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**Training Requirements for the
Battlefield Management System (BMS):
A Preliminary Analysis**

**ARI Field Unit at Fort Knox, Kentucky
Training Research Laboratory**

May 1987



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U.S. ARMY RESEARCH INSTITUTE for the BEHAVIORAL and SOCIAL SCIENCES

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FOREWORD

To ensure that the U.S. Army's future weapon systems are usable by our soldiers, the Army Research Institute for the Behavioral and Social Sciences (ARI) performs behavioral research to provide guidelines and specifications for matching equipment designs with soldier capabilities and limitations. Within the ARI Field Unit at Fort Knox, the Future Battlefield Conditions Team conducts applied research to enhance soldier preparedness through identification of future weapon systems and the methods for training to meet those systems.

This product by the ARI Field Unit at Fort Knox was prepared under Science and Technology Task 3.5.1, "Training Requirements for NBC and the Future Integrated Battlefield," at the request of the TRADOC System Manager (TSM) for the MIAI Block II. ARI's involvement in research on future battlefield conditions supports the Memorandum of Understanding (MOU) between ARI and the U.S. Army Armor Center and School (USAARMC&S) on Land Battle Test Bed research signed 9 January 1986. The results of this effort were briefed to COL Burgess (TSM-TANK) on 6 March 1987, and the report was provided to the TSM office in response to questions addressed in Tab D of the System MANPRINT Management Plan (SMMP).



EDGAR M. JOHNSON
Technical Director

TRAINING REQUIREMENTS FOR THE BATTLEFIELD MANAGEMENT SYSTEM (BMS):
A PRELIMINARY ANALYSIS

CONTENTS

	Page
INTRODUCTION	1
Background	1
Emerging Systems	2
Levels of Automation	3
METHODOLOGY	6
Task Requirements	6
Training Requirements	7
Rating System	8
RESULTS AND DISCUSSION	10
Task Commonality	10
Task Difficulty	10
Device Configuration	11
Additional Training Requirements	11
CONCLUSIONS	12
REFERENCES	14
APPENDIX A. PRELIMINARY TRAINING REQUIREMENTS FOR LOWER ECHELON C ³ SYSTEMS	A-1

LIST OF TABLES

Table 1. Platoon leader's tasks by category	7
2. Description of training requirement ratings in Appendix A	9

LIST OF FIGURES

Figure 1. Prototype BMS display	4
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TRAINING REQUIREMENTS FOR THE BATTLEFIELD MANAGEMENT SYSTEM (BMS):
A PRELIMINARY ANALYSIS

INTRODUCTION

Background

For the current stage of product improvements to the M1A1 tank, the Army has authorized the production of a set of enhancements collectively labelled Block II. Anticipated upgrades to any weapon system, however, may result in unanticipated complications, even system degradation, unless their design and development efforts systematically address product-related manpower and personnel integration (MANPRINT) issues. The goal of the MANPRINT program, therefore, is to improve total system (soldier and equipment) performance by the continuous integration of human factors engineering, manpower, personnel, training, system safety and health hazard considerations throughout the materiel development and acquisition process. One important MANPRINT issue is the timely identification of training requirements--what needs to be trained, when and where--associated with the system or subsystem under development. This report identifies training requirements associated with one of the Block II components, a first-generation Battlefield Management System (BMS) which is expected to partially automate the command, control and communication (C³) of lower echelons.

In support of MANPRINT, The Army Research Institute for the Behavioral and Social Sciences (ARI) has initiated a wide-ranging program to identify, test and revise MANPRINT support technologies. ARI's responsibility for providing research and development (R&D) on MANPRINT-related analytical technologies is part of ARI's mission as an element of the Office of the Deputy Chief of Staff for Personnel (ODCSPER). ARI's approach to meeting MANPRINT requirements has focused on defining the functional characteristics of a system and viewing system operators as extensions of the system. This analysis of BMS training requirements is consistent with this approach and has focused on the functional characteristics of the anticipated BMS system as related to the task requirements of a typical BMS operator.

Preliminary BMS training requirements, the subject of this report, were identified by ARI-Knox at the request of the MANPRINT Joint Working Group (JWG) for the M1A1 Block II. The analysis was conducted to answer, at least partially, some of the training and personnel questions raised by the JWG in their preparation of the System MANPRINT Management Plan (SMMP) for M1A1 Block II.

In general, Block II enhancements to the M1A1 include: enhanced survivability, data bus, navigation system (POSNAV), CO₂ laser range finder (LRF), driver's and commander's independent thermal viewers (DTV, CITV), improved commander's weapon station, and intervehicular information system (IVIS). IVIS, a starter set for BMS, is expected to initiate the automation of C³ functions for lower echelon, battalion-down, Armor units.

As noted in the Operational and Organization (O&O) Plan for BMS, the pace of the Air Land Battle and the numerical superiority of opposing forces

(OPFOR) require significant improvements in the U.S. Army's command, control and communication (C³) capabilities. Although the M1A1 tank is generally regarded as the most lethal and mobile armored weapon system in the world, its capability is severely constrained by repetitive, time consuming and manual C³ functions. A primary goal of the immediate Block II additions to the M1A1, therefore, is to significantly upgrade this weapon system's performance by technological enhancements in the areas of C³.

The training requirements for IVIS are the immediate concern of this analysis, and not the other Block II enhancements. Training requirements for each of the Block II enhancements are anticipated and shall be integrated with the current findings by the JWG in their preparation of the SMMP.

This subjective analysis of BMS training requirements anticipated three successive generations of lower echelon automated C³ systems that are anticipated as a result of technological advances enabling BMS product improvements. In the near term, IVIS has been designated as the precursor to BMS. In midterm, BMS is expected to emerge with the addition of a digitized terrain data base to IVIS. In the far term, the addition of artificial intelligence (AI), with tactical decision making capabilities, to BMS is expected to culminate in an objective C³ system referred to in this report as BMS/AI.

Training requirements were identified by analyzing changes in the platoon leader's (PLT LDR) task requirements associated with each of these three generations of automated C³ systems. The primary objectives of this analysis were to identify: the wide range of PLT LDR's tasks that may be affected by these automated C³ systems; the extent to which the difficulty of training and performing these tasks might be increased, reduced or eliminated by automation; and, the nature and configuration of training devices that might be needed to meet these training requirements.

Emerging Systems

Lower echelon automated C³ systems such as IVIS and BMS are emerging systems. Currently, IVIS is undergoing Engineering Design Tests by the contractor (EDT-C). Design specifications for IVIS have not been formulated, and the EDT-C version of IVIS is the first time that a prototype has been developed to directly test IVIS-based C³ functions. With respect to BMS development, the O&O plan for BMS has yet to be approved by TRADOC. BMS design specifications have not been established, but several prototype BMS systems have been developed to assess user requirements. Most notably, Texas Instruments provided a prototype BMS that was used to identify user information requirements (Jobe, 1986) and Lockheed developed another BMS prototype that was used to identify user interface requirements (Lickteig, 1986). ARI's involvement with these prototypes, and the early formulation of automated C³ functional requirements at the lower echelon (Blasche and Lickteig, 1984), served as the basis for this preliminary analysis of BMS training requirements.

Both the design and development of lower echelon automated C³ is iterative. The proposed BMS, as specified in the O&O Plan, is an ambitious concept that has already slipped well beyond the original developmental milestones that projected BMS fielding in 1988. Monetary and technological

constraints have forced BMS combat developers to both lower their near term requirements, and extend their projected acquisition schedule. IVIS, for example, was initiated in response to these constraints as a BMS starter set, yet even IVIS is not scheduled for M1A1 production cut-in until mid 1990. In view of these constraints, and the complexities inherent in the materiel acquisition process, it was decided that the most useful analysis of BMS training requirements would be one tailored to the successive generations, or levels, of C³ automation anticipated.

Levels of Automation

For this preliminary analysis, training requirements unique to three cumulatively automated C³ systems--IVIS, BMS, BMS/AI--were identified. Before describing each of these levels in some detail, it should be noted that the latter distinction between BMS and BMS/AI is not shared by all members of the combat developments community. A more commonly held assumption is that the tools of artificial intelligence will be sufficiently refined to meet the currently projected schedule of BMS development. But both commercial and military ventures into AI have generated new respect for the information processing capabilities of human intelligence, and in particular the complexity of perceptual and decision making processes. In the application of AI to tactical information processing, this complexity is compounded by the turbulent and unpredictable conditions of the battlefield and the criticality of military decisions and operations. The current analysis, therefore, postulates AI decision making capabilities as a far term improvement, and BMS/AI as a distinct level of automated C³ systems.

The distinction made in this report between BMS and BMS/AI is arbitrary, and not intended to represent official policy of the Department of the Army. The purpose of the distinction is simply to ensure a more comprehensive front-end analysis (FEA) of the differential training requirements that may arise in the iterative development and acquisition of lower echelon automated C³ systems. More detailed descriptions of each of these three levels will now be presented.

