documented through use of simulation.
- The following applies to all publications: Publications should be driven by the needs of the user - content must be captured by the institution - sent back out to

PERFORMANCE ANALYSIS

force via Internet - all publishing, updates, and changes should be by electronic means.

- Begin with a bulletin board or chat room approach to get a handle on the size of the problem posed by digital and back-up changes and to explore innovative approaches to solutions. Catalog digital and back-up in separate documents, or perhaps as an appendix to SM or TTP.

Field Manuals (FM):

- FM will be affected only if digital and back-up changes the basic way of doing things.
- Yes, FM need to be converted to electronic versions.

Operator Manuals (TM):

- The answer is both "No" and "Yes". Size is my concern here. Some digital and back-up coverage must go here, but as few as is reasonable.
- Yes, they should be produced in electronic versions and pocket sized versions.
- The material developer (contractor) should produce these.
- New TM are need for stand alone simulation, like the crew station trainer (CST) and others.

Tactics, Techniques, and Procedures (TTP):

- Only as the digital and back-up requirements affect collective tasks and mission performance. Use electronic magazines and bulletin boards to convey the smaller stuff.
- Yes, these need to be electronic
- MWTB could be used continually to develop and update these (and TSP too).

Training Support Packages (TSP):

- Yes, these will be affected, but they should be produced with a weighted priority. Master the full up basics before you get to the degraded stuff.

PERFORMANCE ANALYSIS

- The institutions are responsible for providing exportable TSPs for the units that cover both individual and collective tasks.

Standing Operating Procedures (SOP):

- Yes, digital and back-up will impact SOP because many procedures and options will be unit dependent if not unit peculiar.
- Yes, this is more critical than many other publications in that each organization is in a different level of fielding digital systems and will need to establish back-ups based on what they have available.
- Simulations would be used to build the majority of the foundation for much of the SOP covering digital and back-up.
- The institution should produce a baseline digital and back-up SOP.

Other:

- We need to get information out as quick as possible; soldier to soldier, commander to commander, technician to technician, etc. The faster we get this moving, the faster we'll get insight into the problem. The "normal" publication method is too slow.
- Need to have on-line lessons learned (chat rooms), etc. to capture and document procedures being developed by soldiers that are different from formal training manuals.
- Must provide online access to lessons learned during critical incidents of digital failure.

PERFORMANCE ANALYSIS

4. Lessons learned input from users is needed for digital and back-up operations. Developers and trainers need user information.

How does the flow of information need to work?

- For system-specific lessons learned, I would think the most effective means would be direct contact with the proponent school (through bulletin board, paper recommendations, AOSP surveys). Could piggyback on an existing system like CALL, but that puts an organization in the middle unnecessarily.
- It needs to work more like a nuclear reaction than a chain. It must be rapid, multiple faceted; not step-by-step through an approval chain. Most of the people in our existing process don't know what the soldiers are talking about in the digital realm. Even if they wrote or are writing the book on performance, their knowledge is usually dated or one or more drops behind existing software.
- Smart card is the way to go.
- Electronic feedback seem to be as good a solution as any.
- Soldier should be able to phone-in, mail-in, or go on-line to ask questions, provide input to problems identified in the field. They should receive an answer directly and if it impacts other, some form of Army distribution must be made.
- It doesn't.
- Look at the way AWE 94-07 was done...that was probably about right. It included the CSA, MACOMS, combat development guys, SMEs, industry.
- Work digital failures into training exercises and gather information from AARs.

What types of information are needed?

- What went wrong and how it was fixed, bypassed, or worked around.
- Performance by tasks, conditions, and standards.
- Need the specific set of conditions so that others can see if they have the assets to apply the solution being discussed. What will be a good solution in one case may not be in another.
- 1. What are the degraded operations? What happens that won't allow system to be used properly? 2. What back-up procedures were used to continue to operate?

PERFORMANCE ANALYSIS

- Take lessons learned at Fort Hood (digital tasks and backup tasks) and crank this information back into the institution's training developers.
- Identify what works. Identify what doesn't work. Identify workarounds and SOPs that are being followed.

What changes are needed to enhance the flow of information in both directions?

- I doubt if many, if any, proponents have an organization or person that analyzes lessons learned to assess their validity and determine where the lessons learned should be integrated into training.
- Break free of the practice of withholding formal approval of everything until we fully explore and cover everything from all angles. This probably includes safety too.
- Develop a course of action, with critique, from critical incidents during training exercises.
- Provide for a "Help Desk" type operation with a single point of input and output.
- Start/establish a process for flow of information.
- We have to consider the effects of personnel turbulence. Probably talking a six year plan during which this learning goes on. You change crews, top to bottom, 3 times in six years. There is no continuity.
- Attitudes need to change. There has to be acceptance that some of the stuff just doesn't work. Data base tracking of information is easy to use and would help track inputs.
- Providing the electronic working chat room concept will invite creative solutions from all levels of users.

PERFORMANCE ANALYSIS

5. Training solutions may be too costly to answer all of the digital and back-up requirements. Analysis could answer the following questions:
- What skills are critical and must be trained and sustained?
 - What skills are important and should be trained but not sustained in the traditional manner (i.e., develop job aids, software prompts, workarounds)?
 - What skills are either low risk, low demand, or low impact so they should not be trained?

Is it reasonable to expect that the Army should do such an analysis? If so, who should direct it or oversee it?
--

- There are two types of analysis needed (maybe more): 1. Analysis to determine what needs to be trained. This analysis needs to be conducted by Armor and Infantry SMEs at the proponent schools (for M1 series tanks and BFVs). 2. Analysis to determine how the training will be accomplished. This analysis has a much broader scope, of course, and will require input from proponent course managers, Soldier's Manual developers, etc.
- I suspect the unit and onsite contractors will begin it. TRADOC will follow and try to catch up later.
- TRADOC.
- I think that it is important that we answer that at some level. I think, for example, that repetition is key to full use of the digital interface devices. Pilots have to train in part to a frequency standard - - so many take offs and landings in a certain time period. There is some parallel to the basic skills in using the equipment. We've learned that reticule aim level XXX is a reasonable standard for units to sustain to allow them to transition to live firing. The proponent should cause this analysis to be done. They may contract, use someone else, but they need to address the issue.
- The reality is that most senior leaders will not make a decision (especially in material development area) without some form of analysis. If a study is done it should be done by TRAC-WSMR.
- Yes. Units will have many great ideas concerning solutions to back-up requirements. However, unit's solutions need to be reviewed, coordinated and a select few of the best ones become doctrine, TTP and SOPs.

PERFORMANCE ANALYSIS

- Yes, and it probably needs to be directed by the DCG TRADOC. The same guy needs to be synching the component parts with top-notch analysts who have no interests at stake or axes to grind. OPTEC/TMC seem to have developed a workable relationship in AWEs.
- Yes! Yes! Yes! It should be part of the original contract with the contractor team responsible for the system. But PMs/PEOs have to ensure it happens. The schools should be completely involved in the process to include oversight of the process with user juries, etc.
- It needs to be Institutional based (i.e. Armor School is the keeper of the standards for all Armor applications.)
- First, look to industry and other services for approaches. It might be helpful to divide back-up training to different members of the crew.

How would the results of such an analysis be useful?

- The more real data you have, the better we can build our simulations and build TSPs. This really means we can create workable, hence, trainable standards.
- It will be useful for management of training development (TD).
- If you do develop a prescriptive training strategy, you need to know what digital or backup tasks should be there and what is the frequency of training that is required. It would be better to assign the frequency and conditions of the tasks based on some analysis rather than arbitrary guidance. Arbitrary - or anecdotal - frequency requirements could have you wasting time on things that people never have trouble doing when they need to, or omitting tasks which need to be trained more repetitively.
- This type analysis should indicate if TD can impact force effectiveness or if material solutions can be identified.
- Analysis would provide units with the best back-up solutions.
- Documentation, properly conducted, can be used in P3I.

SKILL DECAY ANALYSIS

ISSUE: Digital and back-up skills will decay.

1. The effect of decay on digital skills must be established. Some evidence exists that digital skills will decay differently than other physical and/or mental skills.

what has experience with digital functioning identified about loss of skill?

- It might be that this is a generational problem. Might need to examine similarity to old skills. Some times digital functioning might be in direct contradiction to old skills, e.g. "dumping lead" in MI Gunnery.
- For this, we need to ask the scientists.
- OPTEC has collected some information on this from TFXXI AWE. What I have seen shows a fairly rapid decay with what we are currently asking our soldiers to use.
- Decay is rapid; must have sustainment training repeatedly.
- ARI needs to address this.
- We know some digital skills are perishable. FOCUSED DISPATCH taught us some things. User interface that is intuitive can help tremendously with retaining skills. Need to check the CVCC reports for case studies on retention and decay implications.
- We teach a soldier how to assemble/disassemble his weapon blindfolded and that task is retained for 20 years. We can no longer do that with digital tasks because of software changes. Skills decay so we need built in tutorials into soft ware programs.
- The bulk of existing evidence is with procedural skills. Key issue is not so much the decay rate of digital skills but rather the reacquisition rate. Although the decay rate of digital skills might be faster, the reacquisition rate might be steeper.

what should be done to learn more about the decay of digital skills?

- The difficult aspect here concerns the decay of collective tasks in general. Collective task decay is affected by team or group turbulence, task load, type of task (procedural vs. transfer), etc.

SKILL DECAY ANALYSIS

- We must go back to observations and studies.
- Test, test, test.
- Need to test some digital military skills and see how they decay. Would be interesting as a first step in developing the test protocols which would allow you to repeatedly do this.
- Need to address how can we build digital systems to be more intuitively obvious to use so that the skills required are more natural and require less specialty training.
- We must study this to answer. Solutions may be easier than many think. Must identify decay rate and amount of decay.
- This area needs more research. We need to start making some marks on the wall (identified tasks, procedures, etc.).
- We could start out by testing digital soldiers in the first 1st CAV about one year after they went through NET. The answer may be in periodically testing soldiers to gather data. We dropped the old SQT, but maybe we need a digital SQT program.
- Need to conduct a controlled experiment with retention intervals of 90 days, compare decay pattern to decay of procedural skills, which have been well documented. "Retrain" digital skills with 10-20% of original training time and determine 'go' rate. This will begin to map reacquisition rate, which is fundamentally more important than skill decay.

SKILL DECAY ANALYSIS

2. Decay rates must be determined for back-up skills. The shift in the training population from those individuals well-grounded in manual skills to those whom the manual skills play a secondary role will affect skill retention.

what is known about performance that can be applied to projections about back-up skills? Has anything been learned about back-up skills and how quickly they decay when operating in a digital environment?

- Not sure analog skills will be the back up. Gradual or "graceful degradation" may generate new, different skill requirements.
- I wonder if there hasn't already been a study and analysis of these types of problems done by the field artillery (FA) community? They have been using digital indirect fire operations for years.
- Digital systems break frequently enough to exercise the back up systems. But we do not know the digital tasks well enough today. Must solidify digital tasks definition.
- Probably need to research the existing literature as a start point.
- The M1A2 was fielded in 1994 to Saudi Arabian forces. Can they still operate the equipment in backup? Maybe someone should ask them. Over 500 soldiers have been given M1A2 NET at 1st CAV; let's review these soldier's skills.
- Overlearning, through practice, is the best known way to reduce decay. A better conceptual understanding (or mental model) of how a system works can mitigate skill decay.

what studies are needed to help forecast back-up skills decay?

- Perhaps this needs to be focused on during the development of the operational requirements document (ORD) and can therefore be included in the Analysis of Alternatives.
- First we must identify what we mean by "back-up" tasks. Then studies of decay of these back-up tasks are required. A big problem is going to be that proficiency in task performance is difficult to measure.

SKILL DECAY ANALYSIS

- A study approach would be to vary the degree of overlearning of back-up skills. Measure performance 30-90 days after period of normal use. Most decay will likely occur within 90 days. Examine effect of degree of overlearning (Hi/Low) on decay rates.

DISTANCE LEARNING

The Army defines distance learning as:

The delivery of standardized individual, collective, and self-development training to soldiers and units at the right place and right time through the application of multiple means and technology.

ISSUE: There is a clear commitment in the Army to pursue distance learning as the training method of choice in Force XXI and beyond. Digital and back-up training are prime candidates for this approach.

1. What is the impact of distance learning on training development? Consider the following areas:

What courses and/or types of information are best suited for distance learning? Can digital and back-up skills be initially taught by distance learning? Should distance learning be limited to refresher training for these skills?
--

- The primary candidate is the knowledge courses - but not sure "courses" is the real answer. Use the "medium" for what it does well; don't force it into the course box.
- I think to use distance learning via the Internet for individual training and simulations for unit training.
- I don't know that one course or the other lends itself to distance learning. Can skills be taught? - - probably. Should it be limited? - - not sure why you would arbitrarily limit it to refresher training.
- Distance learning is like any other Army product. If we buy good quality DL, it will work. If we buy BS, the soldiers won't use it.
- Distance learning is the reason the pillar paradigm can be broken. Material for distance learning can and should be used in self-development, unit training, and institutional training.
- Not necessarily a valid assumption that distance learning is the way to facilitate initial learning. Would really like to see a media analysis conducted to answer the questions, but suspect that won't happen.
- Distance learning is best suited for core tasks with a wide target audience. Possibly might use it for mandatory instruction e.g., EO briefings and classes. This frees up time for soldiers to get on the equipment and refine their perishable digital tasks.

DISTANCE LEARNING

- Distance learning is better suited to imparting knowledge, as opposed to the “red-time” skills which are better served by the traditional teaching. Practical demonstrations are effective means of training. DL can train digital and back-up skills.

What is the lead time for development and implementation of a subject by distance learning? If digital capabilities change rapidly, can distance learning react in time to changing training needs?

- Yes, if we work and produce on site verses through a school or bureaucracy chain of approval.
- Yes, but via Internet only.
- Need to ask this of distance learning experts.
- Distance learning-if done over Internet-is the fastest way to get applicable current training to soldiers.
- Suspect that changes need to occur in today's procedures if they are intended to keep up with change. Depends on resources provided to sustain training.
- If DL makes use of the Internet, second questions is answered “yes”.

Is a different approach needed in the development of distance learning to replace the inherent knowledge provided by a live instructor? Does it need to be augmented by live instructors on-site with the soldiers.

- We will need to figure out how to create distance group support, reinforcement, help, enthusiasm. Need to insure DL doesn't become a dumping ground for “nice to know” stuff that was cut out of resident training.
- No. Use a mentor on demand 2xhour/day.

DISTANCE LEARNING

- Yes. There is a difference in the development. I don't know if it is in the approach but it is in the level of analysis and design. As mentioned earlier, the live instructor adapts, tailors as he goes on, pulls out additional information or related topics as needed. DL, or exported materials have to be able to stand on their own and allow the student to proceed. Think of the difficulty of showing someone how to turn on your VCR and record a show as opposed to developing a block of instruction which allows them to do it. When showing, you know exactly what the characteristics of your trainee are. You can re-enforce, admonish, correct, right as you go on. You have to try to anticipate and write to all those conditions in a TSP. Augmenting by live instructors can be good if they are prepared and fully integrated into the approach.
- Distance learning, if developed correctly, should minimize..."the inherent knowledge provided by a live instructor." What delta remains should be covered by leaders on site or peer soldiers.
- Yes, but don't know if the personnel required to do this have been charged. Probably does need to be augmented on site, but it depends on the final choices made about content and presentation of DL.
- Yes a different approach is needed because there is an opportunity to apply new training tools and methods not available in the classroom.

Can distance learning be used to change mindsets or attitudes? Digitization and back-up requirements involve fundamentally different tactics and strategies and many learners will need to change basic ideas and previous learning. Can distance learning accomplish this as well as live instruction?

- The answer to this is that it depends on the situation. But DL can be useful in doing this in almost all situations.
- Yes.
- I don't know. Is this the information warrior issue? Getting people accustomed to this delivery mechanism could make them more comfortable with the computer, electronic interface world.
- Yes, it can be used for all these things.
- I think DL supplements live instruction; it is not an either/or.
- DL can change mind-sets if properly implemented. Distance learning does not completely provide all answers; much must still be done by someone live.

DISTANCE LEARNING

- DL can change mind sets. There are great examples of success stories from industry.

Other training development considerations:

- We will not see great economies of time from DL. We must carefully watch the burden we put on the student and the unit.
- I think there are possibilities for DL. It has to be scientifically assessed. At some level we have to understand what we are getting out of the process. It has to be some substantive measure, not comfort, like it or not, feel good approach. Will it deliver a skill which can be used under pressure or whatever environment is appropriate? I can't create the parallel, nor even know if it is relevant, but I don't want my open heart surgeon to have been trained by DL.
- It needs to be determined, what is the right mix of live, virtual, constructive, distance learning?
- Two points: (1) A crosswalk is needed between skill and knowledge type and DL tools. (2) Training costs are always a factor.

DISTANCE LEARNING

2. What will be the effect of distance learning on the soldier? Consider the following areas:

How will distance learning accommodate different types of learners, e.g., computer literate and not; fast learners and problem learners; readers and non-readers?

- Yes, these types can be accommodated but DL loses the group dynamic that is important in this too. Developers will need to provide multiple paths to the students to accommodate different types.
- All effects on these types are positive.
- We've been wrestling with this in the education community forever. Standardized tests measure how well you take tests. Students who are good with the DL environment will probably do well in the courses. Those who aren't, won't. I don't know where it fits, but we haven't been able to cause the participants in our exercises to read the little bit of material we have given them. We're told this generation doesn't read. And for this generation we are developing a DL based delivery philosophy? I don't know that this is even relevant. The basic issue is, I don't know that DL can result in long term skill acquisition. I don't know that it can't. But there should be a substantive body of scientific work that addresses this medium before we commit to it.
- More important is the training audience. Today's soldiers must have an ability to use computers. Bottom line - computers will be/are the back bone of the Army. If a person can not become computer literate and actually be comfortable with using it, that soldier is going to have a hard time in the Army.
- I don't think it will accommodate all these types.
- Much depends on how DL instruction is designed and implemented.
- Incorporating a self-paced, multi-media approach will help.

How will recipients be motivated to use and accept distance learning?

- Link it to promotion; make it part of a certification requirement, make it a required part of the job. Also, push the concepts of self improvement, pride, utility to current or anticipated job. Push the idea soldiers are learn marketable skills for civilian life.
- Tie it to the personnel system.

DISTANCE LEARNING

- Its all about motivation for self-development. I imagine there are certain design skills which make it fun to use, keep you involved, bring you back for more.
- Stress that it is part of their job. Make distance learning part of OPD and NCOPD, Sergeant's Time-every Thursday morning - should be heavy with distance learning.
- It's the old guys who won't be receptive - - younger ones don't have institutional biases.
- Incorporate attractive and interesting instructional design and student interface.

Are there any fundamental differences between instructor mediated learning and distance learning? Will soldiers react in a different way? Are the outcomes the same?

- With DL, you lose the personal touch: counseling, mentoring, bonding. But it still will work.
- Not a problem
- This is a good question for researchers.
- There are fundamental differences between the two types of instruction but attaining skill proficiency is possible with both. If the outcomes are not the same, then distance learning was wrong method or was not appropriate for that content.
- Large number of studies indicated no significant difference.
- (Added comment): Another reason why audio teletraining has received little attention is that there has been an inclination in distance learning to replicate the classroom setting of face-to-face delivery, regardless of content. Here students observe both the instructor and the material being presented and, in the case of two-way video, instructors can observe the students and what they might present. Some researchers have observed that the inclination to the face-to-face video format derives from the fact that traditional instruction is the only familiar instructional frame of reference for designers, developers, and decision makers on these matters. Furthermore, there is the perception that students prefer the security of having their instructor in close proximity, in a real or virtual sense (Hardy and Olcott, 1995). These issues are more organizational than instructional. Nevertheless, audio teletraining might be well suited for instruction in which static visual information can be provided to students in advance and for a course in which the instruction is sequential with little branching. Such is the case for training unit clerks in the ARNG.

DISTANCE LEARNING

Other soldier considerations:

- Don't overstress the soldier except by intent; and then we need to have a valid reason to do so.

DISTANCE LEARNING

3. How should distance learning be managed and administered? Consider the following areas:

who will track and account for who receives the training? This includes official credits for evaluation and promotion considerations. Is this built into distance learning design?

- I'll address distance learning in general. There are distance learning versions of courses that are managed by course managers and instructors. There are distance learning self-development programs (like the one for the M1A2) where students aren't evaluated (well, they're evaluated in terms of test results in the modules, but the test scores aren't reported to anyone) and the goal is self-development on an intrinsic level. Some TSPs (which are DL) are distributed and managed by ATSC. My point is that it's hard to talk about all DL in terms of management and administration. Those functions vary depending on what training is being DL'ed.
- First, I assume diplomas and certificates will continue to be issued by proponents. And commanders and the NCO chain will also follow progress. But the real onus is on the soldier to get what he or she needs to grow and advance. (This also helps answer the motivation problem.)
- Yes, it is all part of a digitized training system.
- The immediate supervisor needs to keep a Job Book. Records must be formal and built into DL design.
- ATRRS should track data on DL usage.

who will evaluate and certify learning? This includes the development and administration of performance measures.

- Proponents, commanders, supervisors, observer/controllers (O/Cs).
- Unit commander and proponent mentors
- Sounds like a life time's worth of work for some contractor.
- The individual's immediate supervisor for training will be responsible. Proponent schools have to develop certification requirements and keep them updated.

DISTANCE LEARNING

What provisions are needed for feedback to the training developers?

- Internal and external evaluations, lessons learned, field and student feedback. All pretty standard stuff.
- Direct feedback via the Internet.

Will distance learning methods have the flexibility to be altered to meet local conditions?

- They must if they are to work. This means the developers need to provide multiple paths.
- Yes
- It must! DL should address specific target audiences.
- It depends on design, implementation strategy, sustainment requirements.
- There are some problems that will have to be overcome if this is to occur. If linked back to a live source, Time Zone differences need to be overcome (e.g., when it is 0800 in Fort Knox, it's 1800 in Korea). If self-paced and on the Internet, the local user will need the capability to download and store and retrieve.

What will be the impact of distance learning on units? Will they be able to support it?

- It will be a substantial burden. We will have to work very hard to keep them from screwing with the students. This is already a problem with resident training (i.e., BNCOC, PLDC scheduling). It will get worse when they can reach out and touch the soldier and there is no one to intervene.
- Unit impacts will all be positive
- It will have a positive impact on OPD, Sergeant's Time, scheduling training.
- Units will probably be able to support this.
- Units will have to be provided additional computer systems. Officers and NCOs down to E-6 or tank commander should be provided their own laptops.

DISTANCE LEARNING

Other training management considerations:

- Who watches quality control across stove pipes? No real mechanism exists to do this now below DA level.
- There should be a unit home page to track individual progress.

DISTANCE LEARNING

4. Distance learning involves a variety of technologies. The implications of hardware, software, cost, availability, flexibility, acceptability, and learning differ with each technology. What is the Army commitment or considerations with the following technologies? What impact will there be on soldiers and on units of each of the following:

Video-teletrainer (VTT)

- This should certainly not be the only answer. When used, it should not be a talking head. Access of and to students is still a problem.
- This is not a paradigm shift. Actually, its the same old thing - just a different way of presenting.
- On a scale of 1 to 10 (with 10 high), this is an 8.
- Equipment must be available at all locations.

Simulations: virtual, constructive, and linked

- These are great, but they eat time and are expensive to support. They are not as fun as doing it for real. After a while, they tend to bore soldiers at the lower levels who don't have that high a level of participation. Arguments about OPTEMPO savings don't mean much to most soldiers.
- When combined with CD ROM, it can be a powerful tool even on individual PCs.
- On a scale of 1 to 10 (with 10 high), this is a 9.

Videos:

- Usually boring, especially in groups. Give them cassettes to take home and review at their leisure.
- Better than written material but not interactive.
- On a scale of 1 to 10 (with 10 high), this is a 2.

PC-based computer assisted instruction programs

- Good, but make them as fast and interactive as possible. We are competing with Nintendo and Sega; we need to act like it.

DISTANCE LEARNING

- A must, but don't just digitize current written and presentation packages.
- On a scale of 1 to 10 (with 10 high), this is a 7.

Internet:

- Everything already exists, we just have to use it. Make more access available: not everything has to be throughout the unit. Consider Post access stations. Install link access ports (modems) in barracks. Libraries can provide access to everyone. Give soldiers help in buying their own laptops. Avoid the, "If we don't issue, it doesn't exist," syndrome.
- The potential exists to archive virtual training programs that can be downloaded and operated interactively.
- On a scale of 1 to 10 (with 10 high), this is a 9.

CD-ROM:

- Good.
- A must.
- On a scale of 1 to 10 (with 10 high) this is a 7.

Others?:

- Removable hard drives (check what they are doing with this at the Intel School). Digital tapes. Smart cards.
- Audio teletraining.

SUMMARY

ADDITIONAL ISSUES:

What other digital and back-up requirement issues can you identify?

- Some issues that need to be answered: Can we select soldiers for this skill at the time they join the Army? Should we isolate digital warriors to digital units only (vice normal rotations)? Can we build objective systems to be simpler and more intuitive?
- Training development will be more important than ever. Solving the issue of how to be responsive in the digital development world is to me one of the fundamental critical issues. Given that digital operations change daily, how do you capture that and spin it back into training development fast enough to be of utility? The other part is how to get training developers and deliverers to get beyond "button-pushing" in figuring out what NET is for a new system. Figuring out and demonstrating how to employ, put to maximum use, etc.
- Many of the back-ups will rely on the base common tasks that all soldiers must possess. We have already seen a decline in map reading and navigation capabilities due to the spread of POSNAV/GPS.
- The up front in-your-face concern: We must identify digital tasks and back-up tasks. That has to be the start point before anything else is done.
- There are three basic needs: (1) Need a basic understanding on the part of the requirement writers, doctrine writers, etc. on the implications of digital and back-up requirements (2) Need a solid 'way to fight digitally' described at every echelon. (3) Need to develop basic conceptual capabilities for bigger picture of change requirements.

From your experience, what digital and back-up issues are most critical for the Army today? And in 10 years?

- Now: Capturing what is going on now as we learn by doing. 10 Years: Orchestrating all the various software drops and new hardware across the affected units. We don't do this well now and it will get harder.
- For both: Do not let the common tasks and fundamentals go away.
- In the future: The acquisition system will accelerate. Training Development must adjust. Identification of digital and back-up collective tasks, conditions, and standards from platoon through brigade is more than critical.

SUMMARY

- Need a better conceptual understanding of the system of systems.
- Now and the future: Break the rice bowls. Must have one system of systems and pull modules in as required.

SUMMARY

YOUR FINAL RECOMMENDATIONS:

- Some near-term fixes can be accomplished easily. Armor is currently revising 19K tasks to produce new Soldier's Manuals in 1 quarter, FY98. We can look at those SL 1-4 tasks to ensure that back-up procedures have been addressed (perhaps not all variations, but we can fill some gaps). I suspect that the back-up problem is not as bad as the 60% figure that this study proposes, but still we need to review tasks. The changes in the task analysis will get the content into the training development system and thus impact on courses, TSPs, STPs, etc. These products cut across institution, unit, and self-development training. In the long term, we need to look at how digital capabilities change doctrine (this has already been done to some extent). Doctrine changes will drive more changes to task analysis and filter through training development products. If a digital lessons learned home page was established, Fort Knox DTDD - as the training and doctrine proponent - would be the logical manager of such a page. That page would provide information, but the information needs to be monitored (e.g., safety office needs to identify back-up recommendations that compromise safety). More important, information would get validated and integrated back into training. Don't think contractor manning of this type home page is a good idea.
- We need to shed the bureaucracy that has grown up around training development and proponentcy. We need to grow some digitally smart TDers. Make them an early part of the material development/combat development/force development experience. We need to work smarter and closer with contractors. We need to explode the means of getting information/lessons learned to our soldiers. We need to capture what is going on at Fort Hood III Corps and export commonalties. We need to design this stuff to be simple to use and to train on. We need to look at/study how the Navy and Air Force handle their problems; its always cheaper to steal than to invent.
- Provide "digital back-up" via Internet. Explore contractor support for training development. Conduct a test for one year as follows: issue computer to all (digitize people); ARI design test. Shift focus of training delivery to units and self-development. Transfer DTLOMS from Fort Knox to Fort Hood for mounted forces; Fort Bragg for dismounted forces, etc. Increase AOB (primary) by reducing AOAC (secondary) for back-up training. Provide redundancy and provide back-up capability by providing each vehicle with back-up GPS.
- I think that approaching the distance learning and self-development and unit training and stability, etc., as a performance issue rather than a training issue is a fundamental problem. Training nibbles at the edge, but looking at why units don't perform and quit saying, "it is just that they aren't trained", continues to be the major task. I don't accept the excuse that we can't affect unit turbulence. If we can

SUMMARY

change all these other things about the Army, we should be able to address this one. The situation we currently have of staffs that are virtually NEVER together more than a year is insane. General Officers who hold their jobs only 12-14 months is ludicrous. And we wonder why we struggle. The phrase from the Vietnam era comes back to me. "Six months worth of experience, relearned twice a year for eight years." (We had six month command tours so the most number of commanders would get the chance to command in combat.) I'm told the answer to that is that there is attrition in combat and therefore we should emulate that in training. Somehow doesn't answer the mail for me.

