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Developing the Reserve Component Virtual Training Program: History and Lessons Learned

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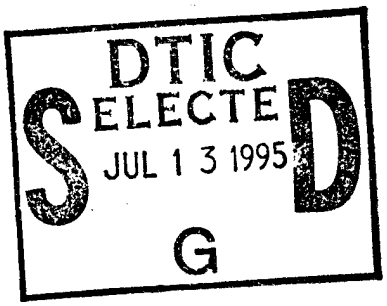

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Director

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13. ABSTRACT *(Maximum 200 words)*

This report describes the development of the Reserve Component Virtual Training Program (RCVTP) for training U.S. Army National Guard (ARNG) armor units using the simulation technologies of Simulation Networking (SIMNET), Janus, and an automated tactical operations center simulator called the Commander/Staff Trainer (C/ST). The report presents the project's background, including the conceptualization of the RCVTP by the contracting agency, the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI), and the contractor team's proposal for operationalizing ARI's conceptualizations. Three of the major goals of the RCVTP are to emphasize execution, to compress training time, and to reduce training management by providing a turn-key program for the ARNG. The report summarizes the design and development of the RCVTP's platoon-, company-, and battalion-level exercises and their training management materials. Significant design issues discussed include identifying tasks appropriate for training in designated simulated environments and incorporating specified design concepts through the process of outlining the training exercises. The development of the exercises and the training management materials is discussed

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in light of their relationship to the design principles and in terms of their relevance to the final RCVTP product. The report describes the formative evaluation and presents findings in the context of the developmental framework. Finally, the report documents the process of extending the developmental methodology through the creation of cavalry troop exercises and identifies lessons learned.

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Training Systems and Education

FOREWORD

Reserve Component units have an increasingly important role in the force mix. These units continually face the challenge of training within time and resource limitations. To help meet this challenge, Congress provided Fiscal Year 1993 research and development funding for the establishment of a Reserve Component Virtual Training Program (RCVTP) at Fort Knox, Kentucky. The intent of this program is to provide structured, compressed training focused initially on Army National Guard (ARNG) armor units, making innovative use of available simulation technologies.

The U.S. Army Research Institute for the Behavioral and Social Sciences (ARI), the Advanced Research Projects Agency (ARPA), the National Guard Bureau (NGB), the U.S. Army Armor Center (USAARMC), and Fort Knox joined efforts (Memorandum of Agreement entitled "National Guard Armor Simulation Center," April 1993) to develop and implement the RCVTP. The ARI Armored Forces Research Unit at Fort Knox accomplished training and development for the RCVTP through a contract effort entitled "Simulation-Based Multiechelon Training Program for Armor Units (SIMUTA)," as part of the Research Task entitled "Strategies for Training and Assessing Armor Commanders' Performance with Devices and Simulations (STRONGARM)."

This report documents experiences and lessons learned from the development and formative evaluation of innovative, simulation-based training for the RCVTP. It has been provided to military observer/controllers (O/Cs) in the 16th Cavalry Regiment at Fort Knox, who are responsible for continued implementation and sustainment of the RCVTP. These personnel and other trainers and training developers will find this report useful in guiding the development, implementation, and expansion of simulation-based training programs.

EDGAR M. JOHNSON
Director

ACKNOWLEDGMENTS

This report summarizes the efforts of a team of military content experts, training development personnel, and simulation technology experts. The authors, who were the Principal Design Scientist and Chief and members of the After Action Review/Formative Evaluation Team, had the pleasure of serving as the Team's "journalists," capturing the cumulative creative energies of a superb group of professionals. The Team was led by the Project Director, Robert S. Sever (BDM) with the assistance of Jack L. Turecek (BDM) as Operations Manager and Design Team Chief. Other key persons included Rex A. Downey (BDM) as Technical Team Chief; members of this Team were Joseph J. Cassidy (PRC), M. A. (Bud) Dannemiller (PRC), Deborah S. Marcum (HumRRO), David T. Maultsby (PRC), Jeffrey K. Skilling (BDM), and Paul G. Smith (BDM). Michael R. Flynn (PRC) was Platoon/Company Team Chief; members of this Team were Carson R. Arnett (PRC), David J. Borgioli (HumRRO), Bradley D. Britt (BDM), Tim A. Brown (PRC), Charlotte H. Campbell (HumRRO), James D. Castleberry (HumRRO), Tim H. Garth (PRC), and William E. Myers (BDM). John M. (Mike) Keenan (BDM) was Battalion/Staff Team Chief; members of this Team were Terry W. Broadwater (PRC), Roy C. Campbell (HumRRO), Kimberly A. Crumley (PRC), Billy D. Elbert (HumRRO), Laura A. Ford (BDM), David L. Harper (PRC), John J. Sanders (PRC), and Alicia R. Sawyer (BDM). Maynard L. (Jack) Burkett was the Team's special scenario designer and Earl L. (Jack) Doyle (HumRRO) was the Team's special Army National Guard (ARNG) Advisor. The Team's administrative support section devoted intense effort to producing over 20,000 pages of exercise materials ranging from platoon through battalion level. Danelle L. Wozniak was the Team's Systems Coordinator, with Marsha L. Morris as the Administrative Coordinator. Lori L. Bailey supported all of the Team's requirements as Graphics Artist. The total team consisted of 36 persons who have all contributed long hours to the completion of the design Simulation-Based Multiechelon Training Program for Armor Units.

These contractor efforts were guided by a steering committee that included Barbara A. Black, Chief, U.S. Army Research Institute for the Behavioral and Social Sciences (ARI), Armored Forces Research Unit; Colonel John C. Johnston, Director, U.S. Army Armor School; Colonel Steven L. Funk, Program Manager, Advanced Research Projects Agency (ARPA); Colonel Jerry L. Veach (ARNG), Special Assistant to the Commanding General, Fort Knox. Billy L. Burnside, ARI, Armored Forces Research Unit, served as contracting officer's representative. These individuals have actively contributed numerous ideas for the project. Finally, the creative energy of Lieutenant General (Ret.) Frederic J. Brown, Ph.D., has stimulated much thought to our efforts.

DEVELOPING THE RESERVE COMPONENT VIRTUAL TRAINING PROGRAM: HISTORY AND LESSONS LEARNED

EXECUTIVE SUMMARY

Requirement:

The Simulation-Based Multiechelon Training Program for Armor Units (SIMUTA) project was required to design, develop, implement, formatively evaluate, and document an innovative, "turn-key," prototype training program focused on Army National Guard (ARNG) armor units. The project was to develop training exercises for armor, mechanized infantry, and scout platoons; armor companies and company teams; and battalions and battalion staffs. These exercises were all to be implemented in the Simulation Networking (SIMNET) system. Staff exercises were also to be implemented using the Janus wargaming simulation and the Commander/Staff Trainer (C/ST) automated Tactical Operations Center Workstations. The C/ST evolved from the Combat Vehicle Command and Control (CVCC) research project. Several objectives, derived from Brown, drove the conceptualization of the program. These were (a) to compress training, (b) to distribute training, (c) to modernize training support, and (d) to focus on critical tasks. A permanent-party observer/controller (O/C) team was created to conduct the training.

Procedure:

Three principles were used to guide the training program design: (a) to train only tasks that are needed for successful performance of movement to contact (MTC) and defense in sector (DIS) missions performed at the National Training Center (NTC), (b) to train those tasks in time-limited segments, and (c) to link training at platoon, company, and battalion levels by means of common training scenarios. In addition, the training was to focus only on the execution phase of the mission. That is, units were to be given orders to execute. Implementation of these principles required two interrelated steps: defining the domain by identifying tasks that support the basic missions and allocating those tasks to training exercises that enact those missions.

The project was conducted in three phases. During the first 4 months of the 17-month effort, project goals were elaborated and development methods were devised. The second phase was the development phase. It was during this phase that training exercises and all of the supporting materials were produced, including guidelines to O/Cs for controlling the exercises, observing performance, conducting exercises, and producing take-home packages. This development phase also incorporated formative evaluation efforts that

used both formal and informal methods to ensure that training plans could be implemented with the desired effects. The final phase was the documentation phase, in which development methods were captured and the history, including formative evaluation feedback, and lessons learned of the project were recorded.

