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BATTALION COMMAND GROUP PERFORMANCE IN SIMULATED COMBAT

Herbert F. Barber and Ira T. Kaplan

ARI FIELD UNIT AT FORT LEAVENWORTH, KANSAS

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The behavior of 27 battalion command groups was studied in a simulated combat environment provided by a computer-driven battle simulator, the Combined Arms Tactical Training System (CATTS). Of the 61 subtasks described in the Command Group Module of the Army Training and Evaluation Program (ARTEP), 50 were evaluated in the CATTS exercises. Nineteen subtasks were identified as relatively weak on the basis of their comparatively low performance ratings, and 23 subtasks were found to be highly correlated with the overall effectiveness ratings. Fourteen subtasks were identified as critical because they

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were both low rated and highly correlated with overall effectiveness ratings. The critical subtasks included identifying, gathering, analyzing, and disseminating intelligence, planning fires, determining the critical place and time, communicating plans and orders, defeating electromagnetic intelligence, reacting to jamming, and concentrating combat power. These subtasks were related to more basic processes, identified in previous research as important determinants of organizational effectiveness, viz., sensing, decisionmaking, communicating, and coping with changes in the environment.

The critical performance identified in this report can be given particular emphasis in the development of command group training systems, training programs, and information-processing and decision-aiding technologies.

The report is written primarily for the research scientist working in command/control simulation, although military personnel will be interested in the conclusions.

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BATTALION COMMAND GROUP PERFORMANCE
IN SIMULATED COMBAT

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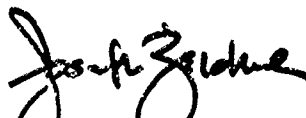Office, Deputy Chief of Staff for Personnel
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March 1979

The Fort Leavenworth Field Unit of the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) conducts research in support of the Combined Arms Center (CAC) at Fort Leavenworth, Kans. The CAC includes the Combined Arms Training Development Activity (CATRADA), the Combined Arms Combat Development Activity (CACDA), and the Command and General Staff College (CGSC).

Two major advances in command and control training being developed by CATRADA are the command group module of the Army Training and Evaluation Program (ARTEP) and the Combined Arms Tactical Training Simulator (CATTS). The ARTEP module describes the command group tasks (and subtasks) that are considered essential to mission accomplishment. CATTS provide training battalion command groups with a simulated battlefield environment that is more realistic than a command post exercise but is less demanding of resources than a field training exercise.

This report describes an application of the ARTEP module to the measurement of command group performance in CATTS: The research identified the ARTEP subtasks that were performed least well and those most highly correlated with overall measures of effectiveness. The results, as discussed, will help refine the command group module of the ARTEP and further develop command and control training systems.

LTC Richard C. Dickson and the staff of the Operations and Validation Division of the Training Devices and Simulations Directorate of CATRADA helped adapt the battalion command group module to CATTS and provided the performance ratings on which this report is based.

JOSEPH ZEIDNER
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BATTALION COMMAND GROUP PERFORMANCE IN SIMULATED COMBAT

BRIEF

Requirement:

To measure and analyze the critical aspects of command and control performance of battalion command groups in simulated combat, by adapting the command group module of the Army Training and Evaluation Program (ARTEP) to a computer-driven battle simulation, the Combined Arms Tactical Training Simulator (CATTS).

Procedure:

Data were collected from 27 battalion command groups that participated in a simulated defense or covering force operation and in an attack. The performance of the command groups on the ARTEP subtasks was evaluated by eight observers, seven of whom were also controllers in the exercise. Each evaluator observed certain subtasks, rated the command group's performance on those subtasks, and recorded specific deficiencies. The evaluators also rated the overall effectiveness of individual group members and of the command group as a whole.

Findings:

The command group module of ARTEP was successfully adapted to CATTS simulation as an alternative training and evaluation method to the conventional command post exercise (CPX) and field training exercise (FTX). Of the 61 subtasks in the Battalion Command Group ARTEP, 50 were evaluated in the CATTS exercises. Performance was rated as relatively weak in 19 subtasks; 23 subtasks were highly correlated with ratings of overall effectiveness. Fourteen subtasks were identified as critical problem areas because they were rated as less satisfactorily performed but were among the subtasks highly correlated with overall effectiveness. Critical subtasks were primarily concerned with intelligence, communications, planning, and concentrating power at the right time and place. The critical subtasks are also related to basic processes in organizational effectiveness, namely sensing, decisionmaking, communicating, and coping with changes in the environment.

Utilization of Findings:

The measurement techniques developed in this project are now being used to provide feedback to command groups trained in CATTS and to

investigate the training effectiveness of battle simulations. Subtask areas identified as critical problem areas can be emphasized in developing both command group training programs and information-processing and decision-aiding technology.

This report is written primarily for the research scientist interested in the development of command/control simulation, although military personnel will be interested in the results.

BATTALION COMMAND GROUP PERFORMANCE IN SIMULATED COMBAT

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BATTALION COMMAND GROUP PERFORMANCE IN SIMULATED COMBAT

INTRODUCTION

Background

Improvements in the mobility and firepower of weapon systems and in electronic warfare have increased both the capabilities and the problems of command. These technological advances have created a need for corresponding improvements in command and control training. The U.S. Army Combined Arms Training Development Activity (USACATRADA) is the proponent for the development of command and control training through the use of simulation technology and for the development of the Army Training and Evaluation Program (ARTEP) for senior-level command groups.

The ARTEP, a relatively new approach to unit training, has replaced the Army Training Test (ATT). To evaluate the complex and dynamic skills required in team performance, the ATT extrapolated techniques that had originally been developed to evaluate individual procedural tasks. Unfortunately, this extrapolation led to measurement procedures that were excessively detailed and subjective. The ARTEP attempts to remedy the weaknesses of the ATT by deemphasizing procedural details in favor of more comprehensive measures of final outcomes. In addition, the ARTEP focuses on identifying and correcting specific problems, whereas the earlier practice put every unit through a preplanned training sequence. The command group modules of the ARTEP are currently being developed in conjunction with the new battle simulations in which they will be implemented.

For many years, senior commanders and their staffs have been trained in the tactical command and control of their units primarily by means of the command post exercise (CPX) and the field training exercise (FTX). These training methods suffer from certain deficiencies. Specifically, the CPX has been criticized because it is relatively insensitive to player input. The CPX scenario is generally written before the play begins; it uses "canned" message inputs; and it follows a relatively predetermined course. Because casualty assessment is often arbitrary and unrealistic, the player group does not get realistic feedback about the consequences of their actions in terms of casualties. The FTX, on the other hand, is usually more realistic, but it is expensive to implement. In addition, the FTX does not necessarily provide valid battlefield outcomes as feedback to players.

In response to these deficiencies in the CPX and FTX, a new generation of battle simulations is being developed by USACATRADA. These battle simulations are free play, are responsive to the command group's actions, and provide realistic battlefield outcomes that show the command group the consequences of their actions.

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The current development of battle simulations and of the command group ARTEP has increased the need to explore the capabilities and requirements of command and control training and also to identify criteria to assess command and control effectiveness. The Army Research Institute (ARI) is developing a test bed at the Combined Arms Center (CAC) to study command and control processes and their contribution to organizational effectiveness. Part of this program involves research to identify critical command group performance requirements, to develop performance measurement procedures, and to help develop specifications for more effective command and control training. The systems approach to training development also requires that the performance of trainees be measured and that the resultant data be fed back to the training system to provide information for improving its content and methodology. This report is part of the feedback process.

Purpose

The purpose of this project was to measure and analyze the critical performances of battalion command groups in simulated combat. The list of subtasks, conditions, and standards from the Battalion Command Group ARTEP (described below and presented as Appendix A) provided the basis for the measurement of command group performance. The combat environment was provided by a computer-driven simulation system, the Combined Arms Tactical Training Simulator (CATTS) (also described below).

The specific objectives of this project were:

1. To adapt the Battalion Command Group ARTEP to a computer-driven simulation (the CATTS).

2. To identify the ARTEP subtasks on which the performance of incumbent battalion command groups is comparatively weak.

3. To describe the specific behaviors that contribute to inadequate performance of subtasks.

4. To measure the relative criticality of each subtask by determining its relation to overall measures of command group effectiveness.

The results of this project provide information that is useful in refining the Battalion Command Group ARTEP and in developing command group training systems. The results also comprise observational data that may lead to increased understanding of the components of command and control.

Battalion Command Group ARTEP

The Army Training and Evaluation Program (ARTEP 71-2) provides a series of combat missions appropriate for the various echelons--e.g., squad, platoon, company--of a unit. For each mission, the following are identified: critical tasks, conditions under which the tasks must be performed, and standards against which the unit's performance will be measured. The ARTEP enables a unit commander to (a) evaluate the combat readiness of his unit, (b) identify training needs, (c) develop a training program tailored to correct the identified deficiencies, (d) train the unit, and (e) reevaluate. As illustrated in Figure 1, training and evaluation are integrated into one closed-loop system. The major thrust of the program is a train-to-correct-deficiencies approach at all echelons.
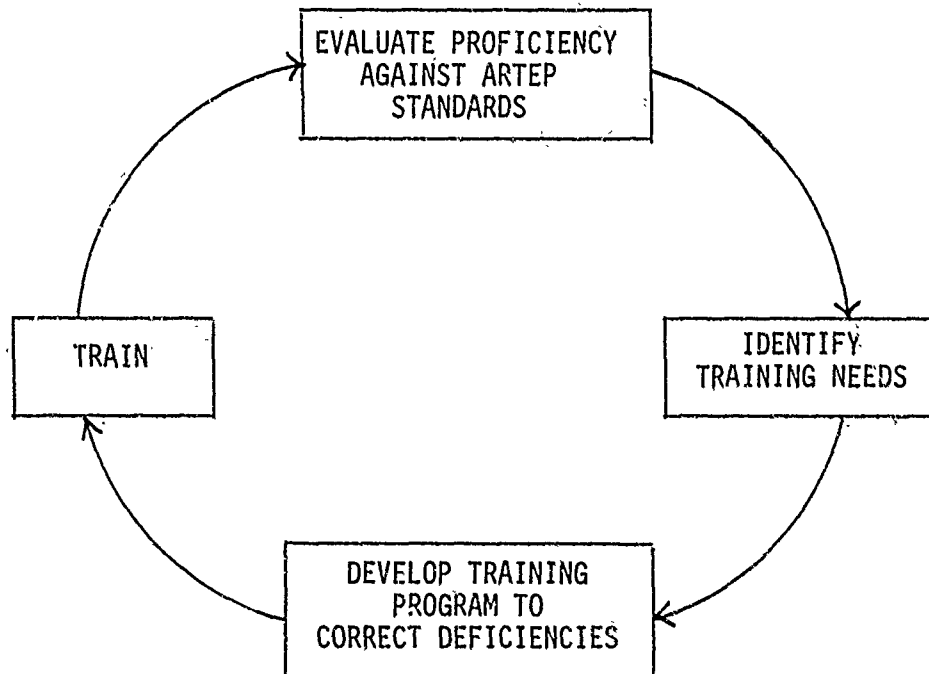
Figure 1. Sequence of steps in the Army Training and
Evaluation Program.

Chapter 10 of the ARTEP identifies 12 critical tasks that the command group of a combined arms task force must be able to accomplish in combat. This Battalion Command Group ARTEP comprises the following tasks:

Task 1. Develop plan based on mission.

Task 2. Initiate intelligence preparation of the battlefield.

Task 3. Prepare and organize the battlefield.

Task 4. Troop lead.

Task 5. See the battlefield during the battle.

Task 6. Control and coordinate combat operations.

Task 7. Employ fires and other combat support assets.

Task 8. Concentrate/shift combat power.

Task 9. Manage combat service support assets.

Task 10. Secure and protect the task force.

Task 11. Troop lead during battle.

Task 12. React to situations requiring special actions.

These 12 tasks are categorized into 61 subtasks with their associated conditions and standards. (For a complete description of the tasks and subtasks, see Appendix A, which is the command group/staff module of ARTEP 71-2.) The interrelations among these tasks and their relations to certain external events or conditions are diagrammed in Figure 2. Five conditions are listed, from left to right across the top of the figure, in the temporal sequence of their occurrence. A vertical line at the left of each condition is alined with the task(s) that the condition initiates. The resources and mission given to the task force (TF) are the initial input to the system, and accomplishment of the mission is the desired final output.

Initially, the command group receives a brigade oral warning and an operations order (OPORD) which describes the situation of the enemy and friendly forces and the mission of the task force. According to the first ARTEP task, the command group develops a plan that relates the mission to friendly and enemy capabilities, terrain, time, and weather. In Figure 2, the arrow from Task 1 to Task 2 represents the subtask of identifying critical combat information and intelligence, which is part of both tasks. The return arrow from Task 2 to Task 1 represents the updating of the plan as new information is received.

Task 2 (intelligence preparation of the battlefield) begins when the command group receives an intelligence summary from the brigade. The task consists of the identification, collection, analysis, and dissemination of critical combat information and intelligence. The output from this task feeds into Task 3.

Task 3 (prepare and organize the battlefield) uses the products generated by the first two tasks. It includes making an initial determination of the critical place where the task force combat power should

Conditions:

The TF is given an oral warning and OPORD.

The TF receives an intelligence summary.

The TF is actively engaged in combat with elements of the enemy force

Enemy forces present a serious threat or a vulnerable target to the TF. (The critical time)

Enemy forces cause the TF to modify its scheme of maneuver.

Given Resources and Mission

1. Develop Plan

2. Intelligence Preparation

3. Organize the Battlefield

4. Troop Lead

5. See the Battle

6. Control Operations

7. Employ Fires

8. Concentrate Combat Power

9. Manage CSS Assets

10. Secure the TF

11. Troop Lead

12. Special Actions

Accomplish the Mission

Before the battle

During the battle
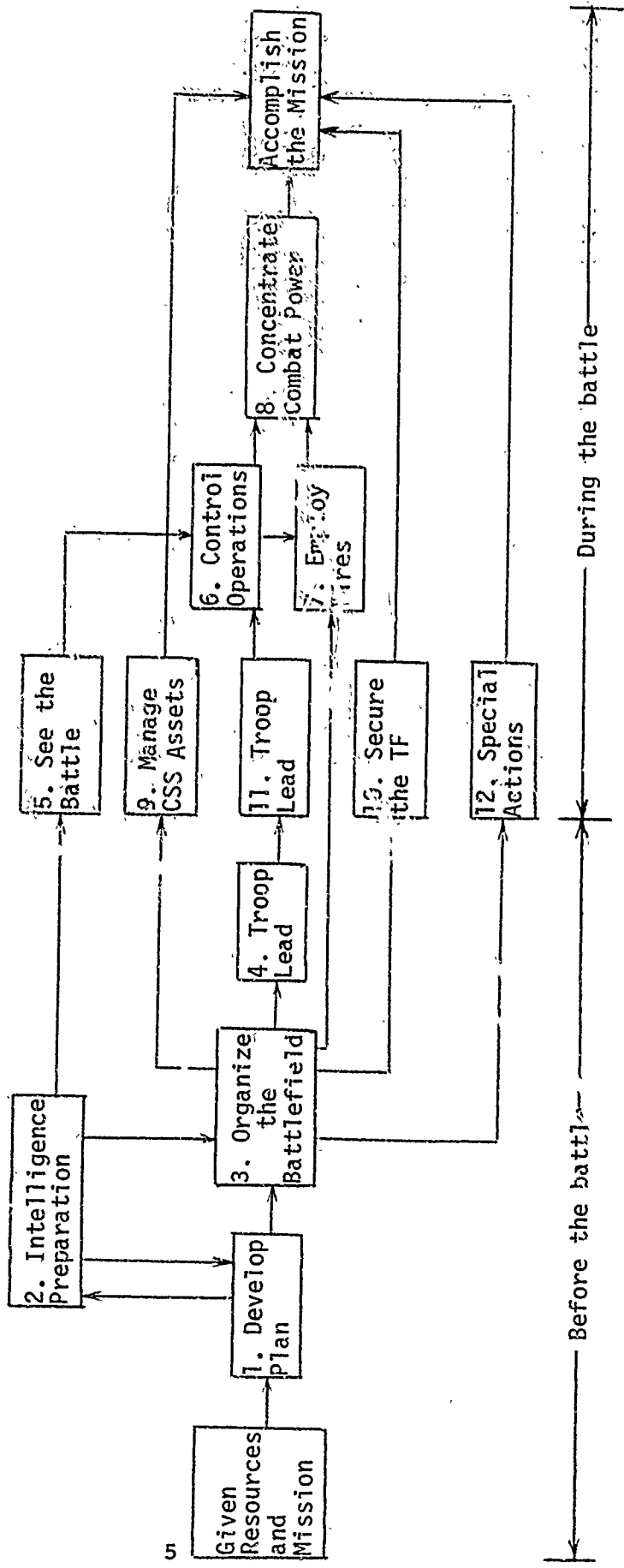
Figure 2. Flow diagram of the Battalion Command Group ARTEP.

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be concentrated, selecting a course of action, selecting control measures, and organizing the task force elements into combined arms teams. Certain components (subtasks) of Task 3 continue as separate tasks during the battle, as indicated by the multiple arrows diverging from this task in Figure 2. Thus, Subtask 3-E, which updates the fire plan developed in Task 1, leads to Task 7 (employ fii and other combat support assets). (Although the subtasks discussed nere do not appear explicitly in Figure 2, they are listed by number in Appendix A.) Subtasks 3-J and 3-K (provide supplies and maintain equipment) continue as Task 9 (manage combat service support (CSS) assets). Security measures initiated in Subtask 1-I continue as Task 10 (secure and protect the task force). Task 4 (troop lead before the battle) flows from Subtask 3-G (communicate/coordinate plans and orders), and continues as Task 11 (troop lead during the battle). Tasks 4 and 11 represent the supervisory functions before and during the battle and thus are related to several of the other tasks (5, 9, 10, 12). The special actions comprising Task 12 (react to enemy electronic warfare, chemical or biological attack, nuclear attack, and loss of a key member of the command group) are all prepared for in Task 3.

The first four tasks are performed before the battle; the rest are performed while the task force is actively engaged in combat with elements of the enemy force. Task 6 (control and coordinate combat operations) focuses on the ability of the command group to modify its scheme of maneuver based on information generated by Task 5 (see the battlefield during the battle). Subtask 6-C (supervise execution) is an aspect of Subtask 11-A. Task 7 refers to the necessary changes in fire support and other combat support that result from modifications produced by Task 6. Finally, Task 8 is a special case of the control function in which the command group concentrates its combat power at the decisive place and time to destroy the enemy force. The manner in which the ARTEP tasks, subtasks, and standards were applied to the measurement of command group performance in CATTS is described in the Method section of this report.

Combined Arms Tactical Training Simulator

The Combined Arms Tactical Training Simulator provides a computer-driven exercise to train maneuver-battalion commanders and their staffs in the control and coordination of combined-arms operations. The CATTS simulates the actions of units in combat; moves elements on and above the battlefield; calculates intervisibility and detection between forces, weapon-to-target ranges, and the effects of weapons employment; and maintains the status of personnel, equipment, ammunition, and fuel for friendly and enemy forces. Speed of movement, line of sight, and weapons effects are affected by changes in weather, terrain contour and soil type, suppressive fires, and personnel and equipment status.

The CATTS exercise is conducted in a real-time, free-play mode. Within the prescribed tactical situation, the battalion commander can

employ his assets in any manner he deems appropriate. The only constraints are the assets available to the battalion and the actions of the enemy commander.