- The information age is already here. The training development community must do the same thing the material development community does. Look at how we can change how we do business - not automate the current way we do business.
- 1. If another group like this gets together, bring to the meeting more people with digital unit experience. When I was told we were assembling a gang of people who are going to answer digital back-up questions, I wondered who would have the "digital expertise." Believe expertise is present, but not readily. 2. I work better when focused on an objective. Would like to have had a specific goal - Purpose Statement. Think I understood - Develop Recommendations for Back-up Training for the Digitized Battlefield. Seems we had a hard time staying on track. 3. Must figure out a way to get information back into institution. Enjoyed the workshop.
- This situation is cracked, but not broken. Need some green suited "young turks" to lay it out and then some influential generals to back them up. 98% of O-6+ don't understand, are biased, or are trying to protect a "rice bowl." You want it fixed, give a bunch of smart CPTs/Majors/LTCs the mission, the resources, and a dedicated unit to practice with. Think outside the box; business as usual isn't cutting it. Contractors can facilitate and assist, but they lack the credibility and clout required to pull it off.
- Army requirement writers need to think outside their office walls. Army requirement writers, doctrine writers need to be responsible for their decisions. Training must be included much, much earlier in the development cycle. Simulations need to play a bigger role in requirements and design. Must have true concurrent [spiral development] involving all of DTLOMS. Please read the lessons learned and pay attention to them. The Army keeps learning the same lessons and never applies them.
- Switch big blocks of training from institutional to self-development. Back-up training needs to emphasize Internet delivery. Explore material fixes for training problems, e.g., redundancy with the PLUGGER. Investigate an increase in Officer Basic with a decrease in the Officer Advanced Course. Review of officer training and NCO

SUMMARY

leader courses. Training development at institutional level suffers from a lack of products, lack of personnel, lack of resources. Transfer DTLOMS for Mounted Forces to Ft Hood. Explore a true Combined Arms School. Recommend a 1 year test of training involving laptops.

- Basic full up digital tasks should be trained at schools. Units should train back-up tasks, "digital" sub-systems, and unit-specific needs. Relook all institutional courses: reduce as required, shift some percentage of tasks to distance learning and self-development; reduce course length and increase digital tasks concentration. Relook the increased role units have in the training development. Digital system SME's are now in the field, not the school houses. Fort Knox needs a pipeline to the center of gravity which is currently Fort Hood.

SUMMARY

FOLLOW-UP CONTACTS OR SOURCES WE SHOULD BE AWARE OF:

- Track these efforts within the Armor School now going on: Distance learning as part of the Master Gunner course; increased digital training in the courses; TAADS conversion of M1A1 TC3; reduction and eventual end of the on site Junior Officer Motor Officer Course
- Review what was learned in the report on Desert Hammer 94-07. See what is available on follow-on by the Cobra Team at NTC. Look at reports on the IUT&E and LUT for the M1A2 and the M2A3.

APPENDIX B

M1A2 DIGITAL TASK DOMAIN

CONTENTS

	Page
Individual Tasks	B-3
Leader Tasks	B-5
Crew Tasks	B-7
Platoon Tasks	B-8
Platoon Battle Drills	B-9
Company/Team Tasks	B-10
Battalion/Task Force Tasks	B-11

Table B-1

M1A2 Digital Tasks: Individual

Task #	Task title
031-503-3005	Prepare and Send NBC 1 Reports
061-283-1002	Locate a Target by Grid Coordinates
061-306-6005	Prepare/Submit Standard Shelling, Mortaring, and Bombing Report
071-326-5705	Establish an Observation Post
171-121-4030	Conduct Vehicle Tactical Navigation
171-121-4055	Employ Vehicular/Organic Smoke
171-121-4063	Supervise Local Security
171-121-4064	Prepare Logistical (LOGSTAT) Report
171-121-4065	Direct Vehicle Tactical Movement
171-122-1013	Zero the M240 Coax Machine Gun on an M1/M1A1/M1A2 Tank
171-122-3005	Engage Targets with the M240 Coax Machine Gun from the Commander's Weapon Station on an M1/M1A1/M1A2 Tank
171-126-1003	Slave Start an M1/M1A1/M1A2 Tank
171-126-1004	Perform Fuel Transfer Procedures on an M1/M1A1/M1A2 Tank
171-126-1007	Prepare the Driver's Station for Operation on an M1/M1A1/M1A2 Tank
171-126-1008	Secure the Driver's Station on an M1/M1A1/M1A2 Tank
171-126-1009	Operate the AN/VVS-2 Night Vision Viewer in the Driver's Hatch on an M1/M1A1/M1A2 Tank
171-126-1011	Troubleshoot the AN/VVS-2 Night Vision Viewer on an M1/M1A1/M1A2 Tank
171-126-1013	Troubleshoot the Engine on an M1/M1A1/M1A2 Tank
171-126-1014	Troubleshoot the Transmission on an M1/M1A1/M1A2 Tank
171-126-1028	Fire an M250 Grenade Launcher on an M1/M1A1/M1A2 Tank
171-126-1029	Prepare the Gunner's Station for Operation on an M1/M1A1/M1A2 Tank
171-126-1036	Engage Targets with the Main Gun from the Gunner's Station on an M1/M1A1/M1A2
171-126-1042	Prepare a Tank Sketch Card on an M1/M1A1/M1A2 Tank
171-126-1051	Operate the Night Vision Viewer from the Loader's Hatch on an M1/M1A1/M1A2 Tank
171-126-1060	Prepare an M1/M1A1/M1A2 Tank for Powerpack Removal
171-126-1066	Troubleshoot the NBC System
171-126-1067	Place the NBC System into Operation on an M1A1/M1A2 Tank
171-126-1102	Perform Driver's Before Operations Check and Services on an M1/M1A1/M1A2 Tank
171-126-1104	Perform Gunner's Before Operation Checks and Services on an M1/M1A1/M1A2
171-126-1105	Perform Tank Commander's Before Operations Checks and Services on an M1/M1A1/M1A2

continued

Table B-1 (continued)

M1A2 Digital Tasks: Individual

Task #	Task title
171-126-1106	Perform Driver's After Operations Checks and Services on an M1/M1A1/M1A2
171-126-1108	Perform Gunner's After Operations Checks and Services on an M1/M1A1/M1A2
171-126-1110	Troubleshoot the M1A2 Tank Using the Driver's Control Panel Warning and Caution Messages
171-126-1111	Operate the Driver's Integrated Display (DID) on an M1A2 Tank
171-126-1113	Operate the Commander's Integrated Display (CID) on an M1A2 Tank
171-126-1114	Prepare the Commander's Station (CS) for Operation on an M1A2 Tank
171-126-1115	Troubleshoot the Fire Control System on an M1A2 Tank
171-126-1116	Boresight the Main Gun on an M1A2 Tank
171-126-1117	Perform Special Gunnery Checks on an M1A2 Tank
171-126-1118	Direct Main Gun Misfire Procedures on an M1/M1A1/M1A2
171-126-1130	Send and Receive Tactical Reports/Overlays on the Commander's Integrated Display (CID) on an M1A2 Tank
171-126-1135	Operate the Gunner's Control and Display Panel on an M1A2 Tank
171-126-1136	Drive an M1A2 Tank
171-126-1137	Operate the Personnel Heater on an M1A2 Tank
171-126-1138	Perform Built-In-Tests on the Commander's Integrated Display (CID) on an M1A2 Tank
171-126-1139	Perform Diagnostics Mode Maintenance on Commander's Integrated Display (CID) on an M1A2 Tank
171-126-1140	Perform Built-In-Tests (BIT) on the Driver's Integrated Display (DID) on an M1A2 Tank
171-126-1141	Perform Diagnostics Mode Maintenance on Driver's Integrated Display(DID) on an M1A2 Tank
171-126-1142	Start/Stop the Engine on an M1A2 Tank
171-126-1143	Operate the Commander's Independent Thermal Viewer (CITV) on an M1A2 Tank
171-126-1144	Prepare the Intervehicular System (IVIS) for Operation on the M1A2
171-126-1145	Prepare the Position/Navigation System for Operation on an M1A2 Tank
171-126-3001	Establish Silent Watch from an M1/M1A1/M1A2 Tank
171-126-3003	Secure the Commander's Weapon Station on an M1/M1A1/M1A2 Tank
171-126-3004	Engage Targets with the Main Gun from the Commander's Station on an M1/M1A1/M1A2 Tank
171-126-3009	Direct Machine Gun Engagements on an M1/M1A1/M1A2 Tank
171-126-3010	Direct Main Gun Engagements on an M1/M1A1/M1A2 Tank
171-131-2083	Perform Plumb and Synchronization on an M1A2 Tank Fire Control System

Table B-2

M1A2 Digital Tasks: Leader

Task #	Task title
031-503-3004	Supervise the Crossing of a Contaminated Area
071-326-5770	Prepare a Platoon Sector Sketch
071-326-5775	Coordinate with an Adjacent Platoon
071-430-0007	Consolidate a Platoon Following Enemy Contact While in the Defense
071-430-0008	Reorganize a Platoon Following Enemy Contact While in the Defense
171-091-1021	Plan Resupply Operations at Platoon/Team Level
171-091-1022	Conduct Resupply Operations at Platoon/Team Level
171-121-3009	Control Techniques of Movement
171-121-3038	Conduct a Relief in Place at Platoon Level
171-121-4010	Conduct Actions on Contact
171-121-4011	Lead an Armor Platoon in a Limited Visibility Attack
171-121-4014	Conduct the Defense of a Battle Position at Platoon Level
171-121-4015	Conduct a Hasty River Crossing
171-121-4016	Conduct a Displacement at Platoon Level
171-121-4017	Supervise Tank Platoon Formations and Drills
171-121-4027	Supervise the Improvement of an Armor Vehicle's Fighting Position
171-121-4028	Plan Occupation of a Battle Position
171-121-4032	Conduct an Attack at Platoon Level
171-121-4033	Conduct the Occupation of a Battle Position at Platoon Level
171-121-4034	Coordinate with Adjacent Units
171-121-4035	Plan a Movement to Contact
171-121-4036	Conduct a Movement to Contact
171-121-4037	Plan a Hasty River Crossing
171-121-4038	Supervise Local Security
171-121-4042	Supervise Quartering Party Activities
171-121-4045	Conduct Troop Leading Procedures at Platoon Level
171-121-4051	Prepare a Situation Report (SITREP)/Status Report (STATREP)
171-121-4052	Execute Tank Platoon Pre-Combat Operations
171-121-4053	Plan an Armor/Scout Tactical Road March
171-121-4054	Conduct an Armor/Scout Platoon Tactical Road March
171-121-4057	Perform Techniques of Movement
171-121-4058	Conduct Quartering Party Activities
171-121-4059	Conduct an Armor In-Stride Breach of a Minefield
171-121-4061	Conduct Armor Tactical Navigation at Platoon Level
171-123-4000	Plan the Occupation of an Assembly Area
171-123-4001	Prepare a Platoon Fire Plan
171-123-4004	Direct Platoon Fire Plan
171-123-4005	Conduct the Occupation of an Assembly Area

Table B-2 (continued)

M1A2 Digital Tasks: Leader

Task #	Task title
171-123-4007	Coordinate an Armor/Scout Platoon Passage of Lines
171-123-4008	Direct a Consolidation and Reorganization at Platoon Level
171-123-4009	Conduct an Armor/Scout Platoon Passage of Lines
171-123-4012	Establish a Perimeter Defense
01-1242.00-0020	Conduct the Occupation/Defense of a Battle Position at Company/Troop Level
01-5700.02-0001	Enforce Platoon and Company Communications Security Measures
01-9020.01-0001	Conduct a Defense at Company/Troop Level
01-9020.02-0002	Conduct an Advanced/Rear Guard at Company/Troop Level
01-9020.02-0003	Conduct a Flank Guard at Company/Troop Level
01-9020.02-0004	Conduct a Stationary Guard at Company/Troop Level
01-9020.03-0008	Process Tactical Information at Company/Troop Level
01-9020.03-0010	Conduct a Hasty Water Crossing at Company/Troop Level
01-9020.03-0013	Prepare and Issue an Operation Order (OPORD) at Company/Troop Level
01-9020.03-0014	Prepare and Issue a Fragmentary Order (FRAGO) at Company/Troop Level
01-9020.03-0016	Prepare a Unit Status Report
01-9020.03-0020	Conduct Cross-Leveling Operations at Company/Troop Level
01-9020.03-0023	Conduct Movement Across a Radiologically Contaminated Area at Company/Troop Level
01-9020.03-0024	Conduct Movement Across a Chemically/Biologically Contaminated Area at Company/Troop Level
01-9020.03-0025	Supervise Unit Response to a Chemical/Biological Attack at Company/Troop
01-9020.03-0026	Supervise Unit Response to a Nuclear Attack at Company/Troop Level
01-9020.03-0027	Conduct Tactical Formation/Movement at Company/Troop Level
01-9020.07-0004	Conduct an Offensive Military Operation on Urban Terrain
01-9020.08-0004	Conduct a Defensive Military Operation on Urban Terrain (MOUT)
04-3303.02-0014	Prepare Platoon or Company Combat Orders

Table B-3

M1A2 Digital Tasks: Crew

Task #	Task title
17-5-1039	Establish an Observation Post/Listening Post
17-5-1080	Employ Operations Security (OPSEC) Measures
17-5-2160	Navigate a Tracked Vehicle Cross-Country
17-5-2500	Occupy a Vehicle Firing Position
17-5-2710	Emplace a Hasty Protective Minefield
17-5-2730	Remove a Hasty Protective Minefield
17-5-5160	Recover a Vehicle (Self-Recovery)
17-5-5260	Prepare a Tracked Vehicle for a Nuclear Attack
17-5-5265	Prepare a Tracked Vehicle for a Chemical Attack
17-5-5267	Cross a Chemically/Biologically Contaminated Area in a Tracked Vehicle
17-5-5269	Cross a Radiologically Contaminated Area in a Tracked Vehicle
17-5-5276	Prepare for Combat
17-5-5278	Conduct Vehicle Maintenance
17-5-5500	Fuel an M1/M1A1/M1A2
17-5-5517	Employ the Mine Clearing Blade on an M1/M1A1/M1A2
17-5-5518	Employ the Mine Clearing Roller on an M1/M1A1/M1A2 Tank
17-5-5520	Extract an Injured Crewman from an M1/M1A1/M1A2 Tank
17-5-5521	Rearm an M1/M1A1/M1A2 Tank
17-5-5540	Extinguish Fires on an M1/M1A1/M1A2
17-5-5585	Engage Multiple Machine Gun Targets on an M1/M1A1/M1A2 Tank
17-5-5622	Engage Targets with the Main Gun on an M1/M1A1/M1A2 Tank
17-5-5695	Boresight an M1A2 Tank with a Muzzle Boresight Device
17-5-5710	Install a Thrown Track on an M1/M1A1/M1A2 Tank
17-5-5720	Install/Remove Track Blocks on an M1/M1A1/M1A2 Tank
17-5-5740	Start an M1/M1A1/M1A2 Tank with Slave Cables
17-5-5750	Tow an M1/M1A1/M1A2 Tank
17-5-5755	Ford a Water Obstacle in an M1/M1A1/M1A2
17-5-5840	Decontaminate a Tracked Vehicle
17-5-5895	React to an Antitank Guided Missile (ATGM)

Table B-4

M1A2 Digital Tasks: Platoon

Task #	Task title
03-3-C016	Conduct Operational Decontamination
12-3-C021	Conduct Consolidation and Reorganization Activities
17-3-0065	Conduct Troop Leading Procedures
17-3-0212	Conduct Tactical Roadmarch
17-3-0214	Coordinate/Assist Passage of Lines Forward/Rearward
17-3-0218	Conduct Reconnaissance by Fire
17-3-0219	Conduct an Attack by Fire
17-3-0220	Assault an Enemy Position
17-3-0221	Execute Actions on Contact
17-3-1014	Coordinate/Conduct a Passage of Lines Forward/Rearward
17-3-1016	Conduct Tactical Movement
17-3-1025	Conduct a Relief in Place
17-3-1026	Emplace and Retrieve a Hasty Obstacle
17-3-1039	Establish an Observation Post
17-3-2000	Conduct Assembly Area Operations
17-3-2269	Follow and Support
17-3-2320	Conduct Convoy Escort
17-3-2380	Disengage From the Enemy
17-3-2420	Conduct Bypass Operations
17-3-2450	Destroy an Inferior Force
17-3-2601	Conduct Hasty Occupation of a Platoon Battle Position
17-3-2602	Conduct Deliberate Occupation of a Battle Position
17-3-2605	Conduct Platoon Defense
17-3-2625	Displace to a Successive/Alternate Battle Position
17-3-2632	Conduct a Perimeter Defense
17-3-2760	Conduct Link-Up
17-3-3061	Conduct Overwatch/Support by Fire
17-3-3070	Conduct Breach Force Operations
17-3-8143	Cross an NBC Contaminated Area
17-3-C601	Perform Resupply Operations
44-3-C001	Conduct Passive Air Defensive Measures

Table B-5

M1A2 Digital Tasks: Platoon Battle Drills

#	Battle drill title
1	Change of Formation Drill
2	Contact Drill
3	Action Drill
4	React to Indirect Fire Drill
5	React to Air Attack Drill
6	React to Nuclear Attack Drill
7	React to Chemical/Biological Attack Drill

Table B-6

M1A2 Digital Tasks: Company/Team

Task #	Task title
03-2-C311	Perform Operational Decontamination
03-2-C328	Respond to a Nuclear Attack
03-2-C334	Respond to a Chemical Attack
03-3-C033	Conduct Thorough Decontamination
12-2-C021	Conduct Consolidation and Reorganization Activities
44-2-C001	Conduct Passive Air Defense Measures
44-2-C221	Take Combined Arms Active Air Defense Measures Against Hostile Aerial Platforms
71-2-0065	Conduct Troop-Leading Procedures
71-2-0212	Conduct a Tactical Roadmarch
71-2-0214	Assist a Passage of Lines
71-2-0219	Attack by Fire
71-2-0220	Assault an Enemy Position
71-2-0221	Execute Actions on Contact
71-2-0222	Advance in Contact
71-2-0309	Conduct an Ambush
71-2-0312	Conduct a Screen
71-2-0318	Conduct Linkup
71-2-0321	Conduct Delay
71-2-0322	Withdraw From Enemy Contact
71-2-0330	Conduct a Guard
71-2-0331	Conduct Air Assault
71-2-0332	Conduct a Hasty River/Gap Crossing
71-2-0601	Conduct Resupply Operations
71-2-1014	Conduct a Passage of Lines
71-2-1016	Conduct Tactical Movement
71-2-1025	Conduct a Relief in Place
71-2-2000	Conduct Assembly Area Activities
71-2-2021	Clear Restrictive Terrain
71-2-2269	Follow and Support
71-2-2420	Conduct Bypass
71-2-2603	Defend a Battle Position
71-2-2605	Defend in Sector
71-2-2607	Defend a Strongpoint
71-2-3015	Cross an NBC Contaminated Area
71-2-3061	Support by Fire
71-2-3070	Breach an Obstacle
71-2-4000	Conduct Route Reconnaissance
71-2-4010	Conduct Zone/Area Reconnaissance

Table B-7

M1A2 Digital Tasks: Battalion/Task Force (excludes staff)

Task #	Task title
7-1-3001	Occupy Assembly Area
7-1-3002	Perform Tactical Roadmarch
7-1-3003	Perform Passage of Lines
7-1-3004	Move Tactically
7-1-3005	Perform Hasty River/Gap Crossing
7-1-3006	Fight a Meeting Engagement
7-1-3007	Assault
7-1-3008	Attack/Counterattack by Fire
7-1-3009	Defend
7-1-3010	Cover Passage of Lines
7-1-3011	Withdraw Not Under Enemy Pressure
7-1-3012	Withdraw Under Enemy Fire
7-1-3013	Delay
7-1-3014	Perform Relief in Place
7-1-3015	Perform Linkup
7-1-3016	Perform Reserve Operations
7-1-3017	Perform Rear Operations
7-1-3018	Perform Raid
7-1-3019	Infiltrate
7-1-3020	Perform Guard
7-1-3021	Bypass Enemy Force
7-1-3022	Reorganize
7-1-3023	Consolidate
7-1-3025	Breakout from Encirclement
7-1-3026	Perform Screen
7-1-3027	Breach Defended Obstacles
7-1-3028	Maintain Operations Security
7-1-3031	Cross a Chemically/Nuclear Contaminated Area
7-1-3401	Maintain Communications
7-1-3901	Command and Control the Battalion Task Force
7-1-3907	Employ Fire Support
7-1-3909	Perform Mobility/Survivability Operations
7-1-3910	Perform NBC Operations

APPENDIX C

**DIGITAL DESCRIPTIONS FOR
INDIVIDUAL M1A2 TASKS**

The following tasks are those that can be accomplished using at least one of the digital systems (CID, DID, CITV, GCDP, IVIS, POSNAV) on the M1A2. For each task, a short description of how it would be performed digitally is provided. Also, a matrix identifies which systems are utilized for each task.

031-503-3005 Prepare and Send NBC 1 Reports

Digital task component(s)

Use the CITV and POSNAV to assist in gathering location information for report. Use the CID with IVIS free text capability to prepare and send report.

Digital systems utilized to accomplish task:

✓	CID		CITV		GCDP
✓	IVIS		DID	✓	POSNAV

061-283-1002 Locate a Target by Grid Coordinates

Digital task component(s)

Use the CITV, CID, and IVIS to determine target location.

Digital systems utilized to accomplish task:

✓	CID	✓	CITV		GCDP
✓	IVIS		DID		POSNAV

061-306-6005 Prepare/Submit Standard Shelling, Mortaring, and Bombing Report

Digital task component(s)

Use CITV and POSNAV to assist in gathering location information for report. Use the CID with IVIS freetext capability to prepare and send report.

Digital systems utilized to accomplish task:

✓	CID		CITV		GCDP
✓	IVIS		DID	✓	POSNAV

071-326-5705 Establish an Observation Post

Digital task component(s)

Use the CID to maintain situational awareness. Use the CITV to scan area of responsibility. Use POSNAV information with IVIS tactical reports.

Digital systems utilized to accomplish task:

✓	CID	✓	CITV		GCDP
✓	IVIS		DID	✓	POSNAV

171-121-4030 Conduct Vehicle Tactical Navigation

Digital task component(s)

The POSNAV, CID with tactical overlays, and DID are used to assist the commander to navigate.

Digital systems utilized to accomplish task:

✓	CID		CITV		GCDP
	IVIS	✓	DID	✓	POSNAV

171-121-4055 Employ Vehicular/Organic Smoke**Digital task component(s)**

On-board smoke is controlled from the DID, normally. The CID can also be used to control on-board smoke.

Digital systems utilized to accomplish task:

✓	CID		CITV		GCDP
	IVIS	✓	DID		POSNAV

171-121-4063 Supervise Local Security**Digital task component(s)**

The CID would be used to maintain situational awareness of the unit. The POSNAV would provide vehicle location to the IVIS for display on the tactical screen.

Digital systems utilized to accomplish task:

✓	CID		CITV		GCDP
✓	IVIS		DID	✓	POSNAV

171-121-4064 Prepare Logistical (LOGSTAT) Report**Digital task component(s)**

The CID with IVIS is used to compile and send the LOGSTAT report.

Digital systems utilized to accomplish task:

✓	CID		CITV		GCDP
✓	IVIS		DID		POSNAV

171-121-4065 Direct Vehicle Tactical Movement**Digital task component(s)**

Use the CID tactical screen to maintain situational awareness with the other vehicles in the platoon.

The POSNAV inputs would be used to provide information for vehicle updates. The DID and POSNAV will be used to aid navigation.

Digital systems utilized to accomplish task:

✓	CID		CITV		GCDP
✓	IVIS	✓	DID	✓	POSNAV

171-122-1013 Zero the M240 Coax Machine Gun on an M1/M1A1/M1A2 Tank**Digital task component(s)**

The coax is zeroed using the Gunner's Control and Display Panel (GCDP) and the Gunner's Primary Sight (GPS).

Digital systems utilized to accomplish task:

	CID		CITV	✓	GCDP
	IVIS		DID		POSNAV

171-122-3005 Engage Targets with the M240 Coax Machine Gun from the Commander's Weapon Station on an M1/M1A1/M1A2 Tank**Digital task component(s)**

The coax can be fired from the M1A2 tank using the CITV to lay the gun, aim, and fire.

Digital systems utilized to accomplish task:

✓	CID	✓	CITV		GCDP
	IVIS		DID		POSNAV

171-126-1003 Slave Start an M1/M1A1/M1A2 Tank

Digital task component(s)

The DID is used in slave starting a tank.

Digital systems utilized to accomplish task:

	CID		CITV		GCDP
	IVIS	✓	DID		POSNAV

171-126-1004 Perform Fuel Transfer Procedures on an M1/M1A1/M1A2 Tank

Digital task component(s)

The DID is normally where fuel transfer is controlled.

Digital systems utilized to accomplish task:

✓	CID		CITV		GCDP
	IVIS	✓	DID		POSNAV

171-126-1007 Prepare the Driver's Station for Operation on an M1/M1A1/M1A2 Tank

Digital task component(s)

The DID is used in power up procedures.

Digital systems utilized to accomplish task:

	CID		CITV		GCDP
	IVIS	✓	DID		POSNAV

171-126-1008 Secure the Driver's Station on an M1/M1A1/M1A2 Tank

Digital task component(s)

The DID is used during power down procedures.

Digital systems utilized to accomplish task:

	CID		CITV		GCDP
	IVIS	✓	DID		POSNAV

171-126-1009 Operate the AN/VVS-2 Night Vision Viewer in the Driver's Hatch on an M1/M1A1/M1A2 Tank

Digital task component(s)

The power for the viewer is controlled from the DID.

Digital systems utilized to accomplish task:

✓	CID		CITV		GCDP
	IVIS	✓	DID		POSNAV

171-126-1011 Troubleshoot the AN/VVS-2 Night Vision Viewer on an M1/M1A1/M1A2 Tank

Digital task component(s)

The DID displays caution messages for certain malfunctions with the viewer. The operator may have to notify organizational maintenance.

Digital systems utilized to accomplish task:

✓	CID		CITV		GCDP
	IVIS	✓	DID		POSNAV

171-126-1013 Troubleshoot the Engine on an M1/M1A1/M1A2 Tank

Digital task component(s)

Cautions and warnings will appear on the DID and may be on the CID screen to alert the driver that a malfunction has occurred. The driver has to respond to the messages.

Digital systems utilized to accomplish task:

✓	CID		CITV		GCDP
	IVIS	✓	DID		POSNAV

171-126-1014 Troubleshoot the Transmission on an M1/M1A1/M1A2 Tank

Digital task component(s)

Cautions and warnings may appear on the DID and may be on the CID screens to alert the operator that a malfunction has occurred. The driver must respond to the messages.

Digital systems utilized to accomplish task:

✓	CID		CITV		GCDP
	IVIS	✓	DID		POSNAV

171-126-1028 Fire an M250 Grenade Launcher on an M1/M1A1/M1A2 Tank

Digital task component(s)

The CID is used to fire the grenade launchers.