IVIS. IVIS, an Armor dedicated weapon subsystem, is an integrated complex of technologies for acquiring, processing, storing and transmitting lower echelon battlefield information. The automated C³ capabilities of IVIS will be supported by a 1553 data bus that allows continuous monitoring and updating of information from the FM radio nets, the turret and hull network boxes, and selected Block II components such as POSNAV, CO₂ LRF and CITV. This information should be made available to the user by way of a monochromatic display panel, and presented in both graphic and alphanumeric formats. The display panel will be partitioned into a number of smaller display areas with each area dedicated to distinct display features and control functions. The actual data and control fields available on IVIS have not yet been specified, nor has the overall configuration and format of the operator's display panel interface. With the exception of the digital terrain data, the prototype BMS display presented in Figure 1 depicts the general display configuration and control functions anticipated for both IVIS and BMS.

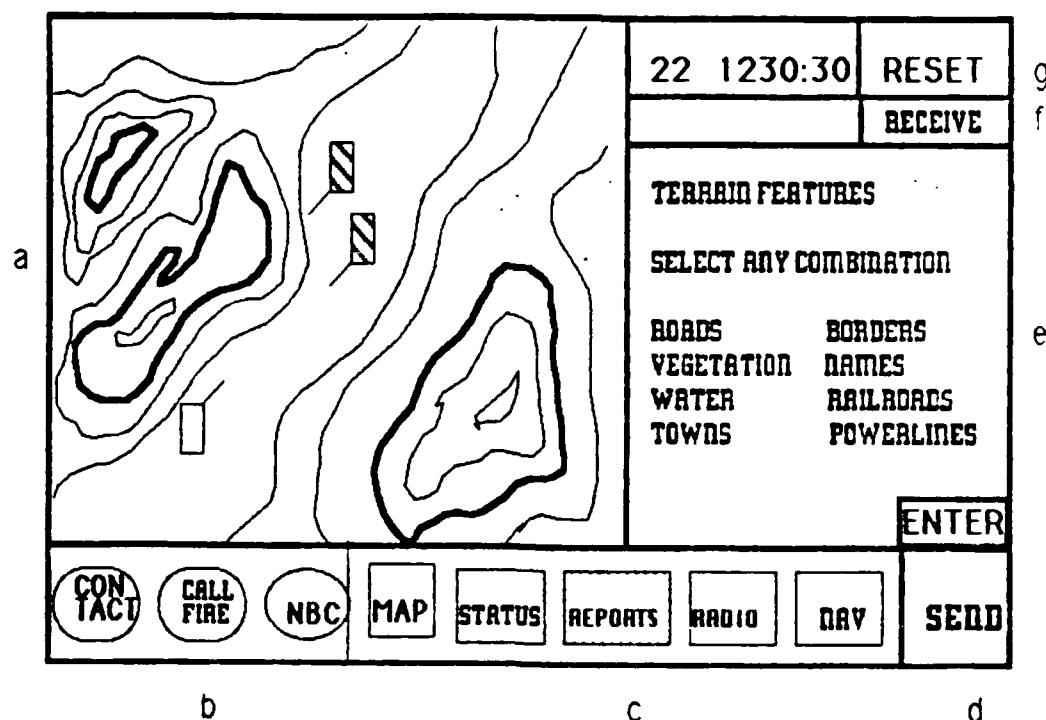


Figure 1. Prototype BMS display (a = map display; b = automatic function keys; c = main menu keys; d = transmit key; e = variable menu display; f = message display; g = date and time display).

Current projections assume that digital terrain data will not be available for IVIS. The most likely alternative is that the "map" area designated for IVIS will display a military grid matrix. Within this grid matrix the user will be able to generate, receive, store, and transmit graphic data such as operational overlays, control measures, and unit symbology. The grid referencing system will provide correspondence between these overlays and the standard paper copy maps. An alternative, and more effective IVIS system would store and provide digitized maps (not digital terrain data) and update map presentations by means of the grid referencing system. In either event, the assumption made for this analysis is that IVIS will not provide the "flexible" map expected for BMS, or the "smart" map anticipated for BMS/AI.

The submenu region of the proposed IVIS display will be primarily designed for textual formats. Alphanumeric data in the form of messages, reports, orders and alerts will be composed, transmitted and received in this region of the user's interface display. The input device, and use of preformatted versus free field entries, are important training requirement factors that have not been resolved. The assumptions made for this analysis are that a touch-sensitive interface or mouse and trackball input device will be used, and that textual entries will be preformatted and menu-driven.

All IVIS-based communications, graphic and alphanumeric, will be transmitted and received by way of digital burst signals transmitted by frequency hopping single channel ground/airborne radio systems (SINCGARS). IVIS storage and interface features will allow users to compose an entire order or report before transmission, verify its accuracy, and then digitally transmit the entire message in millisecond bursts. Both net access and interference will be monitored automatically by IVIS, and call signs and authentication procedures should be automatically annotated and processed for intervehicular communications.

BMS. A primary enhancement assumed for BMS, over IVIS, in the near term is the addition of digitized terrain data at 1:50,000 scale. Currently, Defense Mapping Agency (DMA) data at Level 1 (1:50,000) are not available except for very limited regions of the earth's terrain. In addition, the MIL-STD-1553 data bus supporting IVIS is not powerful enough to process this volume of data. But when automated C^3 systems are enhanced with digital terrain data, significant advances in automating C^3 are projected. These advances are anticipated primarily because terrain visualization is one of the most difficult of all military tasks to perform (Barsam & Simutis, 1985; Rogers & Cross, 1981) and because battlefield geometry is fundamentally spatial, not textual, data. Consider the difficulty of giving someone directions with or without the aid of a map or other graphic aids.

The geometry of the battlefield is a critical component of nearly all C^3 communications, and a digital terrain data base will significantly automate and synchronize lower echelon map and operational overlay information. Terrain visualization will be, at least partially, automated by graded elevation shadings and horizontal or perspective views of the terrain. Map interpretation will be further automated by selective call-up and delete capabilities which are critical for avoiding clutter on the relatively compressed size of the display interface. Selective call-up and delete features are also instrumental in allowing BMS users to tailor their map displays with respect to both individual and situational factors.

Finally, the digitized terrain data base will automate the process of both extracting and inserting tactical information. Line-of-Sight (LOS) and trafficability algorithms, for example, will significantly automate terrain analysis. Graphic presentations of both friendly and enemy weapon system characteristics such as range, elevation and azimuth will greatly assist the execution of such tasks as the preparation of range cards, sector sketches and fire control plans. This analysis of training requirements will more explicitly define the extent of this automation over a cross-section of PLT LDR tasks.

In conclusion, it is noted that the aforementioned BMS manipulations of digital terrain data are achieved by algorithmic transformations of the data base, and such transformations are not regarded as manifestations of artificial intelligence.

BMS/AI. While currently high risk and even unforeseen technological advances may be included in later BMS product improvements, this analysis anticipates that the most significant enhancement in long-term automated C^3 will be artificial intelligence. In the area of automated C^3 , the capstone of an AI system should provide an optimal tactical decision (e.g., plan of

action) that is based on integrated knowledge bases, expert rule-based protocols and real-time battlefield intelligence data. For a more complete discussion of the data-base and processing requirements for AI in an applied Armor setting see Harris, Fuller, Dyck and Rogers (1985).

This tactical decision making capability of AI is significantly more comprehensive and complicated than the piece-meal decision aids anticipated for BMS without AI such as the LOS and trafficability functions previously discussed. Once a tactical decision has been formulated by BMS/AI, the system should be able to automatically tailor and transmit this information (e.g., operations order [OPORD], fragmentary order [FRAGO]) in detail appropriate to both lower and upper echelons. As the execution of this plan unfolds, such as the crossing of phase lines or contact with the enemy, the C³ system should be automatically monitoring, updating and re-analyzing the tactical situation.

As the subsequent analysis of training requirements suggests, this level of C³ automation may significantly reduce the task load and training requirements associated with the PLT LDR position. As stated previously, BMS/AI is a far term C³ system that is included in the present analysis to ensure a more comprehensive FEA and to more explicitly identify potential AI applications for lower echelon C³.

METHODOLOGY

Task Requirements

Training requirements must be based on task requirements. This analysis of BMS training requirements is based on the task requirements associated with the PLT LDR's position. The PLT LDR's position was selected for several reasons. First, there has been considerable speculation that the actual "fighters" on the battlefield will have neither the time or inclination to utilize automated C³ systems. It is assumed that as levels of C³ automation increase, these front-line personnel will be relieved of their more burdensome C³ duties and thereby more capable of pressing the conflict. Secondly, as front-line personnel, PLT LDRs collectively possess a firsthand knowledge of the combat situation that is critical to informed C³. And finally, because of front-line attrition and the relatively limited military background of a PLT LDR the training requirements associated with this position are of particular importance.

The task requirements associated with the PLT LDR position were taken from MTP 17-15-1, The Tank Platoon Mission Training Plan (1985). While this is both an individual and collective training plan, the tasks and standards associated with collective platoon performance are central to the PLT LDR's responsibilities for C³. This MTP provides a relatively complete list of the tactical training requirements associated with the platoon leader's position. This MTP was selected as the source document for this analysis because of its emphasis on tactical training and its inclusion of training and evaluation outlines (T&EO) which list all tasks, subtasks, and supporting tasks required for mission accomplishment.