Communications System. In this exercise, the command group occupied a simulated tactical operations center (TOC) provided with communications equipment normally found in a maneuver battalion. They could communicate with higher, lower, and adjacent units in any manner consistent with Army procedure and with the simulated location of the various units: face-to-face, by telephone or radio, and by written message. Most communication took place by radio and telephone. The battalion command group had seven radio nets with appropriate alternate frequencies. The nets included the brigade command, the brigade intelligence, the brigade administrative logistics, the battalion command, the fire support, and the air support nets. In addition, the command group had a RATT (radio-teletype) unit and field telephones, when appropriate.

Controllers. A permanent, full-time team of controllers mediated between the computer and the command group (the players). The control group included a chief controller who played the role of brigade commander, a brigade S1/S4 controller who also played the roles of service-support-unit commanders and executive officers, a brigade S2/S3 controller, four maneuver- and supporting-unit commanders, a fire support controller, one or two forward observers, a direct air support controller, and an enemy controller.

Figure 3 diagrams the interaction among the controllers, the players, and the computer. Some controllers fed orders from the battalion command group to the computer, using lists displayed on a television screen. Another controller, working independently, input enemy actions. The computer then calculated the results of the simulated engagement or movement and displayed that information to the controllers who relayed it to the command group via radio or telephone communication.

An adjunct member of the control group was the TOC monitor, who observed the command group during the exercise and provided feedback to the battalion commander during a postgame critique. This position was rotated among faculty members of the Command and General Staff College who had had some experience as battalion commanders or staff members and held the rank of lieutenant colonel.

In addition to participating in the simulation, seven of the controllers (the S1/S4, the S2/S3, the fire support coordinator, and the four company commanders) and the monitor rated the performance of the command group on the ARTEP subtasks that they were able to observe. They also recorded specific criticisms of subtask performance and estimated the overall effectiveness of individual staff members and the command group as a whole. These ratings and observations were analyzed to answer the following questions:

1. Which subtasks were rated relatively low?

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Brigade Level	FSE (Fire Support Element)	DASC Direct Air Support Center	S2 (Intelligence)	Brigade Commander	S3 (Operations)	S1 (Administration)	S4 (Logistics)

Orders and Information → / ← Information and Requests

| Battalion Level | FSCOORD (Fire Support Coordinator) | ALO (Air Liaison Officer) | S2 (Intelligence) | Battalion Commander | S3 (Operations) | S1 (Administration) | S4 (Logistics) |

Orders and Information → / ← Information and Requests

Company/ Supporting Unit Level

Company Commanders
Supporting Unit Commanders
Executive Officers
Forward Observers

Instructions → / ← Information

Computer

Platoon Level

Instructions → / ← Information

Enemy Commander

Regimental Level

Figure 3. Relationships between control and player positions in CATTS. Controller positions are enclosed by broken lines.

2. What were the specific deficiencies in the low-rated subtasks?

3. What were the correlations between performance on individual subtasks and estimates of overall effectiveness?

METHOD

Battalion Command Groups

Data were collected from 19 Active Army and 9 National Guard incumbent battalion command groups from the continental United States, including Alaska and Panama. The 27 battalion command groups were composed of 10 armor, 11 mechanized, and 6 infantry units, as shown in Table 1.

Table 1

Battalion Command Groups

Type	Active Army	National Guard
Armor	5	5
Merchanized	9	2
Infantry	5	1

A command group typically included the battalion commander, S1, S2, S3, S4, the air liaison officer (ALO), the fire support coordinator (FSCOORD), the operations sergeant, the intelligence sergeant, the assistant S3 and/or S3 air, the fire support noncommissioned officer (NCO), and one or two radio/telephone operators.

Each command group participated in an exercise for 1-1/2 days. The specific combat operations performed during the exercise depended upon the type of unit participating. Command groups from mechanized and armor battalions received a covering force mission on Day 1 and a daylight attack on Day 2. For infantry command groups, the mission on Day 1 was to defend and on Day 2 to perform a nonsupported, nonilluminated night attack. Differences in mobility and probable real-life missions dictated the different types of operations. The events scheduled for each type of operation are outlined in Appendix B.

Performance Evaluation

The evaluation of specific subtasks was assigned to individual controllers on the basis of interviews conducted at the start of this exercise. During their interviews, controllers were asked to indicate which subtasks they could observe. The subtasks that were rated by each evaluator are summarized in Table 2. Although the brigade S2 and the brigade S3 were played by the same controller, different subtasks were observable in each role, and these are listed separately in the table.

Table 2

Subtasks Rated by Each Controller

Controller	Subtasks
S1/S4	3-J, 3-K, 9-A to 9-D
S2	1-B, 2-A to 2-D, 3-F, 5-A to 5-D, 10-A, 12-A
S3	1-C, 1-D, 3-G, 8-A to 8-D, 10-E
Company commanders (4)	1-A, 1-E to 1-H, 2-B, 3-D, 3-G, 4-B, 5-B, 5-D, 6-B, 8-A to 8-D, 11-A
Fire support	1-I, 1-J, 1-L, 7-A, 7-B, 8-C, 8-D
Monitor	1-A to 1-L, 2-A to 2-D, 3-A to 3-G, 3-J, 3-K, 4-A, 4-B, 5-A to 5-D, 6-A to 6-D, 7-A to 7-C, 8-A to 8-D, 9-A to 9-D, 11-A, 12-A

Of the 61 subtasks in the Battalion Command Group ARTEP, 50 were evaluated in this study; the other 11 were not played. Subtasks 3-H, 3-I, 10-B, and 10-D were not rated, because they involved camouflage and similar battlefield activities that were not simulated in the exercise. Subtask 10-F (detect/impede threats to task force security) was not evaluated, because it was not clear what unique threats the subtask referred to and what action was required by the standard.

Other conditions that were seldom or never simulated were rehearsals (4-C), liaison with territorial security forces (10-C), enemy air strikes (10-G), chemical or biological attack (12-B), nuclear attack (12-C), and loss of a key member of the command group (12-D).

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The generality of the standards was a problem with many subtasks. The ARTEP standards had to be supplemented by the rater's own judgment of what constituted effective or appropriate actions.

All observers were asked to evaluate the command group's performance relative to ARTEP standards by rating on a 3-point scale each subtask that they could observe. The ratings were as follows:

1. Major departure from ARTEP standard. Unsatisfactory.

2. Minor deviation from ARTEP standard.

3. Satisfies ARTEP standard.

As written, the ARTEP calls for a 2-category rating scale: satisfactory or unsatisfactory. A 3-point scale was used in this exercise to permit greater resolution and to allow evaluators to identify deficiencies without being overly harsh in their ratings.

The observation forms paraphrased the subtasks so as to incorporate the standards: e.g., Subtask 1-A (analyze mission) was stated as: "Did the Cmd Gp address all necessary specified tasks in the OPORD or oral warning order?" The subtasks were rated on both days of the exercise. Space was also provided on the form for recording key events that influenced the observer's evaluation.

In addition to rating the subtasks, each observer evaluated the overall effectiveness of the command group, or of the staff member that was observed, on a 5-point scale. For the company commanders and the TOC monitor, the question was: "Overall, how well did this Cmd Gp perform in comparison with previous groups?" Possible answers were these:

1. One of the worst.

2. Worse than average.

3. Average.

4. Better than average.

5. One of the best.

The same scale was used by the monitor to rate the overall performance of the battalion commander, and it was also used by the S1/S4, the S2/S3, and the fire support controllers to evaluate their counterparts on the battalion staff.

The monitor also answered the questions: "Was the mission accomplished on Day 1?" and "Was the mission accomplished on Day 2?" The choice of answers was

1. No.

2. Marginally.

3. Yes.

Data Analysis

Identification of performance areas requiring special emphasis is important in any training program. One objective of this project was to identify those ARTEP subtasks on which the performance of incumbent battalion command groups was relatively weak. To accomplish this objective, the ratings were categorized by rater and type of operation (Day 1 or Day 2), and the following steps were performed for each category:

1. The subtask ratings were averaged across the 27 battalion command groups.

2. A grand mean was calculated by averaging the means of all subtasks evaluated by a given rater on a given day. The corresponding standard deviations were also calculated.

3. Those subtasks whose means were one standard deviation below the grand mean were classified as deficient.

The rater's comments were then examined to ascertain the key events or specific behaviors that influenced the low ratings.

Although the relative performance of command groups on each subtask provides information concerning areas of training need, it does not indicate the degree to which the subtask influenced overall command group effectiveness. All the subtasks listed in the Battalion Command Group ARTEP were judged by military experts to be essential to mission accomplishment, but the relative importance of the subtasks had yet to be determined. Therefore, a second objective of this project was to provide an initial indication of the relative criticality of each subtask.

Relative criticality was measured by the degree of relatedness between individual subtask ratings and estimates of overall effectiveness. This approach is limited, however, by the amount of variability in the ratings. That is, even though a subtask may be essential to effective performance, it may not be correlated with overall measures, because it is performed at the same level across all command groups--e.g., all command groups performed the subtask satisfactorily. Thus, the set of significant correlations constitutes a list of critical subtasks, but the list is not necessarily all inclusive.

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Ideally, the quantitative results of the simulated battlefield engagements would provide an objective measure of command group effectiveness. At present, however, the battlefield outcomes lack sufficient fidelity to reflect the performance of the command groups. Consequently, observer judgments were used as estimates of effectiveness.

RESULTS

The results of this study are divided into two main parts: (a) relative performance on ARTEP subtasks, and (b) relationships of subtasks to overall performance measures. The first part identifies the subtasks on which incumbent battalion command groups were rated relatively low and documents the common deficiencies within those subtasks. The second part measures the relative criticality of each subtask by examining the correlations between subtask ratings and ratings of overall command group effectiveness.

Performance on ARTEP Subtasks

Identification of Low-Rated Subtasks. To identify the subtasks that were rated relatively low, it was necessary to consider the bias of the rater: i.e., some raters were more lenient than others. Comparing the evaluations for those subtasks that were evaluated by more than one observer showed that the monitor generally rated given subtasks higher than the brigade S2/S3 but slightly lower than the company commanders did.

Table 3 summarizes the means and standard deviations for all the subtasks evaluated by each observer on each day of the exercise. The S2 and S2 ratings were averaged separately, because they involved different subtasks, whereas the battalion S1 and S4 worked together on the subtasks rated by the S1/S4 controller. The four company commanders all rated the same subtasks, so their ratings were averaged together. These statistics were computed to allow for rater bias when identifying low-rated subtasks, but they also indicate that there was an improvement in performance from one day to the next.

Improvement in Performance. Comparison of the means in Table 3 shows that the means of subtasks rated by four of the six raters improved from Day 1 to Day 2. Different t tests (two-tailed) for paired scores, performed on the subtasks that were rated on both days, showed the increments for the first support controller ($t = 2.70$, $df = 5$) were significant at the .05 level, and the increments for the company commanders ($t = 3.77$, $df = 11$) and for the S1/S4 ($t = 5.53$, $df = 5$) were significant at the .01 level. The increase in the monitor's ratings was not statistically significant.

Because the scenario changed from Day 1 to Day 2, it is not possible to say whether the higher ratings on the second day resulted from the difference in missions or from learning. However, the increase in

Table 3

Mean and Standard Deviation of Subtask Ratings

Rater[a]	Day 1		Day 2	
	Mean	SD	Mean	SD
S1/S4	2.05	.14	2.28	.16
S2	1.99	.18	1.99	.19
S3	2.23	.26	2.21	.19
CC	2.70	.16	2.80	.15
FS	2.47	.38	2.53	.29
TOC	2.69	.21	2.73	.18

[a]CC = company commander; FS = fire support controller; TOC = TOC monitor.

the S1/S4 ratings was by far the largest, perhaps because the S1/S4 controller made a special point of providing detailed corrective feedback at the end of the first day. This result suggests that CATTS has the potential for improving performance within the timespan of a 2-day exercise by providing explicit feedback on critical performances during the exercise.

Common Weaknesses. A level of one standard deviation below the mean for a given rater on a given day was chosen as the criterion for identifying low-rated subtasks. This value served to identify approximately the lowest one-third (specifically 38%) of the subtasks as relatively weak. Of the 50 subtasks evaluated, 19 were more than one standard deviation below the mean for one or more raters on one or both days of the exercise.

Figure 4 shows the distribution of the low-rated subtasks categorized by ARTEP tasks. In four tasks, more than half the subtasks were rated low: that is, all four subtasks in Task 2 (initiate intelligence preparation of the battlefield), three of the four subtasks in Task 5 (see the battlefield during the battle) and in Task 8 (concentrate/shift combat power), and the one subtask (react to jamming) in Task 12 that was played in the exercise. Four tasks had one-fourth to one-half of their subtasks rated low: Task 1 (develop plan based on mission), Task 3 (prepare and organize the battlefield), Task 9 (manage combat service

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Task

1. Develop plan
2. Intelligence
3. Organize
4. Troop lead
5. See battle
6. Control
7. Employ fires
8. Concentrate
9. Manage CSS
10. Secure TF
11. Troop lead
12. React

.1   .2   .3   .4   .5   .6   .7   .8   .9   1.0
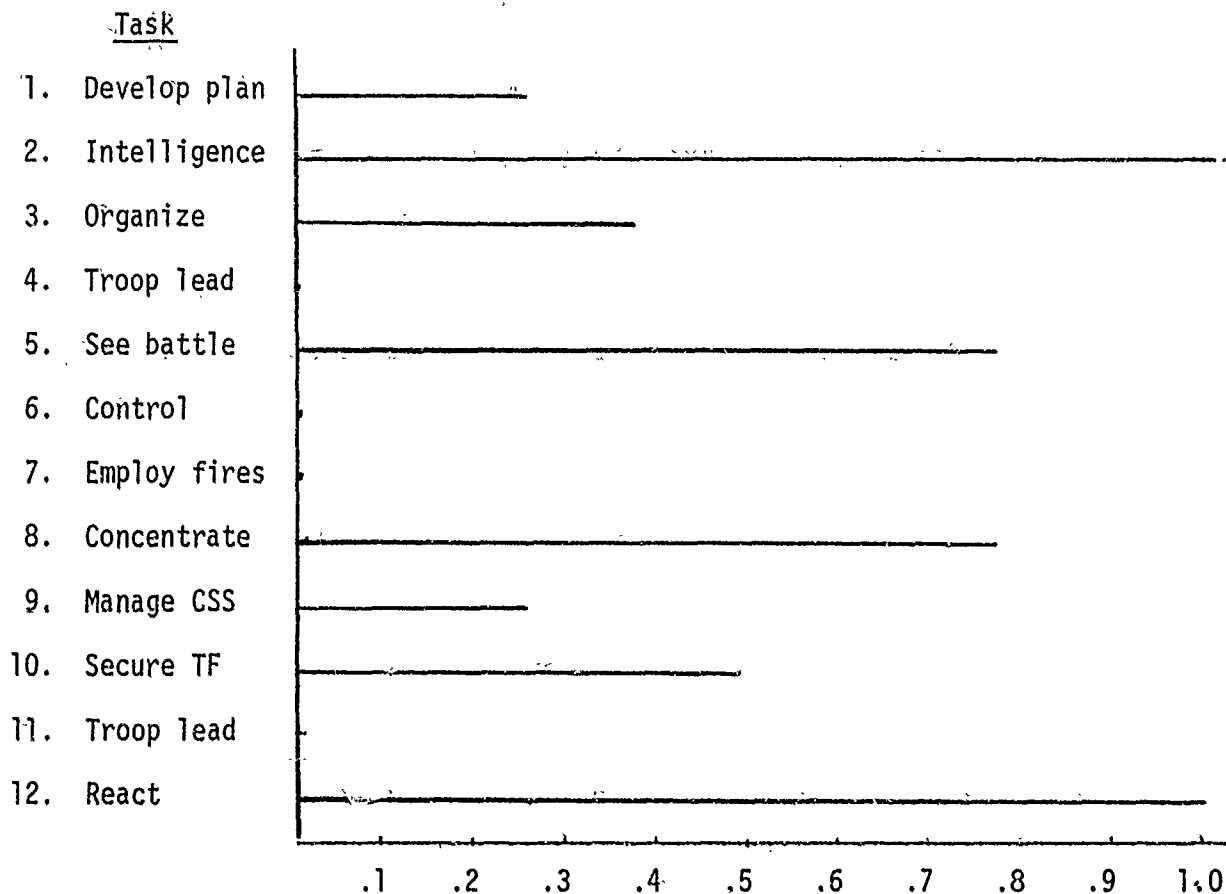
Proportion of Low-Rated Subtasks,

Figure 4. Proportion of subtasks in each task that were rated lower than
one standard deviation below the mean by one or more raters on
one or both days.

support assets), and Task 10 (secure and protect the task force). The
remaining four tasks contained no low-rated subtasks: troop lead (Tasks
4 and 11), control and coordinate combat operations (Task 6), and employ
fires and other combat support assets (Task 7).

The 19 low-rated subtasks are listed in Table 4. A detailed summary
of the ratings for every subtask and the evaluators' criticisms of the
command groups' performance are given in Appendix C. The following para-
graphs outline the subtasks in each task and review the most frequent
criticisms of low-rated subtasks.

Task 1. In developing a plan to accomplish its mission, the com-
mand group performs 12 subtasks. It analyzes the mission (1-A) to iden-
tify the specified and implied tasks that must be addressed in its own
order. The command group also identifies critical enemy information and
intelligence (1-B) and critical friendly information (1-C) and analyzes

Table 4

Subtasks Rated More Than One Standard Deviation
Below the Mean by One or More Raters

Task/Subtask	Description
Task 1	Develop plan based on mission.
1-A	Analyze mission.
1-B	Identify critical enemy information.
1-I	Plan fires.
Task 2	Initiate intelligence preparation of the battlefield.
2-A	Identify critical enemy information.
2-B	Gather information from all appropriate sources.
2-C	Analyze information to predict enemy intentions.
2-D	Disseminate information and intelligence.
Task 3	Prepare and organize the battlefield.
3-F	Develop communication plan, including security considerations.
3-G	Communicate plans and orders.
3-K	Maintain equipment.
Task 5	See the battlefield during the battle.
5-B	Gather information from all appropriate sources.
5-C	Analyze information to predict enemy intentions.
5-D	Disseminate information and intelligence.
Task 8	Concentrate/shift combat power.
8-A	Determine critical place and time.
8-B	Concentrate/shift combat power in the attack.
8-C	Concentrate/shift combat power in the defense or retrograde.
Task 9	Manage combat service support assets.
9-B	Maintain and repair the weapons systems.
Task 10	Secure and protect the task force.
10-A	Defeat or suppress enemy's electromagnetic intelligence effort.
Task 12	React to special situations.
12-A	React to enemy jamming.

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friendly capabilities (1-D). It selects key terrain, control of which would facilitate accomplishment of the mission (1-E). Then, depending on the type of mission, the command group selects avenues of approach for an attack (1-F), or battle positions for defense (1-G), or delay and covering force positions (1-H).

The last four subtasks in Task 1 concern fire support: planning the use of organic/attached and nonorganic fires (1-I), determining priority of fires (1-J) and fire support requirements (1-K), and conducting the initial fire support coordination (1-L).

As shown in Table 4, the three low-rated subtasks in Task 1 were 1-A, 1-B, and 1-I. The most common criticisms for Subtask 1-A were that the command group failed to address the implied task of passage of lines in its order and that its specification of the mission was incomplete or confusing. Under Subtask 1-B, the battalion S2 was cited by the controller counterpart for insufficient awareness of enemy doctrine and force composition. The fire support plan (1-I) was flawed by inadequate selection of priority targets and poor coordination with forward observers. The other subtasks were generally satisfactory, although the selection of avenues of approach (1-F) was sometimes criticized for not minimizing the effects of obstacles, and the battle positions (1-G) did not always maximize task force mobility and reduce vulnerability to air attack.