Digital systems utilized to accomplish task:

✓	CID		CITV		GCDP
	IVIS		DID		POSNAV

171-126-1029 Prepare the Gunner's Station for Operation on an M1/M1A1/M1A2 Tank

Digital task component(s)

The GCDP is used to input ballistic data and meteorological data. There are also 25 cautions that may appear on the GCDP that the gunner must be prepared to respond to.

Digital systems utilized to accomplish task:

✓	CID	✓	CITV	✓	GCDP
	IVIS		DID		POSNAV

171-126-1036 Engage Targets with the Main Gun from the Gunner's Station on an M1/M1A1/M1A2

Digital task component(s)

The CID is used to control the auxiliary pump. The GCDP is used to input and monitor data.

Digital systems utilized to accomplish task:

✓	CID		CITV	✓	GCDP
	IVIS		DID		POSNAV

171-126-1042 Prepare a Tank Sketch Card on an M1/M1A1/M1A2 Tank**Digital task component(s)**

Sketch card is drawn in one of the tactical overlays in the CID and sent via IVIS to other stations.

Digital systems utilized to accomplish task:

✓	CID	✓	CITV		GCDP
✓	IVIS		DID	✓	POSNAV

171-126-1051 Operate the Night Vision Viewer from the Loader's Hatch on an M1/M1A1/M1A2 Tank**Digital task component(s)**

The primary method of controlling the power for the viewer is through the CID.

Digital systems utilized to accomplish task:

✓	CID		CITV	✓	GCDP
	IVIS		DID		POSNAV

171-126-1060 Prepare an M1/M1A1/M1A2 Tank for Powerpack Removal**Digital task component(s)**

The GCDP is used to determine if the tank is level as part of the preparation for power pack removal.

Digital systems utilized to accomplish task:

	CID		CITV	✓	GCDP
	IVIS		DID		POSNAV

171-126-1066 Troubleshoot the NBC System**Digital task component(s)**

The crew would know to perform troubleshooting procedures when cautions or warnings appeared on the CID or DID screens.

Digital systems utilized to accomplish task:

✓	CID		CITV		GCDP
	IVIS	✓	DID		POSNAV

171-126-1067 Place the NBC System into Operation on an M1A1/M1A2 Tank**Digital task component(s)**

The system can be activated from all of the crew positions, however, the commander or driver are the only ones that can fully control the system. Normally the CID is used to control the NBC system.

Digital systems utilized to accomplish task:

✓	CID		CITV	✓	GCDP
	IVIS	✓	DID		POSNAV

171-126-1102 Perform Driver's Before Operations Check and Services on an M1/M1A1/M1A2 Tank

Digital task component(s)

The DID is used to start the engine; check the electrical system gage, tachometer, and caution and warning messages.

Digital systems utilized to accomplish task:

	CID		CITV		GCDP
	IVIS	✓	DID		POSNAV

171-126-1104 Perform Gunner's Before Operation Checks and Services on an M1/M1A1/M1A2

Digital task component(s)

The CID is used to control the auxiliary pump and NBC systems. The GCDP is used to perform a data check.

Digital systems utilized to accomplish task:

✓	CID		CITV	✓	GCDP
	IVIS		DID		POSNAV

171-126-1105 Perform Tank Commander's Before Operations Checks and Services on an M1/M1A1/M1A2

Digital task component(s)

The CID is checked for operation using required tests. The main and back-up NBC systems are also checked from the CID.

Digital systems utilized to accomplish task:

✓	CID		CITV		GCDP
	IVIS		DID		POSNAV

171-126-1106 Perform Driver's After Operations Checks and Services on an M1/M1A1/M1A2

Digital task component(s)

The driver will observe the DID for caution or warning messages and operate the DID to check systems.

Digital systems utilized to accomplish task:

	CID		CITV		GCDP
	IVIS	✓	DID		POSNAV

171-126-1108 Perform Gunner's After Operations Checks and Services on an M1/M1A1/M1A2

Digital task component(s)

The CID is used to turn the auxiliary pump off/on.

Digital systems utilized to accomplish task:

✓	CID		CITV		GCDP
	IVIS		DID		POSNAV

171-126-1110 Troubleshoot the M1A2 Tank Using the Driver's Control Panel Warning and Caution Messages

Digital task component(s)

The DID would be used to perform this task. There are 47 cautions and 13 warnings that the driver must be able to react to.

Digital systems utilized to accomplish task:

✓	CID		CITV		GCDP
	IVIS	✓	DID		POSNAV

171-126-1111 Operate the Driver's Integrated Display (DID) on an M1A2 Tank

Digital task component(s)

The DID is used to navigate using POSNAV, monitor fuel level, cautions and warnings, control the heater, and control the lights and smoke generator.

Digital systems utilized to accomplish task:

✓	CID		CITV		GCDP
	IVIS	✓	DID		POSNAV

171-126-1113 Operate the Commander's Integrated Display (CID) on an M1A2 Tank

Digital task component(s)

The CID is used to prepare the CITV, POSNAV, and IVIS for operation. It is also used to control the radios remotely and send and receive tactical reports and overlays.

Digital systems utilized to accomplish task:

✓	CID	✓	CITV		GCDP
✓	IVIS		DID	✓	POSNAV

171-126-1114 Prepare the Commander's Station (CS) for Operation on an M1A2 Tank

Digital task component(s)

Task includes prepare and operate the IVIS, POSNAV, and CITV. All procedures for these systems are performed from the CID.

Digital systems utilized to accomplish task:

✓	CID	✓	CITV		GCDP
✓	IVIS		DID	✓	POSNAV

171-126-1115 Troubleshoot the Fire Control System on an M1A2 Tank

Digital task component(s)

There are numerous cautions or warnings that may appear on the GCDP or CID to indicate a problem within the fire control system. The CID or GCDP would be used to troubleshoot the fire control system.

Digital systems utilized to accomplish task:

✓	CID		CITV	✓	GCDP
	IVIS		DID		POSNAV

171-126-1116 Boresight the Main Gun on an M1A2 Tank**Digital task component(s)**

The CID, CITV, and GCDP are used when boresighting the tank.

Digital systems utilized to accomplish task:

✓	CID	✓	CITV	✓	GCDP
	IVIS		DID		POSNAV

171-126-1117 Perform Special Gunnery Checks on an M1A2 Tank**Digital task component(s)**

The CID, GCDP and all of the fire control system must be fully operational to perform this task.

Digital systems utilized to accomplish task:

✓	CID	✓	CITV	✓	GCDP
	IVIS		DID		POSNAV

171-126-1118 Direct Main Gun Misfire Procedures on an M1/M1A1/M1A2**Digital task component(s)**

The CID is used to check for tripped or off circuit breakers.

Digital systems utilized to accomplish task:

✓	CID		CITV		GCDP
	IVIS		DID		POSNAV

171-126-1130 Send and Receive Tactical Reports/Overlays on the Commander's Integrated Display (CID) on an M1A2 Tank**Digital task component(s)**

The CID is used to prepare, send, and receive tactical reports and overlays. The POSNAV provides position information to the reports and overlays.

Digital systems utilized to accomplish task:

✓	CID		CITV		GCDP
✓	IVIS		DID	✓	POSNAV

171-126-1135 Operate the Gunner's Control and Display Panel on an M1A2 Tank**Digital task component(s)**

The gunner uses the GCDP to power up gunner's station, input meteorological data, ballistic data, and perform prepare to fire procedures and special gunnery checks.

Digital systems utilized to accomplish task:

✓	CID		CITV	✓	GCDP
	IVIS		DID		POSNAV

171-126-1136 Drive an M1A2 Tank**Digital task component(s)**

The driver uses the DID and POSNAV while driving the tank to aid in navigation.

Digital systems utilized to accomplish task:

	CID		CITV		GCDP
	IVIS	✓	DID	✓	POSNAV

171-126-1137 Operate the Personnel Heater on an M1A2 Tank**Digital task component(s)**

The DID must be used to control and operate the heater.

Digital systems utilized to accomplish task:

	CID		CITV		GCDP
	IVIS	✓	DID		POSNAV

171-126-1138 Perform Built-In-Tests (BIT) on the Commander's Integrated Display (CID) on an M1A2 Tank**Digital task component(s)**

The CID is used in the diagnostic mode to perform this task. The BIT is used to identify malfunctions within the tank. The CITV should be powered up prior to running a BIT. The tests that are performed include: system test, subsystem test, station tests, and tone tests.

Digital systems utilized to accomplish task:

✓	CID	✓	CITV		GCDP
	IVIS		DID		POSNAV

171-126-1139 Perform Diagnostics Mode Maintenance on Commander's Integrated Display (CID) on an M1A2 Tank**Digital task component(s)**

The CID is used to perform this task. Diagnostic maintenance for the crew entails running a CID test and BIT.

Digital systems utilized to accomplish task:

✓	CID	✓	CITV	✓	GCDP
	IVIS	✓	DID		POSNAV

171-126-1140 Perform Built-In-Tests (BIT) on the Driver's Integrated Display (DID) on an M1A2 Tank**Digital task component(s)**

The DID is used in the diagnostic mode to perform this task. The BIT is used to identify malfunctions within the tank. The tests that are performed include: hull system test, subsystem LRU test, station tests, and tone tests.

Digital systems utilized to accomplish task:

✓	CID		CITV		GCDP
	IVIS	✓	DID		POSNAV

171-126-1141 Perform Diagnostics Mode Maintenance on Driver's Integrated Display (DID) on an M1A2 Tank**Digital task component(s)**

If diagnostic maintenance could not be performed from the DID, troubleshooting would have to be performed.

Digital systems utilized to accomplish task:

✓	CID		CITV		GCDP
	IVIS	✓	DID		POSNAV

171-126-1142 Start/Stop the Engine on an M1A2 Tank

Digital task component(s)

The DID is used in the procedures for this task

Digital systems utilized to accomplish task:

	CID		CITV		GCDP
	IVIS	✓	DID		POSNAV

171-126-1143 Operate the Commander's Independent Thermal Viewer (CITV) on an M1A2 Tank

Digital task component(s)

The CITV is used to set sectors, conduct autoscan, search for and designate targets, and as a sight to fire the weapons systems. Turret power must be "on" before the CITV can be used. Turret power is controlled from the CID. The commander's control handle must also be used with the CITV. The handle controls field of view, target designate, manipulating the CITV, and ranging for the CITV.

Digital systems utilized to accomplish task:

✓	CID	✓	CITV		GCDP
	IVIS		DID		POSNAV

171-126-1144 Prepare the Intervehicular System (IVIS) for Operation on the M1A2

Digital task component(s)

The CID is used to enter data.

Digital systems utilized to accomplish task:

✓	CID		CITV		GCDP
✓	IVIS		DID		POSNAV

171-126-1145 Prepare the Position/Navigation System for Operation on an M1A2 Tank

Digital task component(s)

The POSNAV can be prepared from the commander's or driver's stations but is usually prepared from the commander's station. The information for input for the performance of this task is obtained from a military map.

Digital systems utilized to accomplish task:

✓	CID		CITV		GCDP
✓	IVIS	✓	DID	✓	POSNAV

171-126-3001 Establish Silent Watch from an M1/M1A1/M1A2 Tank

Digital task component(s)

This CID is used to control silent watch. There are two types of listening silence. One for digital transmissions and one for voice transmissions. Silent watch also includes use of the intercom.

Digital systems utilized to accomplish task:

✓	CID		CITV		GCDP
✓	IVIS		DID	✓	POSNAV

171-126-3003 Secure the Commander's Weapon Station on an M1/M1A1/M1A2 Tank

Digital task component(s)

When the commander's station is powered down, the commander will interface with the CID, IVIS, and CITV.

Digital systems utilized to accomplish task:

✓	CID	✓	CITV		GCDP
✓	IVIS		DID		POSNAV

171-126-3004 Engage Targets with the Main Gun from the Commander's Station on an M1/M1A1/M1A2 Tank

Digital task component(s)

The commander can engage targets from his position using one of two techniques. The first is from the CITV and the second is from the Gunner's Primary Sight Extension (GPSE). The CITV is controlled from the CID and the POSNAV is used to give the commander a location in military grid coordinates to be used in preparing and sending reports. The primary method would be to engage with the CITV.

Digital systems utilized to accomplish task:

✓	CID	✓	CITV		GCDP
	IVIS		DID	✓	POSNAV

171-126-3009 Direct Machine Gun Engagements on an M1/M1A1/M1A2 Tank

Digital task component(s)

The commander would use the CITV to lay the gun and use the stadia reticle to determine the range to the target prior to the gunner beginning his part of the engagement.

Digital systems utilized to accomplish task:

✓	CID	✓	CITV		GCDP
	IVIS		DID	✓	POSNAV

171-126-3010 Direct Main Gun Engagements on an M1/M1A1/M1A2 Tank

Digital task component(s)

The commander would use the CITV to lay the gun and use the stadia reticle to determine the range to the target prior to the gunner beginning his part of the engagement.

Digital systems utilized to accomplish task:

✓	CID	✓	CITV		GCDP
	IVIS		DID	✓	POSNAV

171-131-2083 Perform Plumb and Synchronization on an M1A2 Tank Fire Control System

Digital task component(s)

The CID, CITV, and GCDP are used to input and collect data to perform this task.

Digital systems utilized to accomplish task:

✓	CID	✓	CITV	✓	GCDP
	IVIS		DID		POSNAV

APPENDIX D

BACK-UP DESCRIPTIONS FOR INDIVIDUAL DIGITAL TASKS BY TYPE: CONVENTIONAL, REPAIR/REPLACE SYSTEM, WORKAROUND

BACK-UP DESCRIPTIONS FOR INDIVIDUAL DIGITAL TASKS BY CATEGORY

CONTENT

Back-up Category	Page
Conventional.....	D-3
Repair/Replace System.....	D-6
Workaround.....	D-8

Conventional

031-503-3005 Prepare and Send NBC 1 Reports

Backup description: 031-503-3005 Prepare and Send NBC 1 Reports

061-306-6005 Prepare/Submit Standard Shelling, Mortaring, and Bombing Report

Backup description: 061-306-6005 Prepare/Submit Standard Shelling, Mortaring, and Bombing Report

171-121-4064 Prepare Logistical (LOGSTAT) Report

Backup description: 171-121-4064 Prepare a Logistical (LOGSTAT) Report

171-126-1042 Prepare a Tank Sketch Card on an M1/M1A1/M1A2 Tank

Backup description: 171-126-1042 Prepare a Tank Sketch Card on an M1/M1A1/M1A2 Tank

171-126-1130 Send and Receive Tactical Reports/Overlays on the Commander's Integrated Display (CID) on an M1A2 Tank

Backup description: 171-121-4051 Prepare a Situation Report/Status Report
171-123-4001 Prepare a Platoon Fire Plan
171-126-1042 Prepare a Sketch Range Card
01-5700.02-2021 Communicate on a Tactical Radio
051-196-3009 Prepare a Route Reconnaissance Overlay
061-283-1002 Locate a Target by Grid Coordinates
071-329-1002 Determine the Grid Coordinates of a Point on a Military Map
071-329-1019 Use a Map Overlay
081-831-0101 Request Medical Evacuation
171-121-4053 Plan an Armor/Scout Platoon Tactical Roadmarch
301-348-1050 Report Information of Potential Intelligence Value
04-3303.01-0019 Use a Map Overlay
171-329-1019 Use a Map Overlay
071-510-0001 Determine Azimuth Using a Protractor
071-510-0001 Compute Back Azimuths
061-283-6003 Adjust Indirect Fire

171-126-3001 Establish Silent Watch from an M1/M1A1/M1A2 Tank

Backup description: 171-126-3001 Establish Silent Watch on an M1/M1A1/M1A2 Tank

171-126-1029 Prepare the Gunner's Station for Operation on an M1/M1A1/M1A2 Tank

Backup description: If the GCDP is inoperable, the tank will have to be fired using degraded mode gunnery techniques.

061-283-1002 Locate a Target by Grid Coordinates

Backup description: 061-283-1002 Locate a Target by Grid Coordinates

Conventional (continued)

171-122-3005 Engage Targets with the M240 Coax Machine Gun from the Commander's Weapon Station on an M1/M1A1/M1A2 Tank

Backup description: 171-122-3005 Engage Targets with the M240 Coax Machine Gun from the Commander's Weapon Station on an M1/M1A1/M1A2 Tank

171-126-1036 Engage Targets with the Main Gun from the Gunner's Station on an M1/M1A1/M1A2

Backup description: 176-126-3004 Engage Targets with the Main Gun from the Commander's Station on an M1/M1A1/M1A2

171-126-1118 Direct Main Gun Misfire Procedures on an M1/M1A1/M1A2

Backup description: 171-126-1118 Direct Main Gun Misfire Procedures on an M1/M1A1/M1A2 Tank

171-126-1135 Operate the Gunner's Control and Display Panel on an M1A2 Tank

Backup description: 171-126-1113 Operate the Commander's Integrated Display on an M1A2 Tank (see Performance Step 8: "Perform gunner back-up functions in the event of GCDP failure").

171-126-3004 Engage Targets with the Main Gun from the Commander's Station on an M1/M1A1/M1A2 Tank

Backup description: 171-126-3004 Engage Targets with the Main Gun from the Commander's Station on an M1/M1A1/M1A2 Tank

171-126-3009 Direct Machine Gun Engagements on an M1/M1A1/M1A2 Tank

Backup description: 171-126-3009 Direct Machine Gun Engagements on an M1/M1A1/M1A2 Tank

171-126-3010 Direct Main Gun Engagements on an M1/M1A1/M1A2 Tank

Backup description: 171-126-3010 Direct Main Gun Engagements on an M1/M1A1/M1A2 Tank

Conventional (continued)

171-121-4030 Conduct Vehicle Tactical Navigation

Backup description: 171-121-4030 Conduct Vehicle Tactical Navigation
061-283-1002 Locate a Target by Grid Coordinates
04-3303.02-0037 Navigate While Mounted
04-3303.01-0019 Use a Map Overlay
171-329-1019 Use a Map Overlay
071-510-0001 Determine Azimuth Using a Protractor
071-510-0001 Compute Back Azimuths
071-329-1005 Determine a Location on the Ground by Terrain
Association;
071-329-1001 Identify Terrain Features on a Map
071-329-1011 Orient a Map using a Compass

171-121-4065 Direct Vehicle Tactical Movement

Backup description: 171-121-4065 Direct Vehicle Tactical Movement
171-121-4030 Conduct Vehicle Tactical Navigation
061-283-1002 Locate a Target by Grid Coordinates
04-3303.02-0037 Navigate While Mounted
04-3303.01-0019 Use a Map Overlay
171-329-1019 Use a Map Overlay
071-510-0001 Determine Azimuth Using a Protractor
071-510-0001 Compute Back Azimuths
071-329-1005 Determine a Location on the Ground by Terrain
Association
071-329-1001 Identify Terrain Features on a Map
071-329-1011 Orient a Map using a Compass

071-326-5705 Establish an Observation Post

Backup description: 071-326-5705 Establish an Observation Post

171-121-4063 Supervise Local Security

Backup description: 171-121-4063 Supervise Local Security

Repair/Replace System

171-126-1144 Prepare the Intervehicular System (IVIS) for Operation on the M1A2

Backup description: If the CID is inoperable then the task cannot be performed and the tank must be repaired.

171-126-1003 Slave Start an M1/M1A1/M1A2 Tank

Backup description: If DID is inoperable the tank may not be able to be slave started and troubleshooting must be performed. If battery power is low a caution message will appear on the DID and CID. The procedure is different than on an M1A1 tank.

171-126-1007 Prepare the Driver's Station for Operation on an M1/M1A1/M1A2 Tank

Backup description: If the DID is inoperable, power up procedures cannot be performed properly.

171-126-1111 Operate the Driver's Integrated Display (DID) on an M1A2 Tank

Backup description: If DID is totally inoperable the tank must be repaired. However, if only partially operational, the commander may be able to back up some of the driver's functions. The functions include: lights (to include driver's night vision viewer), fuel transfer, smoke generator, and hull circuit breakers.

171-126-1114 Prepare the Commander's Station (CS) for Operation on an M1A2 Tank

Backup description: There is no back-up for this task.

171-126-1137 Operate the Personnel Heater on an M1A2 Tank

Backup description: If DID is inoperable the heater cannot be used. There is no back-up for this task.

171-126-1142 Start/Stop the Engine on an M1A2 Tank

Backup description: If the DID is inoperable tank may not be able to be started or shut-down properly. Emergency shut-down procedures can be used, however there is no back-up for this task.

171-131-2083 Perform Plumb and Synchronization on an M1A2 Tank Fire Control System

Backup description: If the GCDP is inoperable then the tank must be repaired. If the CID is inoperable, then the data for the CITV can be entered from the GCDP. If the CITV is inoperable, GPS information only can be entered from the GCDP.

171-122-1013 Zero the M240 Coax Machine Gun on an M1/M1A1/M1A2 Tank

Backup description: If the GCDP is inoperable the coax cannot be zeroed.

Repair/Replace System (continued)

- 171-126-1028 Fire an M250 Grenade Launcher on an M1/M1A1/M1A2 Tank**
Backup description: If CID is inoperable, grenade launchers may not be able to fire.
- 171-126-1011 Troubleshoot the AN/VVS-2 Night Vision Viewer on an M1/M1A1/M1A2 Tank**
Backup description: No back-up procedures for this task.
- 171-126-1013 Troubleshoot the Engine on an M1/M1A1/M1A2 Tank**
Backup description: No back-up procedures for this task.
- 171-126-1014 Troubleshoot the Transmission on an M1/M1A1/M1A2 Tank**
Backup description: No back-up procedures for this task.
- 171-126-1102 Perform Driver's Before Operations Check and Services on an M1/M1A1/M1A2 Tank**
Backup description: If DID is inoperable, the tank must be repaired.
- 171-126-1104 Perform Gunner's Before Operation Checks and Services on an M1/M1A1/M1A2**
Backup description: If the CID or GCDP are inoperable, then the tank must be repaired.
- 171-126-1105 Perform Tank Commander's Before Operations Checks and Services on an M1/M1A1/M1A2**
Backup description: If the CID is inoperable, then the tank must be repaired.
- 171-126-1106 Perform Driver's After Operations Checks and Services on an M1/M1A1/M1A2**
Backup description: If the DID is inoperable, then the tank must be repaired.
- 171-126-1115 Troubleshoot the Fire Control System on an M1A2 Tank**
Backup description: There is no back-up for this task.
- 171-126-1117 Perform Special Gunnery Checks on an M1A2 Tank**
Backup description: There is no back-up for this task.
- 171-126-1136 Drive an M1A2 Tank**
Backup description: If the DID is inoperable, normally the tank cannot be operated.
- 171-126-1145 Prepare the Position/Navigation System for Operation on an M1A2 Tank**
Backup description: There is no back-up for this task.

Workaround

171-121-4055 Employ Vehicular/Organic Smoke

Backup description: If the DID is inoperable, the CID would be used to control on-board smoke. If both could not be used, on-board smoke could not be used.

171-126-1004 Perform Fuel Transfer Procedures on an M1/M1A1/M1A2 Tank

Backup description: If the DID is inoperable the CID may be used in the back-up mode to transfer fuel.

171-126-1008 Secure the Driver's Station on an M1/M1A1/M1A2 Tank

Backup description: If the DID is inoperable, power down procedures may not be able to be performed properly. The CID may be used to power down the tank.

171-126-1009 Operate the AN/VVS-2 Night Vision Viewer in the Driver's Hatch on an M1/M1A1/M1A2 Tank

Backup description: The back-up would be to operate the viewer with a battery or from the CID if DID cannot be used.

171-126-1051 Operate the Night Vision Viewer from the Loader's Hatch on an M1/M1A1/M1A2 Tank

Backup description: If the CID is inoperable, the viewer can be operated with a battery. The power can also be controlled from the GCDP.

171-126-1060 Prepare an M1/M1A1/M1A2 Tank for Powerpack Removal

Backup description: There is no backup task, however an M1A1 Gunner's Quadrant could be used in the task.

171-126-1067 Place the NBC System into Operation on an M1A1/M1A2 Tank

Backup description: If the CID is inoperable the driver could perform this task.

171-126-3003 Secure the Commander's Weapon Station on an M1/M1A1/M1A2 Tank

Backup description: The tank can be powered down from the DID if the CID is inoperable.

171-126-1116 Boresight the Main Gun on an M1A2 Tank

Backup description: If the tactical screen is inoperable in the CID, the CITV can still be boresighted from the GCDP. If the GCDP is inoperable the gunner's auxiliary sight (GAS) is the only sight that could be boresighted.

171-126-1066 Troubleshoot the NBC System

Backup description: Use the back-up NBC system and notify organizational maintenance.

Workaround (continued)

171-126-1108 Perform Gunner's After Operations Checks and Services on an M1/M1A1/M1A2

Backup description: If CID is inoperable, then the driver can use the DID to turn the auxiliary pump circuit breaker off in the turret circuit breaker menu.

171-126-1110 Troubleshoot the M1A2 Tank Using the Driver's Control Panel Warning and Caution Messages

Backup description: If the DID is inoperable, the CID may be used to perform this task.

171-126-1138 Perform Built-In-Tests on the Commander's Integrated Display (CID) on an M1A2 Tank

Backup description: If CID is inoperable the BIT has to be performed from the DID and troubleshooting has to be performed.

171-126-1139 Perform Diagnostics Mode Maintenance on Commander's Integrated Display (CID) on an M1A2 Tank

Backup description: If diagnostic maintenance cannot be performed from the CID, the DID can be used and troubleshooting has to be performed.

171-126-1140 Perform Built-In-Tests (BIT) on the Driver's Integrated Display (DID) on an M1A2 Tank

Backup description: If DID is inoperable the BIT has to be performed from the CID and troubleshooting has to be performed.

171-126-1141 Perform Diagnostics Mode Maintenance on Driver's Integrated Display (DID) on an M1A2 Tank

Backup description: If diagnostic maintenance cannot be performed from the DID, the CID can be used and troubleshooting has to be performed.

171-126-1113 Operate the Commander's Integrated Display (CID) on an M1A2 Tank

Backup description: If the CID is totally inoperable the turret can only be operated in the manual mode, which means that the turret and gun must be moved manually, the ammo door must be opened manually, the gunner cannot use the GPS or TIS, the CITV cannot be used, and there is no digital link with any other station. The commander loses the capability to use the IVIS and all the overlays and reports. The radios can not be controlled remotely. The driver may be able to back-up some of the CID functions such as: POSNAV, NBC controls, waypoint, and compass. The tank would have to be fought in a degraded gunnery mode.

Workaround (continued)

171-126-1143 Operate the Commander's Independent Thermal Viewer (CITV) on an M1A2 Tank

Backup description: Without the CITV the commander has to engage targets with the gunner's primary sight extension (GPSE) using the same gunnery techniques as the M1A1.