Findings:

For the platoon- and company-level training packages, training exercises were divided into "tables" of approximately 1-hour execution time. Thus, an exercise library was created that consisted of armor, mechanized infantry, and scout platoons, armor company and company team, and divisional cavalry troop tables. Fundamental skills were exercised in three tables, the MTC mission was divided into nine tables, and the DIS mission was divided into six tables for the armor and mechanized infantry platoon and the armor company and company team portions of the library. These numbers varied slightly for the scout and cavalry troop tables. Each table targeted a set of critical subtasks for training. For each echelon and type, the set of tables covered all feasible tasks (trainable in the simulation) for these two battalion missions. A "table preview" preceded each table and described the training objectives of the table. Targeted After Action Reviews (AARs) followed each table. A central theme for the AARs was improving performance in the next table. Thus, a cycle of preview-execution-AAR/preview-execution-AAR was set up to reinforce learning.

At the battalion level, the library included the MTC and DIS exercises in SIMNET and Janus and the MTC exercise in C/ST. These exercises were designed to run continuously with an execution time of 2 to 3 hours each. The SIMNET exercises involved the battalion command group, the staff in the main and combat trains command posts, the maneuver companies, and the battalion's slide of fire support. The Janus exercises provided training for the command group, main command post, and combat trains command post. C/ST exercises focused on the commander and primary staff only. Following execution of the exercises, layers of AARs were created to provide feedback to increasingly larger groups of participants. For example, in the Janus-based exercises, AARs for each staff section preceded an AAR that included the commander and all staff members. Although not as tightly controlled as the platoon and company tables, the battalion-level exercises also directed the O/C's attention to particular performance topics to observe during the exercise and discuss in the AARs.

Each of the tables and exercises was implemented during the development effort, first as trials that provided the test-bed for improving the training processes. Each set of tables received two iterations of trials followed by revisions and adjustments based on the results of those trials. Of particular importance was ensuring that planned events indeed occurred so that units could practice targeted tasks. The trials quickly evolved into the ongoing Reserve Component Virtual Training Program (RCVTP).

Every unit that participated in the implementation trials praised the experience. They expressed the belief that they had improved their abilities to execute collective tasks in the following areas: maneuver, reporting, radio procedures, navigation, firing techniques, tactics, and command and control. Several units felt that, in order to receive the amount of training they received in the program, they would have had to spend more than twice the time training in the field. One unit believed that they received, in 2 RCVTP days, the equivalent of 2 weeks training in the field. Soldiers at every level felt that the training was beneficial and worth much more than the time it required.

Lessons learned focused on the intricacy of merging all of the program parts, including technical requirements, training requirements, and personnel requirements, both in terms of contractor expertise and O/C support. The success of the structured training approach is dependent on preparing all of the training instructions necessary to provide opportunities to practice and learn. Assembling such plans requires much attention to detail and coordination.

Operated by the O/C team, the RCVTP has become a popular training alternative among ARNG units. The O/C team conducts training essentially every weekend and often times during the week as well. On several occasions, ARNG units have spent their entire 2-week Annual Training (AT) conducting RCVTP tables and exercises. These weekends have allowed ARNG units to train at platoon, company, and battalion levels all within a relatively short span of time.

Utilization of Findings:

The purpose of this report is to provide a history of the SIMUTA project and the lessons learned from the project. The history takes a realistic look at what happened within the project, both the successful and the less successful endeavors. As the structured approach to collective training gains emphasis, this report provides practical information from which training developers can make generalizations to improve their development processes.

The training program created by the SIMUTA effort and the RCVTP has established itself as a centerpiece for platoon through battalion training. Because of the difficulty ARNG units typically experience training at these echelons, the program fills an important training need. Because of the structured nature of the program, that need is being addressed successfully.

DEVELOPING THE RESERVE COMPONENT VIRTUAL TRAINING PROGRAM (RCVTP): HISTORY AND LESSONS LEARNED

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PROJECT BACKGROUND

INTRODUCTION

The present report describes a project entitled the "Simulation-Based Multiechelon Training Program for Armor Units" (SIMUTA). The purpose of the SIMUTA project was to design, develop, implement, formatively evaluate, and document an innovative, "turn-key," prototype training program focused on Army National Guard (ARNG) armor units. The program was to be designed specifically for the virtual environment of the simulation networking (SIMNET) system, but would incorporate other current and emerging technologies, including the Janus wargame simulation and the Commander/Staff Trainer (C/ST) automated Tactical Operations Center (TOC) Workstations that had evolved from the Combat Vehicle Command and Control (CVCC) research project described in *Combat Vehicle Command and Control Battalion-Level Preliminary Evaluation* (O'Brien, Wigginton, Morey, Leibrecht, Ainslie, & Sawyer, 1992). The documentation of the SIMUTA training development and implementation methodology was to provide a model for extending the program to other missions, other types and echelons of units, or other simulation environments (e.g., the Close Combat Tactical Trainer [CCTT]). All of the training materials prepared by the SIMUTA project were to be designed for implementation in the U.S. Army Armor Center's Reserve Component Virtual Training Program (RCVTP).

The purpose of this report is to provide a history of the SIMUTA project and the lessons learned for its duration. The history takes a realistic look at what happened within the project, both the successful and the less successful endeavors. At the writing of this report, three additional programs have been started that will follow the SIMUTA lead. As this structured approach to collective training gains emphasis, this report provides practical information from which training developers can make generalizations to improve their development processes. The sections in this first chapter provide the background to the project by describing the forces behind the project's objectives and the objectives themselves. These sections also illuminate the initial formulation of the project, covering the time from the initial discussions of the delivery order (DO) to the acceptance of the Project Research Plan (BDM Federal, Inc., 1993). The remaining chapters detail the design, development, and lessons learned for the project.

Background

In 1989, changes in Soviet policies and corresponding demands to reduce the proportion of the budget devoted to defense led the Army to initiate plans for major force reductions. In 1990, the Army proposed a Base Force plan establishing a mix of 12 active, 6 reserve, and 2 cadre reserve divisions. This plan is currently under review to determine if adjustments to the mix of active and reserve forces are needed to meet the threats that are presently envisioned while further reducing expenditures.

The fundamental problem in reserve training is that there are only 12 weekends and one 15-day period of active training each year, a total of 39 training days. Some of this time is devoted to administrative activities and other activities in preparation for and support of

training. Sometimes the geographical distances traveled by Reserve Component to the training site further reduces the effective training time available.

The Reserve Components are not as well resourced for training as their Active Component counterparts. The Reserves do not have ready access to doctrinally appropriate training areas or the financial resources to engage in large scale maneuvers. The results of the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) project Determinants of Effective Performance of Combat Units at the National Training Center demonstrated that maneuvering combat vehicles in terrain of the size prescribed by doctrine was essential to effective training of combat forces (Keesling, W., Ford, P., & Harrison, K., 1994).

Three key initiatives were directed to address these problems. First, the Bold Shift initiative provides additional Active Component support for National Guard unit training, particularly emphasizing crew gunnery and platoon maneuver skills. Second, Congress has directed the National Guard and the Advanced Research Projects Agency to develop a program that uses computer technology to deliver improved training within the constraints faced by Guard units, particularly the geographic distribution of the Guardsmen. Third, Congress has directed that the Army and the National Guard establish a simulation training center utilizing the SIMNET simulators at Fort Knox. An additional benefit of this initiative is that it would increase the utilization of the SIMNET facilities because of training.

SIMUTA, which addresses the third initiative, was a contracted effort directed by the ARI. The work was performed as a DO under the Unit Training and Performance Measurement contract; this particular DO was monitored by ARI's Armored Forces Research Unit. The DO was awarded to BDM Federal, Inc., which had a teaming agreement with PRC, Inc. and the Human Resources Research Organization (HumRRO). BDM provided overall management of the project with PRC and HumRRO providing key management and research staff. The SIMUTA contract effort was guided by a steering committee comprising representatives from each of the project sponsors:

- ARI - Armored Forces Research Unit;
- Director, U.S. Army Armor School;
- Program Manager, Advanced Research Project Agency (ARPA); and
- Special Assistant to the Commanding General, ARNG, Fort Knox.

Project Synopsis

Several objectives, derived from the characteristics of Brown (1991), drove the conceptualization and development of the project:

1. To compress training. The program was to (a) establish a significant improvement in training efficiency through the development of multimedia advance materials for

use at home station, (b) focus on execution by creating short repeatable exercises with maximum time spent in the simulators, and (c) develop a "turn-key" training management component that would free the unit's chain-of-command from the administrative burden of managing the program.