Task 2. All four subtasks in intelligence preparation of the battlefield were rated low. Subtask 2-A (identify critical enemy information) is the same as 1-B, and the same criticism applies. The major deficiency in gathering information (2-B) was assigning every element to report the same information, instead of just the information it was in a position to obtain. Analysis of the enemy was often incomplete (2-C). The battalion staff did not coordinate all the information available to its individual members, and the S2 was slow in disseminating information to the brigade and intelligence to the company commanders (2-D).

Task 3. Preparation and organization of the battlefield requires the command group to tentatively determine the critical place where combat power should be concentrated (3-A), to select a course of action (3-B), and to organize the task force into combined arms teams (3-C). The command group also selects control measures which support the scheme of maneuver (3-D), updates the fire plan (3-E), and develops a communication plan that provides for security (3-F). The preceding activities lead to plans that are coordinated with appropriate agencies, and orders that are issued to task force elements (3-G). As stated before, Subtasks 3-H (reinforce terrain) and 3-I (security measures) were not evaluated, because they involve construction and camouflage that are not simulated in CATTS. Finally, the command group insures that supplies are provided (3-J) and that equipment is maintained (3-K).

The weak subtasks were 3-F, 3-G, and 3-K. The communication plan (3-F) neglected security considerations, which resulted in unnecessarily long communications and a confused reaction to jamming during the battle.

Communicating plans and orders (3-G), one of the most critical functions of the battalion command group, was one of the worst performed. Often the operations order took so long to prepare and to present that the company commanders did not have time to go through their own troop-leading procedures. Also, in spite of the time spent on the OPORD, it frequently omitted important information. Instances of inadequate communication were failing to note the existence of a 60-foot berm (earthen wall) on a canal, and neglecting to tell company commanders about friendly minefields through which they would pass or what to do if communication was lost. Air defense units, Redeye teams, and engineers frequently were not addressed. Some command groups did not have their Air Force or field artillery elements brief the company commanders, who consequently did not know how long it would take to get air support on station or what kinds of artillery support they would have.

Little attention was paid to the repair or evacuation of nonoperational equipment. However, the apparent neglect of maintenance (3-K) may have resulted from the difficulty the S1/S4 controller had in providing realistic details about equipment malfunctions to the battalion S4.

Task 4. Troop leading before the battle involves the supervision of preparations (4-A), of compliance with the task force order (4-B), and of rehearsals (4-C). Preparations and compliance were generally satisfactory, and the scenario did not allow sufficient time to conduct rehearsals.

Task 5. Seeing the battlefield during the battle continues the intelligence processing that begins in Task 2. It comprises the same subtasks, and the performance ratings were nearly as low. The deficiencies cited for identifying (5-A), analyzing (5-C), and disseminating (5-D) information and intelligence were the same as those cited for the corresponding subtasks of Task 2. The main difference was in gathering information: Subtask 2-B mainly told the units what to look for, and its defect was telling everyone to report the same information; Subtask 5-B required active solicitation of information, and its deficiencies were not querying all available sources and not following up routine reports with requests for additional information.

Task 6. The control and coordination of combat operations require that the command group modify its scheme of maneuver in response to enemy actions (6-A), communicate the changes (6-B) and supervise their execution (6-C), and reseed minefields and clear obstacles in support of the changed plans (6-D). Performance of these subtasks were usually judged satisfactory.

Task 7. Modification of the fire support plan (7-A) and employment of other combat support assets (7-C) were performed satisfactorily. The employment of other combat support assets was usually limited to using the engineers to put in minefields.

Task 8. Concentrating combat power at the critical place and time is probably the most crucial task in the ARTEP, but it was not performed well. The command groups' determination of the critical place and time (8-A) was frequently criticized for inability to appreciate the relative movement of friendly and enemy units over the terrain to the "time-distance" problem. Concentrating combat power in the attack (8-B) and in the defense or retrograde (8-C) was criticized for failure to use all available assets, particularly attached and supporting units. Protecting thinly held areas (8-D) was not among the low-rated subtasks.

Task 9. The management of combat service support assets involves providing weapons systems with ammunition and fuel (9-A); health preservation programs, troop subsistence and replacement (9-C); and integrating the service support assets into the scheme of maneuver (9-D). The only low-rated subtask was 9-B, where the common deficiency was not recovering nonoperational vehicles.

In all of Task 9, however, the basic problem was that the players did not understand the magnitude of the tasks required, especially of the S4, considering the constraints of space and time. Generally they responded to requests in order of request arrival instead of in order of priority: e.g., an S4 who was working on a supply estimate when a request for ammunition arrived completed the supply estimate before acting on the more urgent request for ammunition. This weakness probably results from insufficient experience in combat or in simulated combat exercises. The S1 and S4 functions traditionally have not been stressed in CPXs and FTXs.

Task 10. The only subtasks that were evaluated under this task, to secure and protect the task force, were Subtask 10-A (defeat or suppress the enemy's electromagnetic effort), and Subtask 10-E (reduce vulnerability to enemy mass destruction weapons systems). Subtask 10-A was marred by violations of communications security: Messages were too long, and coordinates were given in the clear.

Task 11. Troop lead during battle consists of supervising compliance with the task force order (11-A), which was almost always satisfactory.

Task 12. The only situation that required special action within the scope of this task was to react to enemy jamming, under Subtask 12-A. Jamming of radio communications was extremely disruptive, and the command groups often failed to switch to alternate frequencies and to adequately report the interference to brigade headquarters.

Summary of Low-Rated Subtasks. In the preceding discussion of command group performance, 19 subtasks were designated as relatively weak in comparison with the general level of performance on the 50 subtasks that were evaluated. Table 4 lists the ARTEP subtasks for which ratings were more than one standard deviation below the mean evaluation of any observer on either day of the exercise. Eight of these subtasks (1-B, all of Task 2, and 5-B, 5-C, 5-D) concerned intelligence--identification, collection, analysis, and dissemination of information about the enemy.

The weaknesses in intelligence probably contributed to problems in the utilization of assets, wherein the ultimate deficiency was the failure to concentrate maximum combat power (8-B, 8-C) at the critical place and time (8-A). Predisposing weaknesses in this area were incomplete analysis of the mission (1-A) and an inadequate fire plan (1-I).

In the communication of plans and orders (3-G) and in the dissemination of intelligence (2-D, 5-D), slowness and incompleteness were common deficiencies. Lapses in security (10-A) and an uncertain reaction to enemy jamming (12-A) were other aspects of the communication problem related to neglect of security considerations in the communication plan (3-F). Equipment maintenance (3-K, 9-B) did not influence the simulated battle, and, as noted earlier, the low ratings in this area may have been a result of the simulation itself.

Subtasks Related to Overall Performance Measures

The remainder of this Results section analyzes the relationship between subtask performance ratings and estimates of overall performance. This analysis estimates the relative importance of each subtask in terms of its correlation with the more comprehensive measures of effectiveness.

Ratings were obtained for nine measures of overall performance: six measures for individual members of the command group and three measures for the command group as a whole. Six members of the command group were evaluated on their overall performance in comparison with persons who had played the same positions in previous exercises. The battalion S1, S2, S3, S4, and fire support element were rated by their counterparts on the control group, and the battalion commander was rated by the TOC monitor. In addition, the command group was rated as a whole by the company commanders and the monitor. These overall evaluations by the four company commanders and the monitor were averaged together to provide a composite measure of overall performance. The monitor also judged whether the covering force or defense mission was accomplished on Day 1 and whether the attack mission was accomplished on Day 2.

Intercorrelations Among Measures of Overall Performance. Before describing relationships between subtask ratings and overall performance measures, this section discusses the interrelations among the overall performance measures themselves.

The correlations in Table 5 reflect the interdependence among the members of the command group. Thus, the rating of the battalion commander (BC) was very highly correlated ($r = .92$) with the overall performance of the command group (CG). This correlation is consistent with the dominant role of the commander in the group. Similarly, the S1 and the S4, who work closely together, received highly correlated ratings ($r = .85$) from the S1/S4 controller. The close relationship between the battalion commander and his S3 was reflected in the high correlation ($r = .78$) between their ratings. In fact, the intercorrelations among

Table 5

Intercorrelations Among Ratings of Overall Performance

	S1	S2	S3	S4	FS	BC	M1	M2	CG
S1	1.00								
S2	.43*	1.00							
S3	.55**	.73**	1.00						
S4	.85**	.53**	.58**	1.00					
FS	.09	.02	.13	.07	1.00				
BC	.62**	.62**	.78**	.68**	-.38	1.00			
M1	.47*	.37*	.50**	.46*	-.12	.42*	1.00		
M2	.15	-.03	.09	-.07	.35	.17	.09	1.00	
CG	.63**	.59**	.71**	.74**	-.09	.92**	.50**	.11	1.00

Note. Correlations based on 27 battalion command groups.

S1, S2, S3, S4 = members of command group; FS = fire support coordinator;
BC = battalion commander; M1 = first day's mission; M2 = second day's
mission; CG = command group.

*Significant at the .05 level (one-tailed test).
**Significant at the .01 level (one-tailed test).

the ratings for most members of the command group (S1, S2, S3, S4, and
the commander), the group as a whole, and the first day's mission (M1)
were all significantly greater than zero at the .05 level, most of them
at the .01 level. The only nonsignificant correlations were those in-
volving the fire support coordinator (FS) and the attack mission (M2).

The absence of significant correlations between the fire support
ratings and other performance measures may reflect the independence be-
tween field artillery units and maneuver units in the Army. The battalion
fire support coordinator was not organic to the command group but was
attached for the exercise. This lack of previous interaction probably
hindered the integration of the fire support coordinator into the group;
since he was not a regular member of the group, his performance might not
have been correlated with that of the rest of the command group.

The nonsignificant correlations for mission accomplishment on Day 2 resulted from low variability in the ratings for that mission: 79% of the attack missions were accomplished, and the rest were rated marginal. There was more variation on Day 1, when 61% were judged accomplished, 13% marginal, and 26% not accomplished. Consequently, the underlying relationships between mission accomplishment and the other performance measures were able to produce significant correlations on Day 1. These correlations were not as large, however, as the corresponding correlations with overall command group performance.

Subtasks Related to Overall Performance of Individual Staff Members. A high correlation between the rating for a particular subtask and an estimate of overall performance calls attention to that subtask as a potentially important variable. Table 6 lists the subtasks for which ratings were significantly correlated with the overall performance ratings for the battalion S1, S2, S3, S4, and fire support officer. The subtasks correlated with the ratings for the battalion commander are not listed, because they were very similar to those correlated with the command group ratings, discussed in a later section. The mean correlations over the 2 days (and over the S1 and S4 ratings) were obtained via transformation to Fisher's Z. A detailed summary of all the correlations between subtask and individual ratings is given in Appendix D.

Eighteen of the subtasks listed in Table 6 satisfy the criterion of being significantly correlated with a staff member's performance at the .01 level on both days of the exercise. Subtasks 7-A and 12-A are represented by one of their subitems. Subtask 8-B is the counterpart on Day 2 of 8-C on Day 1. Three more subtasks and another subitem of 12-A were significantly correlated at the .05 level on both days. Most of Tasks 2 and 5, which deal with intelligence, and all of Task 8 (concentrate/shift combat power) were highly correlated with the performance of individual members of the battalion staff. The list also includes two or more subtasks of Tasks 1, 3, 9, and 10, which are concerned with planning, organization, combat service support, and security. The tasks not represented on this list (4, 6, 11) were not evaluated by the three controllers (S1/S4, S2/S3, and fire support) on whose ratings these correlations were based.

The subtasks listed sequentially in Table 6 also can be grouped according to the staff member with whose overall performance they were correlated. Thus, four subtasks (3-J, 3-K; 9-A, and 9-D), related to combat service support and rated by the S1/S4 controller, were significantly correlated with that controller's ratings of the S1 and the S4. Seven of the intelligence subtasks (1-B; 2-A, 2-B, 2-C; and 5-A, 5-B, 5-C) were significantly correlated with the S2/S3 controller's rating of the S2's overall performance. Two subtasks related to enemy electronic warfare (10-A and 12-A) also correlated significantly with the S2 performance rating. Six operations subtasks (3-G; 8-A, 8-B, 8-C, 8-D; and 10-E) were significantly correlated with the overall performance of the S3 as rated by the S2/S3 controller. Finally, only two of the fire support subtasks (1-I and 7-A, Subitem 1) were significantly correlated with the ratings of the fire support officer.

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Table 6

Subtasks Significantly Correlated with Overall Performance
of Members of the Battalion Staff on Both Days

Subtask no.	Subtask description	Staff member	Average correlation
1-B	Identify critical enemy information.	S2	.63**
1-I	Plan fires.	FS	.72**
2-A	Identify critical enemy information.	S2	.63**
2-B	Gather information from all appropriate sources.	S2	.46**
2-C	Analyze information to predict enemy intentions.	S2	.77**
3-G	Communicate/coordinate plans and orders.	S3	.59**
3-K	Maintain equipment.	S1, S4	.47*
3-J	Provide supplies.	S1, S4	.59**
5-A	Identify critical enemy information.	S2	.72**
5-B	Gather information from all appropriate sources.	S2	.44*
5-C	Analyze information to predict enemy intentions.	S2	.77**
7-A	Modify fire support plan as required by enemy actions.		
	1. Communicate new priority of fires to supporting and supported units.	FS	.77**
8-A	Determine critical place and time.	S3	.64**
8-B	Concentrate/shift combat power in the attack.	S3	.67**
8-C	Concentrate/shift combat power in the defense or retrograde.	S3	.81**

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Table 6--Continued

Subtask no.	Subtask description	Staff member	Average correlation
8-D	Protect thinly held areas.	S3	.70**
9-A	Provide weapons systems with ammunition and fuel.	S1, S4	.50*
9-D	Transport and deliver supplies.	S1, S4	.63**
10-A	Defeat or suppress enemy's electromagnetic intelligence effort.	S2	.53**
10-E	Reduce vulnerability to enemy mass destruction weapons systems.	S3	.65**
12-A	React to enemy jamming.		
	1. Recognize jamming and continue operation.	S2	.55**
	2. Report jamming to higher headquarters.	S2	.44*

Note. Correlations based on 27 battalion command groups.

*Significant at the .05 level (one-tailed test).
**Significant at the .01 level (one-tailed test).

Subtasks Related to Overall Performance of the Command Group. Overall performance of the command group was rated by the four company commanders and the monitor, whose ratings were averaged to yield a combined estimate of group effectiveness. The monitor also judged whether the mission was accomplished on Day 1 and on Day 2. The ratings of mission accomplishment generally were not significantly correlated with the ratings of subtask performance, but the estimate of command group effectiveness was so correlated. Appendix E contains all the correlations between subtask ratings and ratings of mission accomplishment. All the correlations of subtask ratings with overall group effectiveness ratings are given in Appendix F, and those having statistical significance are discussed below.

Mean Correlation for Each Task. Figure 5 presents an overview of the relationship between performance on the ARTEP tasks and the estimate of overall command group effectiveness. The mean correlation for each

Task

1. Develop plan
2. Intelligence
3. Organize
4. Troop lead
5. See battle
6. Control
7. Employ fires
8. Concentrate
9. Manage CSS
10. Secure TF
11. Troop lead
12. React

```
0    .10   .20   .30   .40   .50   .60   .70
```
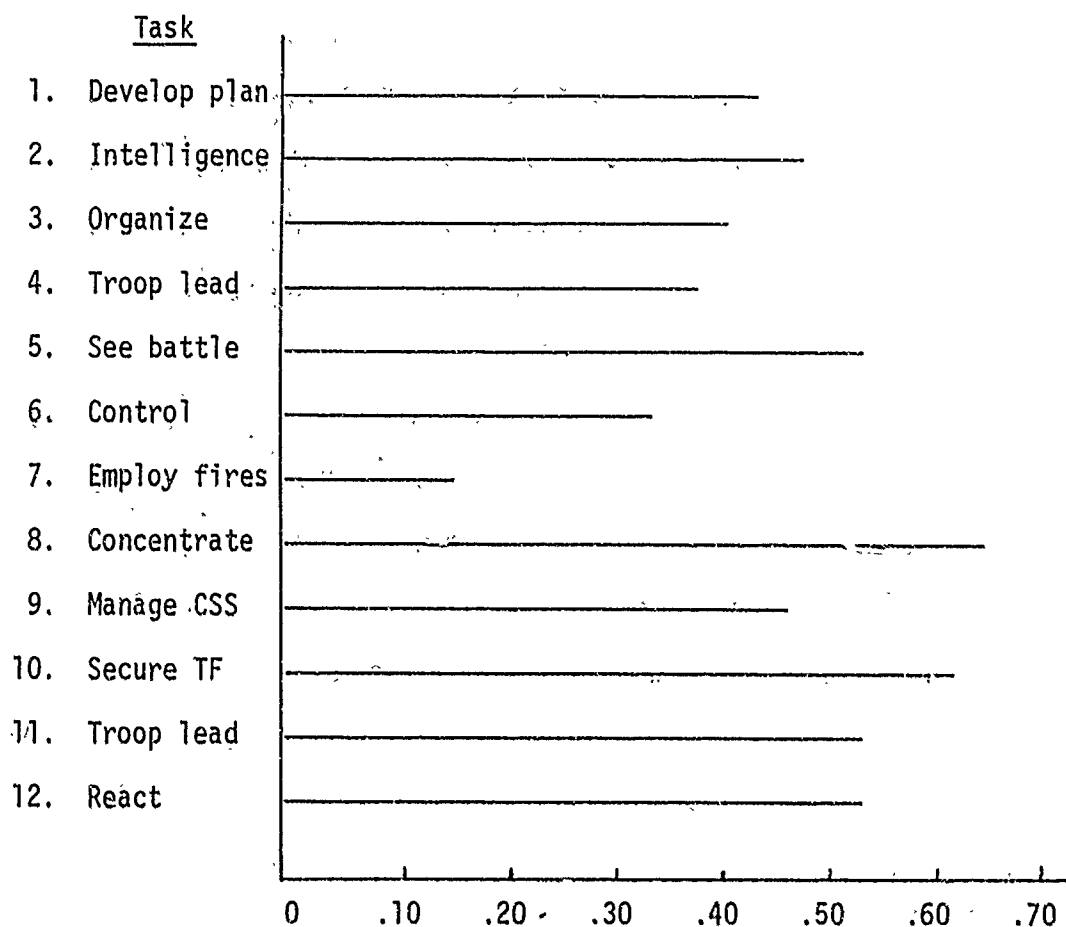
Figure 5. Mean correlations between subtask ratings and overall
command group performance, averaged over the subtasks
in each task.

task was computed from the r's for each subtask in that task, after converting r to Fisher's Z to correct for the skewness of the r distribution. When a subtask was rated by more than one observer, the highest correlation was used in calculating the mean, on the assumption that it represented the judgment of the best-placed observer. Similarly, when a subtask was subdivided into items, the highest correlation was selected on the assumption that it tapped the most relevant behavior.

Appropriately, the task that seems most directly related to success on the battlefield--Task 8 (shift/concentrate combat power)--was the one most highly correlated with overall performance (r = .65). Task 10 (secure and protect the task force) was also highly correlated with command group effectiveness (r = .62). Tasks 5, 11, and 12 (see the battlefield during the battle, troop lead during battle, and react to jamming, respectively) had the same average correlation with overall performance (r = .53).

The next six tasks, ranked in order of their mean correlations, show a gradual decrease in the strength of the relationship between subtask ratings and overall performance. The correlation for intelligence preparation (Task 2) was .48; combat service support (Task 9, $r = .45$), planning (Task 1, $r = .43$), and organizing (Task 3, $r = .40$) followed close behind. It seems reasonable that seeing the battlefield during the battle (Task 5) was more closely related to overall performance than was intelligence preparation of the battlefield (Task 2), and that troop lead during battle (Task 11) was more important than troop lead before battle (Task 4, $r = .37$).