APPENDIX E

**INDIVIDUAL DIGITAL TASKS BY
PERFORMANCE TYPE**

INDIVIDUAL DIGITAL TASKS BY PERFORMANCE TYPE

CONTENT

Performance Type	Page
Communicate Information	E-3
Equipment Operation	E-3
Gunnery	E-3
Maintenance (Diagnostics Only)	E-4
Navigation and Movement	E-4
Situational Awareness	E-5

Task #	Task title
Performance Type: Communicate Information	
031-503-3005	Prepare and Send NBC 1 Reports
061-306-6005	Prepare/Submit Standard Shelling, Mortaring, and Bombing Report
171-121-4064	Prepare Logistical (LOGSTAT) Report
171-126-1042	Prepare a Tank Sketch Card on an M1/M1A1/M1A2 Tank
171-126-1130	Send and Receive Tactical Reports/Overlays on the Commander's Integrated Display (CID) on an M1A2 Tank
171-126-1144	Prepare the Intervehicular System (IVIS) for Operation on the M1A2
171-126-3001	Establish Silent Watch from an M1/M1A1/M1A2 Tank
Performance Type: Equipment Operation	
171-121-4055	Employ Vehicular/Organic Smoke
171-126-1003	Slave Start an M1/M1A1/M1A2 Tank
171-126-1004	Perform Fuel Transfer Procedures on an M1/M1A1/M1A2 Tank
171-126-1007	Prepare the Driver's Station for Operation on an M1/M1A1/M1A2 Tank
171-126-1008	Secure the Driver's Station on an M1/M1A1/M1A2 Tank
171-126-1009	Operate the AN/VVS-2 Night Vision Viewer in the Driver's Hatch on an M1/M1A1/M1A2 Tank
171-126-1029	Prepare the Gunner's Station for Operation on an M1/M1A1/M1A2 Tank
171-126-1051	Operate the Night Vision Viewer from the Loader's Hatch on an M1/M1A1/M1A2 Tank
171-126-1060	Prepare an M1/M1A1/M1A2 Tank for Powerpack Removal
171-126-1067	Place the NBC System into Operation on an M1A1/M1A2 Tank
171-126-1111	Operate the Driver's Integrated Display (DID) on an M1A2 Tank
171-126-1114	Prepare the Commander's Station (CS) for Operation on an M1A2 Tank
171-126-1137	Operate the Personnel Heater on an M1A2 Tank
171-126-1142	Start/Stop the Engine on an M1A2 Tank
171-126-3003	Secure the Commander's Weapon Station on an M1/M1A1/M1A2 Tank
171-131-2083	Perform Plumb and Synchronization on an M1A2 Tank Fire Control System
Performance Type: Gunnery	
061-283-1002	Locate a Target by Grid Coordinates
171-122-1013	Zero the M240 Coax Machine Gun on an M1/M1A1/M1A2 Tank
171-122-3005	Engage Targets with the M240 Coax Machine Gun from the Commander's Weapon Station on an M1/M1A1/M1A2 Tank
171-126-1028	Fire an M250 Grenade Launcher on an M1/M1A1/M1A2 Tank
171-126-1036	Engage Targets with the Main Gun from the Gunner's Station on an M1/M1A1/M1A2
171-126-1116	Boresight the Main Gun on an M1A2 Tank
171-126-1118	Direct Main Gun Misfire Procedures on an M1/M1A1/M1A2

Task #	Task title
Performance Type: Gunnery (continued)	
171-126-1135	Operate the Gunner's Control and Display Panel on an M1A2 Tank
171-126-3004	Engage Targets with the Main Gun from the Commander's Station on an M1/M1A1/M1A2 Tank
171-126-3009	Direct Machine Gun Engagements on an M1/M1A1/M1A2 Tank
171-126-3010	Direct Main Gun Engagements on an M1/M1A1/M1A2 Tank
Performance Type: Maintenance	
171-126-1011	Troubleshoot the AN/VVS-2 Night Vision Viewer on an M1/M1A1/M1A2 Tank
171-126-1013	Troubleshoot the Engine on an M1/M1A1/M1A2 Tank
171-126-1014	Troubleshoot the Transmission on an M1/M1A1/M1A2 Tank
171-126-1066	Troubleshoot the NBC System
171-126-1102	Perform Driver's Before Operations Check and Services on an M1/M1A1/M1A2 Tank
171-126-1104	Perform Gunner's Before Operation Checks and Services on an M1/M1A1/M1A2
171-126-1105	Perform Tank Commander's Before Operations Checks and Services on an M1/M1A1/M1A2
171-126-1106	Perform Driver's After Operations Checks and Services on an M1/M1A1/M1A2
171-126-1108	Perform Gunner's After Operations Checks and Services on an M1/M1A1/M1A2
171-126-1110	Troubleshoot the M1A2 Tank Using the Driver's Control Panel Warning and Caution Messages
171-126-1115	Troubleshoot the Fire Control System on an M1A2 Tank
171-126-1117	Perform Special Gunnery Checks on an M1A2 Tank
171-126-1138	Perform Built-In-Tests on the Commander's Integrated Display (CID) on an M1A2 Tank
171-126-1139	Perform Diagnostics Mode Maintenance on Commander's Integrated Display (CID) on an M1A2 Tank
171-126-1140	Perform Built-In-Tests (BIT) on the Driver's Integrated Display (DID) on an M1A2 Tank
171-126-1141	Perform Diagnostics Mode Maintenance on Driver's Integrated Display (DID) on an M1A2 Tank
Performance Type: Navigation	
171-121-4030	Conduct Vehicle Tactical Navigation
171-121-4065	Direct Vehicle Tactical Movement
171-126-1136	Drive an M1A2 Tank
171-126-1145	Prepare the Position/Navigation System for Operation on an M1A2 Tank

Task #	Task title
Performance Type: Situational Awareness	
071-326-5705	Establish an Observation Post
171-121-4063	Supervise Local Security
171-126-1113	Operate the Commander's Integrated Display (CID) on an M1A2 Tank
171-126-1143	Operate the Commander's Independent Thermal Viewer (CITV) on an M1A2 Tank

APPENDIX F

**BACK-UP DESCRIPTIONS FOR
INDIVIDUAL DIGITAL TASKS
BY PERFORMANCE TYPE**

**BACK-UP DESCRIPTIONS FOR INDIVIDUAL DIGITAL TASKS
BY PERFORMANCE TYPE**

CONTENTS

Performance Type	Page
Communicate Information	F-3
Equipment Operation	F-4
Gunnery	F-6
Maintenance (Diagnostics Only)	F-8
Navigation and Movement	F-10
Situational Awareness	F-11

Performance type: Communicate Information

031-503-3005 Prepare and Send NBC 1 Reports

Backup description: 031-503-3005 Prepare and Send NBC 1 Reports

061-306-6005 Prepare/Submit Standard Shelling, Mortaring, and Bombing Report

Backup description: 061-306-6005 Prepare/Submit Standard Shelling, Mortaring, and Bombing Report

171-121-4064 Prepare Logistical (LOGSTAT) Report

Backup description: 171-121-4064 Prepare a Logistical (LOGSTAT) Report

171-126-1042 Prepare a Tank Sketch Card on an M1/M1A1/M1A2 Tank

Backup description: 171-126-1042 Prepare a Tank Sketch Card on an M1/M1A1/M1A2 Tank

171-126-1130 Send and Receive Tactical Reports/Overlays on the Commander's Integrated Display (CID) on an M1A2 Tank

Backup description: 171-121-4051 Prepare a Situation Report/Status Report
171-123-4001 Prepare a Platoon Fire Plan
171-126-1042 Prepare a Sketch Range Card
01-5700.02-2021 Communicate on a Tactical Radio
051-196-3009 Prepare a Route Reconnaissance Overlay
061-283-1002 Locate a Target by Grid Coordinates
071-329-1002 Determine the Grid Coordinates of a Point on a Military Map
071-329-1019 Use a Map Overlay
081-831-0101 Request Medical Evacuation
171-121-4053 Plan an Armor/Scout Platoon Tactical Roadmarch
301-348-1050 Report Information of Potential Intelligence Value
04-3303.01-0019 Use a Map Overlay
171-329-1019 Use a Map Overlay; 071-510-0001 Determine Azimuth Using a Protractor
071-510-0001 Compute Back Azimuths; 061-283-6003 Adjust Indirect Fire

171-126-1144 Prepare the Intervehicular System (IVIS) for Operation on the M1A2

Backup description: If the CID is inoperable then the task cannot be performed and the tank must be repaired.

171-126-3001 Establish Silent Watch from an M1/M1A1/M1A2 Tank

Backup description: 171-126-3001 Establish Silent Watch on an M1/M1A1/M1A2 Tank

Performance type: Equipment Operation

171-121-4055 Employ Vehicular/Organic Smoke

Backup description: If the DID is inoperable, the CID would be used to control on-board smoke. If both could not be used, on-board smoke could not be used.

171-126-1003 Slave Start an M1/M1A1/M1A2 Tank

Backup description: If DID is inoperable the tank may not be able to be slave started and troubleshooting must be performed. If battery power is low a caution message will appear on the DID and CID. The procedure is different than on an M1A1 tank.

171-126-1004 Perform Fuel Transfer Procedures on an M1/M1A1/M1A2 Tank

Backup description: If the DID is inoperable the CID may be used in the back-up mode to transfer fuel.

171-126-1007 Prepare the Driver's Station for Operation on an M1/M1A1/M1A2 Tank

Backup description: If the DID is inoperable, power up procedures cannot be performed properly.

171-126-1008 Secure the Driver's Station on an M1/M1A1/M1A2 Tank

Backup description: If the DID is inoperable, power down procedures may not be able to be performed properly. The CID may be used to power down the tank.

171-126-1009 Operate the AN/VVS-2 Night Vision Viewer in the Driver's Hatch on an M1/M1A1/M1A2 Tank

Backup description: The back-up would be to operate the viewer with a battery or from the CID if DID cannot be used.

171-126-1029 Prepare the Gunner's Station for Operation on an M1/M1A1/M1A2 Tank

Backup description: If the GCDP is inoperable, the tank will have to be fired using degraded mode gunnery

171-126-1051 Operate the Night Vision Viewer from the Loader's Hatch on an M1/M1A1/M1A2 Tank

Backup description: 171-126-1051 If the CID is inoperable, the viewer can be operated with a battery. The power can also be controlled from the GCDP.

171-126-1060 Prepare an M1/M1A1/M1A2 Tank for Powerpack Removal

Backup description: There is no backup task, however an M1A1 Gunner's Quadrant could be used in the task.

Performance type: Equipment Operation (continued)

171-126-1067 Place the NBC System into Operation on an M1A1/M1A2 Tank

Backup description: If the CID is inoperable the driver could perform this task.

171-126-1111 Operate the Driver's Integrated Display (DID) on an M1A2 Tank

Backup description: If DID is totally inoperable the tank must be repaired. However, if only partially operational the commander may be able to back up some of the driver's functions. The functions include: lights (to include driver's night vision viewer), fuel transfer, smoke generator, and hull circuit.

171-126-1114 Prepare the Commander's Station (CS) for Operation on an M1A2 Tank

Backup description: There is no back-up for this task.

171-126-1137 Operate the Personnel Heater on an M1A2 Tank

Backup description: If DID is inoperable the heater cannot be used. There is no back-up for this task.

171-126-1142 Start/Stop the Engine on an M1A2 Tank

Backup description: If the DID is inoperable tank may not be able to be started or shut-down properly. Emergency shut-down procedures can be used, however there is no back-up for this task.

171-126-3003 Secure the Commander's Weapon Station on an M1/M1A1/M1A2 Tank

Backup description: The tank can be powered down from the DID if the CID is inoperable.

171-131-2083 Perform Plumb and Synchronization on an M1A2 Tank Fire Control System

Backup description: If the GCDP is inoperable then the tank must be repaired. If the CID is inoperable, then the data for the CITV can be entered from the GCDP. If the CITV is inoperable, GPS information only, can be entered from the GCDP.

Performance type: Gunnery

061-283-1002 Locate a Target by Grid Coordinates

Backup description: 061-283-1002 Locate a Target by Grid Coordinates.

171-122-1013 Zero the M240 Coax Machine Gun on an M1/M1A1/M1A2 Tank

Backup description: If the GCDP is inoperable the coax cannot be zeroed.

171-122-3005 Engage Targets with the M240 Coax Machine Gun from the Commander's Weapon Station on an M1/M1A1/M1A2 Tank

Backup description: 171-122-3005 Engage Targets with the M240 Coax Machine Gun from the Commander's Weapon Station on an M1/M1A1/M1A2 Tank.

171-126-1028 Fire an M250 Grenade Launcher on an M1/M1A1/M1A2 Tank

Backup description: If CID is inoperable, grenade launchers may not be able to fire.

171-126-1036 Engage Targets with the Main Gun from the Gunner's Station on an M1/M1A1/M1A2

Backup description: 176-126-3004 Engage Targets with the Main Gun from the Commander's Station on an M1/M1A1/M1A2.

171-126-1116 Boresight the Main Gun on an M1A2 Tank

Backup description: If the tactical screen is inoperable in the CID, the CITV can still be boresighted from the GCDP. If the GCDP is inoperable the GAS is the only sight that could be boresighted.

171-126-1118 Direct Main Gun Misfire Procedures on an M1/M1A1/M1A2

Backup description: 171-126-1118 Direct Main Gun Misfire Procedures on an M1/M1A1/M1A2 Tank.

171-126-1135 Operate the Gunner's Control and Display Panel on an M1A2 Tank

Backup description: 171-126-1113 Operate the Commander's Integrated Display on an M1A2 Tank (see Performance Step 8. "Perform gunner back-up functions in the event of GCDP failure.").

171-126-3004 Engage Targets with the Main Gun from the Commander's Station on an M1/M1A1/M1A2 Tank

Backup description: 171-126-3004 Engage Targets with the Main Gun from the Commander's Station on an M1/M1A1/M1A2 Tank.

Performance type: Gunnery (continued)

171-126-3009 Direct Machine Gun Engagements on an M1/M1A1/M1A2 Tank

Backup description: 171-126-3009 Direct Machine Gun Engagements on an
M1/M1A1/M1A2 Tank.

171-126-3010 Direct Main Gun Engagements on an M1/M1A1/M1A2 Tank

Backup description: 171-126-3010 Direct Main Gun Engagements on an
M1/M1A1/M1A2 Tank.

Performance type: Maintenance (Diagnostics Only)

171-126-1011 Troubleshoot the AN/VVS-2 Night Vision Viewer on an M1/M1A1/M1A2 Tank

Backup description: No back-up procedures for this task.

171-126-1013 Troubleshoot the Engine on an M1/M1A1/M1A2 Tank

Backup description: No back-up procedures for this task.

171-126-1014 Troubleshoot the Transmission on an M1/M1A1/M1A2 Tank

Backup description: No back-up procedures for this task.

171-126-1066 Troubleshoot the NBC System

Backup description: Use the back-up NBC system and notify organizational maintenance.

171-126-1102 Perform Driver's Before Operations Check and Services on an M1/M1A1/M1A2 Tank

Backup description: If DID is inoperable, the tank must be repaired.

171-126-1104 Perform Gunner's Before Operation Checks and Services on an M1/M1A1/M1A2

Backup description: If the CID or GCDP are inoperable, then the tank must be repaired.

171-126-1105 Perform Tank Commander's Before Operations Checks and Services on an M1/M1A1/M1A2

Backup description: If the CID is inoperable, then the tank must be repaired.

171-126-1106 Perform Driver's After Operations Checks and Services on an M1/M1A1/M1A2

Backup description: If the DID is inoperable, then the tank must be repaired.

171-126-1108 Perform Gunner's After Operations Checks and Services on an M1/M1A1/M1A2

Backup description: If CID is inoperable, then the driver can use the DID to turn the auxiliary pump circuit breaker off in the turret circuit breaker menu.

Performance type: Maintenance (continued)

171-126-1110 Troubleshoot the M1A2 Tank Using the Driver's Control Panel Warning and Caution Messages

Backup description: If the DID is inoperable, the CID may be used to perform this task.

171-126-1115 Troubleshoot the Fire Control System on an M1A2 Tank

Backup description: There is no back-up for this task.

171-126-1117 Perform Special Gunnery Checks on an M1A2 Tank

Backup description: There is no back-up for this task.

171-126-1138 Perform Built-In-Tests on the Commander's Integrated Display (CID) on an M1A2 Tank

Backup description: If CID is inoperable the BIT has to be performed from the DID and troubleshooting has to be performed.

171-126-1139 Perform Diagnostics Mode Maintenance on Commander's Integrated Display (CID) on an M1A2 Tank

Backup description: If diagnostic maintenance cannot be performed from the CID, the DID can be used and troubleshooting has to be performed.

171-126-1140 Perform Built-In-Tests (BIT) on the Driver's Integrated Display (DID) on an M1A2 Tank

Backup description: If DID is inoperable the BIT has to be performed from the CID and troubleshooting has to be performed.

171-126-1141 Perform Diagnostics Mode Maintenance on Driver's Integrated Display (DID) on an M1A2 Tank

Backup description: If diagnostic maintenance cannot be performed from the DID, the CID can be used and troubleshooting has to be performed.

Performance type: Navigation and Movement

171-121-4030 Conduct Vehicle Tactical Navigation

Backup description: 171-121-4030 Conduct Vehicle Tactical Navigation
061-283-1002 Locate a Target by Grid Coordinates
04-3303.02-0037 Navigate While Mounted
04-3303.01-0019 Use a Map Overlay
171-329-1019 Use a Map Overlay
071-510-0001 Determine Azimuth Using a Protractor
071-510-0001 Compute Back Azimuths
071-329-1005 Determine a Location on the Ground by Terrain Association
071-329-1001 Identify Terrain Features on a Map
071-329-1011 Orient a Map using a Compass

171-121-4065 Direct Vehicle Tactical Movement

Backup description: 171-121-4065 Direct Vehicle Tactical Movement
171-121-4030 Conduct Vehicle Tactical Navigation
061-283-1002 Locate a Target by Grid Coordinates
04-3303.02-0037 Navigate While Mounted
04-3303.01-0019 Use a Map Overlay
171-329-1019 Use a Map Overlay
071-510-0001 Determine Azimuth Using a Protractor
071-510-0001 Compute Back Azimuths
071-329-1005 Determine a Location on the Ground by Terrain Association
071-329-1001 Identify Terrain Features on a Map
071-329-1011 Orient a Map using a Compass

171-126-1136 Drive an M1A2 Tank

Backup description: If the DID is inoperable, normally the tank cannot be operated.

171-126-1145 Prepare the Position/Navigation System for Operation on an M1A2 Tank

Backup description: There is no back-up for this task.

Performance type:	Situational Awareness
--------------------------	------------------------------

071-326-5705 Establish an Observation Post

Backup description: 071-326-5705 Establish an Observation Post.

171-121-4063 Supervise Local Security

Backup description: 171-121-4063 Supervise Local Security.

171-126-1113 Operate the Commander's Integrated Display (CID) on an M1A2 Tank

Backup description: If the CID is totally inoperable the turret can only be operated in the manual mode, which means that the turret and gun must be moved manually, the ammo door must be opened manually, the gunner cannot use the GPS or TIS, the CITV cannot be used, and there is no digital link with any other station. The commander loses the capability to use the IVIS and all the overlays and reports. The radios cannot be controlled remotely. The driver may be able to back up some of the CID functions such as: POSNAV, NBC controls, waypoint, and compass. The tank would have to be fought in a degraded gunnery mode.

171-126-1143 Operate the Commander's Independent Thermal Viewer (CITV) on an M1A2 Tank

Backup description: Without the CITV the commander has to engage targets with the GPSE using the same gunnery techniques as the M1A1.

APPENDIX G

**PERFORMANCE TYPES FOR LEADER, CREW,
AND COLLECTIVE DIGITAL TASKS**

PERFORMANCE TYPES FOR LEADER, CREW, AND
COLLECTIVE DIGITAL TASKS

CONTENTS

Table	Page
G-1 Leader.....	G-3
G-2 Crew Level	G-8
G-3 Platoon Level	G-11
G-4 Platoon Battle Drills	G-13
G-5 Company/Team Level	G-14
G-6 Battalion/Task Force Level.....	G-17

Table G-1

Digital M1A2 Tasks by Performance Type: Leader

Task #	Task title	Performance Type			
		Communicate Information	Gunnery Maintenance	Navigation & Movement	Situational Awareness
031-503-3004	Supervise the Crossing of a Contaminated Area	☒	☒	☒	☐
071-326-5770	Prepare a Platoon Sector Sketch	☒	☒	☐	☐
071-326-5775	Coordinate with an Adjacent Platoon	☒	☐	☐	☐
071-430-0007	Consolidate a Platoon Following Enemy Contact While in the Defense	☒	☐	☒	☒
071-430-0008	Reorganize a Platoon Following Enemy Contact While in the Defense	☒	☐	☐	☒
171-091-1021	Plan Resupply Operations at Platoon/Team Level	☒	☐	☐	☒
171-091-1022	Conduct Resupply Operations at Platoon/Team Level	☒	☐	☐	☒
171-121-3009	Control Techniques of Movement	☒	☐	☒	☒
171-121-3038	Conduct a Relief in Place at Platoon Level	☒	☐	☒	☒
171-121-4010	Conduct Actions on Contact	☒	☒	☒	☒
171-121-4011	Lead an Armor Platoon in a Limited Visibility Attack	☒	☒	☒	☒
171-121-4014	Conduct the Defense of a Battle Position at Platoon	☒	☒	☒	☒
171-121-4015	Conduct a Hasty River Crossing	☒	☒	☒	☒
171-121-4016	Conduct a Displacement at Platoon Level	☒	☐	☒	☒
171-121-4017	Supervise Tank Platoon Formations and Drills	☒	☐	☒	☒

continued

Table G-1 (continued)

Digital M1A2 Tasks by Performance Type: Leader

Task #	Task title	Performance Type			
		Communicate Information	Gunnery Maintenance	Navigation & Movement	Situational Awareness
171-121-4027	Supervise the Improvement of an Armor Vehicle's Fighting Position	☒	☐	☐	☒
171-121-4028	Plan Occupation of a Battle Position	☒	☐	☐	☒
171-121-4032	Conduct an Attack at Platoon Level	☒	☒	☒	☒
171-121-4033	Conduct the Occupation of a Battle Position at Platoon Level	☒	☒	☒	☒
171-121-4034	Coordinate with Adjacent Units	☒	☐	☐	☒
171-121-4035	Plan a Movement to Contact	☒	☐	☐	☒
171-121-4036	Conduct a Movement to Contact	☒	☒	☒	☒
171-121-4037	Plan a Hasty River Crossing	☒	☐	☐	☒
171-121-4038	Supervise Local Security	☒	☐	☒	☒
171-121-4042	Supervise Quarters Party Activities	☒	☐	☒	☒
171-121-4045	Conduct Troop Leading Procedures at Platoon Level	☒	☐	☒	☒
171-121-4051	Prepare a Situation Report (SITREP)/Status Report (STATREP)	☒	☐	☐	☐
171-121-4052	Execute Tank Platoon Pre-Combat Operations	☒	☐	☐	☐
171-121-4053	Plan an Armor/Scout Tactical Road March	☒	☐	☒	☒
171-121-4054	Conduct an Armor/Scout Platoon Tactical Road March	☒	☐	☒	☒

continued

Table G-1 (continued)

Digital M1A2 Tasks by Performance Type: Leader

Task #	Task title	Performance Type				
		Communicate Information	Gunnery Maintenance	Navigation & Movement	Situational Awareness	
171-121-4057	Perform Techniques of Movement	☒	☐	☒	☒	
171-121-4058	Conduct Quartering Party Activities	☒	☐	☒	☒	
171-121-4059	Conduct an Armor In-Stride Breach of a Minefield	☒	☐	☐	☒	
171-121-4061	Conduct Armor Tactical Navigation at Platoon Level	☒	☐	☒	☒	
171-123-4000	Plan the Occupation of an Assembly Area	☒	☐	☐	☒	
171-123-4001	Prepare a Platoon Fire Plan	☒	☒	☐	☒	
171-123-4004	Direct Platoon Fire Plan	☒	☒	☐	☒	
171-123-4005	Conduct the Occupation of an Assembly Area	☒	☐	☒	☒	
171-123-4007	Coordinate an Armor/Scout Platoon Passage of Lines	☒	☐	☐	☒	
171-123-4008	Direct a Consolidation and Reorganization at Platoon Level	☒	☐	☐	☒	
171-123-4009	Conduct an Armor/Scout Platoon Passage of Lines	☒	☒	☒	☒	
171-123-4012	Establish a Perimeter Defense	☒	☒	☒	☒	

continued

Table G-1 (continued)

Digital M1A2 Tasks by Performance Type: Leader

Task #	Task title	Performance Type			
		Communicate Information	Gunnery Maintenance	Navigation & Movement	Situational Awareness
01-1242.00-0020	Conduct the Occupation/Defense of a Battle Position at Company/Troop Level	☒	☐	☐	☒
01-5700.02-0001	Enforce Platoon and Company Communications Security Measures	☒	☐	☐	☒
01-9020.01-0001	Conduct a Defense at Company/Troop Level	☒	☐	☒	☒
01-9020.02-0002	Conduct an Advanced/Rear Guard at Company/Troop Level	☒	☒	☒	☒
01-9020.02-0003	Conduct a Flank Guard at Company/Troop Level	☒	☐	☒	☒
01-9020.02-0004	Conduct a Stationary Guard at Company/Troop Level	☒	☐	☒	☒
01-9020.03-0008	Process Tactical Information at Company/Troop Level	☒	☐	☐	☒
01-9020.03-0010	Conduct a Hasty Water Crossing at Company/Troop Level	☒	☒	☒	☒
01-9020.03-0013	Prepare and Issue a Operation Order (OPORD) at Company/Troop Level	☒	☐	☐	☐
01-9020.03-0014	Prepare and Issue a Fragmentary Order (FRAGO) at Company/Troop Level	☒	☐	☐	☒

continued

Table G-1 (continued)

Digital M1A2 Tasks by Performance Type: Leader

Task #	Task title	Performance Type			
		Communicate Information	Gunnery Maintenance	Navigation & Movement	Situational Awareness
01-9020.03-0016	Prepare a Unit Status Report	☒	☐	☐	☐
01-9020.03-0020	Conduct Cross-Leveling Operations at Company/Troop Level	☒	☐	☐	☒
01-9020.03-0023	Conduct Movement Across a Radiologically Contaminated Area at Company/Troop Level	☒	☒	☒	☒
01-9020.03-0024	Conduct Movement Across a Chemically/Biologically Contaminated Area at Company/Troop Level	☒	☒	☒	☒
01-9020.03-0025	Supervise Unit Response to a Chemical/Biological Attack at	☒	☐	☐	☒
01-9020.03-0026	Supervise Unit Response to a Nuclear Attack at Company/Troop Level	☒	☐	☐	☒
01-9020.03-0027	Conduct Tactical Formation/Movement at Company/Troop Level	☒	☒	☒	☒
01-9020.07-0004	Conduct an Offensive Military Operation on Urban Terrain	☒	☒	☒	☒
01-9020.08-0004	Conduct a Defensive Military Operation on Urban Terrain (MOUT)	☒	☒	☒	☒
04-3303.02-0014	Prepare Platoon or Company Combat Orders	☒	☐	☐	☒

Table G-2

Digital M1A2 Tasks by Performance Type: Crew Level

Task #	Task title	Performance Type					
		Communicate Information	Gunnery	Maintenance	Navigation & Movement	Situational Awareness	Equipment Operation
17-5-1039	Establish an Observation Post/Listening Post	☒	☐	☐	☐	☐	☒
17-5-1080	Employ Operations Security (OPSEC) Measures	☒	☐	☐	☒	☐	☒
17-5-2160	Navigate a Tracked Vehicle Cross-Country	☒	☐	☐	☒	☐	☐
17-5-2500	Occupy a Vehicle Firing Position	☒	☐	☐	☒	☐	☐
17-5-2710	Emplace a Hasty Protective Minefield	☒	☐	☐	☒	☐	☐
17-5-2730	Remove a Hasty Protective Minefield	☐	☐	☐	☒	☐	☐
17-5-5160	Recover a Vehicle (Self-Recovery)	☐	☐	☐	☐	☐	☒
17-5-5260	Prepare a Tracked Vehicle for a Nuclear Attack	☐	☐	☐	☐	☐	☒
17-5-5265	Prepare a Tracked Vehicle for a Chemical Attack	☐	☐	☐	☐	☐	☒
17-5-5267	Cross a Chemically/Biologically Contaminated Area in a Tracked	☒	☒	☐	☒	☐	☐
17-5-5269	Cross a Radiologically Contaminated Area in a Tracked Vehicle	☒	☒	☐	☒	☐	☐

continued

Table G-2 (continued)

Digital M1A2 Tasks by Performance Type: Crew Level

Task #	Task title	Performance Type				
		Communicate Information	Gunnery	Maintenance	Navigation & Movement Awareness	Situational Equipment Operation
17-5-5276	Prepare for Combat	☒	☐	☒	☐	☐
17-5-5278	Conduct Vehicle Maintenance	☐	☐	☒	☐	☐
17-5-5500	Fuel an M1/M1A1/M1A2	☐	☐	☐	☐	☒
17-5-5517	Employ the Mine Clearing Blade on an M1/M1A1/M1A2	☒	☐	☐	☒	☐
17-5-5518	Employ the Mine Clearing Roller on an M1/M1A1/M1A2 Tank	☒	☐	☐	☒	☐
17-5-5520	Extract an Injured Crewman from an M1/M1A1/M1A2 Tank	☒	☐	☐	☐	☐
17-5-5521	Rearm an M1/M1A1/M1A2 Tank	☒	☐	☐	☐	☐
17-5-5540	Extinguish Fires on an M1/M1A1/M1A2					
17-5-5585	Engage Multiple Machine Gun Targets on an M1/M1A1/M1A2 Tank	☐	☒	☐	☐	☐
17-5-5622	Engage Targets with the Main Gun on an M1/M1A1/M1A2 Tank	☐	☒	☐	☐	☐
17-5-5695	Boresight an M1A2 Tank with a Muzzle Boresight Device	☐	☒	☐	☐	☐

continued

Table G-2 (continued)