2. To distribute training. The program was to (a) increase both training efficiency and effectiveness by the development and distribution of advance materials to support mission planning and preparation by the unit; (b) prepare and distribute Take-Home Packages summarizing performance on critical tasks and subtasks observed during RCVTP training, and suggest areas for training concentration; and (c) design the program itself to be exportable to mobile SIMNET and all ARPA Janus sites.
3. To modernize training support. The program was to leverage existing and emerging networked simulation and other technologies to provide an advanced environment for conducting tactical exercises at the platoon, company, and battalion levels. This principle encompasses a training strategy to intensify the training experience by immersing ARNG units in a "virtual" combat environment to the maximum extent possible.
4. To focus on critical tasks. Every aspect of the program was to be designed and developed to achieve the goal of focusing the unit on improving their execution of critical subtasks.

The accomplishment of the above objectives was to bring about a "turn-key" training program which would open the potential for quality training within SIMNET, Janus, and C/ST to all units, regardless of their previous use of simulation, and provide the technical and support overhead needed for targeted, efficient training.

The RCVTP was established in response to Congressional concerns about the increasingly important role of Reserve Component combined arms maneuver units in the force mix, and the resource limitations and training challenges that these units face. Under the RCVTP initiative, innovative tactical training packages have been produced to focus on training for ARNG Armor units. This research and development effort incorporates combat critical tasks derived from current Field Manuals (FMs) and Army Training and Evaluation Program (ARTEP) Mission Training Plans (MTPs) for the types and echelons of units trained, as well as other doctrinal sources into existing and emerging technologies of distributed interactive simulation.

The RCVTP immerses armor units, from platoon through battalion level, into an intensive practice of combat skills using simulation networking or SIMNET, Janus, and the C/ST. These technologies provide the mechanisms that create realistic battlefield environments where units perform against dynamic threat forces. RCVTP exercises are built around typical scenarios conducted at the National Training Center (NTC), in the context of a Movement to Contact (MTC) and a Defense in Sector (DIS) for armor battalion or armor task force.

The RCVTP battalion/task force training in SIMNET consists of two exercises, one for each of the two missions. A unit may elect to execute either or both of them, depending on the unit's training requirements and time available. The exercises are conducted with

battalion staff operating in a simulated main command post (CP), while the battalion commander, company commanders, platoon leaders, and crews operate in simulators. The exercises can be executed with the unit configured as a tank pure battalion or a tank-heavy task force.

In the battalion-level exercises performed on SIMNET, both the offensive and defensive scenarios require synchronization of battalion staff activities. Depending on the unit's speed of movement and reaction time, the movement to contact exercises can be executed in two to three hours, and the defense in sector can be executed in three to four hours. AARs are prepared and delivered for battalion/task force participants (vehicle commanders and up), including the battalion command group, company commanders, the scout platoon leader, and command post personnel.

Exercises developed specifically for the battalion staff include the *Janus-Mediated Staff exercises (JMSE)* and the C/ST exercise which are built around the same two NTC missions. In JMSE, only the battalion main CP and combat trains command post (CTCP) personnel participate; other roles (*e.g.*, company commander, fire support) are performed by Observer/ Controllers (O/Cs) of the RCVTP[1]. Again, the exercises are followed by detailed AARs that focus on staff synchronization. The C/ST exercise uses simulation to present message traffic to staff members and to post situation maps. This exercise also provides the mechanism by which the staff can create and send message traffic. The C/ST AARs focus on information processing for the staff and the C/ST exercise requires approximately 4 hours.

The emphasis of all battalion level exercises is on execution of assigned tactical missions. Therefore, the RCVTP eliminates the need for units to perform many of the tactical decision-making processes of planning and preparation. That is, the battalion/task force exercise packages include a brigade operations order (OPORD), a synopsis of the decision-making process for developing the battalion/task force OPORD, and a completed battalion/task force OPORD for the unit to execute.

Exercises have also been developed for armor platoon, mechanized infantry platoon, and scout platoon training, as well as company and company team training and divisional cavalry troops. All of these exercise packages present training in the context of the battalion movement to contact and defense in sector scenarios, and are designed for implementation on SIMNET at the Mounted Warfare Simulation Training Center (MWSTC). The exercises are segmented into one-hour periods of execution, preceded by short preview periods and followed by AARs. The segments, called tables, are designed to provide repetitive, but increasingly difficult practice on ARTEP-based tasks that support the battalion MTC and DIS missions. A total of 48 platoon level tables and 51 company level tables have been prepared.

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[1]The O/Cs were a set of active duty NCOs and Officers, many with National Training Center (NTC) or Combat Maneuver Training Center (CMTC) experience. Individual O/Cs were selected both for their expertise in the areas of focus and for their ability to operate a program such as the RCVTP.

Although the focus is on execution, units must conduct some preparation and training at their home stations prior to their RCVTP training at Fort Knox. The RCVTP *Battalion/Task Force Exercise Package* includes advance materials that demonstrate the tactical decision-making activities in the *plan and prepare* phases for the scenarios. For all levels of training, orders, either complete (battalion-level) or in narrative form (company- and platoon-level) with maps and overlays are provided for the units to study. RCVTP O/Cs visit participating units and provide these and other preparation materials that support the tactical missions chosen for training by the unit commander. Additionally, at the conclusion of the training, a succinct Take-Home Package is assembled for the unit, detailing the unit's performance strengths and weaknesses on the tactical exercises.

Turn-key Training

The RCVTP opens the potential for quality training within SIMNET to all units, regardless of their previous use of simulation. The RCVTP provides the technical and support overhead needed for targeted, efficient training. All pre-training preparation materials, scenario-based simulation exercises, after action reviews, and Take-Home Packages are provided by the RCVTP O/C Team. There are only three requirements for participating units:

1. Schedule access to RCVTP.
2. Select the focus for their RCVTP training.
3. Train.

Training Philosophy: Focus on Execution

RCVTP concentrates on training battlefield execution using standardized exercises. As a result, units do not perform the typical plan and prepare phases of warfighting as part of their RCVTP experience. The focus on battlefield execution is derived from two sources.

First, the preparation of quality simulation training requires creation of appropriate cues to trigger performance of targeted training tasks. Technical expertise in the simulation technology and trial-and-error development of friendly and enemy positioning, is required to achieve simulations that reliably produce desired force-on-force engagements. Army National Guard (ARNG) units typically do not have the time or expertise to set up simulation training for maximum benefit. By adopting the philosophy that training will focus on execution, the RCVTP is able to provide standardized exercises that insure training opportunities for critical combat tasks.

Second, fluid execution of a battle plan is difficult. Synchronization and integration of all battlefield components takes practice and experience. Unfortunately, attention to execution skills tends to be overshadowed by the diagnosis of planning mistakes. By providing standardized exercises, complete with orders, RCVTP training can focus on the skills necessary for successful execution.

Immediate AARs

Exercise execution is reinforced by AARs that are conducted with very little delay after the end of an exercise. Several factors make it possible to dramatically shorten the AAR time cycle used at the Combat Training Centers (CTCs). First, with the simulation technologies, the O/Cs are in a position to see and hear everything that happens. For the battalion and company exercises in which the O/Cs act as a team, they are in direct communication with each other during the exercise so that they can share what they are observing, identifying AAR discussion points while the exercise is still ongoing. Thus, AAR development begins during the execution of the exercise. Second, the SIMNET and JMSE playback capabilities are almost instantaneous. O/Cs, who keep notes regarding the times of significant events, can quickly structure a quick visual replay review of the battle. Third, the exercises are highly structured. In platoon and company exercises, essentially all events are preplanned. In battalion and battalion staff training, each repetition is driven by the same order and against the same opposing forces (OPFOR). In addition, each battalion exercise repetition uses the same events list that structures the brigade role in the exercise. Therefore, for any echelon, AAR topics are preplanned so that the O/C only has to prioritize those topics according to unit performance deficits. Because O/Cs become experts in the exercises, they can anticipate the kinds of problems units will experience.

Each factor listed above decreases the amount of time needed for O/Cs to conduct traditional rehearsals of AARs. Well-honed O/Cs can conduct quality AARs with minimum delay and maximum payoff in productive training time.

Succinct Take-Home Packages

The final component of the RCVTP is the Take-Home Package. At every echelon, the Take-Home Packages focus on the information most sought by the training units: "How well did we perform according to ARTEP tasks and standards?" Therefore, the Take-Home Packages provide participating units with observations and comments regarding their performance on the tasks and subtasks that were targeted by the exercises they completed.