On the other hand, to control and coordinate combat operations (Task 6) should be more important than its low correlation ($r = .32$) indicates. A possible explanation of this low correlation is that Task 8 (concentrate/shift combat power) captured the most essential part of the control function. In other words, by defining the concentration of combat power as a separate task, the ARTEP left the rest of control (Task 6) a relatively less critical task.

The task least related to overall performance was Task 7 (employ fires) ($r = .15$). This result agrees with the earlier observation that the fire support coordinator was seldom well integrated into the command group.

Subtasks Significantly Correlated with Group Performance. Part or all of 17 subtasks significantly correlated with the overall performance rating of the battalion command group at the .01 level on both days; 11 more subtasks were significant at or beyond the .05 level on both days. These subtasks are all listed in Table 7. Five subtasks on the list were performed on only 1 of the 2 days, but in a sense they do satisfy the criterion of being significant on both days, because 1-F is the counterpart on Day 2 of 1-G and 1-H on Day 1, just as 8-B on Day 2 corresponds to 8-C on Day 1. The significant correlations for 1-F and 12-A are limited to the specific items listed in the table.

All but two of the subtasks (7-A and 10-A) that were significantly correlated with the performance of individual staff members, as shown in Table 6, were similarly correlated with the performance of the command group as a whole. On the other hand, Table 7 adds nine subtasks (1-D, 1-F, 1-G, 1-H, 1-J; 3-A; 5-D; 6-B; and 11-A) to those listed in Table 6. The subtasks most highly correlated with overall group performance were in the areas of concentrating combat power (3-A; 8-A, 8-B, 8-C, and 8-D), planning (1-B, 1-D, 1-F, 1-G, 1-H, 1-I, and 1-J), and intelligence (2-A, 2-B, 2-C; 5-A, 5-B, 5-C, and 5-D). Combat service support (3-J, 3-K; 9-A, and 9-D), reducing vulnerability to mass destruction weapons (10-E), and reacting to jamming (12-A) were also important, as were the three related functions of communicating orders (3-G), communicating changes 6-B), and supervising compliance (11-A). These are the subtasks identified as most critical in terms of their relationship to overall command group effectiveness.

Table 7

Subtasks Significantly Correlated with Overall Command Group
Performance Ratings on Both Days by One or More Raters

Subtask no.	Subtask description	Average correlation
1-B	Identify critical enemy information.	.45**
1-D	Analyze friendly capabilities.	.42*
1-F	Select routes to objective (attack).	
	5. Maximize effectiveness of own weapons.	.40*
	6. Facilitate control while permitting teams to deploy and maneuver.	.52**
	8. Capitalize on enemy vulnerabilities.	.51**
1-G	Select battle positions (defense).	.55**
1-H	Select initial and successive battle positions (covering force).	.44*
1-I	Plan fires.	.45*
1-J	Determine which units receive priority for fire support.	.42*
2-A	Identify critical enemy information.	.45**
2-B	Gather information from all appropriate sources.	.42*
2-C	Analyze information to predict enemy intentions.	.53**
3-A	Determine place where enemy is likely to concentrate.	.48*
3-G	Communicate plans and orders.	.44*
3-J	Provide supplies.	.63**
3-K	Maintain equipment.	.45*
5-A	Identify critical enemy information.	.43*

Table 7--Continued

Subtask no.	Subtask description	Average correlation
5-B	Gather information from all appropriate sources.	.52**
5-C	Analyze information to predict enemy intentions.	.62**
5-D	Disseminate information and intelligence.	.52**
6-B	Communicate changes.	.48*
8-A	Determine critical place and time.	.62**
8-B	Concentrate/shift combat power in the attack.	.70**
8-C	Concentrate/shift combat power in the defense or retrograde.	.68**
8-D	Protect thinly held areas.	.61**
9-A	Provide weapons systems with ammunition and fuel.	.58**
9-D	Transport and deliver supplies.	.57**
10-E	Reduce vulnerability to enemy mass destruction weapon systems.	.65**
11-A	Supervise compliance with Task Force Order.	.53*
12-A	React to enemy jamming.	
	1. Recognize jamming and continue operation.	.53**
	2. Report jamming to higher headquarters.	.50*

Note. Correlations based on 27 battalion command groups.

*Significant at the .05 level (one-tailed test).
**Significant at the .01 level (one-tailed test).

The utility of both CATTS and of the command group module of the ARTEP were evident in this investigation. The fact that most ARTEP subtasks could be exercised in CATTS demonstrated the utility of CATTS for training battalion command groups, while the value of the ARTEP was confirmed by its usefulness for evaluating command group performance.

With appropriate elaboration, the ARTEP subtasks and standards provided a useful framework for ev   ating the performance of battalion command groups in simulated combat. The results yielded three types of information: relative weaknesses in the performance of subtasks, specific performance deficiencies, and the relative contribution of individual subtasks to overall effectiveness. These data suggest specific refinements in the ARTEP and identify problem areas in command and control.

ARTEP Refinement

This project demonstrated that the command group module of the ARTEP could be adapted to a computer-assisted battle simulation. Considerable planning and interpretation were required, however, before the ARTEP could be applied. It was necessary to determine which subtasks could be observed and who was in the best position to observe them. As the standards were very general and rarely specified objective criteria, each evaluator had to supplement them with subjective judgment. In addition, a 3-point rather than a 2-category scale was used, to increase the resolution of the ratings. After gaining experience with the 3-point scale, the raters expressed a desire for even more response alternatives. Accordingly, a 5-point scale will be used in future research.

Performance evaluation would be easier and more reliable if the number of subtasks were reduced and if the standards were more specific. The similarity in both ratings and criticisms for certain subtasks suggests that the subtasks can be combined with little loss of information. In particular, Tasks 2 and 5, which contain the same subtasks, and Subtask 1-B, which is the same as 2-A and 5-A, can be combined in a single intelligence task. Supervising compliance with the task force order before (4-B) and during battle (11-A) can be combined. Supply (3-J) and maintenance (3-K) can be incorporated into the corresponding subtasks (9-A and 9-B) of Task 9. Updating the fire support plan (3-E) can be omitted, because it is already implied in Subtasks 1-I and 1-J. Subtask 10-F (detect/impede threats to security) also can be eliminated, because it is a vague formulation of more specific subtasks and the raters could not evaluate it. Further simplification may be indicated by a alysis of the intercorrelations among the subtask ratings, but a larger   ple size is required for application of multivariate statistical techniques.

Additional refinements of the ARTEP are suggested by the correlations with overall performance ratings and the specific criticisms reviewed briefly below and fully tabulated in the Results section. The

subtasks are not equally important. Their relative criticality is estimated by the correlations with overall performance. The vagueness of the standards can be reduced by incorporating the specific items identified as deficiencies in Appendix C--e.g., the standard for Subtask 3-G merely states that orders contain essential information, whereas Table C-6 lists specific items that orders frequently omit.

Command and Control Problems

The subtask ratings and specific criticisms of performance indicate fundamental problems in the exercise of command and control. In a more general context, these problems can be categorized under the basic organizational processes of sensing, decisionmaking, communicating, and coping.

In an investigation of the organizational processes that determine the effectiveness of battalion command groups, Olmstead, Christensen, and Lackey[1] found that five processes derived from Schein's Adaptive-Coping Cycle[2] were significantly correlated with group effectiveness scores. These processes were defined as follows:

1. Sensing: the process by which the organization acquires information about the external and internal environments.

2. Communicating information: the process of transmitting information that is sensed to those parts of the organization that can act upon it.

3. Decisionmaking: the process of making decisions concerning actions to be taken as a result of sensed information.

4. Communicating implementation: the process of transmitting decisions and decision-related orders and instructions to those parts of the organization that must implement them.

5. Coping actions: the process of executing actions against an environment (external or internal) as a consequence of an organizational decision.

In the following discussion of command and control problems, it was convenient to combine the two communication processes (numbers 2 and 4 above) into a single category.

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[1] Olmstead, J. A., Christensen, H. E., & Lackey, L. L. Components of Organizational Competence: Test of a Conceptual Framework. HumRRO Technical Report 73-19, August 1973.

[2] Schein, E. H., Organizational Psychology (2nd ed.). Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1972.

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Sensing involves gathering and analyzing information about events and conditions in the environment. All the subtasks concerned with identifying, gathering, and analyzing combat information and intelligence (1-B; 2-A, 2-B, 2-C; 5-A, 5-B, and 5-C) strongly influenced the overall performance ratings. In addition, all but one of them (5-A) were among the low-rated subtasks. Raters noted several deficiencies in this category. A common deficiency was inadequate knowledge of enemy doctrine and force composition. Even more frequently, command groups did not utilize all potential sources of information (e.g., Air Force, forward observers). Nor did they aggressively gather all appropriate information from their sources; they usually relied on routine spot reports and situation reports. These deficiencies contributed to the inability of some groups to adequately predict enemy intentions.

Seven subtasks concerned with decisionmaking were highly correlated with overall performance ratings. In the planning stage of the exercise, selecting routes of approach (1-F), defensive positions (1-G), and covering force positions (1-H) were important, as were two subtasks related to fire support (1-I and 7-A). During the battle, determining the critical place and time (8-A) was strongly related to overall performance. Two of the preceding subtasks were rated relatively low: 1-I for inadequate target selection and poor coordination with forward observers, and 8-A for failure to appreciate the relative movement of friendly and enemy units over the terrain.

Communication of information and orders appeared to give most command groups a great deal of difficulty. Four subtasks concerned with communication (3-G, 5-D, 10-A, and 12-A) significantly influenced overall performance, and all were rated comparatively low. Over two-thirds of the battalion command groups omitted important information from their operation orders (OPORDs) and fragmentary operation orders (FRAGOs). They often failed to provide their company commanders with adequate intelligence, combat support information, and antijamming procedures. They also relied heavily on their standard operating procedures (SOP) to supplement the order, even when attached and supporting units were not familiar with the battalion's SOP. Orders were frequently long, complicated, unclear, and disorganized, and did not allow sufficient time for the company commanders to go through their troop leading procedures.

Several battalion command groups violated communications security by broadcasting too long or giving critical information in the clear. Some groups did not recognize enemy jamming or failed to determine whether all frequencies were jammed. Others did not attempt to override the jamming before switching to an alternate frequency. In addition, jamming reports to brigade headquarters were often incomplete or omitted entirely.

Coping is the utilization of assets to contend with changes in the environment. Combating electromagnetic intelligence (10-A) with jamming (12-A) are coping actions as well as communications processes. The three subtasks concerned with supply (3-J, 9-A, and 9-D) were significantly related to overall performance and were not rated low. Protecting thinly

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held areas (8-D) was also done well. However, the most important activity in this category--concentrating combat power to destroy the enemy force (8-B and 8-C)--was both highly correlated with overall performance ratings and comparatively poorly executed. Problems earlier in the sequence of sensing, decisionmaking, and communicating probably contributed to the weakness in concentrating combat power.

Generality of Results

Several factors limit the generality of the present results. One consideration is the representativeness of the sample. The data are based on 27 battalion command groups, only 6 of which were infantry. Moreover, units from Europe and the Far East were not included. The pattern of training deficiencies might be different for units stationed in potential combat areas.

The exercises were limited to covering force, defense, and attack missions fought on desert terrain. Idiosyncracies in the simulation and in the system itself may have influenced the type of subtask that was identified as critical or deficient, and rater bias also may have influenced that identification. Controller assignments remained essentially constant during the study; only the TOC monitor changed for each exercise. While this constancy contributed to the stability of the ratings, it also limited the performance evaluation to the judgment of particular individuals.

The behaviors evaluated in this study were limited to the subtasks listed in the Battalion Command Group ARTEP. They were further limited to those subtasks that occurred in the exercises and could be observed by the raters. There may be important behaviors, e.g., intragroup coordination, that were not on the subtask list. Some of these limitations will be overcome by future research.

Future Research

Three steps are planned for the immediate future to extend the generality and the scope of this research:

1. The sample size will be increased, particularly by the addition of more infantry units, to improve the reliability and representativeness of the data.

2. The measure of mission accomplishment will be refined to include several dimensions of battlefield outcomes.

3. Multivariate techniques will be employed to identify overlap, clusters, and factors in the performance variables measured by the ARTEP. The larger sample size is necessary to permit the complete application of these techniques.

Over the longer term, it would be desirable to include units stationed outside the United States and to collect data from different scenarios and other simulations. Data should also be collected on other levels of command. When the CATTS software has been refined and stabilized, it will be possible to examine the relationships between judgmental performance evaluations and qualitative outcomes of the simulated battle.

CONCLUSIONS AND IMPLICATIONS

By allocating specific subtasks to the individual controllers who were in a position to observe them, it was possible to evaluate the command group's performance on most of the subtasks in the ARTEP module and, thereby, identify those subtasks that were highly correlated with measures of overall performance and those that were relatively weak. Figure 6 illustrates the relationships among several sets of subtasks that were identified in this study. Fifty of the 61 subtasks in the Battalion Command Group ARTEP were evaluated in CATTS. Of these 50 subtasks, 23 were correlated at the .01 level with overall performance measures for the command group and/or individual staff members, and an
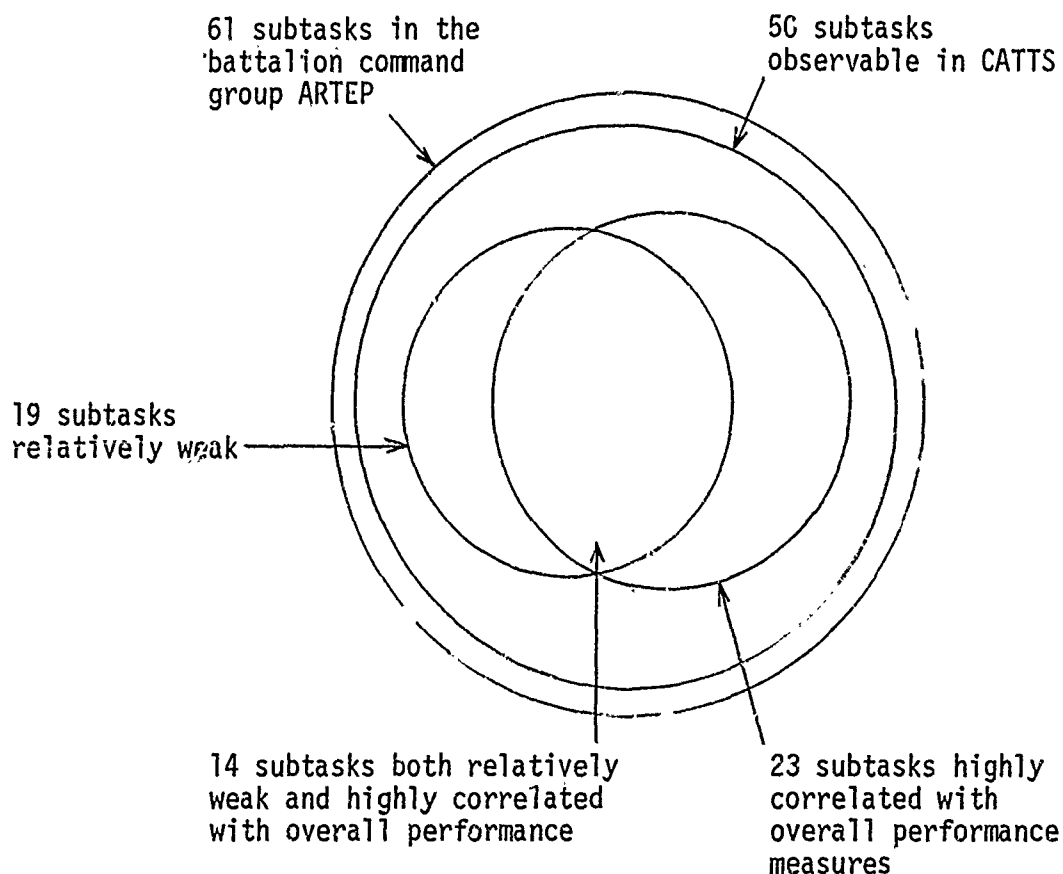
Figure 6. Summary of subtasks evaluated in CATTS.

overlapping set of 19 subtasks was rated relatively low. The intersection of these two sets contained 14 subtasks, summarized in Table 8, which were both low rated and highly correlated with overall performance measures.

Table 8

Subtasks Rated as Deficient and Identified as Most Important
for Battalion Command Group Training

Task/subtask	Description
Task 1	Develop plan based on mission.
1-B	Identify critical enemy information.
1-I	Plan fires.
Task 2	Initiate intelligence preparation of the battlefield.
2-A	Identify critical enemy information.
2-B	Gather information from all appropriate sources.
2-C	Analyze information to predict enemy intentions.
Task 3	Prepare and organize the battlefield.
3-G	Communicate plans and orders.
Task 5	See the battlefield during the battle.
5-B	Gather information from all appropriate sources.
5-C	Analyze information to predict enemy intentions.
5-D	Disseminate information and intelligence.
Task 8	Concentrate/shift combat power.
8-A	Determine critical place and time.
8-B	Concentrate/shift combat power in the attack.
8-C	Concentrate/shift combat power in the defense or retrograde.
Task 10	Secure and protect the task force.
10-A	Defeat or suppress enemy's electromagnetic intelligence effort.
Task 12	React to special situations.
12-A	React to enemy jamming.

The subtasks in Table 8 are concentrated in a few critical areas: Seven of them concern intelligence (1-B; 2-A, 2-B, 2-C; 5-B, 5-C, and 5-D); three involve concentrating combat power at the critical place and time (8-A, 8-B, and 8-C); two concern enemy electronic warfare (10-A and 12-A); the remaining two are plan fires (1-I) and communicate plans and orders

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(3-G). These subtasks, which were both deficient and decisive, appear to constitute the essential core of the Battalion Command Group ARTEP.

The command and control problems identified in this research suggest requirements for improved training and for the development of information processing and decisionmaking aids. Difficulties in identifying critical combat information, analyzing enemy intentions, concentrating combat information, analyzing enemy intentions, and concentrating combat power to meet the major enemy thrust suggest that current enemy doctrine, force structure, and weapons characteristics (including movement rates) should be stressed in training. Many command groups lack appreciation of time-distance relationships and of the lead time required to shift combat power. In addition, the underutilization of some task force assets, particularly of attached and supporting units, indicates the need for increased training in combined arms operations that emphasize the use of such assets.

Improved techniques for gathering, processing, and disseminating information are also required. The communications problems encountered during the exercises indicate that command groups need to develop and "debug" procedures for controlling the battle while maintaining communications security. This need is especially important in the modern electronic warfare environment. Procedures also must be developed for insuring that plans and orders are complete and clear (which may involve going back to the five-part order) and consequently require less radio communication. Difficulties in intrastaff interaction suggest that coordination among staff members needs greater emphasis in future training programs and that improved techniques for sharing information within the command group need to be implemented.

The results of this investigation provide a starting point for the development of objectives and strategies for command group training. They can help individual commanders identify potential problem areas on which to focus during the initial stages of a training program. These data also have implications for the various service schools. They can be viewed as feedback to help identify areas that require emphasis in future curriculum development. Many difficulties identified here can be alleviated by training, but the information-processing problems may require new techniques and devices to overcome human limitations. Information overload can be reduced by reallocating tasks within the command group, by improving message recording, storage, and retrieval procedures and devices; and by developing automated decision aids.