Digital M1A2 Tasks by Performance Type: Crew Level

Task #	Task title	Performance Type					
		Communicate Information	Gunnery	Maintenance	Navigation & Movement	Situational Awareness	Equipment Operation
17-5-5710	Install a Thrown Track on an M1/M1A1/M1A2 Tank	☐	☐	☐	☐	☐	☒
17-5-5720	Install/Remove Track Blocks on an M1/M1A1/M1A2 Tank	☐	☐	☐	☐	☐	☒
17-5-5740	Start an M1/M1A1/M1A2 Tank with Slave Cables	☐	☐	☐	☐	☐	☒
17-5-5750	Tow an M1/M1A1/M1A2 Tank	☐	☐	☐	☐	☐	☒
17-5-5755	Ford a Water Obstacle in an M1/M1A1/M1A2	☒	☐	☐	☒	☐	☒
17-5-5840	Decontaminate a Tracked Vehicle	☒	☐	☐	☐	☐	☐
17-5-5895	React to an Antitank Guided Missile (ATGM)	☒	☒	☐	☒	☐	☐

Table G-3

Digital M1A2 Tasks by Performance Type: Platoon Level

Task #	Task title	Performance Type				
		Communicate Information	Gunnery	Maintenance	Navigation & Movement	Situational Awareness
03-3-C016	Conduct Operational Decontamination	☒	☐	☐	☒	☒
12-3-C021	Conduct Consolidation and Reorganization Activities	☒	☐	☐	☒	☒
17-3-0065	Conduct Troop Leading Procedures	☒	☐	☐	☒	☒
17-3-0212	Conduct Tactical Roadmarch					
17-3-0214	Coordinate/Assist Passage of Lines Forward/Rearward	☒	☐	☐	☒	☒
17-3-0218	Conduct Reconnaissance by Fire	☒	☐	☐	☒	☒
17-3-0219	Conduct an Attack by Fire	☒	☒	☐	☒	☒
17-3-0220	Assault an Enemy Position	☒	☒	☐	☒	☒
17-3-0221	Execute Actions on Contact	☒	☒	☐	☒	☒
17-3-1014	Coordinate/Conduct a Passage of Lines Forward/Rearward	☒	☐	☐	☒	☒
17-3-1016	Conduct Tactical Movement	☒	☐	☐	☒	☒
17-3-1025	Conduct a Relief in Place	☒	☐	☐	☒	☒
17-3-1026	Emplace and Retrieve a Hasty Obstacle	☒	☐	☐	☒	☒
17-3-1039	Establish an Observation Post	☒	☐	☐	☒	☒
17-3-2000	Conduct Assembly Area Operations	☒	☐	☒	☒	☒

continued

Table G-3 (continued)

Digital M1A2 Tasks by Performance Type: Platoon Level

Task #	Task title	Performance Type				
		Communicate Information	Gunnery	Maintenance	Navigation & Movement	Situational Awareness
17-3-2269	Follow and Support	☒	☐	☐	☒	☒
17-3-2320	Conduct Convoy Escort	☒	☐	☐	☒	☒
17-3-2380	Disengage From the Enemy	☒	☒	☐	☒	☒
17-3-2420	Conduct Bypass Operations	☒	☐	☐	☒	☒
17-3-2450	Destroy an Inferior Force	☒	☒	☐	☒	☒
17-3-2601	Conduct Hasty Occupation of a Platoon Battle Position	☒	☐	☐	☒	☒
17-3-2602	Conduct Deliberate Occupation of a Battle	☒	☐	☐	☒	☒
17-3-2605	Conduct Platoon Defense	☒	☐	☐	☒	☒
17-3-2625	Displace to a Successive/Alternate Battle	☒	☐	☐	☒	☒
17-3-2632	Conduct a Perimeter Defense	☒	☐	☐	☒	☒
17-3-2760	Conduct Link-Up	☒	☐	☐	☒	☒
17-3-3061	Conduct Overwatch/Support by Fire	☒	☐	☐	☒	☒
17-3-3070	Conduct Breech Force Operations	☒	☐	☐	☒	☒
17-3-8143	Cross an NBC Contaminated Area	☒	☐	☐	☒	☒
17-3-C601	Perform Resupply Operations	☒	☐	☐	☐	☒
44-3-C001	Conduct Passive Air Defensive Measures	☒	☐	☐	☒	☒

Table G-4

Digital M1A2 Drills by Performance Type: Platoon Battle Drills

#	Title	Performance Type			
		Communicate Information	Gunnery	Maintenance	Navigation & Movement Situational Awareness
1	Change of Formation Drill	☒	☐	☐	☒
2	Contact Drill	☒	☒	☐	☒
3	Action Drill	☒	☒	☐	☒
4	React to Indirect Fire Drill	☒	☐	☐	☒
5	React to Air Attack Drill	☒	☒	☐	☒
6	React to Nuclear Attack Drill	☒	☐	☐	☒
7	React to Chemical/Biological Attack Drill	☒	☐	☐	☒

Table G-5

Digital M1A2 Tasks by Performance Type: Company/Team Level

Task #	Task title	Performance Type				
		Communicate Information	Gunnery	Maintenance	Navigation & Movement	Situational Awareness
03-2-C311	Perform Operational Decontamination	☒	☐	☐	☒	☒
03-2-C328	Respond to a Nuclear Attack	☒	☐	☐	☐	☐
03-2-C334	Respond to a Chemical Attack	☒	☐	☐	☒	☐
03-3-C033	Conduct Thorough Decontamination	☒	☐	☐	☒	☒
12-2-C021	Conduct Consolidation and Reorganization Activities	☒	☐	☒	☒	☒
44-2-C001	Conduct Passive Air Defense Measures	☒	☐	☐	☒	☐
44-2-C221	Take Combined Arms Active Air Defense Measures Against Hostile Aerial Platforms	☒	☒	☐	☐	☒
71-2-0065	Conduct Troop-Leading Procedures	☒	☐	☐	☐	☐
71-2-0212	Conduct a Tactical Roadmarch	☒	☐	☐	☒	☒
71-2-0214	Assist a Passage of Lines	☒	☐	☐	☒	☒
71-2-0219	Attack by Fire	☒	☒	☐	☒	☒
71-2-0220	Assault an Enemy Position	☒	☒	☐	☒	☒
71-2-0221	Execute Actions on Contact	☒	☒	☐	☒	☒
71-2-0222	Advance in Contact	☒	☒	☐	☒	☒
71-2-0309	Conduct an Ambush	☒	☒	☐	☒	☒

Table G-5 (continued)

Digital M1A2 Tasks by Performance Type: Company/Team Level

Task #	Task title	Performance Type				
		Communicate Information	Gunnery	Maintenance	Navigation & Movement	Situational Awareness
71-2-0312	Conduct a Screen	☒	☒	☐	☒	☒
71-2-0318	Conduct Linkup	☒	☐	☐	☒	☒
71-2-0321	Conduct Delay	☒	☒	☐	☒	☒
71-2-0322	Withdraw From Enemy Contact	☒	☒	☐	☒	☒
71-2-0330	Conduct a Guard	☒	☒	☐	☒	☒
71-2-0331	Conduct Air Assault	☒	☒	☐	☒	☒
71-2-0332	Conduct a Hasty River/Gap Crossing	☒	☒	☐	☒	☒
71-2-0601	Conduct Resupply Operations	☒	☐	☐	☒	☒
71-2-1014	Conduct a Passage of Lines	☒	☐	☐	☒	☒
71-2-1016	Conduct Tactical Movement	☒	☒	☐	☒	☒
71-2-1025	Conduct a Relief in Place	☒	☐	☐	☒	☒
71-2-2000	Conduct Assembly Area Activities	☒	☐	☐	☒	☒
71-2-2021	Clear Restrictive Terrain	☒	☐	☐	☒	☒
71-2-2269	Follow and Support	☒	☒	☐	☒	☒
71-2-2420	Conduct Bypass	☒	☐	☐	☒	☒
71-2-2603	Defend a Battle Position	☒	☒	☐	☒	☒

continued

Table G-5 (continued)

Digital M1A2 Tasks by Performance Type: Company/Team Level

Task #	Task title	Performance Type				
		Communicate Information	Gunnery	Maintenance	Navigation	Situational Awareness
71-2-2605	Defend in Sector	☒	☒	☐	☒	☒
71-2-2607	Defend a Strongpoint	☒	☒	☐	☒	☒
71-2-3015	Cross an NBC Contaminated Area	☒	☐	☐	☒	☒
71-2-3061	Support by Fire	☒	☐	☐	☒	☒
71-2-3070	Breach an Obstacle	☒	☒	☐	☒	☒
71-2-4000	Conduct Route Reconnaissance	☒	☒	☐	☒	☒
71-2-4010	Conduct Zone/Area Reconnaissance	☒	☒	☐	☒	☒

Table G-6

Digital M1A2 Tasks by Performance Type: Battalion/Task Force Level

Task #	Task title	Performance Type				
		Communicate Information	Gunnery	Maintenance	Navigation & Movement	Situational Awareness
7-1-3001	Occupy Assembly Area	☒	☐	☐	☐	☐
7-1-3002	Perform Tactical Roadmarch	☒	☐	☐	☒	☐
7-1-3003	Perform Passage of Lines	☒	☒	☐	☒	☒
7-1-3004	Move Tactically	☒	☒	☐	☒	☒
7-1-3005	Perform Hasty River/Gap Crossing	☒	☒	☐	☒	☒
7-1-3006	Fight a Meeting Engagement	☒	☒	☐	☒	☒
7-1-3007	Assault	☒	☒	☐	☒	☒
7-1-3008	Attack/Counterattack by Fire	☒	☒	☐	☒	☒
7-1-3009	Defend	☒	☒	☐	☒	☒
7-1-3010	Cover Passage of Lines	☒	☒	☐	☒	☒
7-1-3011	Withdraw Not Under Enemy Pressure	☒	☒	☐	☒	☒
7-1-3012	Withdraw Under Enemy Fire	☒	☒	☐	☒	☒
7-1-3013	Delay	☒	☒	☐	☒	☒
7-1-3014	Perform Relief in Place	☒	☒	☐	☒	☒
7-1-3015	Perform Linkup	☒	☐	☐	☒	☒
7-1-3016	Perform Reserve Operations	☒	☐	☐	☒	☒
7-1-3017	Perform Rear Operations	☒	☒	☐	☒	☒
7-1-3018	Perform Raid	☒	☒	☐	☒	☒
7-1-3019	Infiltrate	☒	☐	☐	☒	☒
7-1-3020	Perform Guard	☒	☒	☐	☒	☒
7-1-3021	Bypass Enemy Force	☒	☒	☐	☒	☒

continued

Table G-6 (continued)

Digital M1A2 Tasks by Performance Type: Battalion/Task Force Level

Task #	Task title	Performance Type				
		Communicate	Gunnery	Maintenance	Navigation	Situational Awareness
7-1-3022	Reorganize	☒	☐	☐	☒	☐
7-1-3023	Consolidate	☒	☒	☐	☒	☒
7-1-3025	Breakout from Encirclement	☒	☒	☐	☒	☒
7-1-3026	Perform Screen	☒	☒	☐	☒	☒
7-1-3027	Breach Defended Obstacles	☒	☒	☐	☒	☒
7-1-3028	Maintain Operations Security	☒	☐	☐	☐	☐
7-1-3031	Cross a Chemically/Nuclear Contaminated Area	☒	☐	☐	☒	☒
7-1-3401	Maintain Communications	☒	☐	☐	☐	☐
7-1-3901	Command and Control the Battalion Task Force	☒	☐	☐	☒	☒
7-1-3907	Employ Fire Support	☒	☐	☐	☒	☒
7-1-3909	Perform Mobility/Survivability Operations	☒	☐	☐	☐	☒
7-1-3910	Perform NBC Operations	☒	☐	☐	☐	☒

APPENDIX H

**TRAINING PIPELINES FOR TANK
AND MECHANIZED INFANTRY SOLDIERS**

TRAINING PIPELINES FOR TANK AND MECHANIZED INFANTRY SOLDIERS

CONTENTS

	Page
Tank and Mechanized Infantry Weapon Systems	H-6
The Tank Systems	H-6
The Mechanized Infantry Fighting Vehicle Systems.....	H-8
Additional Digital Systems.....	H-9
Systems Summary.....	H-10
Overview of the Education and Progression Model: Tank Crewman and Fighting Vehicle Infantryman.....	H-10
Individual Task Domain: 19K	H-13
Individual Task Domain: 11M.....	H-15
19K One Station Unit Training	H-16
11M One Station Unit Training.....	H-18
Primary Leadership Development Course for 19K and 11M.....	H-19
19K Basic Noncommissioned Officer Course.....	H-20
11M Basic Noncommissioned Officer Course	H-21
19K Advanced Noncommissioned Officer Course.....	H-22
11M Advanced Noncommissioned Officer Course	H-23
Tank And Mechanized Infantry Functional Courses.....	H-24
M1A2 Armor Crewman Qualification Course	H-25
M1A1 Master Gunner Course.....	H-26
M1A2 Master Gunner Transition Course	H-27
M1A1 Tank Commander Certification Course	H-28
M1A2 Tank Commander Certification Course	H-28
Bradley Leaders Course.....	H-29
Bradley Master Gunner Course.....	H-30
Overview of the Education and Progression Model: Armor Officer and Infantry Officer	H-31
Branch Code 12 Individual Task Domain.....	H-32
Branch Code 11 Individual Task Domain.....	H-33
Armor Officer Basic Course.....	H-35
Infantry Officer Basic Course.....	H-36
Armor Officer Advanced Course.....	H-37
Infantry Officer Advanced Course.....	H-38

CONTENTS (Continued)

	Page
Summary of Fort Knox and Fort Benning Institutional Training.....	H-39
Unit Training.....	H-41

LIST OF TABLES

Table H-1. Type and Number of the Bradley Fleet in Fiscal Year 2009	H-9
H-2. Career Progression Model for Tank Crewman (19K) and Infantry Fighting Vehicle Crewman (11M)	H-11
H-3. Skill Level (SL) with Associated Grade and Rank	H-12
H-4. 19K Individual Task Domain.....	H-14
H-5. 19K Tasks by Proponency.....	H-15
H-6. 11M Individual Task Domain by Skill Level (SL).....	H-16
H-7. 11M Tasks by Proponency	H-16
H-8. 19K One Station Unit Training Subject Areas and Hours.....	H-17
H-9. 11M One Station Unit Training Subject Areas and Hours.....	H-19
H-10. 19K Basic Noncommissioned Officer Course by Subject Areas and Hours.....	H-21
H-11. 11M Basic Noncommissioned Officer Course by Subject Areas and Hours.....	H-22
H-12. 19K Advanced Noncommissioned Officer Course by Subject Areas and Hours.....	H-23
H-13. 11M Advanced Noncommissioned Officer Course by Subject Areas and Hours.....	H-24
H-14. M1A2 Armor Crewman K4 Course Subject Areas and Hours.....	H-25
H-15. M1A2-Specific Lessons in the Armor Crewman K4 Course.....	H-26

CONTENTS (Continued)

	Page
Table H-16. M1A2 Armor Crewman Qualification Course: Projected Training Loads by Fiscal Year (FY)	H-26
H-17. 19K Master Gunner Subject Areas and Hours	H-27
H-18. M1A2 Master Gunner Transition Course Subject Areas and Hours	H-27
H-19. M1A1 Tank Commander Certification Course Subject Areas and Hours.....	H-28
H-20. M1A2 Tank Commander Certification Course Subject Areas and Hours.....	H-29
H-21. 11M Bradley Leaders Course Subject Areas and Hours.....	H-30
H-22. 11M Master Gunner Course Subject Areas and Hours.....	H-31
H-23. Branch Code 11 Individual Task Domain	H-34
H-24. Branch Code 11 Tasks by Proponency	H-34
H-25. Branch Code 12 Armor Officer Basic Course Subject Areas and Hours.....	H-36
H-26. Branch Code 11 Infantry Officer Basic Course Subject Areas and Hours.....	H-37
H-27. Branch Code 12 Armor Officer Advanced Course Subject Areas and Hours.....	H-38
H-28. Branch Code 11 Infantry Officer Advanced Course Subject Areas and Hours.....	H-39
H-29. Summary of Fort Knox Tank-Based Initial Entry Training, Noncommissioned Officer Education System, Functional Courses and Armor Officer Courses	H-40
H-30. Summary of Fort Benning Bradley-Based Initial Entry Training, Noncommissioned Officer Education System, Functional Courses and Infantry Officer Courses.....	H-41
H-31. Example of Unit Training Activities and Frequency for a Hypothetical Tank Company.....	H-43
References	H-45

Training Pipelines For Tank and Mechanized Infantry Soldiers

The introduction of digitization and the requirement for back-up skills are certain to have an impact in how, what, and where tank soldiers and mechanized infantry soldiers of the future are trained in these skills. The starting point of changes to training is a complete understanding of the current training picture. This appendix describes the existing training pipeline for active duty enlisted and commissioned soldiers that are assigned to tanks or to mechanized infantry through approximately their first 10 years of service. It describes the courses that soldiers attend and the content of instruction that they receive. Actual 1996 figures are used to describe training loads and hours of instruction; as such, they provide only a snapshot of what the training pipelines looked like at that time. Moreover, training content is dynamic: a large scale portrayal can never be completely current. However, using figures from a fixed point provides a frame of reference for how the training is conducted and a useful baseline when changes to the training are contemplated.

Much of the information on the existing training pipelines contained in this appendix was collected from various Army publications and sources (referenced within). It should be pointed out however, that there is a great deal of bookkeeping difference in numbers of students, hours, attrition rates, and recycles among courses. Sometimes, different sources will cite different numbers. And the numbers used are for a single year, which may reflect an anomaly for that year. This is not intended to be an official report on the status of training at Fort Knox and Fort Benning but only to give an overview of the extent of the two training pipelines. It must also be kept in mind that while there are many similarities in how the tank and mechanized infantry pipelines function, there are also many inherent differences which are not explored in this appendix. Although the two pipelines are discussed in tandem in this presentation, the purpose is not to invite a comparison of the two systems. There are many reasons why course content, task lists, class loads, and instructional hours differ between tank and mechanized infantry for similar courses. This study made no attempt to explore why those differences exist and readers are cautioned not to make comparisons based on the information presented.

This appendix is divided into four main parts. The first part presents a brief synopsis of the type systems (tank and infantry fighting vehicle) that soldiers in the pipeline will be expected to operate in the foreseeable future. The second part presents an overview of the enlisted pipeline and presents a brief summation of each of the courses for tank and mechanized infantry enlisted and non-commissioned soldiers. The third part presents an overview of the officer pipeline and contains a summation of courses for commissioned officers who serve in tank and mechanized infantry. The fourth part addresses typical unit training for both tank and mechanized infantry units. In addition to these institutional and unit training components, all soldiers nominally have a self-development component. However, for active duty soldiers this self-development component is loosely defined and managed and currently has no discernible or documented effect on overall soldier development. Therefore, it has not been included in the presentation.¹

¹ For enlisted soldiers, self-development consists of enrollment in the Military Correspondence Course Program and pursuit of civilian education. Enlisted career soldiers are encouraged to obtain college credits towards an associate or a bachelors degree. Soldiers are "rewarded" by promotion points for their involvement with both.

Tank and Mechanized Infantry Weapon Systems

The pipelines for tank and mechanized infantry are dependent on the type of equipment that soldiers operate. This determines the content of the various courses as well as the units of assignment. This section outlines the type equipment for tank and mechanized infantry that is currently in the field or that is projected to be fielded in the near future.

The Tank Systems

There are three weapons system platforms that tank soldiers will need to be taught to operate; only two of which are currently in the inventory. These are the M1A1 (which also exists in variants such as the M1 and the M1IP); the M1A2; and a planned upgrade to the M1A2 called the M1A2 SEP (for system enhancement program).² The M1A1 is a "conventional" tank in that it does not employ digital linkages in system employment. The other two systems are commonly called "digital" tanks. The M1A1 is the second generation of the M1 series of main battle tanks and became the predominant tank in the active Army tank units following the Gulf War of 1991.

The only other tank currently found in active duty units is the M1A2. This tank has an improved integrated fire control system, data bus architecture, and digital onboard diagnostics for automotive and fire control systems. The tank utilizes digital links to send information through the intervehicular information system (IVIS) including automated reports, overlays, calls for fire, and position-location displays and vehicle condition information. Besides the IVIS, the tank commander has a digital commander's integrated display (CID) which provides him status information about the vehicle and a commander's independent thermal viewer (CITV) which he can use to scan for and acquire targets independent of the activities of the gunner. The gunner operates a digital gunner's control display panel (GCDP) which provides him critical gunnery and target acquisition information from the many components that affect gunnery. The driver has a digital driver's integrated display (DID) which provides him automotive status and location information about the vehicle including the ability to program route waypoints for navigation. Many functions between the CID, GCDP, and DID are shared between the three positions. The entire digital system is also dependent on a position navigation (POSNAV) system which tells the vehicle where it is located.

The M1A2 was first fielded to units in mid-1995 and by the end of fiscal year (FY) 1997 there were three battalion size units (58 tanks) equipped with the M1A2. All of these units are in the 1st Cavalry Division at Fort Hood, Texas.³ There is also a company size plus unit (18 tanks) located at Fort Knox, Kentucky for training purposes. The M1A2 will continue to be fielded at Fort Hood at the rate of about one battalion per year until a density of 327 M1A2s is reached.

However, there are no standards specified for either program. Officer self-development is focused on completing a reading list.

² All variants of the M1 tank are designated as the *Abrams Main Battle Tank*. The M1 tank was first produced in 1978. The M1A1 went into production in 1985 and the M1A2 was first produced in 1986. The prototype M1A2 SEP is scheduled to be available in 1998.

³ The divisional cavalry squadron was also fielded with the M1A2.

After all of the 1st Cavalry Division becomes M1A2 equipped, fielding will switch to the 3rd Armored Cavalry Regiment at Fort Carson, Colorado in the first quarter of FY 1999 (Project Manager Abrams, 1997). Soldiers who operate the M1A2 must be trained, certified, and carry the military occupational specialty (MOS) additional skill identifier (ASI) of K4. The majority of formal M1A2 training during transition fielding was, and will continue to be, conducted by an M1A2 new equipment training (NET) team.⁴ However, in 1995 an add-on training course for new soldiers was added to MOS qualification training at Fort Knox and a transition course for Master Gunners was also added. Finally, in 1996, Fort Knox added an M1A2 Tank Commander's Certification Course. These courses will be addressed in detail later in this appendix.

Although the M1A2 is the most advanced tank currently in the hands of troops anywhere in the world, it is essentially based on 1985 technology. Moreover, the M1A2 is somewhat of an anomaly. Currently, there are no digital links beyond the tank itself so that communications with command posts or with forces not in M1A2 has to be by voice or other non-digital tracking methods. Horizontal and vertical digital connectivity beyond the platoon is essentially non-existent. The result is that full system employment and true digital operations have been slow to evolve.

The third major version of the M1 series tank will be the M1A2 SEP, which is scheduled to be fielded by about 2009. The M1A2 SEP will consist of a number of digital upgrades which are forecast to include new operating systems designed for future growth and compatibility with all other digital systems; better soldier-machine interface through synthetic speech and speech recognition; color panel displays; enhanced computer information processing with more memory capacity; and simultaneous digital and voice communication capability. The tank loader will also be brought into the digital operation of the vehicle through a remote display unit mounted in the loader's station.

The total number of M1A2 and M1A2 SEP tanks to be procured between 1995 and 2015 will be 1079 (Project Manager Abrams, 1997). Out of a total inventory of about 7000 tanks, this means that digital tanks will comprise roughly 15% of the fleet by the time that M1A2 production is scheduled to end in 2015. However, since most of the tank fleet is in the National Guard or unmanned (in prepositioned stocks, war reserve, and training base) the percentage of active duty soldiers who will serve on the M1A2/SEP will be much higher; probably in the neighborhood of 40% to 50% of active duty tank crews will eventually be on these digital systems by the 2009-2015 time frame.

⁴ Operators new equipment training (OPNET) for the M1A2 is designed to teach crews how to operate and maintain the tank. It is conducted at Fort Hood in conjunction with the issuing of the M1A2. OPNET lasts for 45 days and, starting in 1998, will be predominately contractor-based instruction. The NET is historically a short term, one time only endeavor designed to expedite fielding of equipment. It is not designed to substitute for normal resident or non-resident training. The NET team will conduct two more OPNET cycles at Fort Hood in FY 1998 and then move to Fort Carson, Colorado (Ashton, personal communication, 1998).

The Mechanized Infantry Fighting Vehicle Systems

Soldiers in mechanized infantry fight a platform and system called the Bradley, referred to by its designator M2. The basic Bradley is used by several different proponents. When used by the infantry, it is called the *infantry fighting vehicle* (IFV), and it is this role that is the focus of this section.⁵ In its infantry configuration, the Bradley performs two roles: First, it is a troop carrier capable of maneuvering alongside its counterpart, the M1 tank, to deliver infantrymen to fight on the ground dismounted. Second, it has a role as a "fighting vehicle," capable of defeating enemy armor and of providing fire support for its dismounted element.

Since its initial introduction of the prototype vehicle in 1981, until new vehicle production ended in 1995, the Bradley has gone through a series of modifications, improvements, and upgrades. Initial M2 production started in 1982 and produced 2,300 vehicles. In 1985, an upgrade program was applied to the M2 production which was designated the M2A1. There were 1,400 M2A1 Bradleys produced. Starting in 1988, a two phase modification of both existing and new production Bradleys was initiated and was designated the M2A2. Eventually, all 1,400 M2A1 Bradleys were converted to M2A2 and the M2A1 designation no longer applies. At the same time, the original M2 became known as the M2A0.

During extensive evaluations made of the role of the Bradley during the 1991 Gulf War, major modifications were made to the M2A2 and the result was designated the *M2A2ODS* (for *Operation Desert Storm*). The M2A2ODS has a laser range finder (LRF), a global positioning system (GPS) and POSNAV, a driver's thermal viewer, a battle combat identification system, reconfigured stowage, and a missile countermeasure device. The first fielding of the ODS took place in October 1996 and it is destined to replace the M2A2 in two continental United States (CONUS) divisions and in Korea (Johnston, 1996). In 1994, a contract was awarded for the modernization of some M2A2 into a digital version of the Bradley designated the M2A3 (Periscope's USNI Military Database, 1996). The result is that there are four Bradley systems that infantry soldiers must eventually be trained to operate. Three of these are currently fielded (M2A0, M2A2, and M2A2ODS) and the fourth (the M2A3) is undergoing development.

The next generation of the Bradley being developed is the M2A3. This system will have all the improvements of the ODS as well as a core electronic architecture which will support its operation as a digital vehicle. The commander will have a commander's tactical display (CTD) which will provide a color display of a digital map, command and control graphic overlays and messages, and diagnostic and vehicle status information. The CTD is to be supported by a command and control software system (similar in capability to the IVIS on an M1A2) which will allow the commander to digitally construct, send, and receive orders, tactical reports, and overlays. There will be a driver's display of digital vehicle automotive information as well as

⁵ When the BFV is used in an armored cavalry or scout role, it is called the *cavalry fighting vehicle* (CFV) and is designated the M3. Its other key utilizations are in an air defense role equipped with the Stinger missile, where it is called the *Bradley Stinger fighting vehicle* (BSFV), and in a role as the carrier for field artillery forward observers where it is called the *Bradley fire support team* (BFIST) vehicle. The chassis is also the basis for the intelligence community's family of *electronic fighting vehicle systems* (EFVS).

provision for a visual output of navigation and heading data and including the ability to input waypoints and steer-to information. There will also be a digital link to the infantry squad via a squad display monitor which is forecast to have the same display capabilities as the CTD. Because of these enhancements, this vehicle is commonly called the "digital" Bradley.