A representative cross-section of PLT LDR tasks, and all C³ tasks, listed in 17-15-1 were selected for this analysis and are presented in Table 1. The tasks in Table 1 are combined under three fundamental categories of maneuver warfare: Command, Control and Communication; Force Movement; and Offensive and Defensive Operations. For purposes of exposition, some of the original categories listed in 17-15-1 have been consolidated under the Table 1 headings. For example, Perform a Nuclear Contaminated Area Crossing is presented under Force Movement rather than a separate NBC category, and Offensive and Defensive Operations are combined into one category.

Table 1

Platoon Leader's Tasks by Category

Command, Control & Communication	Force Movement	Offensive/Defensive Operations
Perform Platoon Leader Reconnaissance	Perform Tactical Road March	Execute a Hasty Attack
Provide C ² of a Platoon	Execute Actions at a	Perform Assault
Perform Tactical Planning	Halt	Force Activities
Perform Contact Point Activities	Execute Traveling	Assault an OPFOR Position
Conduct Rehearsals for Mission	Perform a Nuclear Con- taminated Crossing	Perform Consolida- tion Activities
		Occupy a Battle Position

Training Requirements

Given the developmental nature of the lower echelon C³ systems, this analysis was based on the primary functional capabilities anticipated for each of the three levels of automated systems under consideration -- IVIS, BMS, BMS/AI. Until design specifications are formulated and operable systems are developed, a quantitative and objective task and skill analysis (TSA) of the human performance required on each system can not be prepared. This preliminary analysis has been based on C³ system functions and capabilities as previously discussed, user information and interface requirements obtained (Jobe, 1986; Lickteig, 1986) using BMS prototypes, and the automated capabilities projected in the BMS O&O Plan. This subjective analysis of training requirements was originally performed by ARI personnel and then reviewed by subject matter experts (SMEs) from the Directorate of Combat Developments (DCD).

The primary objectives of this analysis were to identify the range and nature of PLT LDR tasks affected by these automated C³ systems and the extent to which the performance of these tasks might become easier, more difficult or at least partially eliminated by automation. The analysis also addressed the issue of training devices by identifying which of the PLT LDR tasks affected by automated C³ could be trained by stand-alone training devices versus which tasks would require an interactively, networked configuration of

training devices. Other training requirements considered in this analysis, but not included in Appendix A, were training media, training site, and personnel assignment and selection.

Rating System

The results of this analysis for these primary objectives are presented in Appendix A. Before presenting these results, a brief explanation of the table headings and entries is provided below and summarized in Table 2. The general heading of Appendix A begins with the list of PLT LDR tasks in the first column. Subheadings within this column indicate, in succession, the functional category (e.g., C³, Force Movement), the primary task being analyzed, and finally the subtasks, standards and supporting tasks included under the primary task. The next three columns of the table heading specify, in order, the three levels of C³ systems addressed by this analysis--IVIS, BMS, and BMS/AI. The final column in the table heading addresses the issue of training device configuration, stand-alone or networked training devices. This issue of device configuration was not considered specific to any of the three levels of C³ systems under consideration; the recommendations concerning training device configurations apply to all three levels of automated C³ systems.

This preliminary analysis of training requirements for each of the primary tasks listed in Table 1 also included all of the subtasks, standards and supporting tasks required for execution of the primary task. Training requirements for all subtasks, standards and supporting tasks are therefore also included in Appendix A. The wide range of tasks included in the inventory are expected to provide a representative sample of the tasks required of PLT LDRs and an index of the pervasive impact of automated C³ at the lower echelon.

The first requirement, COMMONALITY, indicates whether the training requirement for the task in question is the "same" (S,s) as conventional training or "different" (D,d) do to the introduction of an automated C³ system. Tasks were rated as "different" when either the procedures or the tools for executing a task were affected by an automated C³ system. The task of map reconnaissance, for example, was rated as "same" under IVIS which does not provide a digital map display. Platoon leaders equipped with IVIS must still refer to their paper maps to perform map reconnaissance. Under BMS, however, this task was rated as "different" although the platoon leader must analyze the same terrain features currently considered for map reconnaissance. But with the digital map display of BMS the platoon leader can selectively tailor his map to more directly and systematically analyze the tactical aspects of key terrain (e.g., line-of-sight, trafficability etc.).

Upper case letters in Appendix A indicate primary tasks and lower case letters are used for all subtasks, standards and supporting tasks. Ratings for the primary task are provided as a summary indicator of the C³ system's impact across all subordinate and supporting tasks. When performance of a task has been completely automated by an advanced C³ system, this column has been left blank to indicate that performance of the task has been eliminated and, therefore, no significant training requirement may exist (except for degraded modes).

The second requirement, Difficulty, indicates whether the automated C³ system has made the task "easier" (E,e) or "potentially harder" (H?,h?) to perform, or if the task has been "partially automated" (PA,pa) or completely "automated" (A,a). IVIS, for example should make a number of PLT LDR tasks easier by providing check lists and initiating cues to facilitate task performance without actually automating or eliminating any of the task components. On the other hand, preparing textual portions of a report or order using message formats and menus may be more difficult than conventional voice (FM radio) procedures. To indicate that these tasks may increase task difficulty they are rated as potentially harder (h?) than conventional reporting requirements. Finally, the graphic portions (e.g., operational overlays) of a PLT LDR's order or report on IVIS will be manually generated but automatically transmitted and, therefore, are listed as partially automated (pa). When the task has been analyzed as the "same" under Commonality no entry was included under Difficulty, to more clearly indicate where changes in PLT LDR training requirements were anticipated.

Table 2

Description of Training Requirement Ratings in Appendix A

Requirement	Rating	Entry	Issues
Commonality	Same	s	Is the PLT LDRs task using an automated C ³ system, the same or different than conventional task performance?
	Different	d	
Difficulty	Easier	e	Is the PLT LDRs task easier, harder, partially automated or completely automated using the automated C ³ system?
	Potentially Harder	h?	
	Partially Automated	pa	
	Automated	a	
Configuration	Stand-Alone	*	Can the PLT LDRs task be trained using a stand-alone automated C ³ system, or must the C ³ system be networked for intervehicular transmissions?
	Network	*	

The final training requirement included in Appendix A, Configuration, indicates whether the task in question can be trained with an independent or "stand-alone" (SA,sa) training device or simulator, or whether training for the task will require that a number of training devices be linked together to form a communication "network" (N,n). Tasks rated as "same" across all systems, indicating no change in task or training requirements, were not assigned a rating under this column.

Additional training requirements considered in this analysis such as training media, training site, and personnel selection and assignment problems are discussed in the following section.

RESULTS AND DISCUSSION

Results are based on the training requirement ratings provided in Appendix A. All ratings were reviewed by SMEs from the Directorate of Combat Developments. Percentages are based on the relative frequency of a given rating across all tasks, subtasks, and supporting tasks appearing in Appendix A. Results are limited to the tasks included in MTP 17-15-1 which focuses on the tactical training requirements for platoons and platoon leaders.

Task Commonality

Automated command and control systems will affect a wide range of PLT LDR tasks and the training requirements for these tasks. Of particular interest is the impact of automated C³ systems on the training requirements for the category of PLT LDR tasks specifically designated as C³. This analysis found that even a first-generation C³ system, IVIS, will change the PLT LDR's task and training requirements for over 50% of the C³ tasks and subtasks listed in Appendix A. As the level of automation increases with BMS and BMS/AI, over 90% of these tasks and subtasks will be affected.

This change in training requirements is clearly not limited to those tasks formally included by 17-15-1 under the category of C³, but extends--albeit to a lesser extent--throughout the sample of tasks included under the categories of Force Movement, Offensive Operations and Defensive Operations. The majority of all tasks considered under each of the PLT LDR functional categories will be performed differently when the more advanced C³ systems, BMS and BMS/AI, are fielded. The pervasive impact of these more advanced C³ systems on PLT LDR training requirements may be best summarized by noting that only 10-15% of all tasks and subtasks listed in Appendix A were rated "same" or unaffected by the objective system, BMS/AI.

Task Difficulty

Automated command and control systems will significantly reduce the difficulty of performing and training PLT LDR tasks, and the more advanced systems will at least partially eliminate many of these tasks through automation. IVIS, for example, when considered across all categories of PLT LDR performance listed in Appendix A was found to make "easier" approximately 25% of the task and subtask entries, and "partially automate" an additional 25%. Tentative ratings of "harder" (h?) were projected only for a few IVIS-based tasks, namely, the preparation of textual reports and orders. On the other hand, only one IVIS-based task, Determine a Location, was rated as completely "automated"--a function of IVIS's interface with the POS NAV system.

As the levels of automation increase with later-generation C³ systems, approximately 60% of the BMS-based PLT LDR tasks were rated as either

"partially automated" or completely "automated," and 80% of the BMS/AI PLT LDR tasks were rated as "partially automated" or completely "automated." More specifically, within the C³ category, the cumulative impact of these later-generation C³ systems should actually eliminate a sizeable portion of the PLT LDR task requirements. The objective system, BMS/AI, may result in the complete automation of the majority of all C³ tasks and subtasks listed in Appendix A.