APPENDIX A

TASKS, CONDITIONS, AND STANDARDS FOR THE
BATTALION COMMAND GROUP/STAFF ARTEP

TRAINING AND EVALUATION OUTLINE

UNIT: __COMMAND GROUP/STAFF__   MISSION: __CONTROL AND COORDINATION OF OPERATIONS.__

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
10-1 Develop plan based on mission. (D-K, LT, CAMMS, CATTS)	TF is given oral warning and OPORD which includes opposing force and friendly situations and a mission which could normally be expected in the scenario developed by the senior evaluator. The size of the opposing force confronting the task force should be determined by the senior evaluator. Guidance for scenario development and opposing force size can be found in paragraph 10-5a(4).	TF command group develops a plan which relates to friendly and opposing force capabilities and vulnerabilities; range, accuracy, and destructive effects of both friendly and opposing force weapons systems; the relief, surface conditions, drainage, vegetation, and manmade features of the terrain; time available; and weather and resources available to accomplish the mission. (Evaluator judgment.) (NOTE: The estimate process is a continuous one; as new data is produced, the plan is constantly updated. Thus, evaluation of this task should take place throughout the unit's preparation for, and execution of, the given mission; evaluation should not be completed until the mission is terminated.)		
10-1-A Analyze mission.	Conditions for Task 10-1 apply.	Command group identifies specified/implied tasks; addresses those tasks in its own oral warning order/frag order/OPORD.		
10-1-B Identify critical combat information and intelligence.	Conditions for Task 10-1 apply.	If offense: Command group identifies avenues of approach to the objective: type, size, number, and location of opposing maneuver and fire support units; opposing force units capable of reinforcing by maneuver and fire; location of obstacles and opposing force's ability to attack by air and EW capability. If defense: Command group identifies avenues of approach into defended area; composition and size of attacking force; opposing force's scheme of maneuver and fire support; opposing force's ability to attack by air and EW capability.		

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ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
		If retrograde: Command group identifies size, type, and number of opposing force units in contact; opposing force units which can reinforce by fire or maneuver; opposing force's intention or capability to exploit; opposing force's reconnaissance; opposing force's ability to attack by air and EW capability.		
10-1-C Identify critical friendly information.	Conditions for Task 10-1 apply.	Command group identifies location status and situation of: 1. TF elements. 2. Major adjacent units and brigade reserve. 3. Supporting forces.		
10-1-D Analyze friendly capabilities.	Conditions for Task 10-1 apply.	Command group analyzes friendly capabilities in terms of METT and submits requests for additional assets from brigade as appropriate.		
10-1-E Select/ control key terrain.	Conditions for Task 10-1 apply.	Terrain which facilitates accomplishment of the TF mission is selected/ controlled by occupation of fires. Terrain which, if captured/controlled by opposing forces, would facilitate accomplishment of the opposing force mission is designated key terrain. If not occupied or controlled, commander accepts the risk.		
10-1-F Select routes/ zones to objective	Conditions for Task 10-1 apply except that mission assigned to TF is	Selects avenues of approach which optimize these considerations: 1. Provide for mission accomplishment.		

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UNIT: __COMMAND GROUP/STAFF__   MISSION: __CONTROL AND COORDINATION OF OPERATIONS.__

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
	either movement to contact, hasty attack, or deliberate attack.	2. Provide maximum cover and concealment. 3. Minimize effects of obstacles. 4. Permit mutual support and overwatch. 5. Permit effective employment of weapons. 6. Facilitate control while permitting teams to deploy and maneuver. 7. Maximize TF and team mobility. 8. Capitalize on opposing force vulnerabilities. 9. Minimize time for teams to close on objective. 10. Facilitate logistical operations.		
10-1-G Select battle positions.	Conditions for Task 10-1 apply except that mission assigned to TF is to defend.	Selects battle positions which optimize these considerations: 1. Block most critical avenues of approach into the defensive sector. 2. Minimize vulnerabilities to opposing force's frontal direct fire weapons and indirect fire weapons. 3. Maximize capabilities of own weapons; permit engagement of targets at maximum effective range. 4. Exploit and reinforce natural terrain obstacles. 5. Permit mutual support and overwatch. 6. Facilitate control while permitting teams to deploy and maneuver. 7. Maximize TF and team mobility; allows for strong, quick counterattacks. 8. Capitalize on opposing force vulnerabilities. 9. Reduce vulnerability to allow air attack. 10. Facilitate logistical operations of subordinate units. 11. Insure continuous communication while minimizing opposing force EW capability.		

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UNIT: __COMMAND GROUP/STAFF__   MISSION: __CONTROL AND COORDINATION OF OPERATIONS.__

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
10-1-H Select delay and covering force positions.	Conditions for Task 10-1 apply except that mission assigned to TF is to delay.	Selects initial and successive battle positions which optimize these considerations: 1. Block most critical avenues of approach into the delay sector. 2. Force opposing force to deploy and concentrate forces repeatedly. 3. Minimize vulnerability to opposing force long-range observation and fires. 4. Maximize effectiveness of own weapons. 5. Force opposing force to travel along exposed approaches. 6. Reinforce natural terrain/manmade obstacles. 7. Facilitate, as developing situation dictates, transition to limited attack, defense, or withdrawal. 8. Reduce vulnerability to air attack.		
10-1-I Plan use of organic/attached and non-organic fires.	Conditions for Task 10-1 apply.	Plan, continuously updated, provides for organic/attached/nonorganic supporting preplanned fires (to include final protective fires), fires against targets of opportunity, suppression, surprise and deception, and air defense coverage while allowing TF elements to maneuver freely.		
10-1-J Determine priority of fires.	Conditions for Task 10-1 apply.	Priority of fires, to include air defense fires, is given to TF element(s) to support the scheme of maneuver. Priorities for counterfires and suppressive fires are established. If appropriate, dedicated battery is specified.		

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TRAINING AND EVALUATION OUTLINE

UNIT: COMMAND GROUP/STAFF   MISSION: OPERATIONS

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
10-1-K Determine fire support required.	Conditions for Task 10-1 apply.	Based on forecasted operations, request additional fire support/ logistical means if necessary; determine priorities for logistical support of fire support assets.		
10-1-L Conduct initial fire support coordination.	Conditions for Task 10-1 apply.	Determine fire support/target acquisition assets available; determine fire support coordination measures.		
10-2 Initiate intelligence preparation of the battlefield. (LT, CAMMS, CATTS)	TF receives intelligence summary (to include terrain and weather factor overlays) from brigade (senior evaluator) keyed to the scenario developed for the exercise. The summary should be incomplete so as to require the TF command group to initiate action to gather missing information.	Command group will develop intelligence to determine significant tactical indicators, targets (enemy movement, reinforcement, artillery locations, air defense positions, assembly areas, and armor) within tactical intelligence zone 2 (out to 50 km), and EW, NBC, and CAS capabilities of opposing forces. (Because battalion intelligence assets are not capable of gathering data to the limits of tactical intelligence zone 2, intelligence from assets supporting higher headquarters must be requested.)		
10-2-A Identify critical combat information and intelligence.	Conditions for Task 10-2 apply.	Standard is the same as that for Task 10-1-B.		

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TRAINING AND EVALUATION OUTLINE

UNIT: __COMMAND GROUP/STAFF__   MISSION: CONTROL AND COORDINATION OF OPERATIONS.

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
10-2-B Gather critical combat information and intelligence.	Conditions for Task 10-2 apply.	Command group determines combat information and intelligence shortfalls and aggressively gathers data from all available/appropriate resources. All assigned, attached, or DS units (ESM, UGS, GSR, recon units, and troops) as well as higher echelon assets (electromagnetic, imagery, and human intelligence) should be considered. As a minimum, collection efforts should focus on identifying obstacles, avenues of approach, and opposing force positions; insuring accuracy of map grids; preparing detailed radar coverage charts; trafficability studies; and determining the most likely positions for artillery, air defense, and antitank elements. These data should then be reduced to overlays.		
10-2-C Analyze opposing force.	Some of the information requested by TF in the previous subtask is furnished to TF by senior evaluator. Information should be in accordance with the exercise scenario.	Command group, based on an understanding of known opposing force tactics and doctrine, will compare that with combat information and intelligence received to predict opposing force intentions.		
10-2-D Disseminate critical combat information and intelligence.	Information of varying degrees of criticality is provided to the TF by the senior evaluator at frequent but random intervals and will represent information from TF elements and adjacent, supporting, and higher units.	Combat information and intelligence disseminated should be event-oriented, rather than in periodic intelligence reports and summaries. Only combat information and intelligence usable to the recipient (TF elements and higher, adjacent, and supporting units) should be disseminated.		

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TRAINING AND EVALUATION OUTLINE

CONTROL AND
COORDINATION OF
OPERATIONS

UNIT: ___COMMAND GROUP/STAFF___   MISSION: ___OPERATIONS___

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
10-3 Prepare and organize the battlefield. (LT, CAMMS, CATTS)	General conditions for Tasks 10-1 and 10-2 apply. Command group uses results generated in Tasks 10-1 and 10-2 as input for this task.	Command group prepares and organizes the battlefield in such a way as to maximize chances for mission accomplishment and survivability of the task force.		
10-3-A Determine critical place.	Preceding conditions apply.	Based on information available before the battle, the command group determines the place in the battlefield where the TF combat power should be concentrated. (NOTE: This determination of critical place is only for planning purposes and initial execution of the battle plan. It will be necessary for the command group to make new determinations once the battle is joined and the situation develops.)		
10-3-B Select a course of action.	Preceding conditions apply.	Based on the command group's analysis of the situation and mission, the results of the combat information and the intelligence provided or gathered, and the recommendations of the command group, the commander selects a course of action which will facilitate mission accomplishment.		
10-3-C Organize for combat.	Preceding conditions apply.	Command group task organizes the task force into company teams. (NOTE: Unusual situations may support the employment of pure rifle or tank companies without cross-reinforcing.) Support (organic and nonorganic) and priorities are developed. TF elements are deployed and a scheme of maneuver is developed. The result should be a plan which will apply maximum combat power at the critical place determined in Task 10-3-A.		

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UNIT: __COMMAND GROUP/STAFF__   MISSION: __CONTROL AND COORDINATION OF OPERATIONS__

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
10-3-D Select control measures.	Preceding conditions apply.	Command group selects control measures which support the scheme of maneuver, facilitate fire and movement by the task force, and permit rapid changes as the battle develops.		
10-3-E Plan organic, attached, and non-organic supporting fires and determine priority.	Preceding conditions apply.	Fire plan is updated; standards shown for Tasks 10-1-I and 10-1-J apply.		
10-3-F Develop a communication plan.	Preceding conditions apply.	Command group develops a communication plan which satisfies the communication requirements of the specific mission, provides for COMSEC, specifies alternate means of communication (electronic, visual, pyrotechnic), and insures operation of MIJI plan.		
10-3-G Communicate/ coordinate plans and orders.	Preceding conditions apply.	Orders are coordinated with appropriate agencies. Orders are issued, usually orally, so as to allow TF elements maximum time to go through troop-leading procedures. Orders are appropriate, clear, and concise and contain esential information.		
10-3-H Reinforce terrain.	Preceding conditions apply.	Command group establishes priorities and tasks TF elements and supporting engineer units to accomplish any or all of the following tasks which support the TF mission/scheme of maneuver:		

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UNIT: COMMAND GROUP/STAFF   MISSION: CONTROL AND COORDINATION OF OPERATIONS.

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
		construct/install obstacles; construct/emplace bridges; consruct vehicle defilades; construct fighting positions/protective bunkers; construct aircraft facilities; construct/improve tactical routes; camouflage critical facilities; clear fields of fire; construct essential CSS facilities.		
10-3-I Plan/ employ active/ passive security measures (e.g., camou-flage, ELSEC, COMSEC, dummy posi-tions of equipment, inoperative equipment realis-tically positioned and camou-flaged.	Preceding conditions apply.	Opposing forces in TF areas of influence/ interest are unable to determine TF strength, task organization, disposi-tions, vulnerabilities, capabilities, or scheme of maneuver. TF vulnerability to opposing force's mass destruction weapons is minimized. Threats to TF security are detected/impeded. Deceptive measures effectively deceive enemy as to TF inten-tions. TF radar is operated only when required for surveillance.		
10-3-J Provide supplies.	Preceding conditions apply.	Coordinate with supporting supply ele-ments to insure that adequate supplies (priority to critical items) are immedi-ately available and issued to accomplish the mission and any subsequent missions.		
10-3-K Maintain equip-ment.	Preceding conditions apply.	Command group determines status of equip-ment and directs repair/evacuation of nonoperational equipment critical to mission accomplishment.		

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TRAINING AND EVALUATION OUTLINE

CONTROL AND
COORDINATION OF

UNIT: __COMMAND GROUP/STAFF__   MISSION: __OPERATIONS__

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
10-4 Troop lead. (LT, CAMMS, CATTS)	Battalion TF warning/frag/OPORD has been given to TF elements. (TF elements are represented by the controllers in CPX, TEWT, or simulation modes.)	Command group supervises preparation for and execution of actions by TF elements required to accomplish the TF mission.		
10-4-A Supervise preparations.	Preceding conditions apply.	Command group inspects preparations by TF elements, making corrections where necessary.		
10-4-B Supervise compliance with TF order.	Preceding conditions apply.	Reaction to TF order by TF elements, to include supporting units, is characterized by compliance, timeliness, effectiveness, and lack of confusion.		
10-4-C Conduct rehearsals.	Preceding conditions apply.	If time permits, require TF elements to rehearse their missions where increased proficiency can be gained through repetition.		
10-5 See the battlefield during the battle. (D-K, CAMMS, CATTS)	The TF is actively engaged in combat with elements of the opposing force. The command group receives sporadic, event-oriented information from subordinate, adjacent, and higher commands (played by senior evaluator).	Command group will continue to process and update combat information and intelligence to determine significant tactical indicators and targets (opposing force movement, reinforcement, artillery locations, air defense positions, assembly areas, and armor) within tactical intelligence zone 2 (out to 50 km).		

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TRAINING AND EVALUATION OUTLINE

UNIT: __COMMAND GROUP/STAFF__   MISSION: __CONTROL AND COORDINATION OF OPERATIONS__

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
10-5-A Identify critical combat information and intelligence.	Preceding conditions apply.	Command group identifies those areas specified in the standard for Task 10-1-B, plus any other areas which will give an indication of opposing force intentions.		
10-5-B Gather critical combat information and intelligence.	Preceding conditions apply.	Command group determines combat information and intelligence shortfalls and gathers data from all available/appropriate resources. All assigned, attached, or DS units (ESM, UGS, GSR, recon units, and troops) as well as higher echelon assets (electromagnetic, imagery, and human intelligence) should be considered. As a minimum, collection efforts should focus on determining opposing force intentions in response to the developing situation; whether he will reinforce or withdraw; movement of units, especially armor; relocations of artillery and air defense positions.		
10-5-C Analyze opposing force.	Some of the information requested by the command group in the previous subtask is furnished to the TF by senior evaluator. Information should be in accordance with the exercise scenario.	Command group, based on an understanding of known opposing force tactics and doctrine, and of the developing situation, will compare that with the information and intelligence received to predict opposing force intentions.		

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TRAINING AND EVALUATION OUTLINE

UNIT: __COMMAND GROUP/STAFF__   MISSION: __CONTROL AND COORDINATION OF OPERATIONS__

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S.	U
10-5-D Disseminate critical combat information and intelligence.	Event-oriented combat information and intelligence is provided to the command group by the senior evaluator, representing information from TF elements and adjacent, supporting, and higher units.	Combat information and intelligence disseminated by the command group should be event-oriented and be usable by the recipient(s). Combat information and intelligence should be accurate and disseminated within a time frame which permits the recipient to react.		
10-6 Control and coordinate combat operations. (LT, CAMMS, CATTS)	General conditions for Task 10-5 apply.	Based on an analysis of combat information and intelligence generated in Tasks 10-2 and 10-5 and an analysis of the developing situation, command group determines whether to modify its scheme of maneuver.		
10-6-A Modify scheme of maneuver.	Opposing forces, by direction of senior evaluator, deploy or maneuver in such a way as to cause the TF to modify its scheme of maneuver. The opposing force may reinforce, withdraw, attack an exposed flank, conduct an airmobile assault to the TF rear, etc.	Command group (in time to react) reassesses the developing situation and determines a new course of action which optimizes cover, concealment, suppression, and teamwork.		

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UNIT: __COMMAND GROUP/STAFF__   MISSION: __CONTROL AND COORDINATION OF OPERATIONS.__

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
10-6-B Coordi-nate/ com-municate changes.	TF commander has approved the new course of action.	Command group makes essential coordina-tion; if the new course of action involves a change in the TF mission, it must be approved by brigade. Change is then communicated to TF ele-ments. (Brigade notifies supporting and adjacent units.) Changes are communi-cated orally as a frag order and include changed objectives, control measures, and scheme of maneuver.		
10-6-C Supervise execution.	Changes have been communicated.	Command group monitors the developing battle, insuring that TF elements and supporting units comply with the changes. In heavy combat, the TF commander participates directly in control of combat operations. He deals personally with problems of cover, concealment, suppression, and teamwork. For best results, the commander does not remain in the TF TOC but moves about the battlefield to personally supervise execution. (In exercises involving simulations, the commander's direct participation in battle can be simulated by requiring the commander to move from the TOC to a remote location which has radio commo with the TOC.)		
10-6-D Maintain the battle-field.	Preceding condi-tions apply.	Command group tasks TF elements and sup-porting engineer units to accomplish any or all of the following tasks which sup-port the TF mission/new course of action: repair damaged roads, bridges, aircraft facilities, POL, ammo, and water supply facilities, protective shelters, and camouflage systems; re-seed minefields; clear or breach opposing force obstacles and friendly obstacles that hinder changed plans.		

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TRAINING AND EVALUATION OUTLINE

UNIT: __COMMAND GROUP/STAFF__   MISSION: __CONTROL AND COORDINATION OF OPERATIONS__

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
10-7 Employ fires and other combat support assets. (D-K, LT, CAMMS, CATTS)	Conditions for Task 10-6 apply.	Command group directs the employment of all organic/attached/nonorganic supporting weapons and other CS assets to concentrate combat power at the critical place and time and to suppress enemy weapons systems which interfere with the accomplishment of the TF mission. Command group requests additional resources if necessary.		
10-7-A Modify fire support plan.	Opposing forces, by direction of senior evaluator, deploy or maneuver in such a way as to cause the TF to modify its fire support plan. The opposing force may reinforce, withdraw, attack an exposed flank, conduct an airmobile assault to the TF rear, etc.	Priority of fires which supports the new scheme of maneuver is communicated to supporting and supported units. Requests for immediate fire support are received and assigned to appropriate fire support agencies. Missions are assigned which support anticipated developments.		
10-7-B Employ (to include organic/ attached weapons systems and supporting artillery, air defense, TAC air, and attack helicopters).	Preceding conditions apply.	Fire support: (1) Is characterized by compatibility of weapons capabilities with targets serviced. (2) Is applied at maximum range. (3) Concentrates maximum number of fire support assets at critical point and time. (4) Results in suppression of opposing force fires (direct, indirect, and air defense), maneuver, and control capability. (NOTE: Smoke can be used to suppress some of the opposing force's weapons systems). (5) Degrades opposing force's capability to reinforce, counterattack, maneuver, or resupply. (6) Is aggressively and violently applied.		