The M2A3 fielding schedule calls for the first unit equipped (FUE) to start in November 2000 with fielding completed by March of 2009. The total number of M2A3 to be procured is 1,602. Table H-1 shows the types of all Bradleys that will be in the inventory by 2009.⁶

Table H-1

Type and Number of the Bradley Fleet in Fiscal Year 2009

Bradley Model				
A0	A2	A2ODS	A3	TOTAL
1,799	1,886	1,433	1,602	6,720

Note: ODS is Operation Desert Storm

Additional Digital Systems

There are two forms of digital systems currently in the digital development scheme: embedded and appliqué. Platforms with embedded digital systems are those platforms that were designed, developed, and tested as digital, such as the M1A2 and the M2A3. Other platforms are retrofitted with a digital capability by adding on to the existing platform without modifying the design of that platform. These add-ons (called appliqué) provide primarily information processing capability rather than the integration of the various platform components provided by the embedded systems. The Army Digitization Office (ADO) Master Plan has identified 28 legacy platforms that are candidates for appliqué, including the M1A1 tank and the non-digital versions of the Bradley. With so many varied platforms to retrofit, there is no single version of appliqué. However, there are four common requirements to appliqué: (1) GPS receiver capability; (2) a computer capability; (3) ability to interface with Single Channel Ground and Airborne System and/or EPLRS; and (4) common application software (ADO, 1998).

A related digital initiative which could also impact the training requirements of the mechanized infantry soldier is the *Land Warrior* program. Forecasts for capabilities of this system include individual GPS and a soldier computer linked to a squad communications system, along with an integrated individual laser range finder, digital image capture, and a combat identification

⁶ The table shows all Bradleys for all uses, not just the IFV, and includes reserve component, training base, pre-positioned vehicles, and war reserve. For example, of the 1,602 M2A3 versions of the Bradley, only 720 will be IFV that are manned in units. The rest will be CFV, BSFV, BFIST, or training base.

system (TRADOC System Manager Soldier System, 1997).⁷ Land Warrior development is focused on the individual dismounted soldier and integration with the M2A3 or appliqué systems is speculative. However, it is potentially a digital requirement for all infantry soldiers, in both mechanized and non-mechanized units, and therefore of probable future training significance.

Systems Summary

It must be emphasized that the descriptions of the tank and Bradley variants, their numbers, dates, and units are subject to change based on budget changes, mission requirements, and technical capabilities. The significance is not in the exactness of the numbers and descriptions but in the fact that the variants will coexist for the next 12 to 20 years. Conventional, digital, and appliqué all will have different capabilities, characteristics, and operational implications.

While only 40% to 50% of active duty soldiers in both tank and mechanized infantry units will eventually be assigned to M1A2 and M2A3 units, virtually all active duty soldiers in both fields will have some interaction, on an as yet to be defined level, with digital. The mix of digital, non-digital, and part-digital equipment is one of the reasons that back-up is such an important training factor. Significant variation will likely exist in back-up; what may be a work-around on one system may require a conventional back-up on another system. The tank and infantry systems personify this situation, with three different tanks and four different versions of the IFV as part of the near term inventories.

Overview of the Education and Progression Model: Tank Crewman and Fighting Vehicle Infantryman

Volunteers who join the Army and choose to serve in tanks are assigned the MOS 19K: M1 Armor Crewman. For FY 1997, there were just under 11,000 active duty 19K positions authorized in the Army. This comprised about 2% of the total Army force.⁸ Those who join the Army and are assigned to mechanized infantry carry the MOS 11M with the job title of Fighting Vehicle Infantryman.⁹ They are part of career management field (CMF) 11: Infantry. Although there are a total of five different jobs in CMF 11, one in particular--the 11B Infantryman--has special implications for the 11M.¹⁰ All 11M are fundamentally and principally 11B; they perform the same requirements as an 11B except they do so in a mechanized environment and with some added requirements engendered by that environment. There are vast areas of overlap between the two jobs; in fact, as will be discussed later in this section, almost all of the 11B job requirements are subsumed into the 11M.

⁷ Land Warrior is the highest priority development system in the infantry community, ranking just above the M2A3 development. Initial Land Warrior fielding is scheduled for 4th quarter FY 2000, the same time as the FUE for the M2A3.

⁸ This is based on a requirement of 518,000 active duty soldiers, which is the number put forth to support a 10 division force.

⁹ This job and title were created in 1981 when the Bradley was introduced. Prior to that time, there was no distinction made between infantrymen who were assigned to carriers (mechanized) and other infantryman jobs.

¹⁰ Besides the 11M and the 11B, the other jobs in CMF 11 are 11C: Indirect Fire Infantryman; 11H: Heavy Antiarmor Weapons Infantryman; and 11Z: Infantry Senior Sergeant. The 11Z applies only at the highest enlisted rank.

Most volunteers who select MOS 19K or MOS 11M are in the 18-21 year old age bracket and the vast majority are high school graduates. Although the variety of first term enlistment options are too numerous to be detailed here, a typical entry level soldier will enlist for an initial period of three years. At the end of a typical first enlistment, approximately 61% of the 19K leave active duty (Davis, 1996b). For 11M, the first term loss rate is about 66% (Barber, personal communication, 1997). The soldiers who do reenlist (approximately 39% for 19K and 34% for 11M)¹¹ are considered "career soldiers" and it is these soldiers that are the focus of this analysis; specifically the period of their careers that cover about the first 10 years of service. It is during this period that the majority of the population are assigned jobs on tanks, on Bradleys, and within units.

Throughout this initial 10 year period, soldiers experience a succession of institutional and unit training while progressing in responsibilities and rank. Table H-2 illustrates a typical progression of assignments, schooling, and promotions during that period.

Table H-2

Career Progression Model for Tank Crewman (19K) and Infantry Fighting Vehicle Crewman (11M)

Years in service											
1	2	3	4	5	6	7	8	9	10		
O S U T	Unit		P L D C	Unit		B N C O C	Unit and/or Career Functional Courses		A N C O C	Unit	
Grade											
E-1	E-2	E-3	E-4	E-5		E-6		E-7			

Note: OSUT is one station unit training. PLDC is the Primary Leadership Development Course. BNCOC is the basic non-commissioned officer course. ANCOC is the advanced non-commissioned officer course. The "E" followed by the number indicates the enlisted grade.

In discussing progression through the system, the terms *skill level (SL)*, *grade*, and *rank* tend to be used somewhat interchangeably. Skill level is a term used to group tasks, proficiencies, and abilities required for soldiers for successful performance in the job at different grades. There are four skill levels in the 19K and 11M MOS.¹² Skill levels are cumulative; that is, the skills required at a lower level are carried over into each succeeding level. Grade is a series of service steps linked to pay and is determined by a combination of experience (years of service and time in grade), accomplishment and ability. There are seven grades in the 19K and 11M MOS. *Rank* is a

¹¹ These initial reenlistment rates are somewhat below the Army-wide average of 43.5% for first term reenlistment.

¹² There are five skill levels overall; the fifth skill level is a different MOS: 19Z for tank soldiers and 11Z for infantry soldiers.

titular designation associated with grade. Table H-3 illustrates the relationship between these terms.

Table H-3

Skill Level (SL) with Associated Grade and Rank

Skill Level	Grade	Rank
SL 1	E-1	Private
SL 1	E-2	Private
SL 1	E-3	Private First Class
SL 1	E-4	Specialist/Corporal
SL 2	E-5	Sergeant
SL 3	E-6	Staff Sergeant
SL 4	E-7	Sergeant First Class

There are three orders of formalized training that soldiers typically experience during this first 10 years of service. This formalized training is commonly referred to collectively as *institutional* training. The first order is initial entry training (IET) which is made up of *basic training* and *advanced individual training*. For both the 19K and the 11M, these two components of IET are combined in a single course called *one station unit training* (OSUT). It is during IET that civilians become soldiers and soldiers become qualified in their entry level job.

The second level of institutional training is the NCOES. There are three components of NCOES that most directly affect 19K and 11M soldiers.¹³ These are the *primary leadership development course* (PLDC), the *basic noncommissioned officers course* (BNCOC), and the *advanced noncommissioned officers course* (ANCOC). These courses are mandatory for advancement within the system.

The final category of institutional training is the *functional courses*. These are career enhancement courses designed to broaden the soldier's skills and utilization beyond the NCOES. Many functional courses are branch immaterial but some are introduced to meet a specific branch need. It is these latter functional courses that are included in this appendix.

Each type of institutional courses (IET, NCOES, functional) will be covered individually in this appendix. All institutional training is conducted under the control of the U.S. Army TRADOC and must follow TRADOC guidelines as established in TRADOC Regulation 350-70, *Training Development Management, Processes, and Products*. Institutional course length is approved by TRADOC. The TRADOC recommended peacetime training week is set at 40 hours. The training week includes both academic and administrative hours. The minimum TRADOC academic week is 36 hours but individual TRADOC entities are free to establish an academic week in excess of 36 hours. Administrative time, however, may not exceed four hours per week

¹³ The fourth component is the U.S. Army Sergeants Major Academy but this falls beyond the 10 year focus of this study.

without specific TRADOC approval. In the ensuing discussion of individual courses, the course hours are compared to the TRADOC standard in order to give a comparative appreciation. It will be noted that most of the courses included in the review exceed the TRADOC standard. Reasons for exceeding this standard were not explored; they are likely grounded in a complex variety of causes that may differ with each course. But the significance of the standard lies in looking forward to added digital and back-up training requirements. When training developers design additional training to meet these requirements, they must be aware of the impact on courses which, for the most part, are already overcommitted in terms of instructional hours.

Typical career soldiers spend much, but not all, of their first 10 years of service in tactical units on tanks or Bradleys.¹⁴ Non-system assignments increase with experience, rank, and schooling. Ninety-nine percent of OSUT graduates are assigned to tactical units and most remain there for their first four to six years of service. After BNCOC, about 80% of graduates are utilized in tactical unit assignments. By the time a soldier completes ANCOC (usually around the ninth year of service) only about 40% of graduates are assigned to tactical units. Non-tactical utilization includes assignments as recruiters, drill sergeants, service school instructors, and observer/controllers (O/C) at combat training centers (CTC).¹⁵

Individual Task Domain: 19K

The Army training system is based on a training ladder for collective and individual tasks. Individual tasks are trained to standard and are linked to the collective tasks in the training ladder through a crosswalk to the Army training and evaluation program (ARTEP). The U.S. Army Armor Center (USAARMC) develops the individual task list for 19K soldiers and makes this information available in a document called the *CMF 19/BC12 Master Task List* (U.S. Army Armor School [USAARMS], 1995a), commonly called the Master Task List.¹⁶ This list identifies all the tasks that a 19K soldier is required to know. Tasks are identified by SL, based on the lowest level at which a task is performed on the job in a tactical environment. Tasks are cumulative; as soldiers progress through successive SL, they retain responsibility for the tasks in a subordinate SL. By the time the 19K attains SL 4, he is expected to be responsible for 567 tasks. But a very large number of the 19K tasks (over 48%) are learned at SL 1, usually in the soldiers' first year of service (see Table H-4).

The Master Task List also identifies tasks by training site. That is, it identifies where tasks are best trained. Two primary sites are identified: The first is "resident" or institutional training; the second designation is "nonresident"--training best done at the unit or through extension

¹⁴ Once the drawdown of US force structure is complete, about 90% of 19K and 11M soldier assignments will be in the continental United States (CONUS).

¹⁵ The demands on CMF 11 to provide soldiers (particularly in the NCO ranks) to non-infantry assignments are increasing. Previously, a career soldier might expect a single non-branch special assignment during his career. The trend appears to be towards multiple non-branch assignments. In 1997, the number of CMF 11 soldiers on special assignment at the same time exceeded 5,000 (Enlisted Personnel Management Directorate, 1997).

¹⁶ The Master Task List is a living document, constantly in a state of revision. Since this analysis was done, the *CMF19/BC12 Master Task List* has been superseded by Fort Knox Supplemental Manual (FKSM) 17-25 *Armor Master Task List*, dated 23 May 1997. However that document was not received in time to be used as the basis for the analysis.

training. It is important to note that the Master Task List identification in this category only indicates "best suited"; it does not dictate the specific courses or location where the tasks must be trained. It does not mean that a particular task must be included in a particular course nor does it preclude a nonresident task from being covered in a program of instruction. The only way to determine what is actually being taught in resident programs at any given time is to check individual lesson plans and monitor courses. Table H-3 identifies training sites and courses based on the Master Task List designations. Regardless of what the Master Task List says as to training site, it is assumed that tasks which are not included in a specific course content are either learned in a unit or they are not learned at all. It is also necessary to point out that all tasks, no matter where they are learned initially, must be sustained either through unit or self-development training.

Table H-4

19K Individual Task Domain

Skill Level	Number of Institutional Tasks By Course	Number of Unit Tasks	Total
SL 1	147 (OSUT)	126	273
SL 2	24 (OSUT/PLDC)	22	46
SL 3	66 (BNCOC)	25	91
SL 4	129 (ANCOC)	28	157
TOTAL	366	201	567

Note: Training sites (resident or nonresident) are listed in the Master Task List. Resident tasks were assumed to be trained in the institution. The course identifications were derived by matching skill level with the course that trains for that skill level. SL is skill level. OSUT is One Station Unit Training. PLDC is the Primary Leadership Development Course. BNCOC is the basic noncommissioned officer course. ANCOC is the advanced noncommissioned officer course.

The final piece of relevant information from the Master Task List is the proponenty listing. All Army tasks are assigned by *proponent*, that is, the institution or TRADOC school that is responsible for developing the performance requirements for a particular task. Proponenty is assigned based on the content of the task. Other proponents can freely incorporate tasks from another proponenty into their soldier's task lists, however, they cannot modify the steps or standards of that task. Only about 46% of the 19K task domain is armor specific. The remainder of the tasks are the responsibility of 16 different proponents (see Table H-5). Any alteration of these non-proponent tasks based on changes generated by digital and back-up must be coordinated with the responsible proponent.

Table H-5

19K Tasks by Proponency

Task Proponency	Number of Tasks
Armor	262
Infantry	130
Chemical	49
Signal	37
Engineer	24
Health Sciences	19
Ordnance	15
Transportation	8
Combined Arms Center	5
Air Defense Artillery	4
Field Artillery	3
Training and Doctrine Command	3
Intelligence	2
Military Police	2
Soldier Support Center	2
Judge Advocate	1
Quartermaster	1
Total = 567	

Individual Task Domain: 11M

The U.S. Army Infantry School (USAIS) develops the individual task list for 11M soldiers and makes this information available in a document called the *Infantry 11M Critical Task List* (USAIS, 1995a). This list identifies all the tasks that an 11M soldier is required to know. Like the preceding description of the 19K domain, 11M tasks are identified by SL, based on the lowest level at which a task is performed on the job in a tactical environment. Tasks are cumulative. By the time the 11M attains SL 4, he is responsible for 465 tasks. But most of the 11M tasks (almost 65%) are learned at SL 1, usually in the soldiers' first year of service (see Table H-6).¹⁷

Because infantry is proponent for most of the basic common combat skills, it develops most of the tasks that make up the 11M domain. Tasks from other proponents constitute only about 30% of 11M tasks (see Table H-7).

¹⁷ The 11M Critical Task List does not identify tasks by training site selection.

Table H-6

11M Individual Task Domain by Skill Level (SL)

Skill Level (SL)	Number of Tasks
SL 1	302
SL 2	60
SL 3	45
SL 4	58
TOTAL TASKS	465

Table H-7

11M Tasks by Proponency

Task Proponent	Number of Tasks
Infantry	326
Chemical	43
Engineer	29
Signal	24
Health Sciences	19
Ordnance	12
Intelligence	3
Quartermaster	2
Air Defense Artillery	2
Field Artillery	1
Combined Arms Center	1
Military Police	1
Soldier Support Center	1
Judge Advocate	1
Total	= 465

19K One Station Unit Training

The 19K OSUT combines the standard eight week basic training with the requirement to become MOS qualified into a single 14 week course.¹⁸ All 19K entry level soldiers attend OSUT conducted in the 1st Armor Training Brigade (ATB) at Fort Knox, Kentucky. Much of 19K OSUT is concerned with soldierization: the acclimatization and teaching of basic disciplines and soldier skills that turn civilians into soldiers. However, at about the third week of 19K OSUT,

¹⁸ Shorter versions of OSUT are available for reserve component (RC) soldiers who are becoming MOS qualified and for soldiers who have reenlisted in the 19K MOS.

trainees begin receiving MOS-specific training on the M1A1 tank (Davis, 1995d). The goal of 19K OSUT is to produce soldiers who possess entry level proficiency at SL 1 as loaders and drivers on the M1A1 tank. Most soldiers enter OSUT as Privates in grade E-1 and are designated as "trainees" until the MOS is awarded. Soldiers who graduate from OSUT are awarded promotion to E-2 along with the award of their MOS.¹⁹ Ninety-nine percent of 19K OSUT graduates are assigned to tactical units for duty on tanks.

During the 14 week course, soldiers receive 673.5 hours of training in 14 task based subject areas (see Table H-8) (USAARMS, 1996b). This averages to 48 hours of scheduled training per week and exceeds the TRADOC 40 hour training week standard by about 20%. Twenty-one percent of the training time is specified as "tank specific," however the situational training exercise (STX), a field exercise, is also conducted on the tank and could be included as tank-specific learning. Some other subject areas also overlap into tank-specific application so that the total vehicle-specific training comprises approximately about 35% to 40% of the instruction.

Table H-8

19K One Station Unit Training Subject Areas and Hours

Subject Area	Hours
M1A1 Specific	140
Administrative Time	126
Situational Training Exercise	80
General Subjects	75
Weapons	58
Examination	32
Reinforcement Training	32
Land Navigation	20
Military Communications	18
Individual Tactical Training	18
First Aid	16
Engineer	14
Nuclear, Biological, and Chemical	14
Physical Training	13.5
Mandatory Training	11
Intelligence	6
Total = 673.5	

¹⁹ 1st ATB OSUT commanders have the authority to promote up to 10% of an OSUT group to E-2 at the end of the basic training portion of OSUT at the eight week point. They also have the authority to promote members of this 10% group to Private First Class (PFC), grade E-3, upon completion of OSUT. Most of the soldiers who are selected will be designated as part of the *Excellence In Armor (ELA)* program which will be discussed later.

In calendar year 1996, there were 2,782 seats allocated for the 14 week 19K OSUT course and another 677 for the shorter reserve component (RC) and prior service training for a total planned training load of 3,359 persons. Of these, 3,025 soldiers actually started training and, for 1996, about 35% attrited during training due to medical, administrative, security, and disciplinary causes or did not graduate during the reporting period for some other reason. Applying the 65% graduation rate to the 14 week OSUT indicates that somewhat in excess of 1,800 new 19K soldiers entered the system in 1996.

An adjunct to 19K OSUT is the Excellence In Armor (EIA) program. Started in 1987, this program is intended to select outstanding soldiers as early as OSUT, identify them through qualification requirements and special training, track them through an annotated Department of the Army (DA) Form 2-1, and utilize them in assignments (USAARMC and Fort Knox, 1996a). The 1st ATB OSUT commanders are authorized to select up to 20% of each OSUT class for the EIA program. Nominations are made at the tenth week of OSUT and a board confirmation is conducted. Once in the program, EIA candidate soldiers complete an additional POI along with the remainder of normally scheduled OSUT POI. This additional EIA POI adds another 50 hours of training to EIA soldier schedules. Designation as EIA soldiers occurs at graduation after all EIA criteria have been met. Throughout their career, EIA soldiers are required to maintain a specific criteria in order to retain EIA status. Once dropped from the EIA program, soldiers cannot be readmitted. At the end of 1996 there were about 3,200²⁰ EIA soldiers on active duty (Davis, 1997b).

Currently, all 19K OSUT training is done on the M1A1 tank. Initial M1A2 training for entry level soldiers is done through an add-on which will be addressed later in the functional course discussions.

11M One Station Unit Training

Infantry 11M OSUT also combines basic training with the requirement to become MOS qualified into a single 14 week and 3 day course.²¹ All 11M entry level soldiers attend OSUT at Fort Benning, Georgia. Much of 11M OSUT is also concerned with soldierization, however, the course also combines basic infantry combat training tasks with more advanced IFV-specific training tasks to maximize the training period. The goal of 11M OSUT is to produce soldiers who possess entry level proficiency at SL 1 as riflemen, assistant machine gunners, and anti-armor specialists in mechanized infantry rifle squads, as well as Bradley drivers. Most soldiers enter OSUT as privates in grade E-1 and are designated as "trainees" until the MOS is awarded. Soldiers who graduate from 11M OSUT are awarded promotion to E-2 along with the award of

²⁰ This number includes 19D (Cavalry Scout) soldiers as well as 19K soldiers.

²¹ Shorter versions of OSUT are available for reserve component soldiers who are becoming MOS qualified and for soldiers who have reenlisted in the 11M MOS.

their MOS.²² Ninety-nine percent of 11M OSUT graduates are assigned to tactical (combat) units for duty in mechanized infantry rifle squads or as Bradley crewmen.

As seen in Table H-9, soldiers in 11M OSUT receive 837 hours of training in seven task-based subject areas (USAIS, 1995f). This averages to slightly over 57 hours of scheduled training per week and exceeds the TRADOC 40 hour training week standard by about 44%. The main goal of 11M OSUT is to produce infantrymen; the 63% of the course indicated in "Common Core" reflects a high concentration on basic infantry tasks. Bradley instruction focuses on vehicle operation and maintenance including driving and on servicing and loading the Bradley weapons systems (TOW, chain gun, and coaxial machine gun). Less than 10% of the instruction is Bradley-specific, but this reflects the jobs that 11M perform in their initial post-OSUT assignments. Most SL1 11M will initially perform as rifle team members in the squad compartment of the vehicle; a smaller number of SL1 11M will initially be assigned as Bradley drivers.

Table H-9

11M One Station Unit Training by Subject Areas and Hours

Subject Area	Hours
Common Core	529.5
Administrative Time	124
M2A2 Specific	68
Squad Tactical Training	32.5
Examinations	31
Squad Automatic Weapon	28
Live Fire	16
Urban Operations	8
Total = 837	

In FY 1996, Fort Benning graduated 3,489 11M OSUT soldiers with a completion rate of 92%.²³ The 8% attrition was primarily due to medical and administrative causes.

Primary Leadership Development Course for 19K and 11M

The PLDC is the first level of NCOES and is a common course for both 19K and 11M soldiers. (In fact, it is a common course for all soldiers who attend, regardless of MOS.) It is designed to prepare selected E-4s to function as junior noncommissioned officers (NCO). Most soldiers who attend PLDC will have indicated at least an intention to reenlist and will be close to

²² Infantry OSUT commanders have the authority to promote up to 10% of an OSUT group to E-2 at the end of basic training portion of OSUT at the eight week point. They also have the authority to promote members of this 10% group to private first class (PFC), grade E-3, upon completion of OSUT.

²³ Figures include 11M OSUT attendees in all categories including reserve components and prior service. Like the rest of the Army, CMF 11 was projecting a major shortfall in OSUT attendees for FY 1997; about 65% of quota (Enlisted Personnel Management Directorate, 1997).

their fourth year of service. According to the U.S. Army Sergeants Major Academy (USASMA), (1991) PLDC is a requirement for promotion to E-5 sergeant.

The PLDC is non-branch specific and is taught at NCO academies at most major installations in the United States and in most overseas commands. Content of PLDC, regardless of where it is taught, is specified and developed by USASMA. According to Davis (1995c), the major subject areas consist of military leadership, communications skills, training and instruction delivery, professional skills (physical fitness, drill and ceremony, inspections, team discipline), supply and maintenance, and military studies (marksmanship, map reading, navigation, combat orders, troop leading procedures, decision-making).

The PLDC is four weeks and two days in length. If position assignment criteria are met, soldiers who are specialist E-4 are eligible for conversion to corporal E-4 (an NCO rank) upon completion of PLDC.

19K Basic Noncommissioned Officer Course

The 19K BNCOC is the intermediate level of 19K NCOES designed to train sergeants (E-5) in mid-level leadership and MOS skills. It is an MOS-specific course. Starting with the 4th quarter FY 1996, 19K BNCOC has been consolidated from eight instructional locations to a single BNCOC location at Fort Knox. Regardless of their assignment and location, all 19K soldiers from that date on will come to Fort Knox for BNCOC. The Fort Knox NCO Academy is responsible for administering and instructing BNCOC (Davis, 1995b).

Soldiers normally attend BNCOC at around their sixth or seventh year of service. Sergeants must be BNCOC graduates to be promoted to grade E-6. About 80% of soldiers who graduate from BNCOC are assigned or return to troop tactical units upon graduation.

The 19K BNCOC is eight weeks in length and encompasses a total of 484 instructional hours for an average of 60.5 hours per week. This exceeds the TRADOC standard 40 hour instructional week by 51%. The breakdown of those 484 hours by subject area is shown in Table H-10 (USAARMS, 1995b).

The "Mandatory Training" subject area in 19K BNCOC represents a variety of topics including NBC, maintenance, safety, leadership, and military training techniques. However, 19K BNCOC is essentially a tank commander's course and much of the training takes place in a tank platoon context. About 46% of the instruction, including the field exercise STX, focuses on tactical employment and doctrine of tank platoons, sections, and individual tanks. While 19K BNCOC is meant to enhance individual skills, it is also geared to immerse soldiers in the collective task environment that they will experience as tank commanders.

In FY 1996, there were a planned 236 allocations for 19K BNCOC at Fort Knox. Only 172 of these allocations were filled and these produced 151 graduates.²⁴ Non-graduates who are

²⁴ The FY 1996 Fort Knox numbers are not accurate indicators of annual 19K BNCOC training inputs in that they represent only two 19K BNCOC classes under the consolidated system. For FY 1997, five 19K BNCOC classes

medically dropped or experienced hardship problems are generally recycled into another 19K BNCOC course; academic failures and disciplinary problems will usually receive reenlistment bars.

Table H-10

19K Basic Noncommissioned Officer Course by Subject Areas and Hours

Subject Area	Hours
Mandatory Training	116
Situational Training Exercise	88
Tactical Seminars	76
Gunnery	60
Tactics	59
Weapons/Mine Clearing	29
Administrative Time	19
Maintenance	19
Military Communications	18
Total = 484	

11M Basic Noncommissioned Officer Course

Starting with the first quarter of FY 1998 (1 October 1997), 11M BNCOC was consolidated from multiple instructional locations within the major commands (MACOMs) to a single 11M BNCOC location at Fort Benning.²⁵

The 11M BNCOC is seven weeks two days in length and encompasses a total of 325 instructional hours for an average of 44 hours per week. This exceeds the TRADOC standard 40 hour instructional week by about 10%. The breakdown of those 325 hours by subject area is shown in Table H-11 (USAIS, 1993).

The 11M BNCOC is intended to prepare mechanized infantry sergeants to be section leaders and squad leaders. In these positions, they are also Bradley vehicle commanders. Most of the 11M BNCOC training content is IFV specific.

were projected and each class has the potential of seating 60 students for a possible total of 300 students. However, historically, BNCOC has had an attendance rate of about 50% of allocations. One of the goals of consolidation is to improve attendance figures (Davis, 1997a).

²⁵ Infantry will be the last branch to consolidate its BNCOC. Staffing, schedules, class load projections, and final content were still being assembled as data for this study was being collected. Therefore, no historical information on BNCOC has been included. Course content reflects the guidance that the Infantry School provided the MACOMs prior to consolidation.

Table H-11

11M Basic Noncommissioned Officer Course
by Subject Areas and Hours

Subject Area	Hours
Situational Training Exercise	88
Tactics	83
Mandatory Training	66
Examinations	31
Gunnery	23
Administrative Time	16
Weapons	10
Military Communication	8
Total = 325	

19K Advanced Noncommissioned Officer Course

The 19K ANCOC is the third level of NCOES and is the last MOS-specific NCOES course. All 19K ANCOC training is conducted by the Fort Knox NCO Academy. The average 19K ANCOC student is a staff sergeant (E-6) who has between four and six years time in that grade and has a total of 10-12 years of service. Almost all 19K ANCOC students have spent considerable time as tank commanders. Graduation from ANCOC is a requirement for promotion to sergeant first class (E-7) (Davis, 1995a). Although the purpose of 19K ANCOC is to prepare soldiers for platoon leadership positions, only about 40% of graduates are immediately assigned or returned to tactical units. The majority go on to positions as instructors, CTC assignments, recruiting duty, RC advisors, and drill instructors. In FY 1996, 107 soldiers completed 19K ANCOC. This was only 42% of the 256 seats allocated.²⁶ Attrition at 19K ANCOC is quite low, normally for medical or administrative causes.