The effect of these automated functions on training requirements must address the issue of system operability. Assuming fully operable C³ systems, the training requirements would be significantly reduced for the majority of all tasks, and eliminated for many additional tasks. Degraded C³ systems, per se, should not significantly impair conventional PLT LDR task performance (i.e., retention of voice FM nets), to the extent that PLT LDR's have been trained for degraded conditions and have not become overly dependent on automated capabilities.

Device Configuration

Many of the tactical training requirements for the PLT LDR's utilization of automated C³ systems can be met using stand-alone C³ training devices. This issue of training device configuration is an important aspect of C³ training requirements with respect to the allocation of training resources. In particular, the analysis suggests that tactical planning and report preparation can be addressed by independent training devices. Within the category of C³ platoon leader tasks this analysis found that the majority of these tasks can be trained, at least at the earliest stages of training with stand-alone C³ devices.

Over all the Appendix A PLT LDR functional categories, however, only approximately 25% of the tasks can be supported by stand-alone training devices. At least 60% of these tasks will require that C³ training systems be "networked" to simulate intervehicular transmissions. Training requirements for the remaining 10-15% of the Appendix A entries, as previously noted, were rated as "same" or unaffected by the fielding of automated C³ systems.

Additional Training Requirements

Key training requirement issues are the selection of training media and the design and development of training devices. Given the computer-based nature of these automated C³ systems, an ideal training media would appear to be computer-based instruction (CBI). Fortunately CBI is an integral component of the Automated Classroom concept which is currently being implemented by the US Army Armor Center (USAARMC). And many of the hardware resources for this training media may soon be available at both institutional and reserve component training sites. As the analysis has indicated, however, training for many of the PLT LDR's tasks will require an interactive network of C³ training devices and this is a resource intensive configuration particularly with respect to supporting hardware. Software and courseware packages for simulating and training automated C³ system functions must be anticipated, and are identified as important training requirement issues to be addressed by the SMMP.

Embedded training, the integration of a training package into the actual weapon system, is also identified as a critical training requirement to be included in the SMMP. The instructional potential of computer-based systems should result in the design specification of embedded training for these automated C³ systems to support both unit and sustainment training. The cost-effectiveness of both CBI and embedded training for reducing the need for instructor and institutional resources provides additional support to this requirement.

Another important training requirement issue is determining the location or site in which training activities might take place. The current analysis has focused on a distinction between classroom versus field training locations. This analysis suggests that the majority of PLT LDR tasks considered can be initially trained in a classroom or institutional setting. More specifically, all of the tasks listed under the C³ category, with the exception of several tasks requiring ground reconnaissance or navigation, appear suitable for at least initial training in the classroom. For the Offensive and Defensive categories, PLT LDR tasks such as tactical planning, the issue of the plans, and the coordination of plans among echelons can all be initially trained in a classroom equipped with C³ training devices. In general, tasks requiring field training sites are terrain and weapon system dependent such as the actual execution of movement, occupation and assault operations.

A final training requirement issue is the identification of potential training and assignment problems. As indicated in Appendix A the proposed automated C³ systems may require that users submit and receive textual reports, orders and messages. To the extent that voice transmissions are eliminated, automated C³ systems may require substantially more training time and resources than conventional C³. While voice synthesis and recognition capabilities may be sufficiently advanced for integration into BMS and BMS/AI, they are not anticipated for IVIS. Directly related to this issue of textual rather than vocal communication protocols, potential assignment problems should be investigated. Whether personnel minimally meeting the current verbal and reading ability standards will be able to compose accurate non-vocal reports using these automated C³ systems must be empirically resolved.

CONCLUSIONS

Based on the tactical training requirements of the platoon leader's mission training plan, MTP 17-15-1, this analysis has documented the pervasive impact of automated C³ systems on the current tasks, subtasks, and standards associated with platoon leader performance. Automated C³ systems will affect an increasing number of current platoon leader task and training requirements. And the impact of these automated C³ systems is clearly not limited to the category of C³ tasks, but extends to each of the fundamental categories of lower echelon maneuver warfare included in MTP 17-15-1.

A primary conclusion of this analysis is that these automated C³ systems will substantially reduce the current task and training requirements associated with small unit leadership. This reduction will be accomplished by automating, or at least partially automating, many of the time-consuming and repetitive manual and cognitive tasks required for planning, monitoring, and

reporting combat operations at the lower echelon. In addition, this analysis has identified, in a general way, some of the unique training requirements associated with the operation and utilization of these automated C³ systems.

For nonresident training it is concluded that the computer-based nature of these automated systems provides an excellent medium for embedded training programs. The initial priority of this embedded training is a tutorial program that provides users a clear and self-explanatory introduction to the utilization and capability of all display and control functions provided by the automated command, control, and communication system. A more comprehensive embedded training package should provide users the opportunity to interactively practice the utilization of these C³ capabilities in the context of realistic mission scenarios and exercises.

It is also concluded that for residential training, computer-based instructional (CBI) programs be developed in support of these automated C³ systems. These CBI programs should include the training components described above for embedded training, but also provide a more comprehensive and adaptive training package. In particular, this CBI should be tailored for various users and multiple levels of training, from preliminary to advanced. This computer-based instruction should also include such instructional features as self-paced and adaptive training, immediate feedback and knowledge of results for users, and an evaluation of user proficiency for instructors. To reduce the system costs associated with these training requirements, it is noted that this CBI could be developed to operate on the Electronic Information Delivery System (EIDS) which is the Army Standard for CBI.

Finally, it is recommended that the development of these automated training systems should be pursued as quickly as possible. To proceed beyond the level of preliminary analysis to a more formal set of training requirements for automated C³ systems, prototype systems must be extensively utilized and tested by both users and professional trainers. In particular, the issues of informational overload and personnel assignment and selection can only be accurately assessed when operative systems are placed in the hands of potential users and trainers. Automated training systems in residential and non-residential settings could then be used not only in support of training for currently fielded C³ systems, but also as a test bed for ensuring that both user and training requirements are included in the design and development of future automated C³ systems.

By considering now the potential training requirements of future automated C³ systems, the Army may better ensure that operator performance is optimized and training requirements are minimized. The timely identification of training requirements, such as those identified in this report, should result in their explicit specification in these systems' source selection documents and Required Operational Capabilities (ROC). The intent of the current analysis, therefore, has been to identify a preliminary set of training requirements that must be continuously addressed and refined as BMS and related automated C³ systems for lower echelons move through the Life Cycle System Management Model (LCSMM).

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APPENDIX A
PRELIMINARY TRAINING REQUIREMENTS FOR LOWER ECHELON C³ SYSTEMS

PLATOON LEADER/PLATOON TASKS

CATEGORY: Communications, Command and Control
(5-III-2-3)

PLATOON LEADER/PLATOON TASKS		PLATOON LEADER/PLATOON TASKS									
CATEGORY: Communications, Command and Control (5-III-2-3)		CATEGORY: Communications, Command and Control (5-III-2-3)									
		IVIS		IPIS		PMS/AL		PMS/AL		PMS/AL	
		Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty
TASK: Perform platoon leader's reconnaissance (5-III-2-3-1)		S		D	E		PA				*
SUBTASKS/STANDARDS:											
01. Analyze the Mission To Be Accomplished		s		d	e		pa				*
02. Determine the Area In Which the Unit Will Operate		s		d	e		pa				*
03. Perform a Map/Ground Reconnaissance to Determine the Following:		s		d	e		pa				*
a. Fields of fire and observation		s		d	pa						*
b. Cover and concealment		s		d	pa		pa				*
c. Obstacles		s		d	e		pa				*
d. Key terrain		s		d	e		pa				*
e. Selection of terrain features for orientation (check points)		s		d	e		pa				*
f. Overwatch positions		s		d	e		pa				*
g. Consolidation/reorganization locations		s		d	e		pa				*
h. Avenues of approach		s		d	e		pa				*
i. Axis of advance		s		d	e		pa				*
j. Weather conditions		s		s			pa				*

LOWER Echelon Automated Command and Control Systems

PLATOON LEADER/PLATOON TASKS	IVIS		IMS		IMS/AI		CONFIGURATION	
	Omniomality	Difficulty	Omniomality	Difficulty	Omniomality	Difficulty	Stand Alone	Network

CATEGORY: Communications, Command and Control
(5-III-2-3)

TASK: Perform platoon leader's reconnaissance
(5-III-2-3-1) (Continued)

k. Specific fighting positions	s		d	e	d	pa	*	*
l. Covered and concealed routes	s		d	pa	d	pa	*	*
m. Target reference points (TRP)/ indirect fire targets	s		d	e	d	pa	*	*
n. Engagement areas	s		d	e		a	*	*
o. Trafficability	s		d	pa		a	*	*

SUPPORTING TASKS:

SL 1

Estimate Range
Identify Terrain Features (Natural and
Man-made) on a Map
Determine Grid Coordinates of a Point on a
Military Map Using Military Grid Reference
System.
Determine Magnetic Azimuth
Determine Direction

SL 3

Identify Adjoining Map Sheets
Determine Azimuths and Compute Back Azimuths
Locate an Unknown Point on a Map
Locate your Position on a Map or on the Ground
Determine a Location on the Ground by Terrain
Association

	s			a		a	*	*
	s			a		a	*	*
	d	e		a		a	*	*
	s			a		a	*	*
	d	pa		a		a	*	*
	s			a		a	*	*
	d	pa		a		a	*	*