Strategic Organization of the Development Effort

In late April 1993, the contractor presented a proposed organization for the project (see Figure 1). In this organization, the Design Team formed the core of the SIMUTA effort. Originally formed to outline the basic design of the training for Task 2 of the project, the team would continue its existence through the life of the project to ensure standardization, consistency, adherence to instructional system design (ISD) standards, and quality management. The Design Team concept was directly tied to the staffing plan (see Figure 2). The Design Team was formed around the Team Chief/Operations Manager, and comprised personnel from the development and Technical Support Teams. Once Task 2 was completed, these personnel would transition to their respective development/Technical Support Teams to implement the design. The Design Team would continue with the Team Chief/Operations Manager as the nucleus and reform with key personnel as needed. The Design Team was

responsible for ensuring that development proceeded in accordance with the design specified in Task 2, for overseeing the day-to-day operation of the other teams, and for ensuring that schedules and deliverable requirements were met.

The initial concept of the contractor organization specified three development teams responsible for training specific echelons: a platoon team, a company team, and a battalion team. An alternative organization was proposed early in the project. A Technical Support Team and an AAR/Formative Evaluation Team were added, and the platoon and company developers were combined into a single team. The Technical Support Team was composed of personnel with expertise in the various systems and simulations to be used in the project.

This team provided the technical support for the other teams. The AAR/Formative Evaluation Team consisted of personnel responsible for developing and implementing the AAR and the formative evaluation. Additionally, this team was responsible for the development of O/C training, project history, quality control procedures, unit training management support, and Take-Home Packages. Members of the AAR/Formative Evaluation Team supported the two development teams during the development and implementation for the training. As the project unfolded, this was accomplished by incorporating members of the team into the development teams in a matrix-like organization. In this way, the team chief retained oversight of the training development in line with his role as the Principal Design Scientist. The two development teams consisted of both subject matter experts and instructional designers. These teams developed the scenarios and all the training materials for their level of training exercises.

Early Phases of the Work Effort

Upon the contract's initiation, the contractor presented a project concept briefing to ARI. The intended outcome of this meeting was to obtain approval of the technical and management approach, and personnel staffing plans.

In the concept briefing, the contractor team emphasized that the technical approach had four essential characteristics: a consistent vision, forethought, feedback, and integration. The consistent vision would drive all the components by grounding the development process on a cornerstone mission, using time compression wherever possible, and incorporating a systematic training strategy. This cornerstone mission was to be a full battle package of a brigade-level mission, including all information necessary to re-create the battle and play it back in SIMNET. Forethought called for the contractor to precede the scenario development with documenting all development steps to be taken. Feedback would come from the outcomes of early development being used to amend earlier decisions. For integration, the changes in the procedures would be coordinated among all teams and levels of staff. The contractor prepared and delivered to ARI its technical response. The delivery order was initiated on June 8, 1993.

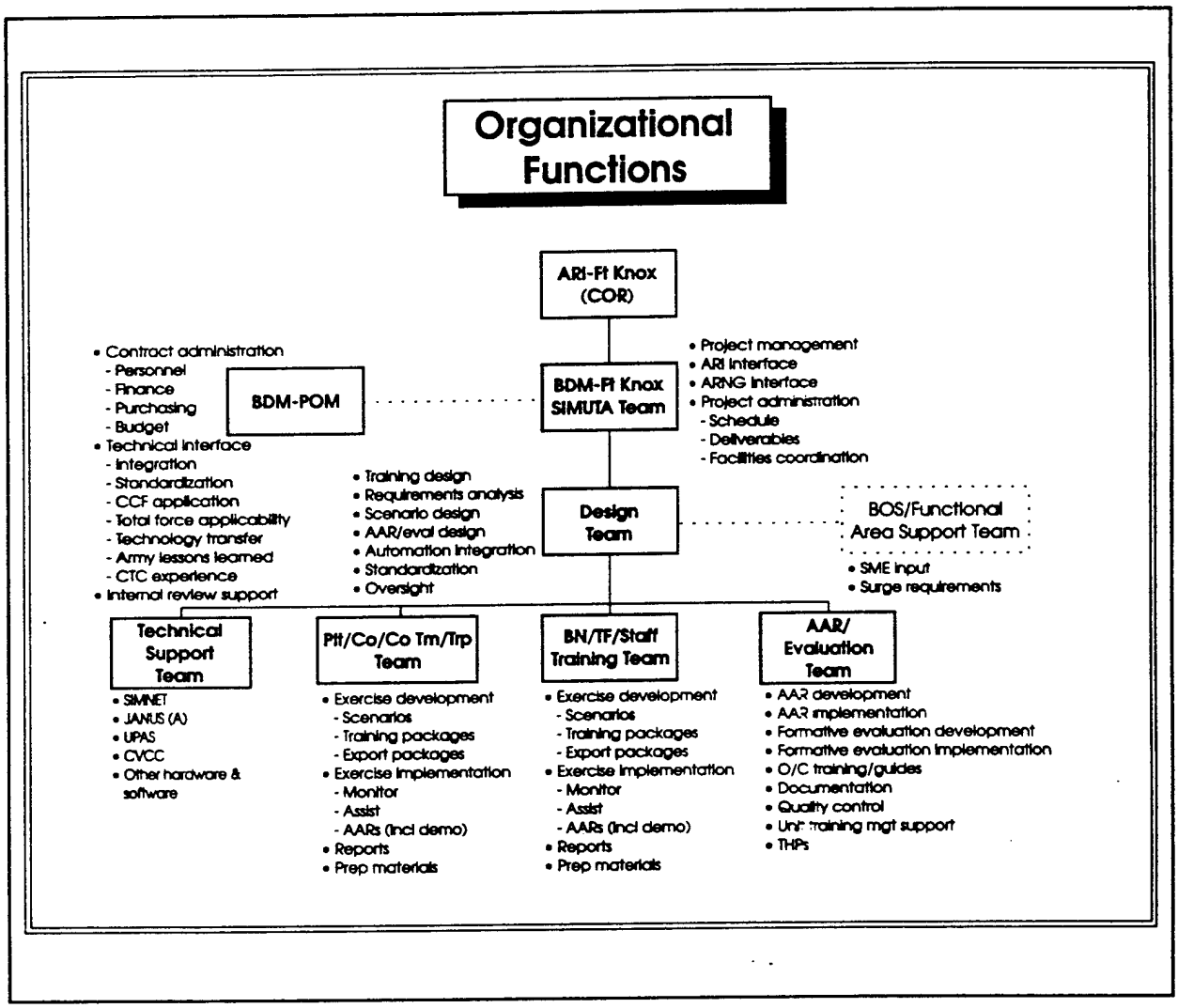

Figure 1. Organizational functions.