The 19K ANCOC runs for 12 weeks and 2 days with a scheduled 525.5 instructional hours. This exceeds the TRADOC recommended training week by about 6%. The subject areas for 19K ANCOC instructional hours are shown in Table H-12 (USAARMS, 1991a).

Much of the content of 19K ANCOC focuses on NCO leadership, supervisory, management, and administrative skills. However over 50% of 19K ANCOC instruction is on tactical employment of the tank platoon including platoon maneuver and fires, tactical road marches, actions on contact, passage of lines, and offensive and defensive operations. A field training exercise culminates the tactical training. Almost 85% of the 157 individual 19K SL 4 tasks are designated to be acquired in 19K ANCOC. However, most of these are leadership and administrative tasks such as awards, counseling, the NCO rating system, and accountability.

²⁶Historically, ANCOC fills only about 50% of its allocated seats. For FY 1997, it is anticipated that about 195 staff sergeants should be selected to attend (Davis, 1997a).

Table H-12

19K Advanced Noncommissioned Officer Course
by Subject Areas and Hours

Subject Area	Hours
Tactics	241
Administrative Time	57
Leader Training	52
Gunnery	49
Examination	48.5
Field Training Exercise	24
Maintenance	19
Weapons	13
Nuclear, Biological, Chemical	11
Training Management	6
Military Communications	5
Total = 525.5	

11M Advanced Noncommissioned Officer Course

The demographics of the 11M ANCOC student are very similar to his 19K counterpart described above. Almost all 11M ANCOC attendees have spent considerable time as squad leaders and as Bradley commanders. Graduation from 11M ANCOC is a requirement for promotion to sergeant first class (E-7) and subsequent assignment to a platoon sergeant position. The purpose of 11M ANCOC is to prepare soldiers for mechanized infantry platoon leadership by providing technical, tactical, and management instruction. In FY 1996, 392 soldiers attended 11M ANCOC. This was 83% of the 470 seats allocated. Attrition at 11M ANCOC is also quite low, again normally for medical or administrative causes.

The 11M ANCOC runs for 10 weeks and two days with a scheduled 587 instructional hours or about 56.5 hours per week. This exceeds the TRADOC recommended training week by about 41%. The subject areas for 11M ANCOC instructional hours are shown in Table H-13 (USAIS, 1995c).

The training subject area of Administrative Time covers a plethora of nonacademic subjects including physical fitness training; in-briefs by the commandants, branch chief, and small group instructors; orientation on the Delta Force, rangers, and the Army club system; personal counseling; and academic retraining, if necessary. However, most of the course centers around mechanized infantry technical and tactical requirements, with about 35% of the course devoted to tactical training on the employment of the mechanized infantry platoon.

Table H-13

11M Advanced Noncommissioned Officer Course
by Subject Areas and Hours

Subject Area	Hours
Administrative Time	162
Tactics	103
Situational Training Exercise	99
Leader Training	82
Examination	66
Maintenance	16
Land Navigation	14
Gunnery	13
Training Management	13
Military Communications	13
Nuclear, Biological, and Chemical	6
Total = 587	

... Tank and Mechanized Infantry Functional Courses

Functional courses are career enhancement training designed to broaden soldier skills beyond the NCOES. Functional courses are considered as part of institutional training. There is a wide variety of such training available and typical schools and courses attended by 19K and 11M soldiers are the Combat Life Saver Course; Nuclear, Biological, and Chemical (NBC) School; Drill Sergeant School; Equal Opportunity Representative Course; U.S. Army Recruiting School; and the Battle Staff Noncommissioned Officers Course (USAARMC, 1996a). Besides these courses, many soldiers in 11M typically will attend the Airborne Course and the Air Assault Course as well. However, for purposes of this study, the functional courses detailed here are restricted to those available only to soldiers in 19K or 11M.

For the 19K, currently these are the *MIA2 Armor Crewman Course*, the *MIA1 Master Gunner Course*, the *MIA2 Master Gunner Transition Course*, and the *MIA1* and the *MIA2 Tank Commander's Certification Courses* (TC³). For the 11M, the options are the *Bradley Leaders Course* and the *Bradley Master Gunner Course*.²⁷ All functional courses, including the MOS specific courses, are volunteer training and most result in the awarding of an MOS additional skill identifier (ASI).

²⁷ The TC³ courses and the Bradley Leaders Course are also attended by commissioned officers. The other functional courses are enlisted only courses.

M1A2 Armor Crewman Qualification Course

Although this course is taught by Fort Knox's 1st ATB in conjunction with OSUT, it is considered a functional course. It is currently given only to 19K OSUT graduates who have been designated for assignment to the 1st Cavalry Division at Fort Hood, the only tactical unit that has M1A2 tanks. Soldiers in this category are "held over" after OSUT until they complete this training. The training is a one week, 44 hour course at the end of which soldiers are awarded the K4 (M1A2 Armor Crewman) ASI and are considered to have the minimal qualifications necessary to begin functioning as M1A2 loaders and drivers. Table H-14 shows the subject area allocation of the 44 hour course (USAARMS, 1995d).

Table H-14

M1A2 Armor Crewman K4 Course Subject Areas and Hours

Subject Area	Hours
M1A2 Specific	28
Administrative Time	10
Examination	4
Reinforcement Training	2
Total	44

The course instruction and examination is all hands-on and equipment intensive. The 28 hours of "M1A2-specific" content is broken out in Table H-15. Except for some of the driving instruction which takes place on the M1A2 driver simulator, all instruction is done on an M1A2 tank. The optimum typical ratio of students to tank (and instructor) for this type training is 3:1. This has major implications for equipment. The M1A2 is a low-density, limited-procurement, high-cost item; maintaining extensive numbers of systems in the training base impacts the deployment of the system to combat units.²⁸

During FY 1996, the 1st ATB trained 65 soldiers through the M1A2 Armor Crewman Qualification Course. This number is expected to grow significantly as the number of systems increases, NET focus shifts, and the requirement for M1A2 replacement soldiers at SL 1 accelerates. The 1st ATB projection for annual training loads for this course for the next six years is shown in Table H-16 (1st ATB, personal communication, 1996).

²⁸ The number of M1A2 tanks projected as a dedicated requirement to support this course alone is forecast to grow to 18 over the next 5 years (1997-2001). This does not include other training base requirements. Eighteen tanks is the equivalent of four and a half platoons; a significant slice of combat power that is not available for force projection.

Table H-15

M1A2-Specific Lessons in the Armor Crewman K4 Course

M1A2 Specific Topics	Hours
Troubleshoot Driver's Integrated Display	7
Drive (Program a Waypoint)	7
Prepare Driver's Station	5
Driver's preventive maintenance checks and services	4
Extinguish a Fire	3
Operate AN/VVS-2	1
Start/Stop Engine	1
Total = 28	

Table H-16

M1A2 Armor Crewman Qualification Course: Projected Training Loads By Fiscal Year (FY)

	FY 96	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02
Projected Training Loads	65	196	281	440	530	680	605

M1A1 Master Gunner Course

The Master Gunner Course is an Armor School functional course taught only at Fort Knox. The purpose of the course is to produce NCOs that serve as the primary unit expert in all matters related to tank gunnery and tank gunnery training. To be eligible to attend Master Gunner training, soldiers must be in the grade E-5 through E-7, have been a tank commander for two years with six months experience in an M1A1 and meet several other qualifying requirements. Upon graduation, soldiers are awarded an ASI (A8) and will generally be utilized in Master Gunner slots from there on (USAARMS, 1991b). M1A1 Master Gunners are found in units on the basis of one per tank company, tank battalion, heavy brigade and heavy division.²⁹ In FY 1996 there were 192 seats allocated for the Master Gunner Course (Davis, 1996a). Seventy percent of these allocations were filled and 123 of these soldiers went on to graduate as Master Gunners.

²⁹ In July 1997 the Chief of Staff of the Army (CSA) approved the change in NCO structure (CINCOS) which downgraded armor Master Gunner slots. As a result, 146 tank company Master Gunner slots were downgraded from sergeant first class (E-7) to staff sergeant (E-6) and 38 tank battalion Master Gunner slots were downgraded from master sergeant (E-8) to sergeant first class (E-7). The total number of 19K Master Gunners authorized Army wide is about 290 (Lady, 1997).

The 19K M1A1 Master Gunner course is 11 weeks in length and contains 446 instructional hours. It is right at the TRADOC recommended level of instructional hours. During training, students receive instruction in advanced gunnery methods, turret weapons systems maintenance, and training management. The specific subject areas and hours are shown in Table H-17 (USAARMS, 1991b).

Table H-17

19K Master Gunner Subject Areas and Hours

Subject Area	Hours
Maintenance	141
Gunnery	104
Examination	81
Administrative Time	49
Leader Training	38
Weapons	16
M1A1 Specific	12
Military Communications	5
Total = 446	

M1A2 Master Gunner Transition Course

This functional course is taught only at the Armor School at Fort Knox. Among the qualifications to attend this course, soldiers must be M1A1 Master Gunners (ASI A8) who have been awarded the M1A2 K4 ASI and have served for at least six months as a tank commander on an M1A2. The transition course is four weeks in length. The content of the course is shown in Table H-18 (USAARMS, 1995c). In 1996, 11 soldiers completed Master Gunner transition to the M1A2. Upon completion they were awarded the ASI K8 (M1A2 Master Gunner).

Table H-18

M1A2 Master Gunner Transition Course Subject Areas and Hours

Subject Area	Hours
Maintenance	105
Advanced Gunnery	39
Administrative Time	16
Total = 160	

M1A1 Tank Commander Certification Course

The M1A1 TC³ is a functional course taught only at Fort Knox. The course is generally attended by NCOs grade E-5 and up and by officers generally in grade O-4 and below. The course is designed to re-train personnel who were originally tank qualified but who have been in non-tank, non-unit assignments for a period of time. Examples are soldiers who have been on recruiting duty, branch immaterial assignments, academic schooling, Reserve Officer Training Corps (ROTC)/Service Academy assignments, and special duties.³⁰ In general, attendance at this training will be *en route* on an assignment to an M1A1 unit.³¹

The M1A1 TC³ is two weeks in length and the POI calls for 91.5 hours of instruction. This exceeds the TRADOC recommended training load by about 15%. The subject areas of those 91.5 hours is shown in Table H-19 (USAARMS, 1992). Virtually all of this training is conducted hands-on on vehicles with the students performing as tank crew members. In FY 1996, Fort Knox conducted 10 M1A1 TC³ courses and trained 199 soldiers.³²

Table H-19

M1A1 Tank Commander Certification Course Subject Areas and Hours

<u>Subject Area</u>	<u>Hours</u>
Gunnery	42
M1A1 Specific	19.5
Maintenance	13
Examination	9
Weapons	4
Administrative Time	4
Total = 91.5	

M1A2 Tank Commander Certification Course

This is a functional course taught only at Fort Knox. It is primarily attended by both NCO (E-5 and above) and officers (O-4 and below). Although it would appear to be a counterpart to the M1A1 TC³, it is actually most similar in intent to the OSUT related M1A2 Armor Crewman Course. It is intended to prepare M1A1 qualified NCOs and officers for assignment to M1A2 units. Currently it is used to train those soldiers *en route* to assignment with the 1st Cavalry

³⁰ Officers from other branches who are on orders to attend the Armor Officer Advanced Course will also attend this course.

³¹ Attendance at the course is not mandatory before such an assignment. Attendance at the course may depend on availability and other priorities.

³² This course may be phased out of the Fort Knox training curriculum in FY 1998 and converted to a resident course administered by the RC (16th Cavalry, 1997).

Division at Fort Hood.³³ Primarily it picks up M1A2 unit designated soldiers as they complete BNCOC and ANCOC, or the armor officer basic course (AOBC) or the armor officer advanced course (AOAC).³⁴ Soldiers who complete the M1A2 TC³ are awarded the ASI K4 (USAARMS, 1995d).

The M1A2 TC³ course is three weeks in length and has a 143 hour POI. This POI requirement exceeds the TRADOC standard by about 20%. The subject area breakout of the POI is shown in Table H-20 (USAARMS, 1995d). Most of the instruction is hands-on, on tank, training. In FY 1996, there were five classes conducted that trained 96 soldiers.

Table H-20

M1A2 Tank Commander Certification Course
Subject Areas and Hours

Subject Area	Hours
Commander's Station	50
Gunner's Station	32
Driver's Station	23
Live Fire	20
Maintenance	9
Administrative Time	7
Mandatory Training	2
Total = 143	

Bradley Leaders Course

The Bradley Leaders Course (BLC) is an infantry functional course taught only at Fort Benning. It is designed to train infantry NCOs who are transitioning to 11M and officers who are not Bradley qualified and who are scheduled for a mechanized infantry assignment. NCOs who attend the course must be sergeant (E-5) and above and officers must be in the rank of captain (O-3) or below. The primary purpose of the course is to teach students to command and fight a Bradley. Starting in 1997, the training is vehicle specific depending on the soldiers unit or projected assignment. Two vehicles are currently trained; the M2A2 and the M2A2ODS.

The BLC is seven weeks in length with a scheduled instructional load of 698 hours or just under 100 hours per week. This exceeds the TRADOC recommended 40 hour weekly standard by almost 150%. Table H-21 shows these 698 hours by subject area (USAIS, 1995b). The

³³ However, it is not a requirement that all soldiers going to such an assignment receive this training. Course attendance depends on availability and other priorities.

³⁴ Except for BNCOC, attendance at TC³ in conjunction with such courses depends on availability and other priorities. Starting in October 1996, all 19K BNCOC students who are assigned to go to or return to an M1A2 unit after BNCOC will be scheduled to attend M1A2 TC³ in conjunction with BNCOC.

course is heavily gunnery oriented; gunnery accounts for over 70% of the instructional load.³⁵ Gunnery includes both on-vehicle and conduct of fire trainer (COFT) training.

Table H-21

11M Bradley Leaders Course Subject Areas and Hours

Subject Area	Hours
Gunnery	496.5
Administrative Time	61.5
Tactics	36
Weapons	32.5
Examination	24
Vehicle Identification	19
Hull Operations	15.5
Turret Operations	7
Introduction and Safety	6
Total	= 698

In FY 1996 there were 526 allocations scheduled for BLC with 467 attendees with an attendance rate approaching 90%.

Bradley Master Gunner Course

The Bradley Master Gunner Course is an infantry functional course taught only at Fort Benning. The purpose of the course is to produce NCOs that serve as the primary unit expert in all matters related to Bradley gunnery and Bradley gunnery training. To be eligible to attend Bradley Master Gunner training, soldiers must be in the grade E-5 through E-7, qualified in MOS 11M,³⁶ have qualified as a Bradley commander or gunner on Bradley Table VIII within nine months, and have passed the Bradley Gunnery Skills Test (BGST) within six months. Attendees must also be Bradley COFT Instructor/Operator (I/O) qualified and must have certified or recertified as an I/O within the year. Upon graduation, soldiers are awarded an ASI of J3 and will generally be utilized in Master Gunner slots from there on (USAIS, 1996). Bradley Master Gunners are found in units on the basis of one per mechanized infantry platoon, mechanized infantry company, mechanized infantry battalion, heavy brigade and heavy division. In FY 1996 there were 326 seats allocated for the Bradley Master Gunner Course. Forty-nine percent of these allocations were filled and 123 of these soldiers went on to graduate as Master Gunners.

³⁵ Feedback from field commanders identified tactical competence as a weakness in newly assigned Bradley platoon leaders. In late 1997, a trial program was initiated that added mechanized tactics and a two day field training exercise (FTX) to BLC. The effects of this added training and the reactions of the field will be evaluated at the end of the trial period (Otto, 1997).

³⁶ Soldiers with MOS 19D who will serve as Master Gunners in CFV units also attend this course.

The Bradley Master Gunner course is 13 weeks in length and contains 674.5 instructional hours, or an average of about 52 hours per week. This exceeds the TRADOC recommended 40 hour standard by roughly 30%. Training is heavily oriented towards Bradley gunnery; about 50% of the allocated hours are devoted to gunnery including the Bradley COFT Senior Instructor/Operator (SI/O) course which is included in the POI. The specific subject areas and hours are shown in Table H-22 (USAIS, 1996).

Table H-22

11M Master Gunner Course Subject Areas and Hours

Subject Area	Hours
Gunnery	307.5
Administrative Time	91.5
Examinations	88
Weapons	76
COFT SI/O Course	44.5
Turret Operation	43.5
Training Devices	21
Introduction	2.5
Total = 674.5	

Starting in the fourth quarter of 1997, the Bradley Master Gunner Course began adding an M2A2ODS track for those students assigned to the Fort Stewart, Georgia units of the 3rd Infantry Division. This track will add five days to the length of the Master Gunner Course (Otto, 1997).

Overview of the Education and Progression Model:
Armor Officer and Infantry Officer

Officers receive their commission through three predominant sources: the ROTC, the United States Army Military Academy, and from the enlisted ranks through officer candidate school (OCS) or direct commissions. The ROTC is the single largest provider of new officers. Almost all officers are college graduates between the ages of 21 and 24 when they receive their commission. Officers who are commissioned in armor carry the designation Branch Code (BC) 12.³⁷ Officers who are commissioned in the infantry carry the designation BC 11.³⁸

The typical newly commissioned second lieutenant (O-1) receives his initial entry training at either Fort Knox or at Fort Benning, followed by assignment to a unit where he will serve either

³⁷ Armor officers in BC 12 serve in both tank and cavalry units. The discussion in this study is limited to typical tank assignments and schooling. Armor assignments try to avoid "single tracking," therefore typical Armor career officer troop assignments will include both tank and cavalry assignments.

³⁸ Infantry officers in BC 11 serve in both mechanized and non-mechanized infantry assignments. Non-mechanized infantry assignments include light infantry, air assault, airborne, and ranger units. The discussion in this study is limited to typical Bradley unit assignments and schooling.

as a tank platoon leader, a mechanized infantry platoon leader, or a specialty platoon leader.³⁹ At 24 months time in grade, the typical O-1 is promoted to first lieutenant (O-2). During the time after promotion to O-2, officers in battalions will usually serve as a company executive officer (XO), specialty platoon leader, or special staff officer. There are currently 28 active duty tank battalions (Office, Chief of Armor, 1997) that follow base and modified tables of organization and equipment (TO&E). These battalions have slots for a total of 1,148 commissioned officers, however, only about 49% of these are slots for armor officers serving in company level positions (platoon leaders, executive officers, company commanders). The situation is similar for mechanized infantry officers. There are 25 active duty mechanized infantry battalions with an authorized total of 1,025 officer slots. Five hundred of these positions are at the mechanized infantry company level.

Between 36 and 48 months of service, officers will attend their branch Officer Advanced Course at Fort Knox or at Fort Benning⁴⁰ Following schooling (and promotion to captain [O-3] which usually occurs between two and three years time in grade as an O-2) these officers are looking for command assignments. However, company command slots for both armor and infantry officers with tank or mechanized infantry companies are extremely limited and turn-over of each command position only occurs between 12 to 24 months. Of the 239 company level command assignments currently available in armor units, 47% (112 slots) are in TO&E tank companies. Company command opportunities are much greater in infantry because of the number of light infantry command slots available. But command of TO&E mechanized infantry companies is limited to just 100 slots. While waiting for (or after completing) command, there are also demands for branch qualified O-3s in brigade and battalion staff positions, as service school instructors, in recruiting command, as observer/controllers, in the ROTC cadre, and in functional area (non-branch) assignments (Hertling, 1997).

This progression from precommissioning through company level approximates armor and infantry officers' first 10 years of service.

Branch Code 12 Individual Task Domain

The Army officer training system is based on a training ladder for collective and individual tasks. Officer individual tasks are a combination of branch specific and branch immaterial tasks. Task training starts in the pre-commissioning phase and carries over through company level training. Officer tasks are designated in Military Qualification Standards (MQS) manuals.⁴¹ All of

³⁹ There are three specialty platoon leader positions in both the tank and in mechanized infantry battalions that call for branch specific (armor or infantry) officer assignments: Scout Platoon, Heavy Mortar Platoon, and Support Platoon (USAARMS, 1996b). Generally the policy is to assign officers to lead specialty platoons after they have had experience as tank or mechanized infantry platoon leaders but actual assignments are done by the unit commander based on unit needs.

⁴⁰ Resuming an earlier program, starting in 1996 a small number of armor and infantry officers are selected each year to cross train with other branches by attending the Armor, Infantry, Field Artillery, Air Defense Artillery, Engineer, and Aviation Advanced Courses (Hertling, 1997).

⁴¹ The MQS manuals are soldier training publications (STP). For armor officers there are three MQS manuals: Two of these are MQS of Common Tasks (STP 21-I-MQS and STP 21-II-MQS). The third is the armor MQS manual (STP 17-12II-MQS).

the individual tasks for armor officers are consolidated in the *CMF19/BC12 Master Task List* (USAARMS, 1995a).

Armor officer tasks are designated as either "lieutenant" tasks or "captain" tasks and are also identified as to whether the recommended training site is "resident" or "non-resident." For officers, "resident" translates into the AOBC for lieutenant level tasks and the AOAC for the captain level tasks.⁴² Tasks that are designated as "non-resident" are to be acquired through unit training or through officer self-development.⁴³ There are a total of 871 tasks that BC 12 captains are accountable for.⁴⁴

Armor officers are expected to acquire the bulk of their individual skills and knowledges early in their careers; over 75% of the total individual task domain for armor officers are designated lieutenant level tasks. Likewise, the majority of tasks are designed to be initially acquired at either AOBC or AOAC--over 65% of the domain. Thirty-two percent of the BC 12 tasks are armor proponent tasks; the remaining 64% are the responsibility of 16 other proponents. However, as might be expected for a combat arms job, three proponents (armor, the Combined Arms Center, and infantry) account for just under 70% of the BC 12 individual domain (USAARMS, 1995a).

Branch Code 11 Individual Task Domain

Like his armor counterpart, infantry officer task training starts in the pre-commissioning phase and carries over through company level training. Infantry officer tasks are also designated in MQS manuals. All of the individual tasks for infantry officers are consolidated in the *BC 11 Master Task List* (USAIS, 1997).⁴⁵

Infantry officer tasks are designated as either "precommission" tasks, "lieutenant" tasks (O-1) or "captain" tasks (O-3) depending on what point in the officer's development they are expected to be acquired. There are a total of 271 tasks that BC 11 captains are accountable for. The levels are shown in Table H-23 (USAIS, 1997). Infantry officers are also expected to acquire the bulk of their individual skills and knowledges early in their careers; over 75% of the officer tasks are designated as lieutenant level or below.

⁴² This does not mean that all tasks so designated are actually taught in these courses or that all "non-resident" tasks are not. The Armor Center Analysis Branch makes a recommendation for training site but other factors influence what tasks are actually taught in a given course of instruction.

⁴³ Regardless of where the skill is actually acquired, units are responsible for all officer sustainment training and collective task training. Almost all units have an active officer professional development (OPD) program. Unit training is outlined in more detail in a later part of this appendix.

⁴⁴ Accounting for officer tasks is difficult and task lists are in a constant state of flux. These figures are based on a draft October 1996 Master Task List working paper which identifies a total of 1016 tasks for BC 12 officers. Seventy-five of these tasks pertain to the M60 series tank which is no longer found in active duty units and 55 tasks are specific to the M551 Sheridan, which is out of the inventory except for some specialty applications. Another 15 tasks apply only to the M1A2 tank. The remaining 871 tasks include M1A1 applications. The list also includes 54 MQS Professional Knowledge (PK) subjects which some argue are not "tasks" at all. However the greatest reason for the numerical discrepancy between the 19K task list in Table H-3 and the BC 12 list is that the BC 12 list includes cavalry and scout tasks. In the enlisted ranks, Cavalry Scout is a separate MOS (19D).

⁴⁵ Despite its recency, indications from the USAIS are that this document is currently being revised.

Table H-23

Branch Code 11 Individual Task Domain

Level	Number of Tasks
Precommission	97
Lieutenant	111
Captain	63
Total Tasks = 271	

The Master Task List also identifies the proponent for the officer tasks (Table H-24). About 30% of the BC 11 tasks are infantry proponent tasks; the remaining 70% are the responsibility of twenty-one other proponents (USAIS, 1997).

Table H-24

Branch Code 11 Tasks by Proponency

Task Proponency	# of Tasks	Task Proponency	# of Tasks
Infantry	80	Intelligence	6
Combined Arms & Logistics	27	Judge Advocate	6
Chemical	26	Engineer	3
Health Sciences	24	Military Police	3
Combined Arms Center	17	JFK Special Warfare Center	2
Command and General Staff College	17	U.S. Army Physical Fitness School	2
Signal	12	Air Defense Artillery	1
Soldier Support Center	12	Field Artillery	1
Quartermaster	11	National Guard Bureau	1
Ordnance	10	U.S. Army Reserve	1
TRADOC	8	USASMA	1
TOTAL TASKS (BC11) = 271			

Note: TRADOC is the United States Army Training and Doctrine Command. JFK is John Fitzgerald Kennedy. U.S. is the United States. USASMA is the United States Army Sergeants Major Academy.

However, this does not tell the whole story for the officer assigned to a mechanized infantry unit. The BC 11 individual task domain in the Master Task List currently only identifies a core list of tasks for infantry officers without regard to unit of assignment. By implication, BC 11 officers assigned to Bradley units are also responsible for the 326 infantry tasks identified as requirements for 11M enlisted soldiers and shown in Table H-5. Therefore the task requirement for infantry officers serving in mechanized units is closer to 600 tasks. Because the Bradley platoon leader is also a Bradley crewmember (vehicle commander), he will be responsible for all

Bradley SL 3 and SL 4 enlisted tasks. This means the preponderance of the 300-plus additional tasks will be O-1 tasks, learned either in BLC or very early in the officer's unit assignment.⁴⁶

Armor Officer Basic Course

The AOBC is conducted only at Fort Knox and is a course designed to branch qualify newly commissioned officers⁴⁷ in individual, tank crew, and platoon tasks. Besides leading a platoon, BC 12 second lieutenants are required to fight their individual tanks as a functioning member of the tank crew. They are therefore required to be technically proficient in all tank related enlisted SL 1 and SL 2 tasks and to be particularly proficient in SL 3 (tank commander) tasks. Ninety-nine percent of active duty U.S. Army AOBC graduates are assigned to troop TO&E units and almost all of these go directly to positions as either tank or cavalry platoon leaders.

The AOBC is 15 weeks and 2 days in length and has a total course POI of 906 hours or an average 59 hour week. This exceeds the TRADOC standardized course instructional load of a 40 hour week by 47%. The subject areas and hours are shown in Table H-25 (USAARMS, 1996a).

The AOBC is heavily focused on tank training and currently all AOBC instruction and field problems are conducted on M1A1 tanks. Over 30% of the course is on tactical training involving employment of the tank platoon, including a six day field training exercise in which students rotate positions in the tank and in the platoon command structure. The cavalry training in the course is not designed to produce cavalry leader proficiency. Instead there is a three week functional course, the Scout Platoon Leader's Course (SPLC), which is for both commissioned and noncommissioned officers. Most AOB graduates who are earmarked for cavalry assignments will attend this course in conjunction with AOBC (16th Cavalry, 1997).

In FY 1996, there were 684 AOBC seats forecast and 598 officers attended. Attrition in AOBC is around 3%, mostly for medical or administrative reasons. Officers who do not qualify in AOBC are subject to board action for revocation of commission.

Proposals have been staffed with TRADOC to increase the current 15 week 2 day AOBC instructional program to 17 weeks. The additional eight days would be focused on equipment-specific operation and tactics, based on the officer's projected assignment. This focus would be either cavalry/scouts⁴⁸ or M1A1. It is also projected that starting in the third quarter of FY 1998, AOBC will implement an M1A2 branch module in all AOBC instruction where operation and employment differs from the M1A1 (16th Cavalry, 1997).