LOWER ECHELON AUTOMATED COMMAND AND CONTROL SYSTEMS

PLATOON LEADER/PLATOON TASKS										
	IVIS		IWS		IWS/AI		CONFIGURATION			
	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Stand Alone	Network		
CATEGORY: Communications, Command and Control (5-III-2-3)										
TASK: Perform platoon leader's reconnaissance (5-III-2-3-1) (Continued)	S	E	D	E	D	PA	*			
Navigate From One Point on the Ground to Another Point	d	pa	d	pa	d	pa	*			
Orient a Map to the Ground by Terrain Association	d	e	d	pa		a	*			
SL 4 Select a Movement Route Using a Map	s		d	pa		a	*			

LOWER Echelon Automated Command and Control Systems

PLATOON LEADER/PLATOON TASKS	IVIS		IWS		IWS/AL		CONFIGURATION	
	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Stand Alone	Network

CATEGORY: Communications, Command and Control

(5-III-2-3)

TASK: Provide command and control of a platoon
(5-III-2-3-2)

SUBTASKS/STANDARDS:

01. Communicate the Mission and Concept of Operations to Subordinate Leaders by FRACO or OFORD (platoon leader)

02. Inform All Personnel of the Platoon Mission

SUPPORTING TASKS:

SL 1 Communicate Using Visual Signaling Techniques
Send a Radio Message

SL 3 Establish, Enter, or Leave a Radio Net
Analyze Terrain Using the Five Military Aspects of Terrain

MQS II Prepare a Situation Report (SITREP)

	D	E	D	PA	D	PA	*	
	d	pa	d	pa		a	*	
	d	pa	d	pa		a	*	
	s	h?	s	pa	s	pa	*	
	d	e	d	pa	d	pa	*	
	s		d	pa		a	*	
	d	h?	d	pa		a	*	

LOWER Echelon Automated Command and Control Systems

	IVIS		IWS		IWS/AI		CONFIGURATION	
	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Stand Alone	Network

PLATOON LEADER/PLATOON TASKS

CATEGORY: Communications, Command and Control
(5-III-2-3)

TASK: Perform tactical planning (5-III-2-3-3)
(5-III-2-3-1)

SUBTASKS/STANDARDS:

01. Determine the Platoon's Mission
02. Develop Course of Action for the Platoon Based on the Company Plan, and the Factors of METT-T
03. Select the Best Course of Action for Mission Accomplishment Based on Advantages and Disadvantages
04. Prepare Warning Order, FRAGO, and OPORD

SUPPORTING TASKS:

SL 1 Determine Grid Coordinates of a Point on a Military Map Using Reference System

SL 4 Select a Movement Route Using a Map Use a Map Overlay Prepare a Platoon/Element's Fires in the Defense

MS II Plan/Conduct a Screening Mission Prepare a Platoon Defensive Fire Plan Formulate a Platoon Attack Plan

S	D	PA	D	PA	PA	*
d	d	pa	d	pa	pa	*
s	d	pa		a		*
s	d	pa		a		*
d	d	pa		a		*
d	e					
d	e	a		a		*
s	d	pa		a		*
d	d	pa		a		*
s	d	pa		a		*
d	e	pa		a		*
s	d	pa		a		*
d	e	pa		a		*
s	d	pa		a		*

LOWER ECHELON AUTOMATED COMMAND AND CONTROL SYSTEMS

PLATOON LEADER/PLATOON TASKS	IVIS						IWS/AL						CONFIGURATION	
	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Stand Alone	Network
CATEGORY: Communications, Command and Control (5-III-2-3)														
TASK: Perform contact point activities (5-III-2-3-5)	D	PA	D	PA										*
SUBTASKS/STANDARDS:														
01. Navigate to Contact Point														
a. Establish contact point on an identifiable location on the terrain	d	pa	d	e					d	e				*
b. Arrive at contact point in sufficient time to effect the minimum coordination	s		d	e					d	pa				*
c. Use prearranged recognition signals for both daylight and night based on the CEOI and/or unit SOP prior to the exchange of any information	d	e	d	pa					d	pa				*
02. Secure Contact Point with Available Security Forces	s													*
03. Communicate to Other Contact Party. The specific information is determined by the mission. For example, a passage of lines would include:	d	pa	d	pa										*
a. Designation of unit(s) to pass	d	pa	d	pa										*
b. Mission of units and tentative battle plans	d	pa	d	pa										*
c. OPFOR situation	d	pa	d	pa										*

LOWER FIELDION AUTOMATED COMMAND AND CONTROL SYSTEMS

PLATOON LEADER/PLATOON TASKS	IVIS				IAMS				IAMS/AI				CONFIGURATION	
	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Stand Alone	Network
CATEGORY: Communications, Command and Control (5-III-2-3)														
TASK: Perform contact point activities (5-III-2-3-5) (Continued)														
d. Friendly locations - for day and night	D	PA	D	PA					A				*	
e. Contact and coordination points	d	pa	d	pa					a				*	
f. OPs and patrol routes	d	pa	d	pa					a				*	
g. Passage points and lanes	d	pa	d	pa					a				*	
h. Obstacle locations and types	d	pa	d	pa					a				*	
i. Assembly areas	d	pa	d	pa					a				*	
j. CS and CSS locations for emergency support	d	pa	d	pa					a				*	
k. Routes	d	pa	d	pa					a				*	
l. Traffic control points	d	pa	d	pa					a				*	
m. Recognition signals	d	pa	d	pa					a				*	
n. CDDI information	d	pa	d	pa					a				*	
o. Contamination	d	pa	d	pa					a				*	
p. Type and number of vehicles to pass	d	pa	d	pa					a				*	
q. Delineation of responsibilities of passing and static unit	d	pa	d	pa					a				*	

LOWER EQUIPMENT AUTOMATED COMMAND AND CONTROL SYSTEMS

PLATOON LEADER/PLATOON TASKS	IVIS				IWS				IWS/AI				CONFIGURATION	
	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Stand Alone	Network

PLATOON LEADER/PLATOON TASKS

CATEGORY: Communications, Command and Control
(5-III-2-3)

TASK: Perform contact point activities
(5-III-2-3-5) (Continued)

*

04. Navigate through the Appropriate Passage
Lane, if applicable

A

*

SUPPORTING TASKS:

SL 1

Use Challenge and Password
Identify Friendly and Threat (OPFOR)
Armored Vehicles

d

pn

pn

d

pn

s

s

s

s

s

d

pa

*

LOWER Echelon Automated Command and Control Systems

PLATOON LEADER/PLATOON TASKS	IVIS				IWS				IWS/AI				CONFIGURATION			
	Continuity	Difficulty	Continuity	Difficulty	Continuity	Difficulty	Continuity	Difficulty	Continuity	Difficulty	Continuity	Difficulty	Stand Alone	Network	Stand Alone	Network
CATEGORY: Communications, Command and Control (5-III-2-3)																
TASK: CONDUCT rehearsals for current mission (5-III-2-3-6)	D	E	D	PA	D	PA	D	PA	D	PA					*	
SUBTASKS/STANDARDS																
01. Conduct Rehearsals Which Do Not Interfere with Subordinate Unit Troop-Leading Procedures and/or Preparations for the Actual Mission	d	e	d	pa	d	pa	d	pa	d	pa					*	
02. Complete the Rehearsal per the Time Schedule	s		d	e	d		d		d	pa					*	
03. Identify and Correct Mistakes during the Rehearsal	s		d	e	d		d		d	pa					*	
SUPPORTING TASKS:																
SL 3 Prepare to Conduct Training	d	e	d	pa	d	pa	d	pa	d	pa					*	
Conduct Training	d	e	d	pa	d	pa	d	pa	d	pa					*	
Evaluation the Conduct of Training	s		d	e	d		d		d	pa					*	
Provide Input Concerning the Status of Training	s		d	e	d		d		d	pa					*	

LOWER ECHELON AUTOMATED COMMAND AND CONTROL SYSTEMS

PLATOON LEADER/PLATOON TASKS CATEGORY: Defensive Operations (5-III-2-4)	IVIS				IWS/AL				CONFIGURATION	
	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Stand Alone	Network

TASK: OCCUPY a battle position (5-III-2-4-4)
(5-III-2-3-5)

SUBTASKS/STANDARDS:

01. Perform Tactical Planning, Map/Ground

- Reconnoiter the terrain in 30 minutes or less per BP
- Select BPs based on a thorough analysis of likely OPROR avenues of approach, and the ability of the BP to offer line-of-sight engagements on an OPROR moving on a given avenue of approach (MEIT-T)
- Within the limitations of the terrain, the BP should:
 - Enable the platoon to deliver *effective fires* (especially flanking fires at optimal ranges) in accordance with the associated fire control technique (TRP, engagement area, etc.)
 - Provide cover, (especially hull-down or reverse slope positions) concealment, and long-range observation