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TRAINING AND EVALUATION OUTLINE

UNIT: __COMMAND GROUP/STAFF__   MISSION: __CONTROL AND COORDINATION OF OPERATIONS.__

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
		(7) Results in efficient expenditure of tank, ATGM, and mortar ammo. Ammo constraints are imposed to insure adequate supply for contingency missions as appropriate.		
10-7-C Employ other combat support assets.	Preceding conditions apply.	(1) Army and/or USAF electronic warfare units are requested to jam enemy command and control communications, air defense radars, and weapons systems which rely on electronic guidance or control. (2) Supporting combat engineers are tasked to: (Offense) Breach and clear minefields, obstacles, and fortified positions; assist in river-crossing operations; assist in forward movement of fuel and ammunition; lay mines and create obstacles to protect exposed flanks. (Defense, Retrograde) Create obstacles and minefields to reinforce defensive advantages of the terrain, block avenues of approach, and delay opposing forces in the fields of fire of TF weapons systems; provide protective shelter; maintain supply and tactical routes.		
10-8 Concentrate/ shift combat power. (D-K, LT, CAMMS, CATTS)	Opposing forces, directed by senior evaluator, maneuver in such a way as to present a serious threat to the TF or a target with vulnerabilities the TF should exploit.	The command group concentrates/shifts its combat power at the decisive place and time to destroy the opposing force.		

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TRAINING AND EVALUATION OUTLINE

UNIT: ___COMMAND GROUP/STAFF___   MISSION: ___CONTROL AND COORDINATION OF OPERATIONS.___

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
10-8-A Determine critical place and time.	Preceding conditions apply.	Command group reads the battlefield and determines the precise place and time where maximum combat power should be deployed. (NOTE: This determination can best be evaluated by analyzing the extent of opposing force casualties and the outcome of the battle.)		
10-8-B Concentrate/shift combat power in the attack.	The opposing force, directed by senior evaluator, has maneuvered in such a way that it is vulnerable to exploitation by the TF.	Command group concentrates at the point where the opposing force is weak; it moves forces to the critical point, while achieving surprise by careful use of terrain, camouflage, movement during periods of reduced visibility, decoys, electronic countermeasures, etc. Suppressive fires, supporting attacks, and close air support are intensified. Pressure is maintained on the opposing force. Once opposing force forward combat elements have been penetrated, the command group directs TF elements to seek out the enemy rear. The concentration of combat power, usually under the personal supervision of the TF commander, should be rapid, aggressive, and violent.		
10-8-C Concentrate/shift combat power in the defense or retrograde.	Opposing force, directed by senior evaluator, has maneuvered in such a way that his force ratio is greater than 3:1 and poses a serious threat to the security of the TF.	Command group concentrates its organic/attached/DS assets according to their weapons capabilities and the movement of the opposing force. Artillery/mortar fires are increased to destroy/button up tanks and preclude opposing force infantry from dismounting. Command group requests attack helicopter and close air support; repositions forces, to include dismounted antitank guided missile teams; and, if necessary, requests additional units from the brigade reserve. As reinforcements arrive, command group organizes them for combat and assigns battle positions and missions.		

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TRAINING AND EVALUATION OUTLINE

UNIT: __COMMAND GROUP/STAFF__   MISSION: __CONTROL AND COORDINATION OF OPERATIONS.__

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
10-8-D Protect thinly held areas.	In concentrating combat power at the critical point, the command group has reduced combat power in other areas.	Command group directs organic/supporting forces to conduct economy-of-force operations in the thinly-held areas. If available, command group requests additional assets, such as scout or attack helicopters, to assist. Modifies fire support plan and deception plan.		
10-9 Manage combat service support assets.	General conditions for Task 10-5 apply.	The command group orients the TF's CSC assets to the weapons systems insuring that the CSS effort is dedicated to arming, fueling, and fixing the systems and supporting the troops who operate the systems. Evaluation of performance should be determined in terms of percentage of functioning equipment and weapons in the TF and in terms of the actions taken by the battalion command group to obtain maintenance assistance from the appropriate higher levels of maintenance support.		
10-9-A Arm and fuel the systems.	Preceding conditions apply. Evaluator personnel input pre-programed requests for supplies and equipment from TF elements.	Ammunition, POL, equipment, and other supplies critical to the capability of the TF weapons systems are available and utilized. Command group informs TF elements of the controlled supply rate (CSR). Requests for supplies/ equipment are handled expeditiously IAW SOP. Delivery to TF elements is made as far forward as deemed prudent.		

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TRAINING AND EVALUATION OUTLINE

UNIT: __COMMAND GROUP/STAFF__   MISSION: ___CONTROL AND COORDINATION OF OPERATIONS.___

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
10-9-B Fix the systems.	Preceding conditions apply. Evaluator personnel input pre-programed requests for maintenance assistance from TF elements.	Command group directs maintenance and repair of its systems by organic assets. When maintenance is beyond TF capabilities, command group requests contact teams for repair of specific systems as far forward as the situation permits. Battlefield cannibalization, if appropriate, is directed. When a system cannot be repaired on the battlefield, arrangements are made for recovery and evacuation or destruction.		
10-9-C Support the troops.	Preceding conditions apply. Evaluator personnel input various prepro-gramed requests for assistance from TF elements.	Command group supervises implementation of health preservation programs, manage-ment of troop subsistence, and control and expeditious movement of replacements to points where they are needed.		
10-9-D Inte-grate CSS into scheme of maneu-ver.	Preceding conditions apply.	Command group maneuvers CSS resources assigned to the TF, keeping support units in proximity to the weapon systems they support, commensurate with the risk involved. Supplies are delivered tacti-cally. Transportation assets are used to fit movement of CSS resources to the scheme of maneuver.		
10-10 Secure and protect the TF. (LT, CAlMS, CATTS)	Conditions for Task 10-5 apply.	Command group supervises TF operations to insure the opposing force's intelli-gence collection effort is suppressed. (NOTE: Evaluation of performance of this task is best determined by analyz-ing results of the opposing force's intelligence collection effort. Opti-mally, opposing force is unable to determine TF strength, task organization, dispositions, vulnerabilities, capabilities, or intentions.)		

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TRAINING AND EVALUATION OUTLINE

UNIT: COMMAND GROUP/STAFF   MISSION: CONTROL AND COORDINATION OF OPERATIONS

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
10-10-A Defeat or suppress opposing force's electromagnetic intelligence effort.	Preceding conditions apply.	Communications and electronic security measures are rigidly adhered to throughout the TF.		
10-10-B Defeat or suppress opposing force's imagery intelligence effort.	Preceding conditions apply.	An effective program of cover, concealment, and camouflage discipline is enforced.		
10-10-C Defeat or suppress opposing force's human intelligence effort.	Preceding conditions apply.	Appropriate and precise liaison is conducted with territorial security forces.		
10-10-D Deceive the opposing force.	Preceding conditions apply.	Opposing force is deceived by implementing any or all of the following: (1) Dummy equipment/positions are realistically sited and camouflaged. (2) Actual damaged equipment (not recoverable) is realistically sited and camouflaged. (3) Phantom radio nets are operated by trained intelligence units (requested of and approved by higher headquarters).		

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CONTROL AND
COORDINATION OF
OPERATIONS.

UNIT: COMMAND GROUP/STAFF   MISSION:

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
10-10-E Reduce vulnerability to opposing force mass destruction weapons systems.	Preceding conditions apply.	Except when required by mission or situation to concentrate, TF elements should be dispersed to the extent feasible as dictated by terrain and situation.		
10-10-F Detect/ impede threats to TF security.	Preceding conditions apply. Opposing forces (as directed by senior evaluator) maneuver in such a way as to present a threat to TF security.	Command group recognizes and assesses the opposing force and takes necessary action to counter it.		
10-10-G Detect/ defeat opposing force air assets.	Opposing force aircraft attack the TF.	Command group establishes AD priorities and organizes AD assets. Directs air defense fires if those fires are not already being delivered. Repositions AD assets to protect critical positions/ facilities on the battlefield. Assesses and reports damage.		
10-11 Troop lead during battle. (LT, CAMMS, CATTS)	Conditions for Task 10-5 apply.	Command group supervises execution of actions by TF elements required to accomplish the TF mission.		

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TRAINING AND EVALUATION OUTLINE

UNIT: __COMMAND GROUP/STAFF__   MISSION: __CONTROL AND COORDINATION OF OPERATIONS.__

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
10-11-A Supervise compliance with TF order.	Preceding conditions apply.	Command group supervises the execution of the TF order by TF elements and supporting units, making corrections as necessary. TF commander moves about the battlefield, personally directing the battle at the critical time and place. (In exercises involving simulations, the commander's direct participation in battle can be simulated by requiring the commander to move from the TOC to a remote location which has radio commo with the TOC.)		
10-12 React to situations requiring special actions. (LT, CAMMS, CATTS)	The situations listed below are designed to be interjected at various times during the play of an exercise. The senior evaluator determines how often these situations should be used and when. This precludes player personnel from anticipating the situations; the element of surprise enhances realism.	TF continues operations with a minimum of confusion and disruption.		
10-12-A React to opposing force electronic warfare.	TF is performing assigned mission. Opposing force jams TF nets and sends imitative messages to various TF stations.	Command group recognizes opposing force jamming activities and continues operation without revealing effectiveness of the jamming activity. Reports are sent to higher headquarters using secure means of communication, if available. Directs switch to spare frequency as a last resort measure, using proper authentication techniques. (NOTE: Evaluators may interject other conditions requiring frequency shift, e.g., lost CEOI, lost radio.) Command group detects imitative messages and insures that no TF elements respond to them. TF continues mission.		

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TRAINING AND EVALUATION OUTLINE

UNIT: __COMMAND GROUP/STAFF__   MISSION: __CONTROL AND COORDINATION OF OPERATIONS.__

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
10-12-B React to chemical or biological attack.	TF is performing assigned mission. TF elements report an attack by a chemical or biological agent.	Command group receives/verifies reports. Sounds alarm and directs the implementation of NBC defensive measures IAW SOP. Relays report of attack to adjacent, supporting, and higher headquarters. Directs continuous monitoring, decontamination, and marking of contaminated areas. Submits appropriate reports. Command group wears protective equipment (if in affected area) until unit NBC teams (simulated) determine it is safe to unmask.		
10-12-C React to nuclear attack.	TF is performing assigned mission. TF elements report a nuclear burst.	All personnel take cover. Command group collects burst data and reports IAW SOP. Directs continuous monitoring, reports data, arranges evacuation of casualties, and directs damage assessment and emergency decontamination. Continues performance of mission under radiological hazard conditions.		
10-12-D React to loss of key member of command group.	Senior evaluator designates one or more members of command group (commander, S3, S2, etc.) a casualty.	Command group continues to operate effectively in performance of mission. Adjustments made to command group organization and responsibilities. Higher headquarters notified.		
		NOTE: TAB A, next page, contains suggested support requirements.		

ARTEP 71-2

APPENDIX B
EXERCISE SCHEDULES

The armor and mechanized infantry battalion command groups had the following schedule of activities:

Day 1--Covering Force Operation

Time	Event
0700	Players arrive, receive administrative briefing.
0730	Battalion receives reconnaissance report.
0745	Brigade updates battalion on present situation and mission.
0830	Battalion OPORD briefing to company commanders.
0930	Battalion starts moving toward canal where enemy is expected to attack.
1030	Enemy begins moving toward canal.
1100	Battalion arrives at canal.
1130	Enemy arrives at canal, attacks, and begins to cross canal.
1300	Enemy completes canal crossing and delay begins.
1430	Battalion command groups break contact and make passage of lines into main battle area (MBA).

Day 2--Attack

Time	Event
0700	Players arrive.
0730	Brigade fragmentary order given.
0830	Battalion gives fragmentary order to company commanders.
1130	Brigade reaches objective.
1200	Lunch.
1300	Critique.
1400	Systems briefing.
1430	Players released.

The following is the schedule of activities for the light infantry battalion command groups:

Day 1--Defense

Time	Event
0700	Players arrive, receive administrative briefing.
0730	Reconnaissance report given to battalion command group.
0745	Brigade updates enemy situation.
0830	Battalion OPORD briefing to company commanders.
0930	Battalion arrives at starting/landing zone.
1100	Battalion elements in battle positions.
1115	Covering force units begin passage of lines through player battalion.
1245	Enemy attacks forward battle positions.
1315	Enemy attacks main battle area.
1630	Enemy breaks contact.

Day 2--Nonilluminated Night Attack

Time	Event
0700	Players arrive, brigade gives FRAGO order.
0800	Battalion FRAGO order briefing to company commanders.
0930	Company commanders reach line of departure (LD).
1130	Battalion achieves objective.
1200	Lunch.
1300	Critique.
1400	Systems briefing.
1430	Players released.

Since this is a free-play exercise, the times listed above are approximate and varied slightly from one exercise to another according to the actions of each command group.

APPENDIX C
PERFORMANCE ON ARTEP SUBTASKS

Task 1: Develop Plan Based on Mission

This task comprises 12 subtasks, 3 of which were problem areas:
analyze mission, identify enemy information, and plan fires. The sub-
tasks and their mean ratings are summarized in Table C-1. Seven ob-
servers rated the command group's performance on various parts of Task 1:
the four company commander controllers (whose averaged ratings are shown
in the column labeled CC), the S2/S3 controller, the fire support con-
troller, and the TOC monitor. The three problem subtasks are indicated
by asterisks, which mark the ratings that were more than one standard
deviation below the mean of all ratings by the designated rater on the
given day.

Performance on the planning function was generally not observable as
it occurred but was evaluated on the basis of the operations order. Sub-
task 1-A (analyze mission) was rated relatively low by the company com-
manders on Day 1, because the operations order occasionally omitted part
of the mission--especially the implied task of making a passage of lines
near the end of the covering force operation. The mean company commander
rating of 2.6 for this subtask on Day 1 is not low in absolute terms,
but it is low in comparison with the other subtasks rated by the company
commanders.

Table C-2 summarizes the common deficiencies in the three problem
subtasks of Task 1, together with the proportion of command groups of the
total 27 in which each deficiency was reported. The proportions of de-
ficiencies in this and subsequent tables are low estimates, because the
controllers did not always write comments on the observation forms to
explain their low ratings.

Subtask 1-B was rated relatively low (2.5) by the TOC monitor com-
pared with his other ratings on Day 1. It was rated even lower (2.1 on
both days) in absolute terms by the S2 controller. The major deficiency
in this subtask (identify critical combat information and intelligence)
was insufficient knowledge of enemy tactics and force structure.

Subtask 1-I (plan use of organic/attached and nonorganic fires) was
rated very low by the fire support controller, who was in a better posi-
tion to evaluate it than the TOC monitor. The fire support controller
rated this subtask unsatisfactory for more than half the command groups
on Day 1 and for more than one-third of the groups on Day 2. Common
criticisms were too many and poorly selected priority targets, insuffi-
cient coordination with forward observers, and lack of coordination be-
tween the fire plan and the maneuver plan.

The remaining subtasks of Task 1 generally were performed satisfac-
torily. Subtasks 1-C and 1-D, dealing with friendly information and

Table C-1

Mean Ratings for Task 1: Develop Plan Based on Mission

Subtask	S2		S3		CC		FS		TOC	
	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2
1A. Analyze ... ~tify tasks	2.1				2.6*	2.8			2.9	2.9
1B. Identify critical enemy information		2.1							2.4*	2.6
1C. Identify critical friendly information			2.6	2.4					2.8	2.7
1D. Analyze friendly capabilities			2.6	2.5					2.7	2.9
1E. Select key terrain to control or occupy					2.9	3.0			2.7	2.8
1F. Select routes to objective (attack)						2.9				2.9
1. Provide for mission accomplishment						3.0				
2. Provide maximum cover and concealment						3.0				
3. Minimize effects of obstacles						2.6*				
4. Mutual support and overwatch						3.0				
5. Maximize effectiveness of own weapons						2.9				
6. Facilitate control while permitting teams to deploy and maneuver						2.9				
7. Maximize TF and team mobility						2.9				
8. Capitalize on enemy vulnerabilities						2.9				
9. Minimize time to objective						3.0				

Rater

Table C-1--Continued

Rater

Subtask	S2 Day 1	S2 Day 2	S3 Day 1	S3 Day 2	CC Day 1	CC Day 2	FS Day 1	FS Day 2	TOC Day 1	TOC Day 2
1G. Select battle positions (defense)					2.8		2.7			
1. Block critical avenues of approach					3.0					
2. Minimize vulnerabilities to enemy fire					3.0					
3. Maximize effectiveness of own weapons.					2.8					
4. Exploit and reinforce natural terrain obstacles					3.0					
5. Permit support and overwatch					3.0					
6. Facilitate control while permitting teams to deploy and maneuver					2.9					
7. Maximize TF and team mobility					2.6*					
8. Capitalize on enemy vulnerabilities					2.8					
9. Reduce vulnerability to air attack					2.5*					
1H. Select initial and successive battle positions (covering force)					2.8		2.6			
1. Block critical avenues of approach					2.9					
2. Force enemy to deploy and concentrate forces repeatedly					2.8					

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Table C-1—Continued

Subtask	S2 Day 1	S2 Day 2	S3 Day 1	S3 Day 2	CC Day 1	CC Day 2	FS Day 1	FS Day 2	TOC Day 1	TOC Day 2
3. Minimize vulnerability to enemy long-range observation and fires					2.8					
4. Maximize effectiveness of own weapons					2.7					
5. Force enemy to travel along exposed approaches					2.8					
6. Reinforce natural terrain and man-made obstacles					2.9					
7. Reduce vulnerability to air attack					2.8					
1I. Plan fires							1.6*	1.9*	2.8	2.7
1J. Determine which units receive priority for fire support							2.5	2.5	2.6	2.7
1K. Determine supply requirements for fire support								2.7	2.7	2.7
1L. Determine fire support coordination measures							2.5	2.7	2.8	2.7
1. Determine fire support/target acquisition assets available							2.6	2.6		
2. Determine fire support coordination measures							2.3	2.7		

*More than one standard deviation below the mean.

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Table C-2

Deficiencies Identified in Task 1: Develop Plan Based on Mission

Proportion

1A. Analyze mission: identify tasks

- Command group failed to address implied task of passage of lines .... .30

- Incomplete or confusing specification of mission .... .22

- Left out part of mission or gave incorrect mission .... .07

1B. Identify critical enemy information

- S2 not aware of enemy doctrine and force composition .... .25

- S2 unable to analyze the threat opposing the task force .... .07

1I. Plan fires

- Poor or inadequate selection of priority targets .... .33

- Poor coordination with forward observers .... .30

- Fire plan not prepared in conjunction with maneuver plan .... .19

- Too many priority targets .... .19

Note. Each proportion represents the number of battalion command groups (out of 27) that exhibited the specified deficiency.

capabilities, were usually done well, although adjacent units sometimes received slight attention. Subtasks 1-E, 1-F, and 1-G were broken down into more specific items for the company commanders. Most of these items were rated satisfactory. The three exceptions were Subitem 3 under Subtask 1-F, and Subitems 7 and 9 under Subtask 1-G. Subtask 1-L was divided into two subitems for the fire support controller. The ratings for these four subtasks in Table C-1 are the means of the ratings for the several items (listed below the subtask) into which each subtask was categorized.

Task 2: Initiate Intelligence Preparation of the Battlefield

All four subtasks of Task 2 were rated consistently low. As indicated in Table C-3, the monitor's ratings for all subtasks were more than

Table C-3

Mean Ratings for Task 2: Initiate Intelligence
Preparation of the Battlefield

| | Rater | | | | | |
| | S2 | | CC | | TOC | |
Subtask	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2
2A. Identify critical enemy information	2.1	2.1			2.4*	2.4*
2B. Gather information from all appropriate sources	1.8*	1.9	2.5*	2.7*	2.3*	2.3*
2C. Analyze information to predict enemy intentions	2.2	2.2			2.3*	2.3*
2D. Disseminate information and intelligence	2.1	2.1			2.3*	2.4*

*More than one standard deviation below the mean

one standard deviation below the mean, and so were the company com-
manders' ratings for Subtask 2-B. The S2's ratings were also quite low;
only one of them is starred because most of the S2's ratings were uni-
formly low.