⁴⁶ Even this accounting of tasks is probably not completely accurate. Many of the 11M infantry tasks duplicate infantry tasks in the BC 11 list. There is no readily accessible Bradley-specific task list since many of the tasks apply to Bradley and non-Bradley infantry requirements.

⁴⁷ Besides providing initial entry training for all US Army armor RC and active duty officers, AOBC also trains all U.S. Marine Corps tank officers and a sizable contingent of foreign officers.

⁴⁸ This would supplement, not replace, the requirement to attend the SPLC.

Table H-25

Branch Code 12 Armor Officer Basic Course Subject Areas and Hours

Subject Area	Hours
Tactics	233
Administrative Time	169
Mandatory Training	108
Gunnery	103
Maintenance	63
Examinations	49
M1A1 Specific	44
Leader Training	43
Situational Training Exercise	41
Military Communications	18
Weapons	15
M3 Bradley	12
Land Navigation	6
Nuclear, Biological, Chemical	2
Total = 906	

Infantry Officer Basic Course

The IOBC is conducted only at Fort Benning and is a course designed to branch qualify newly commissioned officers in individual, platoon, and leadership tasks. They develop skills in training management, weapons systems, leadership, tactics, and equipment. There are no Bradley specific tasks taught as part of IOBC, although all IOBC students receive some instruction on Bradley and mechanized infantry operations in the IOBC. Upon completion of IOBC, lieutenants who are scheduled for assignment to Bradley units will attend the BLC.

The IOBC is 16 weeks in length and has a total course POI of 1059 hours or an average of almost 66 hours per week. This exceeds the TRADOC standard 40 instructional hour week by 65%. The subject area and hours for IOBC are shown in Table H-26 (USAIS, 1995e).

Table H-26

Branch Code 11 Infantry Officer Basic Course Subject Areas and Hours

Subject Area	Hours
Situational Training Exercise	398.5
Tactics	254.5
Administrative Time	142.5
Leader Training	106
Weapons	63
Examinations	37.5
Maintenance	32
Military Communications	11
Nuclear, Biological, and Chemical	9
Land Navigation	5
Total = 1059	

The IOBC provides entry level infantry officers for all unit positions - mechanized, light, airborne, air assault, ranger - in both the active army and RC. In FY 1996, there were 998 seats scheduled for IOBC and 846 (85%) were filled. Over 85% of those officers (727) graduated with their class.

Armor Officer Advanced Course

The AOAC is designed to prepare career officers for company-level command and to serve as battalion and brigade staff officers. Staff orientation is towards serving as battle captains at battalion and brigade. AOAC is conducted only at Fort Knox and is attended by RC, Marine Corps, foreign officers, and career officers from other U.S Army branches, as well as by BC 12 officers. The course often marks a point where some officers will switch orientation from previous cavalry assignments to tank assignments and vice versa. Officers who are scheduled to go to cavalry assignments generally will attend the three week Cavalry Leaders Course in conjunction with AOAC.

The AOAC is 20 weeks in length with 764 hours in the POI. This is about 5% below the TRADOC standard for course load. The content of these 764 hours is shown in Table H-27 (USAARMS, 1994).

Overall, AOAC is not an equipment oriented course; however the equipment focused training that is conducted, such as gunnery, is done on the M1A1. Most of the training however, is on the conduct of the military decision making process. Army active duty officers that graduate from AOAC are sent in temporary duty status to Fort Leavenworth, Kansas for six weeks to attend the Combined Arms and Service Staff School before returning to Fort Knox and being dispatched to their next assignment (Hertling, 1997). In 1996, there were 409 officers from all sources scheduled to attend AOAC. There were 340 seats actually filled for that fiscal year.

Table H-27

Branch Code 12 Armor Officer Advanced Course
Subject Areas and Hours

Subject Area	Hours
Tactics	441
Leader Training	95
Examinations	67
Maintenance/Supply	64
Gunnery	36
Command Post Exercise	32
Military Communications	16
M1A1 Specific	9
Nuclear, Biological, Chemical	4
Total = 764	

There are initiatives being introduced in the AOAC to integrate upcoming digital operation into the instruction, primarily into the battle captain phases of the course. The primary program being introduced focuses on the Force XXI Battle Command Brigade and Below (FBCB²) program. This multifaceted effort integrates digitized feeds from lower echelons (from digital and appliqué systems) into tactical operations centers at battalion and brigade where they are combined with top down computer based systems in maneuver, indirect fire artillery, intelligence, air defense and combat service support. Plans are underway to incorporate instruction and command post exercises into the AOAC that utilize these systems. In FY 1999, AOAC is scheduled to be reduced in length from 20 to 18 weeks. This is part of TRADOC's Captain's Professional Military Education initiative which will standardize all advanced courses at 18 weeks. Under this plan, the first two weeks will be devoted to a standardized Common Core Tasks instruction while the remaining 16 weeks will be branch specific (16th Cavalry, 1997).

Infantry Officer Advanced Course

The IOAC is conducted only at Fort Benning. It has the goal of preparing career officers for company level command and to serve on battalion and brigade level staffs. The IOAC is currently 20 weeks in length with 761.6 instructional hours in the POI. This is just under 5% under the TRADOC standard for the weekly instructional load. The breakout of these instructional hours is shown in Table H-28 (USAIS, 1995d).

Table H-28

Branch Code 11 Infantry Officer Advanced Course
Subject Areas and Hours

Subject Areas	Hours
Tactics	498
Leader Training	120
Administrative Time	43
Logistics	36
Examinations	27
Military Communications	13
Weapons	12.6
Nuclear, Biological, and Chemical	12
Total = 761.6	

The IOAC covers both light and mechanized infantry and is taught in four phases. The first phase is company level operations and lasts for 10 weeks. The second phase lasts seven weeks and covers battalion operations. There is a one week brigade phase which concentrates on operations on National Training Center (NTC), Fort Irwin, California terrain. The final phase is a one week stability and support operations instruction.

In FY 1996, there were 617 officers forecast to attend IOAC. Almost 90% (547) of these seats were filled.

Like all officer career courses, the IOAC is scheduled to undergo some radical changes due to TRADOC's directives to reduce these advanced courses to 18 weeks, with the first two weeks devoted to teaching 52 Common Core tasks. The remaining 16 weeks will be for branch specific instruction. The net result will be a four week, 20 percent loss of instructional time from the current POI. The USAIS is currently reviewing its POI with a scheduled implementation period during 1998 (Phillips, 1997).

Summary of Fort Knox and Fort Benning
Institutional Training

Despite the emphasis on decreasing resident instruction, both Fort Knox and Fort Benning continue to play a significant role in providing resident, institutional instruction to their soldiers in IET, NCOES, functional, and officer course training. During 1996, almost 35% of the 19K enlisted force was in residence at Fort Knox at one time or other to receive training. Student hours spent in 19K training approached 2.2 million for that year. Armor officers spent over 800,000 hours training in AOBC and AOAC in 1996. In that same year, 11M student hours spent in training at Fort Benning approached 3.7 million and that figure does not include 11M BNCOC nor does it reflect subsequent extensions to the BLC and 11M Master Gunner courses. Infantry

officer Fort Benning based student hours exceeded 1.3 million in IOBC and IOAC during that same period.

Table H-29 and Table H-30 present a recap of how that training was spent. Training is dynamic and the portrayal in this summary does not necessarily reflect the picture at a different point in time, nor does it reflect future trends such as the move towards distance learning to decrease classroom time. Nonetheless it is significant that most classes are in excess of TRADOC standards for course loads. In part, this indicates the complexity of the jobs of the tank soldier and the mechanized infantryman.

Table H-29

Summary of Fort Knox Tank-Based Initial Entry Training, Noncommissioned Officer Education System, Functional Courses, and Armor Officer Courses

Course	POI Hours	TRADOC Standard	1996 Student Enrollment
OSUT	673.5	+20%	3025
BNCOC	484	+51%	172
ANCOC	525.5	+6%	110
M1A2 Armor Crewman	44	+10%	65
M1A1 Master Gunner	446	+1.5%	133
M1A2 Master Gunner Transition	160	----	11
M1A1 TC ³	91.5	+15%	199
M1A2 TC ³	143	+20%	96
AOBC	906	+47%	598
AOAC	764	-5%	340

Note: POI is program of instruction. TRADOC is the United States Army Training and Doctrine Command. OSUT is One Station Unit Training. BNCOC is the basic non-commissioned officer course. ANCOC is the advanced non-commissioned officer course. TC³ is the tank commander certification course. AOBC is the Armor Officer Basic Course. AOAC is the Armor Officer Advanced Course.

Table H-30

Summary of Fort Benning Bradley-Based Initial Entry Training, Noncommissioned Officer Education System, Functional Courses, and Infantry Officer Courses

Course	POI Hours	TRADOC Standard	1996 Student Enrollment
OSUT	837	+44%	3770
BNCOC	325	+10%	Not Available
ANCOC	587	+41%	392
Bradley Leader Course	698	+150%	407
Bradley Master Gunner	674.5	+30%	160
IOBC	1059	+65%	846
IOAC	761.6	-5%	547

Note: POI is program of instruction. TRADOC is the United States Army Training and Doctrine Command. OSUT is One Station Unit Training. BNCOC is the basic non-commissioned officer course. ANCOC is the advanced non-commissioned officer course. IOBC is the Infantry Officer Basic Course. IOAC is the Infantry Officer Advanced Course.

Unit Training

The model for unit training is based on a top down assessment of requirements and priorities by the commander. The basis for unit training is the commander's mission essential task list (METL). The METL is based on two criteria: The unit's wartime operational and contingency plans and essential directives such as mission training plans, transition and deployment requirements, and force integration plans. METL must meet several requirements: It must apply to the entire organization; must support and complement higher headquarters METL; it is developed without considerations to restraints imposed by resource restrictions. The METL is intended to be selective; tasks which fall outside of the METL are not trained. The result is that there is no standardized training schedule or calendar; there are as many schedules as there are units.

The higher METL is selected by the controlling tactical headquarters (usually the division, sometimes the corps). Each succeeding unit in the chain (brigade, battalion and company) then identifies its METL. The company is the lowest level that selects a METL. If wartime missions change, each unit in the chain must reevaluate its METL. Additionally, commanders at all levels periodically review their METL to insure it is in support of the wartime mission.

A METL identifies *essential* tasks. Each subordinate unit analyzes both the mission and the METL they are given to identify *specified* and *implied* tasks that apply to their organization. From that, they identify their own unit METL. The Army Training and Evaluation Program Mission Training Plan (ARTEP-MTP) documentation is used to identify *collective* unit tasks

which support wartime mission statements. Individual unit METL are usually a combination of collective tasks (e.g., Perform Tactical Road March) and war plan directives (e.g., Conduct Rail Loading). Individual tasks are then identified that support or cross-walk with the collective tasks.

Based on this METL analysis, commanders conduct a training *assessment* which compares the unit's current proficiency with their desired proficiency to meet METL requirements. The assessment results in the establishment of unit training goals and training priorities and in identifying training *events* to meet these. Training events include such activities as live fire, command post exercises, STX, and field training exercises (FTX). Training events are manifested in a training *calendar* which identifies what each unit will be doing during a specified period of time. Training calendars are developed down through company level. Training calendars are nested in each other and identify activities and participants; the lower the level, the more detailed the schedule (DA, 1990).

However, units cannot train constantly and consistently at high levels; there are too many other demands on individual and unit resources. The final piece of the unit training model is *time management*. Through time management, units create periods during which they can maximize training on METL requirements by trading off for less productive training periods. A typical time management tool used in units is the *Red, Amber, Green* method. In this method, during a Green period, the focus is on collective tasks, and leader tasks integrated with multi-echelon training. All focus is on maximum participation in training with only limited personal absences tolerated. Training during this period usually takes advantage of ranges, local maneuver training areas, and major training areas such as CTCs. During an Amber training period, the training concentration is on individual and crew level training. Some collective training at platoon level may be possible. Scheduled maintenance of equipment is a high priority during this period. Individual soldiers are scheduled for administrative, medical, and other appointments as well as being allowed reasonable personal time for family matters. During Red periods, only limited individual and crew training is conducted. The unit is often committed in support activities such as post support, ROTC support, special events, and demonstrations. Leaves and passes are maximized and sometimes block leave is included (DA, 1988).

As a result of METL and training management, there is no standardized or model unit training schedule of activities. Individual unit training activities are dependent on a number of different variables and each unit is distinct. However, there is much commonality in the types of training that units will be undergoing at any particular time. Table H-31 is an example of that commonality for armor units. Mechanized infantry would have a very similar agenda with infantry specific orientation. The table identifies what training activities individuals, crews, platoons and the company would typically experience and on what frequency. While not an example of a training calendar or schedule, Figure H-2 reflects the activities that would be designated in a company schedule at different times through a series of training cycles.

Table H-31

Example of Unit Training Activities and Frequency for a Hypothetical Tank Company

LEVEL WHEN	SOLDIER	CREW	PLATOON	COMPANY
DAILY	- Physical Training - Individual Task Training	Opportunity Training -- Individual/Collective	Opportunity Training -- Collective	Scheduled Training (METL)
WEEKLY	- Sergeant's Time - Common Task Training - PMCS (individual equipment/weapons) - Continuing Education - Officer professional development	- Sergeant's Time - Unit conduct of fire training - PMCS (vehicles/ systems) - Technical Operations - Drills	- Communications Exercise - PMCS (vehicles/ systems) - Collective	- Command Maintenance - Map Exercise (METL Task)
MONTHLY	Weapons training	- Multiple integrated laser engagement system training - Forward observer simulator training - Thermal Mode Training	- Map Exercise - Field or situational training exercise - Drills	- Gunnery Training - Tactics Training
QUARTERLY	Tank crew gunnery skills test	Combat Tables (Tables I-IV)	- SIMNET Training - Fire Control Exercise (all tank commanders)	- Field or situational training exercise - Tactical exercise without troops
SEMI-ANNUAL	- Army Physical Fitness Test - Common Task Training	Crew Qualification (Tables V-VIII)	Maintenance Services	- Command Inspection - Fire Control Exercise
ANNUAL			- Combat/Tactical Tables - Tables XI-XII, G, H, I - External evaluation (ARTEP)	- External Evaluation - Combined arms live fire exercise

Note: METL is mission essential task list. PMCS is preventive maintenance checks and services. SIMNET is simulation network. ARTEP is the Army Training and Evaluation Program.

Appendix H

References

- Army Digitization Office. (September 1997). ADO Home Page [On-line], Available: <http://www.ado.army.mil/smrtbook/sbgif2.htm>.
- Army Digitization Office. (1998). Army Digitization Master Plan [On-line], Available: <http://www.ado.army.mil/admp/>
- Davis, R.W. (1995a). Armor/cavalry ANCOC shaping future platoon sergeants, Armor, July-August, pp. 5, 22.
- Davis, R.W. (1995b). BNCOC: a "pit stop" on the road to success. Armor, May-June, pp. 5, 50.
- Davis, R.W. (1995c). What you can expect from a PLDC graduate, Armor, March-April, p. 5.
- Davis, R.W. (1995d). What you can expect from an OSUT graduate, Armor, January-February, pp. 5, 48.
- Davis, R.W. (1996a). Once a master gunner, always a master gunner. Armor May-June, p. 8.
- Davis, R.W. (1996b). Retention - a need for concern, Armor, November-December, p. 6.
- Davis, R.W., (1997a). ANCOC/BNCOC scheduled training for FY 97, Armor, March-April, pp. 6-7.
- Davis, R.W. (1997b). A reflection of success: the excellence in armor soldier, Armor, January-February, pp. 5, 50.
- Department of the Army. (1988). FM 25-100 Training the Force. Washington, DC: U.S. Government Printing Office.
- Department of the Army. (1990). FM 25-101 Training the Force: Battle Focused Training. Washington, DC: U.S. Government Printing Office.
- Enlisted Personnel Management Directorate. (1997). The status of the force. (unpublished briefing slide). Fort Benning, Georgia.
- Hertling, M. (1997). Managing career progression in a smaller, higher tempo army, Armor, November-December, pp. 47-51.
- Johnston, LTC. (1996). Briefing for the TSM Bradley Fighting Vehicle System, (unpublished briefing slides). Fort Benning, Georgia.

- Lady, D. L. (1997). NCO restructuring makes its impact on the armor force, Armor, November-December, pp. 6, 56.
- Office, Chief of Armor. (1997). List of active component armor units, (unpublished list), Fort Knox, Kentucky: Armor Proponency Division.
- Otto, R. (1997). POI Changes to Bradley Leaders Course (BLC) and Master Gunner Course (MG), (unpublished information paper). Fort Benning, Georgia.
- Periscope's USNI Military Database. (1996). United States Naval Academy Home Page [Online], Available as of January 1998: <http://www.nadn.navy.mil/MilFacts/weapons/gcv/apc/W0003657.htm>
- Phillips, M. (1997). Infantry Officer Advanced Course, (unpublished fact sheet), Fort Benning, Georgia.
- Project Manager Abrams. (1997). M1A2 fielding schedule, (unpublished briefing slides), Fort Knox, Kentucky: 1997 Abrams Fielding Conference
- 16th Cavalry. (1997). Fort Knox cav unit trains armor force leaders, Armor, November-December, pp. 12-15.
- Training and Doctrine Command System Manager Soldier System. (1997). Land Warrior Operational Requirement, (unpublished briefing slide), Fort Benning, Georgia.
- U.S. Army Armor Center and Fort Knox. (1996a). Armor Enlisted Professional Development Guide. Fort Knox, Kentucky.
- U.S. Army Armor Center and Fort Knox. (1996b). FKSM 71-8 Armor/Cavalry Reference Data. Fort Knox, Kentucky.
- U.S. Army Armor Center & School. (draft 1998). ARTEP 71-1-MTP Mission Training Plan for the Tank and Mechanized Infantry Company and Company Team. Fort Knox, Kentucky.
- U.S. Army Armor School. (1991a). Program of Instruction Armor Crewman NCO Advanced Course. Fort Knox, Kentucky: Headquarters, U.S. Army Armor School.
- U.S. Army Armor School. (1991b). Program of Instruction M1/M1A1 Abrams Master Gunner Course. Fort Knox, Kentucky: Headquarters, U.S. Army Armor School.
- U.S. Army Armor School. (1992). Program of Instruction M1/M1A1 Tank Commander Certification Course. Fort Knox, Kentucky: Headquarters, U.S. Army Armor School.
- U.S. Army Armor School. (1994). Program of Instruction Armor Officer Advanced Course. Fort Knox, Kentucky: Headquarters, U.S. Army Armor School.

- U.S. Army Armor School. (1995a). CMF 19/BC12 Master Task List. Fort Knox, Kentucky: Headquarters, U.S. Army Armor School.
- U.S. Army Armor School. (1995b). Program of Instruction BNCOC M1A1 Abrams Armor Crewman. Fort Knox, Kentucky: Headquarters, U.S. Army Armor School.
- U.S. Army Armor School. (1995c). Program of Instruction M1A2 Abrams Master Gunner Transition Course. Fort Knox, Kentucky: Headquarters, U.S. Army Armor School.
- U.S. Army Armor School. (1995d). Program of Instruction M1A2 Tank Commanders Certification Course. Fort Knox, Kentucky: Headquarters, U.S. Army Armor School.
- U.S. Army Armor School. (1995e). Program of Instruction M1A2 Tank Crewman. Fort Knox, Kentucky: Headquarters, U.S. Army Armor School.
- U.S. Army Armor School. (1996a). Program of Instruction Armor Officer Basic Course. Fort Knox, Kentucky: Headquarters, U.S. Army Armor School.
- U.S. Army Armor School. (1996b). Program of Instruction 19K10-OSUT M1A1 Abrams Armor Crewman. Fort Knox, Kentucky: Headquarters, U.S. Army Armor School.
- U.S. Army Infantry School. (1993). Program of Instruction 11M BNCOC. Fort Benning, GA: Headquarters, U.S. Army Infantry School.
- U.S. Army Infantry School. (1995a). Infantry 11M Critical Task List. Fort Benning, GA: Headquarters, U.S. Army Infantry School.
- U.S. Army Infantry School. (1995b). Program of Instruction Bradley Leaders Course. Fort Benning, GA: Headquarters, U.S. Army Infantry School.
- U.S. Army Infantry School. (1995c). Program of Instruction Fighting Vehicle Infantryman ANCOC Course. Fort Benning, GA: Headquarters, U.S. Army Infantry School.
- U.S. Army Infantry School. (1995d). Program of Instruction Infantry Officer Advanced Course. Fort Benning, GA: Headquarters, U.S. Army Infantry School.
- U.S. Army Infantry School. (1995e). Program of Instruction Infantry Officer Basic Course. Fort Benning, GA: Headquarters, U.S. Army Infantry School.
- U.S. Army Infantry School. (1995f). Program of Instruction One Station Unit Training (Infantry). Fort Benning, GA: Headquarters, U.S. Army Infantry School.
- U.S. Army Infantry School. (1996). Program of Instruction BFV System Master Gunner Course. Fort Benning, GA: Headquarters, U.S. Army Infantry School.

U.S. Army Infantry School. (1997). BC11 Master Task List. Fort Benning, GA: Headquarters, U.S. Army Infantry School.

U.S. Army Sergeants Major Academy. (1991). Program of Instruction Primary Leadership and Development Course. Fort Bliss, Texas: Headquarters, U.S. Army Sergeants Major Academy.

APPENDIX I
ACRONYM LIST

Acronym List

AAO	Authorized Acquisition Objective
AAR	After Action Review
ACCP	Army Correspondence Course Program
ACIS	Army Company Information System
ACS	Army Community Service
ADO	Army Digitization Office
ADTLP	Army-wide Doctrinal and Training Literature Program
AFRU	Armored Forces Research Unit
AIT	Advanced Individual Training
ANCOC	Advanced Noncommissioned Officer Course
AOAC	Armor Officer Advanced Course
AOBC	Armor Officer Basic Course
AOSP	Advanced On-Board Signal Processor
ARNG	Army National Guard
ARTEP	Army Training and Evaluation Program
ARI	United States Army Research Institute for the Behavioral and Social Sciences
ASARC	Army Systems Acquisition Review Council
ASAT	Automated Systems Approach to Training
ASI	additional skill identifier
ATB	Armor Training Brigade
ATCCS	Army Tactical Command and Control System
ATGM	anti tank guided missile
ATRRS	Army Training Resource Requirements System
ATSC	Army Training Support Center
AWE	advanced warfighting experiment
BC	branch code
BFIST	Bradley fire support team
BFV	Bradley fighting vehicle
BGST	Bradley Gunnery Skills Test
BIT	built in test
BLC	Bradley Leaders Course
BMOC	Battalion Maintenance Officer Course
BNCOC	Basic Noncommissioned Officer Course
BOI	Basis of Issue
BSFV	Bradley Stinger fighting vehicle
CAC	Combined Arms Center
CALL	Center for Army Lessons Learned
CASCOM	U.S. Army Combined Arms Support Command
CATS	combined arms training strategy
CBT	computer based training
CCTT	close combat tactical trainer
CD	compact disk

CD-ROM	compact disk-read only memory
CFV	cavalry fighting vehicle
CID	commander's integrated display
CINCOS	change in NCO structure
CITT	commander's integrated training tool
CITV	commander's independent thermal viewer
CMF	career management field
CMTC	Combat Maneuver Training Center
COFT	conduct of fire trainer
CONUS	continental United States
CP	command post
CS	commander's station
CSA	Chief of Staff of the Army
CST	crew station trainer
CTC	combat training center
CTD	commander's tactical display
CVCC	combat vehicle command and control
DA	Department of the Army
DBCS	Digital Battle Command System
DCD	Directorate of Combat Developments
DCG	Deputy Commanding General
DCS-CD	Deputy Chief of Staff, Combat Developments
DCS-T	Deputy Chief of Staff for Training
DCSDOC	Deputy Chief of Staff, Doctrine
DFD	Directorate of Force Development
DID	driver's integrated display
DL	distance learning
DSARC	Defense Systems Acquisition Review Council
DTDD	Directorate of Training and Doctrine Development
DTLOMS	Doctrine, Training, Leader Development, Organizations, Materiel, and Soldiers
EFVS	electronic fighting vehicle system
EIA	Excellence In Armor
EO	Equal Opportunity
EPLRS	Enhanced Position Location Reporting System
EXFOR	experimental force
FA	Field Artillery
FBCB ²	Force XXI Battle Command, Brigade and Below
FKSM	Fort Knox supplemental manual
FM	field manual/frequency modulation
FORSCOM	U.S. Army Forces Command
FRAGO	fragmentary order
FTX	field training exercise
FUE	first unit equipped
FY	fiscal year

GAS	gunner's auxiliary sight
GCDP	gunner's control display panel
GICOD	good idea cut-off date
GIGO	garbage in, garbage out
GPS	global positioning system
GPS	gunner's primary sight
GPSE	gunner's primary sight extension
HITT	high transfer training
ICOM	Inputs, Controls, Outputs and Mechanisms
IDA	Institute for Defense Analysis
IET	initial entry training
IFV	infantry fighting vehicle
I/O	instructor/operator
IOAC	Infantry Officers Advanced Course
IOBC	Infantry Officers Basic Course
IOTE	Initial Operational Test and Evaluation
IRR	Individual Ready Reserve
IUT&E	individual user's test and evaluation
IVIS	intervehicular information system
JFK	John Fitzgerald Kennedy
LCM	life cycle model
LOGSTAT	logistics status
LRF	laser range finder
LRU	line replaceable unit
LUT	limited user test
MACOM	major command
MANPRINT	Manpower and Personnel Integration
MBT	main battle tank
METL	mission-essential task list
MOS	military occupational specialty
MOUT	military operations on urban terrain
MQS	military qualification standards
MTP	mission training plan
MWTB	mounted warfare test bed
NBC	nuclear, biological, and chemical
NCO	noncommissioned officer
NCOES	noncommissioned officers education system
NCOPD	NCO professional development
NET	new equipment training
NTC	National Training Center
OAC	Officer Advanced Course
OBC	Officer Basic Course

OBE	overtaken by events
O/C	observer/controller
OCS	officer candidate school
ODCSOPS	Office of the Deputy Chief of Staff for Operations
ODS	Operation Desert Storm
OJT	On-the-Job Training
OOTW	operations other than war
OPD	officer professional development
OPNET	operator new equipment training
OPORD	operation order
OPSEC	operational security
OPTEC	Army Operational Test and Evaluation Command
ORD	operational requirements document
OSUT	one station unit training
PC	personal computer
PCC	Pre-Command Course
PEO	Program Executive Office
PFC	private first class
PGT	platoon gunnery training
PK	professional knowledge
PLDC	Primary Leadership and Development Course
PLGR	precision lightweight global positioning system receiver
PM	program manager
PMCS	preventive maintenance checks and services
POI	program of instruction
POSNAV	position navigation
RC	reserve component
R&D	research & development
ROTC	Reserve Officer Training Corps
SAT	Systems Approach to Training
SD	self-development
SEP	system enhancement program
SIMNET	simulation networking
SINGARS	single-channel ground and airborne radio system
SI/O	senior instructor/operator
SITREP	situation report
SL	skill level
SM	soldier's manual
SME	subject matter expert
SOP	standard operating procedure
SPLC	Scout Platoon Leader Course
SPOTREP	spot report
SQT	Skill Qualification Test
STATREP	status report

STP	soldier training publication
STX	situational training exercise
TC ³	Tank Commander Certification Course
TCGST	tank crew gunnery skills test
TD	training developers
TDY	temporary duty
TM	technical manual
TMC	Traffic Management Center
T-NET	tactical internet
TO&E	table of organization and equipment
TOW	tracked optically, wire-guided
TRAC	TRADOC Analysis Center
TRADOC	Training and Doctrine Command
TSM	TRADOC Systems Manager
TSP	training support package
TTP	tactics, techniques, and procedures
TV	television
UCOFT	unit conduct of fire trainer
U.S.	United States
USAARMC	U.S. Army Armor Center
USAARMS	U.S. Army Armor School
USAIS	U.S. Army Infantry School
USASMA	U. S. Army Sergeants Major Academy
USNI	U.S. Navel Institute
VTC	video teleconference
VTT	video-teletrainer
WRAP	Warfighter Rapid Acquisition Program
WSMR	White Sands Missile Range
XO	executive officer