LOWER FOREIGN AUTOMATED COMMAND AND CONTROL SYSTEMS

PLATOON LEADER/PLATOON TASKS	IVIS							
	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Stand Alone	Configuration
CATEGORY: Defensive Operations (5-III-2-4)								
TASK: OCCUPY a battle position (5-III-2-4-4) (5-III-2-3-5) (Continued)	D	E	D	PA	D	PA		*
(3) Not be an obvious target for direct- or indirect-fire suppression	S		d	pa	d	pa	*	
(4) Have adequate concealed routes in and out	S		d	pa	d	pa	*	
(5) Be large enough for the force assigned	S		d	e	d	pa	*	
d. Select BPs in depth	S		d	pa	d	pa	*	
e. Select graphic control measures that:								
(1) Are located on or in proximity to a likely QP/R avenue of approach	S		d	pa		a	*	
(2) Permit targets on them to be engaged and hit by at least one of the weapon systems whose fires it is designed to engage	S		d	pa		a	*	
(3) Enhance a concentration of direct-fire weapon systems	S		d	pa		a	*	
(4) Are planned in association with obstacles (natural, manmade, or planned) that will enhance weapons effects (i.e., increase flank engagements, deny cover, etc.)	S		d	e	d	pa	*	

PLATOON LEADER/PLATOON TASKS CATEGORY: Defensive Operations (5-III-2-4)	IVIS				IPCS				IWS/AL				CONFIGURATION	
	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Stand Alone	Network		
TASK: OCCUPY a battle position (5-III-2-4-4) (5-III-2-3-5) (Continued)	D	E	D	PA	D	PA					PA		*	
(5) Are marked by readily identifiable terrain features on the map	S		d	e	d	e					e		*	
(6) Provide sufficient control measures to enable the platoon leader to control the battle, without saturating the map	d	e	d	pn	d	pn					pn		*	
02. Issue a Five-Paragraph OPORD that covers, at a minimum:	d	e	d	pa	d	pa					pn		*	
a. Sequence and passage of covering force or other units, as appropriate. Passage lane, contact point, and recognition signals should be included	d	e	d	pn	d	pn					pn		*	
b. Priority of direct-fire engagements	d	e	d	e	d	e					pa		*	
c. Degree of control imposed on next lower echelon	d	e	d	pn	d	pn					pn		*	
d. Graphic portrayal of anticipated engagement initiation (engagement areas, etc.)	d	pn	d	pa	d	pa					pa		*	
e. Required rate of OPFOR destruction by phase for successful mission accomplishment	d	e	d	e	d	e					pn		*	
f. Disengagement scheme	d	e	d	e	d	e					pn		*	

LOWER ECHELON AUTOMATED COMMAND AND CONTROL SYSTEMS

PLATOON LEADER/PLATOON TASKS		IVIS		IRIS		IRIS/AL		CONFIGURATION	
		Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Stand Alone	Network
CATEGORY: Defensive Operations (5-III-2-4)									
TASK: OCCUPY a battle position (5-III-2-4-4) (5-III-2-3-5) (Continued)									
g. Location type, and NLT constitution time of prestocks		d	e	d	pa	D	D	PA	*
h. Movement and BP occupation plan		d	e	d	e	d	d	pa	*
03. Do Not Exceed the 1/3 Rule when Planning for the Operation		s		d	e	d	d	pa	*
04. Submit an Initial Fire Plan to Company Commander within 30 Minutes		d	pa	d	pa			a	*
05. Conduct Movement to the BP IAW Movement and BP Occupation Plans and Prescribed Times		d	pa	d	pa	d	d	pa	*
06. Occupy the BP		s		d	pa	d	d	pa	*
a. Elements approach from the rear of the BP		s		d	e	d	d	pa	*
b. If OPs have not been previously established, they are immediately established		s		d	pa	d	d	pa	*
c. TCs submit sketch range cards to platoon leaders that incorporate sectors and TRPs designated by the platoon leader, within 20 minutes of occupation		d	pa	d	pa			a	*
07. Prepare Tank Fighting Positions:		s		s					

LOWER EQUIPMENT AUTOMATED COMMAND AND CONTROL SYSTEMS

PLATOON LEADER/PLATOON TASKS	IVIS		IPS		PVS/AL		CONFIGURATION	
	Omniability	Difficulty	Omniability	Difficulty	Omniability	Difficulty	Standalone	Network
CATEGORY: Defensive Operations (5-III-2-4)								
TASK: OCCUPY a battle position (5-III-2-4-4) (5-III-2-3-5) (Continued)	D	E	D	PA	D	PA		*
a. Camouflage "primary" fighting position, clear fields of fire, and reconnoiter route to hide position within 30 minutes	S		S					
b. Reconnoiter "alternate" and "supplementary" fighting positions including routes from primary within 60 minutes	S		d	pn	d	pn	*	
c. On the platoon's subsequent BP, mark a primary fighting position and reconnoiter routes to same within 2 hours	S		d	pn	d	pn	*	
08. Establish Chemical Agent Alarm Systems through the Platoon within 90 Minutes	S		S					
09. Establish Hot Loops and Wire or Radio Communications to OPs (platoons/sections)	S		S					
10. Coordinate with Adjacent Tanks and Platoons:								
a. Overlapping direct- and indirect-fire	d	pa	d	pa		a	*	
b. Overlapping observation/security plans (OPs, patrols, etc.)	d	pa	d	pa		a	*	
c. Obstacle emplacement	d	pa	d	pa		a	*	
d. Location of flank elements	d	pa	d	pa		a	*	

LOWER Echelon Automated Command and Control Systems

PLATOON LEADER/PLATOON TASKS	IVIS				IPS				IPS/AL				CONFIGURATION	
	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Stand Alone	Network
CATEGORY: Defensive Operations (5-III-2-4)														
TASK: OCCUPY a battle position (5-III-2-4-4) (5-III-2-3-5) (Continued)	D	E	D	PA	D	PA	D	PA					*	
e. Routes out of RP	d	pn	d	pa	d	pa	d	a					*	
11. Reconnoiter Subsequent RPs, to include routes to and from battle positions	s		d	pn	d	pn	d	pn				*		
12. Complete Rehearsals and Necessary Preparations and Markings of RPs	d	e	d	e	d	e	d	e				*		
13. Emplace Local Obstacles that Support the Platoon Battle Positions	s		s		s		s							
14. Perform Immediate Emplacement of Reinforcing Obstacles upon Effective Attachment of Assets	s		s		s		s							
15. Perform Minor RP Adjustment	d	e	d	pa	d	pa	d	pn				*		
Adjustment is reported graphically IAW fire plan submitted to higher headquarters	d	pn	d	pa	d	pa	d	a				*		
16. Execute Maintenance, Resupply, and Rest Plans as the situation permits	d	e	d	pa	d	pa	d	pa				*		
17. Prepare to Conduct One of the following Actions:	d	e	d	pn	d	pn	d	pn				*		
a. Deliver effective fires on targets IAW the designated fire control technique (TRP, engagement area, etc.) indicated on respective execution matrices	d	e	d	pn	d	pn	d	pn				*		

LOWER FOULON AUTOMATED COMMAND AND CONTROL SYSTEMS

PLATOON LEADER/PLATOON TASKS	IVIS				RMS				RMS/AT				CONFIGURATION	
	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Stand Alone	Network
CARRY: Defensive Operations (5-III-2-4)														
TASK: OCCUPY a battle position (5-III-2-4-4)	D	E	D	PA	D	PA	D	PA						*
(5-III-2-3-5) (continued)														
b. Conduct long-range observation from covered and concealed positions	S		S											
c. Move within the BP on concealed routes so as to avoid detection	S		d	pa	d	pa	d	pa						*
d. Identify positively terrain features associated with graphic control measures, under all visibility conditions	d	e	d	pa	d	pa	d	pa						*
SUPPORTING TASKS:														
SL 1 Camouflage Equipment														
Camouflage your Defensive Position	S		S											
Practice Noise, Light, and Litter Discipline	S		S											
Select Temporary Fighting Positions	S		d	pa	d	pa	d	pa						*
SL 2 Emplace and Recover Field Expedient Warning Devices														
Supervise/Evaluate Construction of a Fighting Position	S		S											
SL 3 Supervise Preparation of a Squad-Size Element's Defense Position														
Establish an Observation Post	S		S											*

HEATER FORBORN AUTOMATED COMMAND AND CONTROL SYSTEMS

PLATOON LEADER/PLATOON TASKS	IVIS				IWS				IWS/AI				CONFIGURATION	
	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Stand Alone	Network
CATEGORY: Defensive Operations (5-III-2-4)														
TASK: OCCUPY a battle position (5-III-2-4-4) (5-III-2-3-5) (Continued)	D	E	D	PA	D	PA	D	PA						*
SL 4														
Coordinate with Adjacent Platoon-Size Elements	d	pa	d	pa	d	pa	d	pa						*
Prepare a Platoon/Element Sector Sketch	d	pa	d	pa	d	pa	d	pa					*	
NQS 1														
Supervise Construction of Vehicle Fighting Positions	s		s		s		s							
Coordinate with Adjacent Platoon	d	pa	d	pa	d	pa	d	pa						*
Employ and Activate Platoon Early Warning System (PEWS)	s		s		s		s							
Supervise: Employ Pyrotechnic Early Warning Devices	s		s		s		s							
Supervise: Emplace and Recover Field Expedient Warning Devices	s		s		s		s							