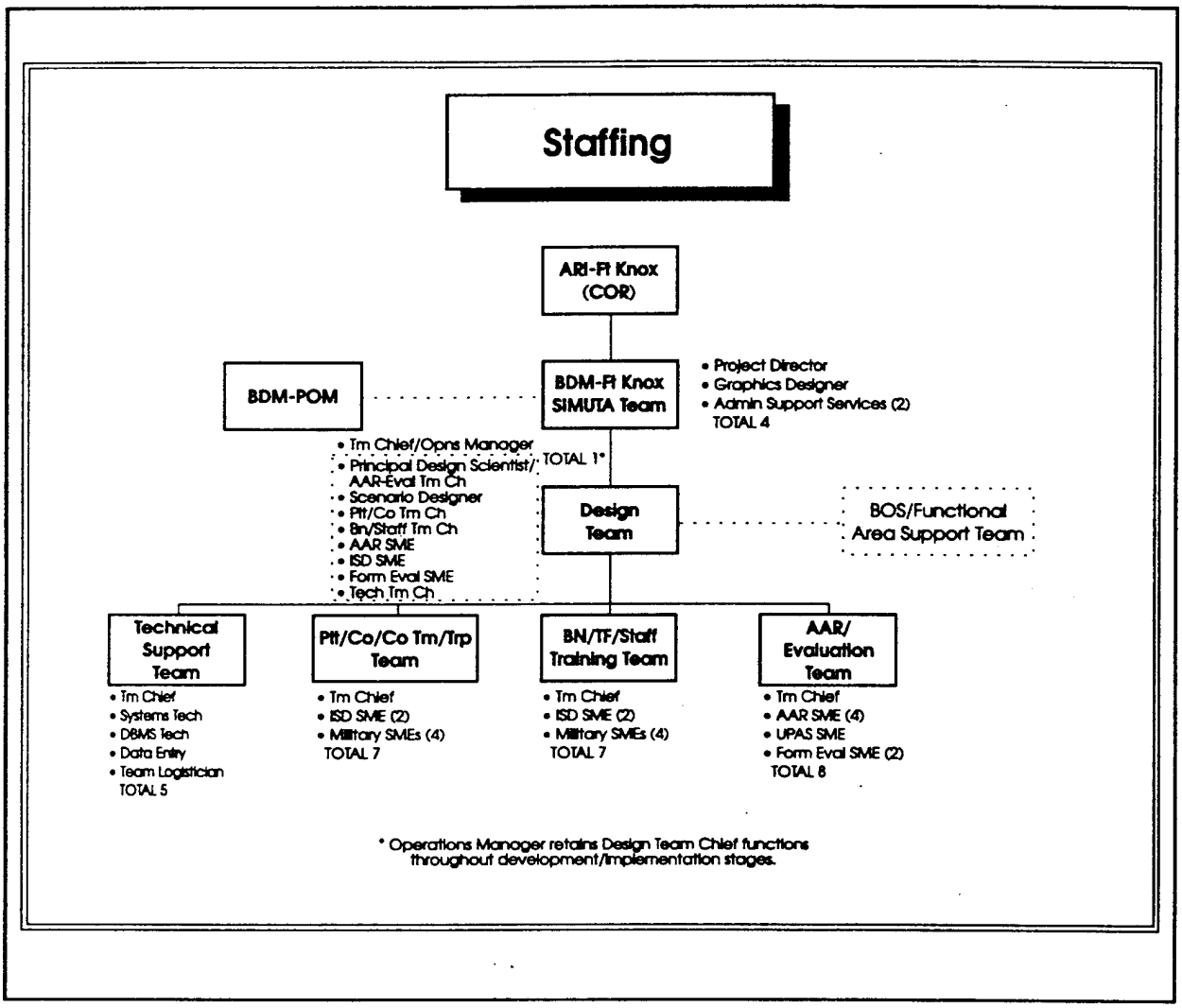

Figure 2. Staffing.

Work started on the Project Research Plan immediately after the delivery of the contractor's technical response. More detailed than the technical response, the Project Research Plan (BDM Federal, Inc., 1993) was intended to be a description of how the contract team would execute the work. In other words, the technical response served as the basis of the Project Research Plan.

The Project Research Plan (BDM Federal, Inc., 1993) was prepared in accordance with the requirements of Task 1 of the statement of work (SOW). The Project Research Plan was divided into two parts: the Research Plan and the Management Plan. The Research Plan detailed the work which would be performed to address the SIMUTA goals and objectives and the methods for achieving these goals. It described the detailed approach to training program design, training program development, training program monitoring, and formative evaluation. Note that the purpose of this Research Plan was not to describe details of the final products but to describe the methodologies for their development. Thus, the Research Plan represented the Design Team's deepening understanding of how to achieve SOW objectives. Efforts focused on attempting to identify the parts of this elaborate effort at the beginning of the project. The Management Plan described the team's approach for managing the overall effort and provided a task breakdown and schedule. It presented details of milestones, coordination meetings, and deliverables, and described the staffing for the project.

In mid-July 1993, the final version of the Project Research Plan (BDM Federal, Inc., 1993) was submitted to ARI and subsequently briefed to ARI and the project steering committee. After some discussion regarding points of clarification and omissions, the Project Research Plan was revised and submitted. This plan provided the Government-approved road map for the SIMUTA effort.

Organization of the Report

The following chapters document the design and development of the specific components of the RCVTP: the platoon, company, armored cavalry, and battalion exercises and the associated training management materials. Specifically, Chapter 2 documents the exercise design process. Chapter 3 discusses the objectives for the formative evaluation and the methods by which the evaluation was implemented. Because the results of the formative evaluation are so tightly tied to product development, these results are provided as explanations for developmental improvements made to the training exercises and training management products in Chapters 4 and 5. Chapter 6 discusses the extension of the design and development processes to armored cavalry exercises, and Chapter 7 provides a synopsis of lessons learned during this project which could benefit others conducting similar projects.

CHAPTER II. TRAINING PROGRAM DESIGN

Once the Project Research Plan (BDM Federal, Inc., 1993) was finalized, work on actual design and development began. Specifically, the initial design phase focused on selecting tasks for training, partitioning selected National Training Center (NTC) scenarios into exercises and tables, and creating the exercise and table specifications. The first products included a complete set of table outlines contained in training packets and a description of the methods used to create the tables. This chapter describes the initial design process, through preparation of the Final Design Report (Hoffman, 1993).[2]

Three principles were used to guide the training program design: (a) to train only tasks that are needed for successful performance of selected missions performed at the NTC, (b) to train those tasks in time-limited segments, and (c) to link training at platoon, company, and battalion levels by means of common training scenarios. The remainder of this chapter describes the implementation of these principles as requiring two major steps: first, defining the training domain by identifying tasks to be trained, and second, allocating those tasks to training tables.

Compiling Task Lists

Three major considerations controlled the design of the training: target audience, training devices, and training scenarios. The target audience for the exercises was U.S. Army National Guard (ARNG) armor units, battalion and below. This included armor battalion staffs; armor battalions and task forces; armor companies and company teams; cavalry troops; and armor, mechanized infantry, and scout platoons. Given these types of units, the domain of collective tasks to be trained was defined. Specification of the particular simulation devices constrained selection of tasks to those that could be supported by the simulation devices. Finally, the offensive and defensive training scenarios, to be presented to the SIMUTA Team by the NTC, were to confine training to those tasks required for successful performance on those scenarios. These scenarios were termed "cornerstone" scenarios in that they were to provide the foundation of exercise design.

The procedure for defining the training content within the above guidelines, as specified in the Project Research Plan (BDM Federal, Inc., 1993), included the following three steps:

1. Assemble a comprehensive listing of potential tasks.
2. Filter potential tasks against SIMNET, Combat Vehicle Command and Control (CVCC), and/or Janus capabilities.
3. Identify filtered tasks that are explicit or implied in the cornerstone scenarios.

Although a step-by-step application of these procedures was anticipated, the steps became intertwined in the execution for several reasons. Ideally, the NTC scenarios would have contained details describing initial operations orders (OPORDs), the course of events

[2]Most of the following text relating to defining the training domain and developing exercise outlines was adapted from the Final Design Report (Hoffman, 1993).

during the battle, and the activities of a successful unit during that battle. These scenarios would have then driven task selection and focused the evaluation of tasks based on the limitations of SIMNET and other simulations. In fact, the SIMUTA Team received only NTC division OPORDs, and these arrived late. Fortunately, the SIMUTA Team had already been informed that the cornerstone scenarios would likely involve two battalion-level missions: Movement to Contact (MTC) and Defense in Sector (DIS). This information was used to focus task identification for all echelons and simulation capabilities analysis for the battalion and battalion staff. In addition, the division-level NTC scenarios that were received did not contain full battle histories; they only contained battle plans as reflected in the division OPORDs. Thus, the scenarios could not be used to determine which of the doctrinal tasks were actually performed in the mission. For all echelons, the scenarios could only be used along with appropriate doctrinal materials to infer the tasks that were implied by the scenarios and to provide general guidance for the exercises.

Step 1. Assemble a Comprehensive Listing of Potential Tasks

The first step in designing the exercises was to assemble the domain of tasks that applied to the types of to-be-trained units. SIMUTA staff identified two primary categories of sources for the domain: (a) standard training and doctrinal Army publications that include appropriate Field Manuals (FMs) and Army Training and Evaluation Program (ARTEP) Mission Training Plans (MTPs); and (b) a variety of developmental analyses that attempted to define battalion activities as an integrated system.

Doctrinal Sources

References for the applicable ARTEPs and FMs are presented in Table 1. They describe missions and collective tasks, and specify conditions and standards for their execution and evaluation. There are some differences between the FMs and ARTEPs in the terminology by which missions and tasks are specified. However, the FMs and ARTEPs are a standardized source for assembling tasks by echelon and mission, thereby providing a coherent statement of unit performance requirements. Our analysis focused on tasks within MTC and DIS missions.

The ARTEP MTPs present unit actions at several levels of detail. Numbered collective tasks represent the level on which training is focused. These tasks, however, are embedded in superordinate categories called missions. Missions are the highest level of activity for company and platoon echelons. In reference to battalion actions, the highest level activities are termed operations, although informally these are often also called missions. The numbered collective tasks, referred to above, are broken into subtasks, which are in turn composed of standards representing the detail at which performance measurement can be targeted.