The common deficiencies are listed in Table C-4, which shows that
the most frequent shortcoming was the failure in 2-B to assign each task
force element to report the specific information it was best able to
obtain. Instead, everyone was usually assigned to report everything,
whether it was observable or not. Subtasks 2-A (which is the same as
1-B) and 2-C both suffered from inadequate knowledge of threat doctrine
and capabilities. Intelligence dissemination (2-D) tended to be slow
and incomplete. The incompleteness resulted partly from the individual
staff members not pooling the information they received from their re-
spective sources.

Table C-4

Deficiencies Identified in Task 2: Initiate Intelligence
Preparation of the Battlefield

Subtask	Proportion
2A. Identify critical enemy information	
. S2 not aware of enemy doctrine and force composition	.25
. S2 unable to analyze the threat opposing the task force	.07
2B. Gather information from all appropriate sources	
. All combat elements, scouts, and GSR (ground surveillance radar) were tasked to report the same information	.85
2C. Analyze information to predict enemy intentions	
. S2 did not fully comprehend the battlefield activity	.11
. Primarily based on intelligence from brigade, and not on information from front-line units.	.11
. S2 not fully aware of threat doctrine, tactics, and force structure.	.11
2D. Disseminate information and intelligence	
. Slow in disseminating intelligence to company commanders or passing information up	.33
. Battalion staff not coordinating among themselves	.30
. Most spotreps and sitreps were incomplete	.15
. Could have passed more intelligence up and down the chain	.11

Note. Each proportion represents the number of battalion command groups (out of 27) that exhibited the specified deficiency.

Task 3: Prepare and Organize the Battlefield

Three of the nine subtasks that were evaluated under Task 3 were rated relatively low, as shown in Table C-5. Subtask 3-H (reinforce terrain) was not rated, because it requires construction activities that were not simulated in CATTS, and Subtask 3-I (plan/employ active/passive security measures) was not evaluated, because it involves camouflage, also not simulated.

Table C-5

Mean Ratings for Task 3: Prepare and Organize the Battlefield

Rater

Subtask	S1/S4 Day 1	S1/S4 Day 2	S2 Day 1	S2 Day 2	S3 Day 1	S3 Day 2	CC Day 1	CC Day 2	TOC Day 1	TOC Day 2
3A. Determine place where enemy is likely to concentrate									2.8	2.9
3B. Select a course of action									2.9	3.0
3C. Organize TF into combined arms teams									2.8	2.8
3D. Select reference points on terrain to facilitate control of teams							2.9	2.9	2.9	2.8
1. Support scheme of maneuver							2.9	2.9		
2. Facilitate first movement							3.0	2.9		
3. Permit rapid change							2.9	2.9		
3E. Update fire plan									2.8	2.7
3F. Develop communication plan, including security considerations			1.6*	1.6*					2.6	2.7
3G. Communicate plans and or 's					2.0	2.0*	2.5*	2.5*	2.5	2.7
3J. Provide supplies	2.1	2.5							2.9	2.8
3K. Maintain equipment	1.9*	2.1*							2.9	2.9

*More than one standard deviation below the mean

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Weaknesses in the communication plan (3-F) listed in Table C-6 resulted in deficiencies in communications security (10-A) during battle and in reaction to jamming (12-A).

Table C-6

Deficiencies Identified in Task 3: Prepare and
Organize the Battlefield

Proportion

3F. Develop communication plan, including security considerations

. No or inadequate provisions for procedures to be followed   .30
    in case of lost communication due to jamming
. No mention of the requirements for radio listening silence   .19
    or for alternate frequency
. No mention of the need for brevity of communication   .15

3G. Disseminate plans and coordinate with appropriate agencies

. Important information omitted from OPORD (e.g., fire sup-   .67
    port, minefields, berm, enemy organization, combat
    support, march order/routes, prepositioned ammo,
    action if jammed, alternate frequency). Also, the
    battalion relied on its SOP (Standard Operating Prc-
    cedure) to supplement the operations order, even with
    attached and supporting units which may not have been
    familiar with the battalion's SOP.

. Order took too long to prepare and present. Did not allow   .37
    enough time for company commanders to go through troop-
    leading procedures.

. Order too complicated, not clear, disorganized.   .25

. Warning order not given   .25

3K. Maintain equipment

. Little attempt to repair/evacuate non-operational equipment .30

Note. Each proportion represents the number of battalion command groups (out of 27) that exhibited the specified deficiency.

Task 4: Troop Lead before Battle

As shown in Table C-7, supervision of preparation (4-A) and of execution (4-B) were usually judged satisfactory. The scenario did not allow sufficient time to conduct rehearsals (4-C).

Table C-7

Mean Ratings for Task 4: Troop Lead Before Battle

		Rater			
		CC		TOC	
	Subtask	Day 1	Day 2	Day 1	Day 2
4A.	Supervise preparation of TF elements			2.8	2.9
4B.	Supervise compliance with plan	2.9	3.0	2.9	3.0

Task 5: See the Battlefield during the Battle

Task 5, a continuation of Task 2, comprises the same subtasks. The ratings in Table C-8 identify three subtasks (5-B, 5-C, and 5-D) as relatively low. The common criticisms (Table C-9) of identifying, analyzing, and disseminating intelligence are similar to those for the corresponding

Table C-8

Mean Ratings for Task 5: See the Battlefield During the Battle

		Rater					
		S2		CC		TOC	
	Subtask	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2
5A.	Identify critical enemy information	2.1	2.1			2.5	2.6
5B.	Gather information from all appropriate sources	2.0	2.0	2.5*	2.7*	2.4*	2.6
5C.	Analyze information to predict enemy intentions	2.1	2.1			2.2*	2.4*
5D.	Disseminate information and intelligence	2.1	2.1	2.5*	2.5*	2.4*	2.5*

*More than one standard deviation below the mean.

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Table C-9

Deficiencies Identified in Task 5:   See the Battlefield
During the Battle

	Proportion
5A. Identify critical enemy information	
. S2 not aware of enemy doctrine and force composition	.25
. S2 unable to analyze the threat opposing the Task Force	.07
. Relied mainly on brigade	.04
5B. Gather information from all available sources	
. Did not use all assets	.52
. Asked only for routine spotreps and sitreps. Did not seek additional information.	.19
5C. Analyze information to predict enemy intentions	
. S2 not aware of enemy doctrine and force composition	.19
. Relied primarily on intelligence from brigade, and did not analyze information from front-line units	.07
. Had difficulty determining the intentions of the enemy	.07
5D. Disseminate information and intelligence	
. Slow in disseminating intelligence to company commanders or passing information up	.33
. Battalion staff not coordinating among themselves	.30
. Most spotreps and sitreps were incomplete	.19
. Limited intelligence sent down	.04

Note.   Each proportion represents the number of battalion command groups (out of 27) that exhibited the specified deficiency.

subtasks of Task 2. The major difference in the pattern of deficiencies was the change from not tasking individual units to report what they were actually in a position to observe (2-B) to not actively collecting information from every element during the battle (5-B).

Task 6:   Control and Coordinate Combat Operations

All four subtasks were generally rated satisfactory, as shown in Table C-10.

Table C-10

Mean Ratings for Task 6: Control and Coordinate Combat Operations

| Subtask | Rater | | | |
| | CC | | TOC | |
	Day 1	Day 2	Day 1	Day 2
6A. Modify plan as required by enemy actions.			2.7	2.9
6B. Communicate changes	2.7	2.9	2.7	2.6
6C. Supervise execution of changes			2.8	2.8
6D. Direct combat engineers to support changed plan			2.8	2.8

Task 7: Employ Fires and Other Combat Support Assets

This task was rated satisfactory by the fire support controller and the monitor (Table C-11). The fire support controller's rating for modification of the fire support plan (7-A) is the mean of his evaluations of two subitems:

1. Communicating new priorities, and

2. Assigning requests for fire support.

Table C-11

Mean Ratings for Task 7: Employ Fires and Other Combat Support Assets

| Subtask | Rater | | | |
| | FS | | TOC | |
	Day 1	Day 2	Day 1	Day 2
7A. Modify fire support plan as required by enemy actions	2.7	2.7	2.9	2.9
1. Communicate new priority of fires to supporting and supported units	2.4	2.4		
2. Assign requests for fire support to appropriate units	2.9	2.9		
7B. Employ fire support assets appropriately	2.5	2.7	2.8	2.7
7C. Employ other combat support assets			2.9	3.0

Employment of fires (7-B) which is played extensively in CATTS, was done well by most command groups. Subtask 7-C had little content, because (a) electronic warfare units were not played and (b) few combat engineer activities were simulated.

Task 8: Concentrate/Shift Combat Power

Three of the four subtasks were rated low by one or more observers (Table C-12) for the reasons summarized in Table C-13. Most of the command groups did not determine the precise place and time to concentrate combat power (8-A) during covering force operation on Day 1 because they did not appreciate how quickly both friendly and enemy units moved across the terrain. Concentrating combat power during the attack on Day 2 was criticized for being too slow, for keeping too big a reserve, and for not bringing all available assets to bear at the critical point. Concentrating combat power in the defense or retrograde was rated low by the S3 and the monitor and was criticized frequently for failure to use all available assets (especially attached and supporting units) and for becoming decisively engaged during the covering force operation.

Table C-12

Mean Ratings for Task 8: Concentrate/Shift Combat Power

	Rater							
	S3		CC		FS		TOC	
Subtask	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2
8A. Determine critical place and time	2.1	2.2	2.6*	2.8			2.5	2.7
8B. Concentrate/shift combat power in the attack		2.0*		2.8				2.7
8C. Concentrate/shift combat power in the defense or retrograde	1.9*		2.7		2.9		2.4*	
8D. Protect thinly held areas	2.1	2.1	2.7	2.8	2.6	2.7	2.9	2.8

*More than one standard deviation below the mean.

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Table C-13

Deficiencies Identified in Task 8: Concentrate/Shift Combat Power

Proportion

8A. Determine critical place and time.

. Did not appreciate time-distance problems (inability   .85
    to determine speed of enemy, speed of friendly units,
    trafficability of terrain)

8B. Concentrate/shift combat power in the attack

. Reacted too slowly to affect battle   .15
. Reserve was too big/not utilized   .11
. Did not make use of all available forces   .11

8C. Concentrate/shift combat power in defense or retrograde

. Inadequate use of attached and supporting units (Cav,   .78
    TOW, Scouts, Vulcans)
. Failed to use available assets (reserves, air, artillery,   .59
    and smoke)
. Became decisively engaged during the covering force   .19
    operation

Note. Each proportion represents the number of battalion command groups
(out of 27) that exhibited the specified deficiency.

Task 9: Manage Combat Service Support Assets

The S1/S4 controller was more critical of the performance of the sub-
tasks than the monitor, as shown in Table C-14. Since the brigade S1/S4
controller interacted with counterparts on the battalion staff, the S1/S4
may have been in a better position to make the judgment. The only sub-
task in Task 9 that was rated more than one standard deviation below the
mean for either day was 9-B, which is concerned with maintenance and re-
pair. As in the corresponding subtask (3-K) before the battle, this weak-
ness may have resulted from a lack of realistic information about equip-
ment malfunctions in the simulation. The common deficiency was in not
recovering non-operational vehicles (Table C-15).

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Table C-14

Mean Ratings for Task 9: Manage Combat Service Support Assets

| Subtask | Rater | | | |
| | S1/S4 | | TOC | |
	Day 1	Day 2	Day 1	Day 2
9A. Provide weapons systems with ammunition and fuel	2.1	2.4	2.9	2.8
9B. Maintain and repair weapons systems	1.9*	2.1*	3.0	2.9
9C. Provide health preservation programs, subsistence, and replacements	2.0	2.2	2.9	3.0
9D. Transport and deliver supplies	2.3	2.4	2.7	2.6

*More than one standard deviation below the mean.

Table C-15

Deficiencies Identified in Task 9: Manage Combat
Service Support Assets

Proportion

9B. Maintain and repair weapons systems

. No effort made to recover non-operational vehicles   .33

Note. Each proportion represents the number of battalion command groups
(out of 27) that exhibited the specified deficiency.

Task 10: Secure and Protect the Task Force

The principal weakness (Table C-16) was in ignoring the enemy's
electromagnetic intelligence efforts (10-A). Camouflage (10-B), human
intelligence (10-C), deception (10-D), and enemy airstrikes (10-G) were
not simulated. Subtask 10-F (detect, impede threats to task force
security) was not evaluated because it had no distinctive content apart
from Subtasks 6-A, 6-B, 6-C, 8-C, and the other subtasks of Task 10. The
elements of the task force were usually dispersed to reduce vulnerability
to enemy mass destruction weapons (10-E), according to the S3 controller.

Table C-16

Mean Ratings for Task 10:   Secure and Protect the Task Force

Subtask	Rater			
	S2		S3	
	Day 1	Day 2	Day 1	Day 2
10A. Defeat or suppress enemy's electromagnetic intelligence effort.	1.8*	1.7*		
10E. Reduce vulnerability to enemy mass destruction weapons systems			2.3	2.3

*More than one standard deviation below the mean.

The brigade S2 controller criticized communications security (10-A) for giving locations and coordinates in the clear and for having overlong transmissions that might be detected by the enemy (Table C-17).

Table C-17

Deficiencies Identified in Task 10:   Secure and Protect
the Task Force

                                                            Proportion

10A. Defeat or suppress enemy's electromagnetic intelligence effort

. Violated communications security. (Location and   .25
  coordinates in clear, communications too long.)

. Broke radio silence   .07

Note.   Each proportion represents the number of battalion command groups (out of 27) that exhibited the specified deficiency.

Task 11:   Troop Lead during Battle

Like Subtask 4-B which it continues, and 6-C which continues or parallels it, Subtask 11-A (Table C-18) was nearly always rated as satisfactory by the company commanders and the monitor.

Table C-18

Mean Ratings for Task 11:   Troop Lead During Battle

Subtask	Rater			
	CC		TOC	
	Day 1	Day 2	Day 1	Day 2
11A. Supervise compliance with TF order	2.8	2.9	2.9	2.9

Task 12:   React to Special Situations

The only part of this task that was simulated was enemy jamming
(12-A).   The enemy did not send imitative messages in 12-A.   There were
no chemical or biological attacks (12-B) or nuclear attacks (12-C).   With
a few minor exceptions late on the second day, no key member of the com-
mand group was lost (12-D).   The reaction to jamming was severely criti-
cized by the S2 controller, who was able to observe it more closely than
the monitor.   The S2's rating for this task in Table C-19 is the mean of
the scores for the three subitems that he evaluated.

Table C-19

Mean Ratings for Task 12:   React to Special Situations

Subtask	Rater			
	S2		TOC	
	Day 1	Day 2	Day 1	Day 2
12A. React to enemy jamming	1.8*	1.7*	2.6	2.5*
1. Recognize jamming and continue operation	1.8*	1.7*		
2. Report jamming to higher headquarters	2.1	1.8*		
3. Switch to spare frequency	1.5*	1.5*		

*More than one standard deviation below the mean.

The S2's most frequent criticisms (Table C-20) were for failure to
switch to alternate frequency as a last resort and for inadequate reports
of jamming to brigade headquarters.   Other deficiencies were (a) not rec-
ognizing jamming, (b) not determining whether all frequencies were jammed,
and (c) not trying to communicate through the jamming before changing to
an alternate frequency.

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Table C-20

Deficiencies Identified in Task 12: React to Special Situations

	Proportion
12A. React to enemy jamming	
. Did not switch to alternate frequency	.63
. Jamming report incomplete or omitted.	.44
. Failed to recognize jamming	.22
. Did not determine whether all frequencies were jammed	.15
. Did not attempt to override jamming before changing to alternate frequency	.11

Note. Each proportion represents the number of battalion command groups (out of 27) that exhibited the specified deficiency.

CORRELATIONS BETWEEN SUBTASK RATINGS AND OVERALL PERFORMANCE
RATINGS FOR MEMBERS OF THE BATTALION STAFF

Three controllers interacted with and evaluated their counterparts on the battalion staff: The S1/S4 controller rated the battalion S1 and S4, the S2/S3 controller rated the S2 and S3, and the fire support controller rated the battalion fire support coordinator. The correlation between the ratings for a specific subtask and the overall performance ratings for each staff member is a measure of the weight that the controller gave to that subtask in his evaluation of the player. A high correlation indicates that the subtask is an important function of the person who performs it. The 83 correlations in the next four tables range from .06 to .83. Of those, 46 are significant at the .01 level, and an additional 12 at the .05 level.

S1 and S4 Performance Ratings

The battalion S1 and S4 worked closely together. As reported in Table 5 of this report, there was high correlation between their overall performance ratings ($r = .85$). Thus, the correlations between overall performance and the ratings for specific subtasks should be similar for the S1 and S4. This expectation is confirmed in Table D-1, although all the subtasks except 9-C (troop support) are primarily S4 functions. Subtask 9-D--which requires integrating combat service support resources into the scheme of maneuver and keeping support units near the weapons systems they support--was the subtask most highly correlated with overall performance. Providing supplies before the battle (3-J) was a close second.

At the other extreme, the subtask least correlated with overall performance was 9-C. Subtask 9-B also was not significantly correlated with overall performance, which is consistent with the earlier observation that the maintenance and repair of weapons systems were not realistically simulated during the exercise.

S2 Performance Ratings

The subtask most highly correlated with overall performance of the battalion S2 (both ratings provided by the brigade S2 controller) was analyzing combat information and intelligence to predict enemy intentions. This subtask is designated 2-C when it occurs during intelligence preparation of the battlefield, and 5-C when it is part of seeing the battlefield during the battle. The second highest set of correlations in Table D-2 is for identifying critical combat information and intelligence, designated 1-B, 2-A, and 5-A during successive phases of the exercise.

Two variables that were correlated with the battalion S2's overall performance were not the S2's particular responsibility: defeating the

Table D-1

Correlations between the Brigade S1/S4 Controller Ratings
on ARTEP Subtasks and Battalion S1 and S4
Overall Performance Ratings

Subtask	Bn S1 Overall Performance Rating		Bn S4 Overall Performance Rating	
	Day 1	Day 2	Day 1	Day 2
TASK 3. Prepare and organize the battlefield				
3J. Provide supplies	.59**	.57**	.57**	.61**
3K. Maintain equipment	.40*	.57**	.36*	.52**
TASK 9. Manage combat service support assets				
9A. Provide weapons systems with ammunition and fuel	.37*	.55**	.49**	.58**
9B. Maintain and repair weapons systems	.24	.31	.21	.27
9C. Provide health preservation programs, subsistence and replacements	.13	.06	.09	.08
9D. Transport and deliver supplies	.58**	.65**	.64**	.65**

Note. Correlations based on 27 battalion command groups.

 *Significant at the .05 level (one-tailed test)
**Significant at the .01 level (one-tailed test)

enemy's electromagnetic intelligence effort (10-A) and recognizing jamming (12-A, Subitem 1) are the concern of anyone who communicates over the radio. Functions of the battalion S2 that were less highly correlated with the rating of his overall performance were gathering information (2-B and 5-B), submitting a report of jamming to higher headquarters (12-A, Subitem 2), disseminating intelligence (2-D and 5-D), and developing a communication plan, including security considerations (3-F).