LOWER ECHELON AUTOMATED COMMAND AND CONTROL SYSTEMS

	IVIS		IWS		IWS/AI		CONFIGURATION	
	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Stand Alone	Network

PLATOON LEADER/PLATOON TASKS

CATEGORY: Force Movement (5-III-2-5)

TASK: EXROUTE actions at a halt (5-III-2-5-1)

SUBTASKS/STANDARDS:

01. Perform Scheduled Halt Actions
 - a. Clear the route for continuing traffic
 - b. Conduct platoon coil or herringbone drill
 - c. Establish local security
 - d. Perform the actions planned for in the OPORD/movement order
 - e. Perform during-operations maintenance on all vehicles during the absence of planned actions
 - f. Move out as a unit at the prescribed time.
02. Perform Unscheduled Halt Actions
 - a. Clear the route for continuing traffic by initially assuming a herringbone formation
 - b. Establish 360° security immediately upon herringbone formation
 - c. Establish the cause of the halt; if OPFOR contact, the leader directs actions on contact

D	E	D	E	D	PA	*
d	e	d	e	d	pa	*
d	e	d	e	d	pa	*
d	e	d	e	d	pa	*
s		s		s		
d	e	d	e	d	pa	*
s		s		s		
s		s		s	pa	*
d	e	d	e	d	pa	*
d	e	d	e	d	pa	*
s		s		s	pa	*
d	e	d	e	d	pa	*

LOWER ECHELON AUTOMATED COMMAND AND CONTROL SYSTEMS

PLATOON LEADER/PLATOON TASKS	IVIS				IWS/AI				CONFIGURATION	
	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Stand Alone	Network

CATEGORY: Force Movement (5-III-2-5)

TASK: EXECUTE actions at a halt (5-III-2-5-1)
(Continued)

d. Submit status report to higher headquarters once the cause is determined and course of action is decided

e. Perform actions to overcome the impediment to movement:

(1) Proceed on original march plan with adjusted times

(2) Stop to consolidate and reorganize

(3) Revert to actions taken during a scheduled halt

03. Move Out as a Unit at the Designated Time or on Order

SUPPORTING TASKS:

SL 1

Collect/Report Information
Camouflage Your Defensive Position
Select Temporary Fighting Positions

D	E	D	E	D	D	PA	*
d	h?	d	pa	d	pa	pa	*
d	e	d	pa	d	pa	pa	*
d	e	d	pa	d	pa	pa	*
d	e	d	pa	d	pa	pa	*
d	e	d	e	d	pa	pa	*
d	e	d	pa	d	pa	pa	*
d	pa	d	pa	d	pa	pa	*
d	s	s	s	s	s	s	s

LOWER EQUIPMENT AUTOWARDED OFFROAD AND CONTROL SYSTEMS

PLATOON LEADER/PLATOON TASKS	IVIS						INS/AL						CONFIGURATION	
	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Stand Alone	Network
CATEGORY: Force Movement (5-III-2-5)														
TASK: PERFORM a tactical road march (5-III-2-5-6) (Continued)	D	E	D	PA	D	PA								*
SUBTASKS/STANDARDS:														
01. Report Passage of Critical Points:	d	e	d	pa	d	a							*	
a. Starting point	d	e	d	pa		a							*	
b. Checkpoint	d	e	d	pa		a							*	
c. Release point	d	e	d	pa		a							*	
02. Perform Movement within Time Specified in OFFORD without Exceeding the Catch-Up Speed	d	e	d	pa		pa							*	
03. Maintain Intervehicular Distances (as specified in the march order, within +25 meters.)	s		d	e	d	e							*	
04. Move on the Route of March except	d	pa	d	pa	d	pa							*	
a. To react to OFFORD contact	s		s		s	pa							*	
b. To bypass obstacles	s		s		s	pa							*	
05. Orient Crew Weapon System to Provide 360° Security Overlap	s		s		s	pa							*	

LOWER ECHELON AUTOMATED COMMAND AND CONTROL SYSTEMS

PLATOON LEADER/PLATOON TASKS	IVIS				IWS				IWS/AI				CONFIGURATION	
	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Stand Alone	Network
CATEGORY: Force Movement (5-III-2-5)														
TASK: PERFORM a tactical road march (5-III-2-5-6) (Continued)	D	E	D	PA	D	PA	D	PA					*	
06. Maintain Air Guards to Scan for Aircraft throughout the Movement	S		S			pa							*	
07. Perform a Linkup with the Quartering Party/Contact Point Elements without Causing a Movement Stoppage of the Remainder of the Column	d	e	d	e	d	pa							*	
08. Execute Actions at Halts (LAW 5-III-2-5-1)														
09. Meet Enemy Contact with the Immediate Execution of Action Drills by Both the Element Under Fire and by Those Close Elements with Freedom to Maneuver	d	e	d	e	d	pa							*	
SUPPORTING TASKS:														
SL 1 Camouflage Equipment	S		S											
SL 3 Determine A Location on the Ground by Terrain Association	d	e	d	pa	d	pa							*	
Navigate From One Point on the Ground to Another Point	d	pa	d	pa	d	pa							*	
Orient a Map to the Ground by Terrain Association	d	pa	d	pa	d	pa							*	
SL 4 Prepare a Platoon/Element Sector Sketch	d	pa	d	pa	d	pa							*	

LOWER Echelon Automated Command and Control Systems

PLATOON LEADER/PLATOON TASKS	IVIS		IWS		IWS/AI		CONFIGURATION	
	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Stand Alone	Network

CATEGORY: Force Movement (5-III-2-5)

TASK: EXECUTE traveling (5-III-2-5-2)

SUBTASKS/STANDARDS:

01. Maintain Orientation along the Designated Route or Axis Using Column, Line, or Wedge formation

a. Move continuously

b. Maintain interval and dispersion between vehicles as terrain and weather permit

c. The platoon leader initiates movement with visual/radio signal for column, wedge, or line formation

d. The platoon leader chooses a route which uses all natural cover and concealment

e. Individual vehicles use terrain-driving techniques to reduce exposure

f. Vehicles maintain orientation using wingman concept

02. Maintain Visual Contact between the Sections for the Duration of the Movement

03. Establish Positions for Vehicles:

a. The platoon leader positions himself in a position that optimizes his control

D	E	D	PA	D	PA	*
d	pa	d	pa	d	pa	*
d	e	d	pa	d	pa	*
s		d	e	d	e	*
d	pa	d	pa	d	pa	*
s		d	pa		a	*
s		d	pa	d	pa	*
s		s		d	pa	*
s		s		s		
d	e	d	e	d	pa	*
d	e	d	e	d	pa	*

LOWER Echelon Automated Command and Control Systems

PLATOON LEADER/PLATOON TASKS	IVIS		IWS		IWS/AI		CONFIGURATION	
	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Stand Alone	Network

CATEGORY: Force Movement (5-III-2-5)

TASK: EXROUTE traveling (5-III-2-5-2)
(Continued)

- b. The platoon leader assigns areas of responsibility for observation and fire to ensure 360° platoon security according to unit SOP
- c. The platoon leader insures 360° security for the platoon
- d. The tank commander maintains 360° Security for Each Vehicle

SUPPORTING TASKS:

SL 1

Send a Radio Message
Identify Friendly and Threat (OPFOR)
Armored Vehicles

D	E	D	PA	D	PA		*
d	e	d	e	d	pa		*
d	e	d	e	d	pa		*
d	e	d	e	d	pa		*
d	h?	d	pa	d	pa		*
s		s		d	pa		*

LOWR EQUIPION AUTOMATED COMMAND AND CONTROL SYSTEMS

PLATON LEADER/PLATON TASKS	IVIS		IWS		IWS/AL		CONFIGURATION	
	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Stand Alone	Network

CATEGORY: NUC (5-III-2-9)

TASK: PERFORM a nuclear contaminated area crossing (5-III-2-9-11)

SUBTASKS/STANDARDS:

01. Prepare for Crossing

a. Place externally stored equipment inside or cover it with available material

b. Direct individuals who may be exposed to radioactive dust particles to wear protective masks or cover their noses and mouths with handkerchiefs or clean rags.

c. Establish operational exposure guidance (OEG), ensure all leaders and radiac equipment operators know it

d. Ensure all drivers, vehicle commander and leaders know route of march or have strip maps

e. Check radiac instrument

f. Place radiac instruments into operation

02. Cross the Area

a. Avoid stirring up dust, keep out of dust cloud and avoid low ground, overhanging branches and heavy brush to the extent possible

	D	E	D	PA	D	PA	*	*
	s		d	e	d	pa	*	*
	s		s					
	d	e	d	e	d	pa	*	*
	s		d	e	d	pa	*	*
	d	pa	d	pa	d	a	*	*
	s		s		d	pa	*	*
	s		s		s			
	d	pa	d	pa	d	pa	*	*
	d	e	d	e	d	e	*	*

LOWER ECHELON AUTOMATED COMMAND AND CONTROL SYSTEMS

PLATOON LEADER/PLATOON TASKS	IVIS				IWS				IWS/AL				CONFIGURATION	
	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Stand Alone	Network

CATEGORY: NBC (5-III-2-9)

TASK: PERFORM a nuclear contaminated area crossing (5-III-2-9-11) (Continued)