For the platoon and company levels, essentially all ARTEP collective tasks became candidate tasks for SIMUTA training, subject to filtering by simulation capabilities. That is, all but one task could be required during a battalion MTC or DIS depending on the tactical

Table 1

Standard Sources for Battalion, Company, and Platoon Tasks and Missions

ARTEP/FM	Title
ARTEP 7-8-MTP	Mission Training Plan for the Infantry Rifle Squad and Platoon (Department of the Army (DA), 1988g)
ARTEP 7-247-11-MTP	Mission Training Plan for the Mechanized Infantry Platoon and Squad (M2 Equipped) (DA, 1987a)
ARTEP 17-57-10-MTP	Mission Training Plan for the Scout Platoon (DA, 1988i)
ARTEP 17-237-10-MTP	Mission Training Plan for the Tank Platoon (DA, 1988c)
ARTEP 17-1-MTP	Mission Training Plan for the Tank and Mechanized Infantry Company and Company Team (DA, 1988d)
ARTEP 71-2-MTP	Mission Training Plan for the Tank and Mechanized Infantry Battalion Task Force (DA, 1988e)
ARTEP 71-3-MTP	Mission Training Plan for the Heavy Brigade Command Group and Staff (DA, 1988f)
FM 7-7J	The Mechanized Infantry Platoon and Squad (Bradley) (DA, 1993a)
FM 17-15	Tank Platoon (DA, 1987b)
FM 17-98	Scout Platoon (DA, 1990)
FM 71-1	Tank and Mechanized Infantry Company Team (DA, 1988h)
FM 71-2	Tank and Mechanized Infantry Battalion Task Force (DA, 1988b)
FM 71-3	Armored and Mechanized Infantry Brigade (DA, 1988a)
FM 100-5	Operations (DA, 1993b)
FM 101-5	Staff Organization and Operations (DA, 1993c)
FM 71-123	Tactics and Techniques for Combined Arms Heavy Forces: Armored Brigade, Battalion/Task Force, and Company/Team (DA, 1992b)

considerations of mission, enemy, terrain, troops and time available (METT-T). The Final Design Report (Hoffman, 1993) lists these tasks for armor platoons, mechanized infantry platoons, scout platoons, company teams, and armor companies. The Final Design Report

also cites tasks identified by ARTEP 71-2-MTP for the tank and mechanized infantry battalion task force (Department of the Army (DA), 1988e) that support battalion MTC and DIS operations.

Given that ARTEP 71-2-MTP (DA, 1988e) identifies collective tasks, battalion staff "tasks" appear as subtasks and standards that are specific to staff officers, staff sections, or staff teams. In some instances, ARTEP 71-2-MTP explicitly identifies which subtasks belong to which staff element, but in other cases it does not. At this stage in development, the subtasks specific to battalion staff were not identified.

To ensure that the lists derived from ARTEPs were exhaustive, SIMUTA Team members cross-referenced the task content of the ARTEPs with that contained in the following field manuals: (a) FM 71-1 (DA, 1988h), (b) FM 71-2 (DA, 1988b), (c) FM 71-3 (DA, 1988a), and (*d) FM 71-123 (DA, 1992b). The cross-referencing revealed no other tasks that needed to be included in RCVTP exercises. For battalion-level exercises, however, tasks from additional sources were examined.

Supplementary Sources

The second category of sources for defining the training domain pertained only to battalion-level training and consisted of several ongoing research analyses. These analyses define combat tasks and functions, staff coordination, and supporting activities that occur during conduct of operations. Some of these were only in the conceptual stage, while others were undergoing application trials and/or refinement. These sources include Combined Arms Battle Tasks (Lewman & Root, undated), Battle Staff Training System Development (work in progress, ARI-Fort Benning), Commander's Battle Staff Handbook (Pleban, Thompson, & Valentine, 1993), and Battle Staff Integration (Olmstead, 1992).

These efforts were reviewed to determine their utility and applicability to the SIMUTA goals. For tasks in these sources to be included as a valid training objective, they had to meet the following three requirements:

1. Tasks must be identifiable. The activities must be discrete elements of behavior with beginning and end points and identifiable performance patterns. A key element of successfully compressing training time is to be specific in teaching soldiers what to do and when to do it. This implies that "theories" are only useful for SIMUTA training if they have been translated into concrete examples of performance.
2. Tasks should not be duplications or restatements of doctrinal tasks. To be considered, supplementary tasks that are not duplicates must be qualitatively different and identify performance not reflected in the doctrinal source task list.
3. Tasks must be measurable. If performance of a supplementary task cannot be defined except by stating the subordinate subtasks or elements, it adds nothing and will not be a candidate for training. The tasks should be retained only if the supplementary task can be defined in measurable performance terms that are separable from other listed tasks. Note that some supplementary tasks may

elaborate on ARTEP tasks by telling when to perform a task, who should be doing it, or who should be monitoring its execution.

An analysis of the supplementary sources showed that most reflected innovative efforts to organize battalion task force and battalion staff actions and interactions. The review also found that there were three characteristics shared by most sources:

1. Almost all of the sources were ARTEP-based. They may have rearranged ARTEP subtasks and assigned new titles, but they were nevertheless derived from the ARTEPs.
2. Most sources concentrated on the planning and preparation phases with a less thorough treatment of the execution phase. In contrast, the emphasis for SIMUTA was on the execution phase.
3. Most sources were organized around Battlefield Operating Systems (BOS), which reflect Army philosophy regarding tactical planning. SIMUTA requirements, on the other hand, centered on mission-driven events, not BOS slices. The BOS concept is not inconsistent with SIMUTA, but it is not the most efficient way of organizing SIMUTA tasks. Rather, SIMUTA training was intended to integrate BOS functions across battalion staff members.

These sources served as valuable references for developing the events that comprise the scenarios for the battalion staff exercises. However, the conclusion was that they would not be used to supplement the battalion staff task list derived from the ARTEP 71-2 MTP (DA, 1988e).

Battalion Staff Tasks

Although platoon-, company-, and battalion-level task lists were reasonably complete, it was clear from our review that there was not a definite source of clearly delineated staff "tasks." Our best source remained the battalion ARTEP-MTP where staff actions are embedded in the collective tasks. At this point in the development process, staff training was treated as being parallel to battalion training. That is, battalion tasks were used to identify simulation capabilities and cornerstone representation. Later, specific staff subtasks were derived from the collective tasks for the exercise outlines. Additional details concerning staff performance requirements were developed during the preparation of complete training materials and measurement systems.

Step 2. Filter Task Lists by Capabilities of Training Technologies

The second major step for identifying tasks was to determine which of the tasks compiled from the source materials could be trained in SIMNET and, for the battalion staff, which could be trained using the CVCC technology or using Janus.

Platoon-, Company-, and Battalion-Level Tasks

Burnside (1990) assessed which collective tasks could be trained on SIMNET for the armor platoon ARTEP 17-237-10-MTP (DA, 1988c), the tank and mechanized infantry company team ARTEP 71-1-MTP (DA, 1988d), and the tank and mechanized infantry

battalion task force ARTEP 71-2-MTP (DA, 1988e). He noted, however, that as SIMNET capabilities were revised, these initial designations would need to be updated. Thus, the first step in the filtering process was to identify any SIMNET enhancements that impacted on the performance of task and subtask standards. ARTEP tasks for the armor platoon, mechanized infantry platoon, and scout platoon were then evaluated using Burnside's method[3]. Burnside recommended that a panel of SMEs familiar with the tasks and SIMNET be used to evaluate how well each of the detailed standards could be performed in SIMNET. Such a panel was assembled from SIMUTA staff who conducted the evaluations.

One requirement for the SIMUTA project was to ensure that the training remained mission-focused. Thus, tasks would be trained in a context of continuous mission operations. Given this requirement, the task-by-task assessment of Burnside may have been too strict. For example, only 35% of the ARTEP 17-237-10-MTP (DA, 1988c) armor platoon tasks were recommended for training, based on Burnside ratings of "highly" or "partially" supported. If a cornerstone mission scenario were created using only this limited subset of tasks, and any important tasks were omitted, then inappropriate performance chains would be created. Therefore, tasks that received ratings from the Burnside method of "P" (partial) or less were reconsidered using an adaptation of assessment methods designed by Hoffman and Morrison (1989) and Drucker and Campshure (1990). The method assessed how much of the task could be performed in simulation, the functional fidelity of SIMNET, and whether the task could be observed in SIMNET. SMEs were then asked to make an overall judgment about whether or not each task should be a candidate for simulation training. This method is outlined in Figure 3.