Table D-2

Correlations between the Brigade S2 Controller Ratings on ARTEP
Subtasks and the Battalion S2 Overall Performance Rating

Subtask	Bn S2 Overall Performance Rating	
	Day 1	Day 2
TASK 1. Develop Plan Based on Mission		
1B. Identify critical enemy information	.61**	.65**
TASK 2. Initiate Intelligence Preparation of the Battlefield		
2A. Identify critical enemy information	.61**	.65**
2B. Gather information from all appropriate sources	.47**	.46**
2C. Analyze information to predict enemy intentions	.69**	.83**
2D. Disseminate information and intelligence	.40*	.27
TASK 3. Prepare and Organize the Battlefield		
3F. Develop communication plan, including security considerations	.36*	.27
TASK 5. See the Battlefield During the Battle		
5A. Identify critical enemy information	.71**	.73**
5B. Gather information from all appropriate sources	.44*	.44*
5C. Analyze information to predict enemy intentions	.74**	.80**
5D. Disseminate information and intelligence	.38*	.31
TASK 10. Secure and Protect the Task Force		
10A. Defeat or suppress enemy's electromagnetic intelligence effort	.56**	.50**
TASK 12. React to Special Situations		
12A. React to enemy jamming		
1. Recognize jamming and continue operation	.57*	.58**
2. Report jamming to higher headquarters	.42*	.54*
3. Switch to spare frequency	.07	.10

Note. Correlations based on 27 battalion command groups.

*Significant at the .05 level (one-tailed test)
**Significant at the .01 level (one-tailed test)

S3 Performance Ratings

The subtasks listed in Table D-3 are functions with which the battalion S3 assists the battalion commander. All four subtasks that comprise Task 8 (concentrate/shift combat power) were highly correlated with the overall evaluation of the battalion S3 by the brigade S3 controller. Subtasks 10-E (dispersing the task force elements, when possible, to reduce vulnerability to mass destruction weapons) and 3-G (briefing the company commanders) were also significantly correlated with the rating of the S3. Subtasks 1-C and 1-D (identifying and analyzing friendly information) were the least strongly related to S3 overall performance.

Table D-3

Correlations between the Brigade S3 Controller Ratings on ARTEP
Subtasks and the Battalion S3 Overall Performance Rating

	Bn S3 Overall Performance Rating	
Subtask	Day 1	Day 2
TASK 1. Develop Plan Based on Mission		
1C. Identify critical friendly information	.30	.31
1D. Analyze friendly capabilities	.31	.44*
TASK 3. Prepare and Organize the Battlefield		
3G. Communicate/coordinate plans and orders	.64**	.53**
TASK 8. Determine critical place and time		
8A. Determine critical place and time	.56**	.70**
8B. Concentrate/shift combat power in the attack		.67**
8C. Concentrate/shift combat power in the defense or retrograde	.81**	
8D. Protect thinly held areas	.67**	.72**
TASK 10. Secure and Protect the Task Force		
10E. Reduce vulnerability to enemy mass destruction weapons systems	.65**	.65**

Note. Correlations based on 27 battalion command groups.

*Significant at the .05 level (one-tailed test)
**Significant at the .01 level (one-tailed test)

Fire Support Performance Ratings

The two items that were most highly correlated with overall performance of the battalion fire support coordinator (FSCOORD) both involved planning (see Table D-4). Developing the initial fire support plan (1-I) and communicating the new priority of fires when the plan was modified (7-A, Subitem 1) were correlated with overall performance at the .01 level on both days of the exercise. Protecting thinly held areas with fire support (8-D) was less highly correlated on both days, whereas determining which units receive priority (1-J) and employing assets appropriately (7-B) were correlated on one day but not on the other. The remaining items (1-L, Subitems 1 and 2; 7-A, Subitem 2; and 8-C) rated by the brigade fire support controller were not significantly correlated with his evaluation of the battalion FSCOORD.

Table D-4

Correlations between the Brigade Fire Support Controller Ratings
on ARTEP Subtasks and the Battalion Fire Support
Coordinator (FSCOORD) Overall Performance Rating

	Bn FSCOORD Overall Performance Rating	
Subtask	Day 1	Day 2
TASK 1. Develop Plan Based on Mission		
1I. Plan fires	.74**	.69**
1J. Determine which units receive priority for fire support	.65**	.31
1L. Determine fire support coordination measures		
1. Determine fire support/target acquisition assets available	.32	.34
2. Determine fire support coordination measures	.27	.10
TASK 7. Employ Fires and Other Combat Support Assets		
7A. Modify fire support plan as required by enemy actions		
1. Communicate new priority of fires to supporting and supported units	.82**	.72**
2. Assign requests for fire support to appropriate units	.19	.19
7B. Employ fire support assets appropriately	.29	.67**
TASK 8. Concentrate/Shift Combat Power		
8C. Concentrate/shift combat power (fire support assets) in defense or retrograde	.20	
8D. Protect thinly held areas (with fire support)	.46*	.60**

Note. Correlations based on 27 battalion command groups.

*Significant at the .05 level (one-tailed test)
**Significant at the .01 level (one-tailed test)

APPENDIX E
CORRELATIONS BETWEEN SUBTASK RATINGS AND
RATINGS OF MISSION ACCOMPLISHMENT

After each day's exercise, the TOC monitor judged whether the task force had accomplished its mission. The questionnaire did not specify the response alternatives, but the answers fell into three categories: no, marginally, and yes. These responses were assigned the numerical values: 1, 2, and 3, respectively, for the purpose of computing Pearson coefficients of correlation between ratings of mission accomplishment and ratings of subtask performance.

Table E-1 summarizes the correlations between the monitor's rating of mission accomplishment and the subtask ratings provided by the controllers and by the monitor. Comparatively few correlations were statistically significant, and there was little consistency in the correlations for a given subtask, either among raters or between Day 1 and Day 2. Thus, it appears that mission accomplishment was not a reliable measure of overall performance, perhaps because there was a different monitor for every exercise and judgments were not based on consistent criteria.

Table E-1

Correlations between Subtask Ratings and Ratings of Mission Accomplishment

	Rater											
	S1/S4		S2		S3		CC		FS		TOC Monitor	
Subtask	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2
TASK 1							.26	.05				
1A											.62**	.20
1B			.10	.04							.15	.57**
1C					.27	.18					.27	.51*
1D					.14	.03					.23	.30
1E							.40*	NV			.10	.65**
1F												.48*
1							.06					
2							.20					
3							.00					
4							.25					
5							.19					
6							.26					
7							.32					
8							.04					
9							.50*					
1G											NV	
1							NV					
2							NV					
3							NV					
4							NV					
5							NV					
6							NV					
7							NV					
8							NV					
9							NV					
1H											.06	
1							.02					
2							.24					
3							.16					
4							-.03					
5							-.05					
6							.16					
7							.31					
1I									.12	-.20	.10	.19
1J									.16	.23	.02	-.12
1K											.06	-.02
1L											.20	.09
1									.20	-.29		
2									.03	.03		

Note. Correlations based on 27 battalion command groups.

*Significant at the .05 level (one-tailed test)
**Significant at the .01 level (one-tailed test)
NV - No correlation, because there was no variability.

Subtask	S1/S4 Day 1	S1/S4 Day 2	S2 Day 1	S2 Day 2	S3 Day 1	S3 Day 2	Rater CC Day 1	CC Day 2	FS Day 1	FS Day 2	TOC Monitor Day 1	TOC Monitor Day 2
TASK 2												
2A			.10	.04			.10	.04			.02	.42
2B			-.10	.20			-.01	.20	.22	.17	.05	.46*
2C			.19	.01			.19	.01			.31	.70*
2D			.06	.18			.08	.18			.22	.46
TASK 3												
3A											.59**	.19
3B											.00	.45*
3C											.00	.57**
3D											.26	.36
1							.32	.33				
2							.34	.20				
3							.40*	.06				
3E											.16	.25
3F			.06	.05							.06	.41*
3G					.41*	-.07	.34	.14			.49*	.13
3J	.41*	.26									.22	.63**
3K	.45*	.33									.29	.67*
TASK 4												
4A											.59*	NV
4B							.30	.14			.33	NV
TASK 5												
5A			.06	.14							.42*	.43
5B			.10	.26			.16	.03			.34	.39
5C			.20	.12							.38	.46
5D			.01	.25			.29	.52*			.47*	.77**
TASK 6												
6A											.43*	.10
6B							.53*	.24			.33	.23
6C											.23	.19
6D											.31	.30
TASK 7												
7A											.01	-.30
1									-.09	.07		
2									.22	-.16		
7B									-.26	-.38	-.20	.50*
7C											-.22	NV

Note. Correlations based on 27 battalion command groups.

*Significant at the .05 level (one-tailed test)
**Significant at the .01 level (one-tailed test)
NV - No correlation, because there was no variability.

Table 2-1--Continued

	S1/S4		S2		S3		CC		FS		TOC Monitor	
Subtask	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2
TASK 8												
8A					.40*	.04	.27	.24			.23	.21
8B						.34		.38				.53*
8C					.57**		.1?		.14		.04	
8D					.47*	.23	.17	.14	.42*	.30	.15	.77**
TASK 9												
9A	.20	.26									.28	.40
9B	.61**	.46*									NV	.66*
9C	.12	.02									.16	NV
9D	.50**	.40*									.30	.73**
TASK 10												
10A			.16	.22								
10E					.62*	.03						
TASK 11												
11A							.28	.10			.59*	.18
TASK 12												
12A											.17	.11
1			.10	.11								
2			-.24	.05								
3			-.06	.03								

Note. Correlations based on 27 battalion command groups.

*Significant at the .05 level (one-tailed test)
**Significant at the .01 level (one-tailed test)
NV - No correlation, because there was no variability.

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APPENDIX F
CORRELATIONS BETWEEN SUBTASK RATINGS AND
OVERALL COMMAND GROUP PERFORMANCE

The correlations between the subtasks and the estimate of overall
command group performance were examined as an additional indication of
the importance of each subtask. As stated previously, the overall esti-
mate was the average of five ratings of command group performance from
the four company commanders and the TOC monitor. To simplify the fol-
lowing discussion, the tasks and subtasks in the Battalion Command Group/
Staff ARTEP are grouped into three phases: (a) the planning phase con-
sisting of Task 1; (b) the preparation and organization phase consisting
of Tasks 2, 3, and 4; and (c) the execution phase consisting of Tasks 5
through 12. Tables F-1, F-2, and F-3 present the correlations between
subtask ratings from each observer and the average rating of overall
command group performance listed by phase.

Planning: Task 1

The correlations between subtask ratings for Task 1 and overall
command group ratings are presented in Table F-1. Examination of the
table indicates that the S2/S3 controller's rating of Subtask 1-B
(identify enemy information) was significantly correlated with the
overall rating on both days; so were the S2/S3 controller's rating and
the monitor's rating of 1-D (analyze friendly capabilities). Other
subtasks significantly correlated on both days were 1-I (plan fires)
and 1-J (determine which units receive priority for fire support), as
rated by the monitor.

Subtasks 1-F (select avenues of approach) and 1-H (select delay and
covering force positions) were played on only 1 of the 2 days. Some
elements of each of these subtasks were correlated with overall perfor-
mance, as was the monitor's rating for 1-G (select battle positions) and
1-H. Several high correlations for elements of 1-G were not significant
because of the small number of groups that played the defense mission.

Preparation and Organization: Tasks 2-4

The correlations between subtask and overall ratings for Tasks 2,
3, and 4 are given in Table F-2. Most of the ratings for intelligence
preparation of the battlefield (Task 2) were significantly correlated
with command group overall performance. Identification (2-A), collec-
tion (2-B), and analysis (2-C) of intelligence were correlated on both
days for two raters.

Task 3 (prepare and organize the battlefield) had several subtasks
that correlated significantly with overall performance. The monitor's
ratings of 3-A (determine where the enemy is likely to concentrate) were
significant on both days, as were the company commanders' ratings of 3-G

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Table F-1

Correlations between Subtask Ratings and Command Group Overall Performance Ratings (Task 1)

	S1/S4		S2		S3		Rater CC		FS		TOC Monitor	
Subtask	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2
TASK 1												
1A							.43*	.12			.36*	.27
1B			.44**	.46**							.64**	.33
1C					.17	.23					.32	.30
1D					.39*	.44*					.65**	.47*
1E							.48**	NV			.32	.19
1F												.26
1							.32					
2							.21					
3							.16					
4							.01					
5							.40*					
6							.52**					
7							.27					
8							.51**					
9							.07					
1G											.55**	
1							.79					
2							.79					
3							.79					
4							NV					
5							.79					
6							.91*					
7							.90*					
8							.55					
9							.29					
1H											.44*	
1							.26					
2							.33					
3							.36					
4							.47*					
5							.39					
6							.43*					
7							.41*					
1I												
1J									.12	.26	.53**	.36*
1K									.16	.08	.42*	.42*
1L											.34	.17
1									-.03	.03	.17	.25
2									.10	.28		

Note. Correlations based on 27 battalion command groups.

*Significant at the .05 level (one-tailed test)
**Significant at the .01 level (one-tailed test)
NV - No correlation, because there was no variability.

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Correlations between Subtask Ratings and Command Group
Overall Performance Ratings (Tasks 2, 3, and 4)

	Rater											
	S1/S4		S2		S3		CC		FS		TOC Monitor	
Subtask	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2
TASK 2												
2A			.44**	.46**							.42*	.46*
2B			.41*	.40*			.42*	.36*			.50*	.30
2C			.51*	.55**							.61**	.52*
2D			.45**	.27							.57**	.34
TASK 3												
3A											.53**	.43*
3B											.52**	.03
3C											.23	.13
3D											.27	.33
1							.51**	.25				
2							.49**	.26				
3							.37*	.32				
3E											.18	.28
3F			.31	.29							.20	.23
3G					.36*	.32	.52**	.36*			.29	.17
3J	.62**	.65**									.13	.13
3K	.42*	.48**									.02	.03
TASK 4												
4A											.42	.29
4B							.42*	.32			.34	NV

Note. Correlations based on 27 battalion command groups.

*Significant at the .05 level (one-tailed test)
**Significant at the .01 level (one-tailed test)
NV - No correlation, because there was no variability.

(disseminate plans and orders). Provide supplies (3-J) and maintain equipment (3-K) were correlated when rated by the S1/S4 but not when rated by the monitor. This discrepancy suggests that the monitor was not in as good a position to observe these subtasks as the S1/S4 controller, who was directly involved in their performance.

Subtasks 3-B (select a course of action), 3-D (select control measures), and 4-B (supervise compliance with plan) correlated significantly on Day 1 but not on Day 2. It is possible that these subtasks were more critical on the first day than on the second. On the other hand, it is also likely that the first day's ratings were more highly correlated with overall performance than the second day's, because the exercise was twice as long on Day 1.

Execution: Tasks 5-12

The correlations for Tasks 5-12 are summarized in Table F-3. Like Task 2, of which it is a continuation, Task 5 (see "battlefield during the battle") was generally correlated with overall performance. All four subtasks, dealing with identification, collection, analysis, and dissemination of intelligence, were correlated for one or more raters on both days.

Some subtasks were significantly correlated with overall performance when rated by the controllers but not when rated by the monitor. Subtasks 6-B (communicate changes), 9-A (provide ammunition and supplies), 9-D (transport and deliver supplies), 11-A (supervise compliance with task force order), 12-A (react to jamming), and all of Task 8 (concentrate/shift combat power) fall into that category, which probably means that the controllers, who were directly involved in the performance of those subtasks, were in a better position to evaluate them than was the monitor.

Subtask 10-E (reduce vulnerability to mass destruction weapons) was also significantly correlated in the overall performance on both days. None of the fire support correlations was significant, however. That result is consistent with the lack of significance found earlier (Table 5 of this report) between the overall fire support rating and all the other ratings of overall performance.

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Table F-3

Correlations between Subtask Ratings and Command Group
Overall Performance Ratings (Tasks 5-12)

	Rater											
	S1/S4		S2		S3		CC		FS		TOC Monitor	
Subtask	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2
TASK 5												
5A			.42*	.43*							.52*	.33
5B			.40*	.40*			.53**	.51*			.49*	.19
5C			.57**	.66**							.71**	.55*
5D			.48**	.27			.56**	.47**			.54**	.33
TASK 6												
6A											.43*	.10
6B							.57**	.38*			.33	.23
6C											.23	.19
6D											.31	.30
TASK 7												
7A											.09	.10
1									.23	.14		
2									.18	.18		
7B									.13	.04	-.16	-.24
7C											-.01	NV
TASK 8												
8A					.50**	.72**	.37*	.18			.03	.04
8B						.70**		.45*				.12
8C					.20*		.66**		.02		.15	
8D					.65**	.56**	.50**	.28	.03	.00	.09	.40
TASK 9												
9A	.56**	.61**									.08	.21
9B	.29	.31									NV	.50
9C	.34	.31									.39*	NV
9D	.60**	.54**									.11	.16
TASK 10												
10A			.39*	.22								
10E					.65**	.66**						
TASK 11												
11A							.61**	.44*			.32	.09
TASK 12												
12A											.24	.15
1			.48**	.58**								
2			.35*	.62**								
3			.13	.03								

Note. Correlations based on 27 battalion command groups.

*Significant at the .05 level (one-tailed test)
**Significant at the .01 level (one-tailed test)
NV - No correlation, because there was no variability.

ARI Distribution List

4 OASD (M&RA)
2 HQDA (DAMI-CSZ)
1 HQDA (DAPE-PBR
1 HQDA (DAMA-AR)
1 HQDA (DAPE-HRE-PO)
1 HQDA (SGRD-ID)
1 HQDA (DAMI-DOT-C)
1 HQDA (DAPC-PMZ-A)
1 HQDA (DACH-PPZ-A)
1 HQDA (DAPE-HRE)
1 HQDA (DAPE-MPO-C)
1 HQDA (DAPE-DW)
1 HQDA (DAPE-HRL)
1 HQDA (DAPE-CPS)
1 HQDA (DAFD-MFA)
1 HQDA (DARD-ARS-P)
1 HQDA (DAPC-PAS-A)
1 HQDA (DUSA-OR)
1 HQDA (DAMO-ROR)
1 HQDA (DASG)
1 HQDA (DA1G-PI)
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1 HQ First Army, ATTN: AFKA-OI-TI
2 HQ Fifth Army, Ft Sam Houston
1 Dir, Army Stf Studies Ofc, ATTN: OAVCSA (DSP)
1 Ofc Chief of Stf, Studies Ofc
1 DCSPER, ATTN: CPS/OCP
1 The Army Lib, Pentagon, ATTN: RSB Chief
1 The Army Lib, Pentagon, ATTN: ANRAL
1 Ofc, Asst Sect of the Army (R&D)
1 Tech Support Ofc, OJCS
1 USASA, Arlington, ATTN: IARD-T
1 USA Rsch Ofc, Durham, ATTN: Life Sciences Dir
2 USARIEM, Natick, ATTN: SGRD-UE-CA
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1 USAIMA, Ft Bragg, ATTN: Marquat Lib
1 US WAC Ctr & Sch, Ft McClellan, ATTN: Lib
1 US WAC Ctr & Sch, Ft McClellan, ATTN: Tng Dir
1 USA Quartermaster Sch, Ft Lee, ATTN: ATSM-TE
1 Intelligence Material Dev Ofc, EWL, Ft Holabird
1 USA SE Signal Sch, Ft Gordon, ATTN: ATSO-EA
1 USA Chaplain Ctr & Sch, Ft Hamilton, ATTN: ATSC-TE-RD
1 USATSCH, Ft Eustis, ATTN: Educ Advisor
1 USA War College, Carlisle Barracks, ATTN: Lib
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1 USA Concept Anal Agcy, Bethesda, ATTN: MOCA-MR
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1 USAEC, Ft Monmouth, ATTN: C&F-ed Dev Br
1 USA Materials Sys Anal Agcy, Aberdeen, ATTN: AMXSY-P
1 Edgewood Arsenal, Aberdeen, ATTN: SAREA-BL-H
1 USA Ord Ctr & Sch, Aberdeen, ATTN: ATSL-TEM-C
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1 USA Infantry Bd, Ft Benning, ATTN: STEBC-TE-T
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