- b. Conduct movement buttoned up if consistent with the tactical situation
 - c. Conduct radiological monitoring and keep PL informed of contamination level (NBC personnel)
 - d. Record dose rate received passing through the area (NBC personnel)
 - e. Move with vehicles buttoned up and in overpressurized mode (if applicable)
03. Exit Contaminated Area
- a. Discard expendable items that have been contaminated
 - b. Perform decontamination, if mission permits
 - c. Evacuate casualties IAW unit SOP
 - d. Submit NBC report to the company/team commander (platoon leader)

SUPPORTING TASKS:

SL 1
Send a Radio Message

LOWER ECHELON AUTOMATED COMMAND AND CONTROL SYSTEMS

PLATOON LEADER/PLATOON TASKS CATEGORY: NBC (5-III-2-9)	IVIS				IMS/AI				CONFIGURATION	
	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Stand Alone	Network
TASK: PERFORM a nuclear contaminated area crossing (5-III-2-9-11) (Continued)	D	E	D	PA	D	PA				*
SL 3 Use an IM-174-Series Radiometer	s		s		s					*
Direct the Crossing of a Contaminated Area	d	pa	d	pa	d	pa			pa	*
Use an AN/PDR-27 Radiac Set	d	pa	d	pa	d	pa			pa	*
Prepare and Submit NEO-4 Report	d	h?	d	pa	d	pa			pa	*
Supervise Radiation Monitoring	s		s		s				pa	*
Select a Movement Route Using a Map	s		d	e	d				a	*

LOW-PR EDITION AUTOMATED COMMAND AND CONTROL SYSTEMS

CATEGORY: Offensive Operations (5-111-2-10)

TASK: EXECUTE a hasty attack (5-III-2-10-2)

SUBTASKS/STANDARDS:

01. React to OPFOR Presence without
Hesitation and Send Spot Report
02. Initiate Fire and Movement to Destroy
the OPFOR Before Being Fixed by the
OPFOR
03. Conduct the Assault
 - a. Ensure that maneuver elements are
overwatched
 - b. Use suppressive direct and indirect
fire against the OPFOR
 - c. Attack the OPFOR at his weakest point,
i.e., flanks, and ensure sufficient
combat power to defeat the OPFOR in
detail
04. Continue the Original Mission Having
Eliminated the OPFOR Threat

SUPPORTING TASKS:

SL 1 Collect/Report Information

II SOI

11 Prepare a Situation Report (SITREP)
Conduct a Hasty Attack

IVIS		INS		INS/Al		CONFIGURATION	
Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Stand Alone	Network
D	E	D	PA	D	PA	*	
d	h?	d	pa	d	pa	*	
d	pa	d	pa	d	pa	*	
d	e	d	pa	d	pa	*	
d	e	d	pa	d	pa	*	
d	pa	d	pa	d	pa	*	
d	e	d	pa	d	pa	*	
d	h?	d	pa	d	pa	*	
d	pa	d	pa	d	pa	*	

PLATOON LEADER/PLATOON TASKS

	COMPARISON OF DIFFICULTY				CONCLUSION	
	IWS		IWS/AI		ORIENTATION	
Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Network
						Stand Alone
						Network

CATEGORY: Offensive Operations (5-III-2-10-5)

TASK: FERFORM assault force activities
(5-III-2-10-5)

SUBTASKS/STANDARDS:

01. Assault the Objective in such a manner as to seize the objective and defeat the OPFOR in detail or force **hls withdrawal**

02. Move along the Best Covered and Concealed Routes to Specific Points

a. Use terrain to avoid OPFOR fire

b. Use appropriate measure to control fire and movement

c. Maintain radio contact with supporting force to keep up a responsive fire support

03. Move as Close to Supporting Fire as Possible

SUPPORTING TASKS:

SL 2 _____ Collect/Report Information
Move Under Direct Fire
React to Indirect Fire

SL 2 Prepare/Submit Standard Shelling, Mortaring, and Bombing

PLATOON LEADER/PLATOON TASKS	LOWER Echelon AUTOMATED COMMAND AND CONTROL SYSTEMS									
	IVIS			IWS			IWS/AI			CONFIGURATION
	Commonality	Difficulty	Commonality	Commonality	Difficulty	Commonality	Commonality	Difficulty	Stand Alone	

CATEGORY: Offensive Operations (5-III-2-10-5)

TASK: PERFORM assault force activities
(5-III-2-10-5) (Continued)

SL 3

Coordinate with Adjacent Platoon-Size Elements

D	E	D	PA	D	PA					*
d	pa	d	pa	a						*

IVIS		PMS		PMS/AI		CORRELATION	
Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Stand Alone	Network

PLATOON LEADER/PLATOON TASKS

CATEGORY: Offensive Operations (5-III-2-10-5)

TASK: ASSAULT an OPFOR position (5-II-2-10-3)

SUBTASKS/STANDARDS:

01. Select the Scheme of Maneuver that Best Suits the Terrain, OPFOR Situation, and Friendly Capabilities (platoon leader)
02. Maneuver through Defensive Fire Making Maximum Use of:
 - a. Available cover and concealment
 - b. Indirect fires
 - c. Smoke
 - d. Well-placed direct fire
03. Maintain Concentration of Available Force at the Decisive Time and Point in the OPFOR's Defense
04. Breach the Defensive Position with Minimum Losses to Friendly Forces
05. Defeat the OPFOR in Detail on the Objective or Force His Withdrawal
06. Report Platoon's Actions to Higher Headquarters (platoon leader)

LOWER PCELEON AUTOMATED COMMAND AND CONTROL SYSTEMS									
PLATOON LEADER/PLATOON TASKS		IVIS		IWS		IWS/AI		CONFIGURATION	
Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Stand Alone	Network

CATEGORY: Offensive Operations (5-III-2-10-5)

TASK: ASSAULT an OPPOR position (5-III-2-10-3)
(Continued)

SUPPORTING TASKS:

SL 1

Send a Radio Message
Collect/Report Information
Select Temporary Fighting Positions

D	E	D	PA	D	PA				*
d	h?	d	pa	d	pa				*
d	pa	d	pa	d	a				*
s		d	pa	d	a				*

SL 4

Prepare a Platoon/Element Sector Sketch

d	pa	d	a						*
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LOWER ECHELON AUTOMATED COMMAND AND CONTROL SYSTEMS

PLATOON LEADER/PLATOON TASKS	IVIS		I2S		IMS/AL		CONFIGURATION	
	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Stand Alone	Network

CATEGORY: Offensive Operations (5-III-2-10-5)

TASK: PERFORM consolidation activities
(5-III-2-10-8)

SUBTASKS/STANDARDS:

01. Assess the Situation and Regain Complete Control of All Elements as quickly as possible
02. Eliminate Any OPFOR Elements Remaining on the Objective
03. Establish Security with Observation Posts
04. Perform Reconnaissance to Improve Security
05. Prepare for Immediate and Future Missions
06. Position Tanks on Armor Avenues of Approach
07. Execute Preplanned Indirect Fire and Close Air Support in support of the Consolidation of the Objective
08. Report Location and Status to the Next Higher Headquarters (platoon leader)
09. Evacuate Casualties, PWs, and Damaged Equipment in accordance with the OPFOR/Unit SOP

D	E	D	PA	D	PA	*
d	pa	d	pa	d	pa	*
s		d	pa	d	pa	*
s		d	pa	d	pa	*
s		d	pa	d	pa	*
d	pa	d	pa	d	pa	*
s		d	pa	d	pa	*
d	pa	d	pa	d	pa	*
d		d	pa	d	pa	*
d	h?	d	pa	d	pa	*
d	pa	d	pa	d	pa	*

LOWER ECHELON AUTOMATED COMMAND AND CONTROL SYSTEMS

PLATOON LEADER/PLATOON TASKS	IVIS				PWS/AL				CONFIGURATION	
	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Commonality	Difficulty	Stand Alone	Network
CATEGORY: Offensive Operations (5-III-2-10-5)										
TASK: PERFORM consolidation activities (5-III-2-10-8) (Continued)	D	E	D	PA	D	PA				*
10. Redistribute Personnel, Supplies, Ammunition, and Equipment within the Platoon as Necessary to Continue the Mission	d	e	d	pa	d	pa				*
11. Update and Develop Fire Plans to Support a Continued Mission. When the objective is to be held for a lengthy period of time, this includes final protective fires (FPF)	d	pa	d	pa		a			*	
12. Execute Chemical Detection Procedures	s		s			s				
13. Continue to Develop the Position, Camouflage Equipment, Monitor Survey Terms, Initiate Sleep Plans, and Prepare and Submit Routine Reports	d	pa	d	pa	d	pa			*	
SUPPORTING TASKS:										
SL 1 Send a Radio Message	d	h?	d	pa	d	pa			*	
Use Challenge and Password	s		s		s					
Camouflage Equipment	s		s		s					
Camouflage Your Defensive Positions	s		s		s					
Collect/Report Information	d	pa	d	pa		a			*	
Evaluate a Casualty	s		s		s					
SL 3 Establish an Observation Post	s		d	e	d	pa			*	
Supervise Personnel Handling Ammunition	s		s		s				*	
HQS 11 Prepare a Situation Report (STINCP)	d	h?	d	pa		a			*	