Battalion Staff Tasks

Finally, there was a requirement to replicate the Burnside method for the battalion staff tasks, applying the filtering criteria to trainability in Janus and the automated Tactical Operations Center (TOC) Workstations developed for the CVCC effort. Janus and CVCC were not as well known or as accessible as SIMNET. There was, however, limited documentation on the combat development version of Janus. This provided preliminary direction for including or eliminating tasks based on the characteristics and capabilities of Janus. There was also CVCC documentation available, including training plans, scenarios, and exercise procedure guides. In addition, several SIMUTA staff members were former members of the team that had conducted research with CVCC and were familiar with the CVCC system. CVCC capabilities were judged by these staff experts.

Much of the focus in the ARTEP 71-2-MTP (DA, 1988e) is on the planning and preparation phases of operation. The simulations, however, replicate the environment primarily for the execution phase. Thus, to maximize use of simulation, staff training would emphasize execution activities. The planning and preparation activities, while unquestionably critical, would not be rigorously trained by the RCVTP. Rather, a standardized battalion order would be provided to staff personnel.

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[3]For filtering tasks for the scout and mechanized infantry platoons, SIMUTA Team members applied the Burnside (1990) methodology to tasks in the ARTEP 17-57-10-MTP (DA, 1988i), for scout platoons, and FM 7-J7 (DA, 1993a), for mechanized infantry platoons and squads.

Training for how to conduct the planning phase of an operation was not part of the RCVTP training package. Staffs would prepare for execution by studying the battalion order and any accompanying annotations, rationales, and interpretations needed to clarify the order and by viewing Demonstration Videotapes depicting execution of the operation. They would also be expected to conduct rehearsals using home station resources. Expectations for staff performance during the exercises would be consistent with information provided in advance by means of the decision support templates (DSTs). It was critical that staffs understand that execution in simulation would be driven by the standardized order.

Tasks were not assessed separately for CVCC, on the premise that battalion tasks that can be performed in SIMNET can be supported by CVCC; CVCC capabilities were developed as SIMNET tools. There was an issue about the precise role of CVCC in staff training. The alternatives were (a) positioning ARNG staffs as operators of CVCC equipment, or (b) having the staff operate in the standard SIMNET command post with message traffic handled by CVCC and relayed to the command post by O/Cs. The recommendation was that ARNG staffs would be allowed direct access to the CVCC terminals. This would reduce the amount of radio communication with outside sources, allowing more concentrated O/C attention on the internal staff actions and interactions. In addition, the CVCC displays would be used to eliminate map posting activities, again to allow concentration on staff interaction. Essentially, the CVCC/SIMNET system was to become an "automated" exercise driver; the system could be programmed before an exercise to provide the information cues needed to elicit staff responses. Battalion actions that were generated in SIMNET could be displayed and reacted to in the CVCC environment with concentrated attention on practicing team information processing, coordination, and situation monitoring. Thus, CVCC would teach patterns of information flow among key staff members, but would not teach precise mechanisms for the flow. This practice would allow staff members to generate a conceptual schema for understanding staff roles and functions. As this concept for using the CVCC began to develop, a corresponding name change was needed: the CVCC-based system was renamed the Commander/Staff Trainer (C/ST).

Step 3. Identify Tasks Needed to Perform Cornerstone Scenarios

This step in the plan called for analyzing task performance portrayed in a successfully executed, as defined by the NTC, NTC cornerstone scenario. Successful execution of an exercise was to be demonstrated through a unit's performance of the tasks and critical subtasks necessary to achieve their objectives. Historical data about the battalion's actions during execution were to serve as an indication of which tasks should be included in SIMUTA tables. However, no historical data were provided. Only a division order was provided to guide the identification of the tasks required for training. By itself, this order told little about what battalion, company, and platoon tasks were performed in support of the division mission.

Given these problems, an alternate approach was used. This approach began with analysis of ARTEP 71-2-MTP (DA, 1988e) to identify tasks that were applicable to the two cornerstone missions. The tasks that survived the filtering process described above were crosswalked against the two cornerstone mission requirements as represented in Figures 3-3 and 3-6 of ARTEP 71-2-MTP. These figures specify the collective tasks required for the

MISSION (7) TASKS	CRITERIA DETERMINANTS						REASONS
	1) PERFORM/ EXECUTE	(2) DO ALL COMP	(3) PART COMP	(4) NO COMP	(5) S/R EQUIV	(6) OBSERVE PERFORM	(7) INCLUDE DOMAIN

RULES FOR FILLING OUT RATING FORM

1. DEFINITION OF TERMS:

   a. Perform/execute. Your judgment whether task can be executed in SIMNET.
   b. Do all components. Can all subtasks or components of tasks be performed on SIMNET.
   c. Do part components. Write yes if parts of task or supporting sub-task can be performed on SIMNET.
   d. No components. Write no if task cannot be performed on SIMNET.
   e. Stimuli/Response. Does performing the task on SIMNET provide the stimuli required to cue the task. Does the response required replicate the procedures as done on actual equipment.
   f. Observe performance. Can the task (or parts) be observed in SIMNET. For now, lets don't measure, implies different criteria.
   g. Include in domain. Your call on whether the task is a candidate task for inclusion into the task domain.

2. Rules

   a. Answer 1 thru 7 either yes or no. A no response requires specific reasons in the comment column.
   b. Number 3 marked yes requires comments if number 2 is marked no.

Figure 3. SME rating method.

MTC and DIS operations. All of the filtered (i.e., trainable) tasks at the battalion level were included in one or the other of these two missions. ARTEP 71-2-MTP also identifies, through a crosswalk, the company and company team collective tasks that are associated with the various battalion operations. Again, all trainable company-level tasks were included as potential requirements of the two given battalion operations.

Neither the company ARTEP 71-1-MTP (DA, 1988d) nor the platoon ARTEP 17-237-10-MTP (DA, 1988c) were found to contain a similar crosswalk matrix specifying platoon collective tasks associated with the company mission. However, applicable platoon collective tasks were identified as subtasks under the company collective tasks. For the armor and mechanized infantry platoons, all trainable tasks were consistent with battalion MTC and DIS operations. For the scout platoon, one trainable task was identified as being inconsistent with the cornerstone missions.

Outlining Exercise Tables

The next major phase was the development of outlines for a set of exercise tables that incorporated the tasks selected for training in the context of the cornerstone missions. The Statement of Work (SOW) stated the requirement to provide "scenario outlines" along with a description of SIMUTA's experimental approach to developing these outlines. The technical response to the SOW specified that the outlines would contain the following six components: (a) a situation, (b) a mission, (c) training objectives, (d) tasks to be trained, (e) key teaching points, and (f) the conditions required to stimulate performance of key teaching points. The Project Research Plan (BDM Federal, Inc., 1993) further refined this approach to developing the outlines. The approach included developing one prototype outline along with guidance detailing the outline creation process. The format of the outline would provide a straightforward, readily comprehensible method of portraying the key specifications and occurrences of the exercises. The guidance document would train SIMUTA developmental staff, provide a reference for their developmental work, and serve as a standard for evaluating individual outline products.

In August 1993, the SIMUTA staff presented ARI a completed prototype outline, an outline format detailing the outline creation process, and a description of the outline's purposes. The purposes of the outlines were to provide (a) a framework for fitting tasks into tactical exercises, (b) a protocol for comparing difficulty levels of tables, (c) a display format for insuring equivalent levels of detail, and (d) a standardized system for recording specifications for exercises. Accordingly, the outline format specified that each scenario outline include the following six elements: identifying information, training objectives, context, map specifications, events/story lines, and graphic representations. After ARI review and acceptance, the outline format and the prototype outline were distributed to those responsible for creating the outlines, along with training on how to create the remaining outlines.

In the Project Research Plan (BDM Federal, Inc., 1993), a three-part process was proposed for completing the outlines. Training development specialists and military subject matter experts (SMEs) would (a) partition the cornerstone scenario story line into discrete exercises, (b) examine instructional sequencing principles, and (c) complete the exercise outlines in accordance with those principles. However, because of delays in the delivery of

NTC cornerstone scenarios and the absence of any cornerstone rotation historical data, the exercise outline process specified in the Project Research Plan had to be revised.

Figure 4 presents a flow chart of the revised process that was used to create exercise tables from the tasks identified for cornerstone performance. When the process began, SIMUTA staff knew only that the scenarios must incorporate two general missions: MTC and DIS. From this point, the process was one of creating a story line that incorporated tasks identified as being trainable in the simulations and doctrinally appropriate for the two battalion cornerstone scenarios. The process consisted of 15 steps, some of which are combined in the following description.

Step 1. Create Exercise Table Partitions

Table Designation for Company and Company Team Exercises

Step 1 is designating the company-level tables and exercises, and is representative of the process of partitioning the MTC and DIS missions. In partitioning the missions, SIMUTA staff personnel examined each mission as a whole, and then divided the missions into well-defined segments. After the missions had been partitioned, the resulting product was reexamined to ensure that the partitioning principles, described below, were employed as intended. In the end, the task required two revisions of the original partitioning effort.

The principles by which the missions were to be partitioned were based on alternative ways of operationalizing the "crawl, walk, run" (CWR) model for sequencing training. The exploration of CWR began prior to receiving NTC division operations orders. It was assumed that the selection of platoon and company tasks to be trained would be largely unaffected by these specific orders, as long as the battalion missions were either an MTC or a DIS. Therefore, our analysis of CWR concepts focused on company and platoon activities to provide examples of alternative instructional sequencing.

According to the SOW, each of the SIMUTA platoon and company exercises was to be produced in three versions of difficulty and realism, in accordance with the CWR concept. There was, however, no single definition for CWR which was commonly accepted. ARTEP 17-237-10-MTP (DA, 1988c) associated CWR with different training methods, from simple low-fidelity simulations (e.g., sand tables) to more elaborate field exercises, with the implication that low-fidelity simulations should be used first. A slightly different interpretation was that training fidelity should be matched to unit proficiency. That is, low-fidelity simulations (crawl training) should be used with beginning units and high fidelity simulations used for units nearing the mastery level of proficiency. From this interpretation followed the implication that CWR corresponds to different levels of proficiency. Finally, CWR has been used to refer to the complexity of the mission being trained, which would likewise be tied to level of proficiency.

In the SOW Concept Briefing and Technical Response to the SOW (see Chapter 1), the SIMUTA staff presented an interpretation that CWR be treated as a multidimensional concept. In other words, we proposed that CWR tables be constructed as combinations of different training techniques and exercise complexity levels. Training techniques were defined as interventions. For crawl tables, O/Cs would intervene to teach and instruct as necessary to

assist soldiers in performing the tasks. In walk tables, O/Cs would be limited to occasional prompting and coaching to initiate tasks. Finally, in run tables, O/Cs would rarely intervene during execution, but act only as mentors and discussion facilitators during AARs.

Exercise complexity was defined in terms of the speed with which tasks would need to be completed and the number of tasks that would need to be conducted simultaneously. These two components would be associated with complexity of the mission as defined by the factors of mission, enemy, troops, terrain, and time available (METT-T). If only enemy and time were varied (the two easiest to control in SIMNET), crawl tables would have smaller enemy units and more time to react than would walk and run tables. By varying METT-T across crawl, walk, and run tables, time for O/C teaching and coaching can be varied and the number of tasks to be executed can be varied.

The ambiguity surrounding the CWR definition warranted a systematic consideration of alternative meanings. A series of brainstorming sessions made it clear that platoon and company offensive tasks naturally fall into an easy-to-difficult performance array when they are sequenced for an unfolding MTC mission. In addition, when these tasks are arrayed against a traditional threat meeting engagement, there is a natural repetition of tasks over increasingly difficult threat conditions. Given this natural array, crawl-walk-run was defined as two-dimensional concept referring (a) to an increasingly difficult series of tasks and (b) to an increasingly difficult set of conditions.

From this conceptualization, an initial series of offensive "tables" was outlined. An exercise table was defined as a standardized one-hour exercise on SIMNET. Table 2 presents the initial contents for exercise tables for the company MTC tasks. The layout shows the two-dimensional sequence of easy to difficult tasks and conditions. Within rows, tasks become more difficult from left to right. Down the rows, METT-T conditions become more difficult. Following the sequence in Table 2, the entire offensive mission story line is represented by starting in the top left exercise table and moving across the row, then working left-to-right across the second row, and finally moving left-to-right across the third row. After subsequent refinements through pilot tests and trials, the exact contents of these exercise tables changed somewhere, but the concept remained the same (see Chapter 4).

Within the cornerstone defensive scenario (DIS), there were two potential company missions: Defense in Sector and Defend a Battle Position. Thus, two exercises with three tables each were planned to reflect these missions. Table 3 presents the initial proposal for these exercise tables. These missions do not flow as naturally from one to the other as the offensive missions. However, Defense in Sector is the more difficult of the two missions. Thus, Defend a Battle Position was tentatively planned as the first exercise and Defense in Sector the second.

During the discussions of the CWR concept, consideration was also given to the level of proficiency that ARNG units may bring to a SIMUTA weekend of training. Time and space for maneuver training is severely limited for ARNG units, so that basic platoon and company proficiency cannot be assumed for all ARNG units. Indeed, prior to SIMUTA, conducting basic drills was a frequent activity for ARNG units when they used SIMNET. Therefore, a series of fundamentals tables was proposed. These tables were independent of the battalion operation. Being apart from a specific mission context allowed a leader's attention to be

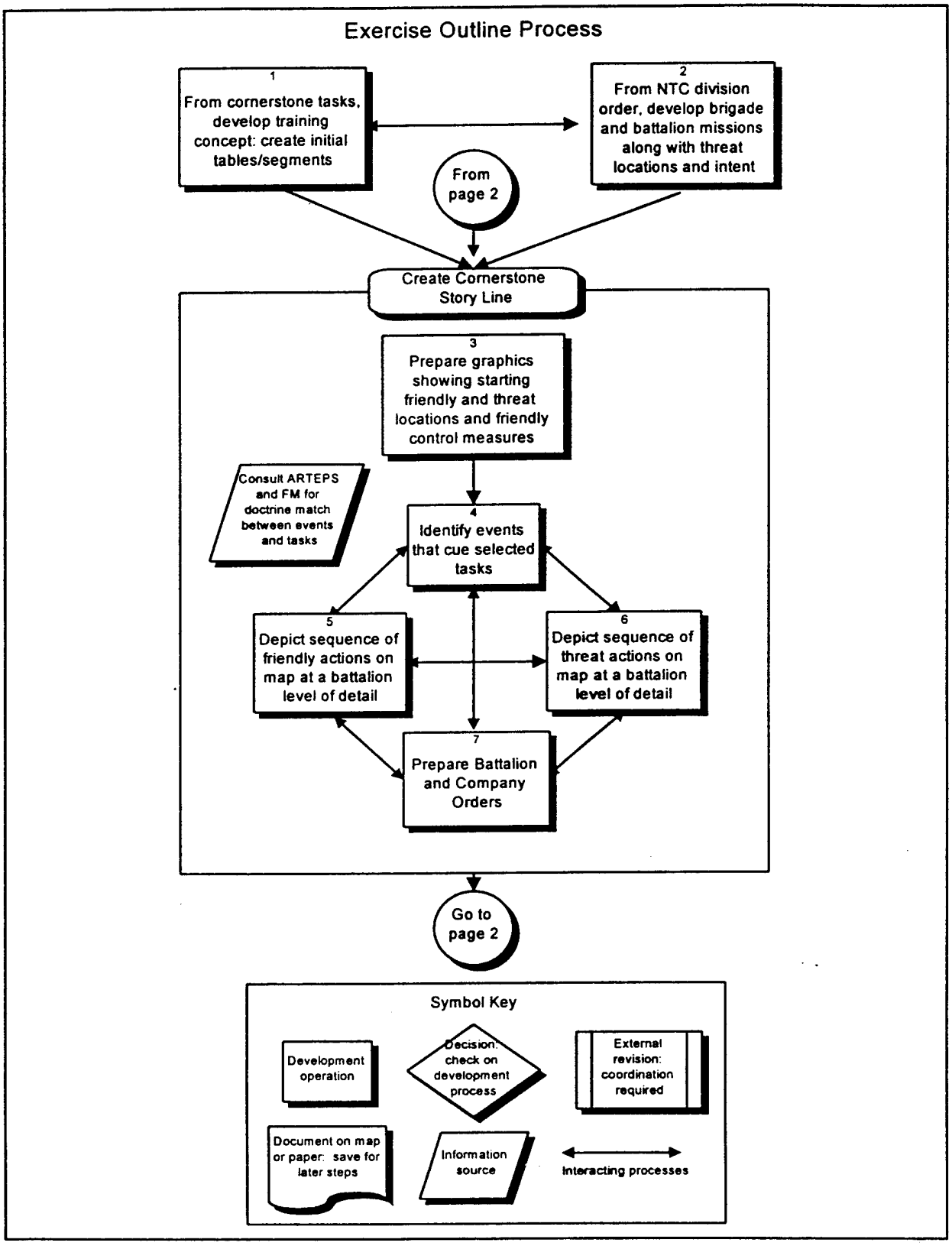

Figure 4. Exercise outline process.

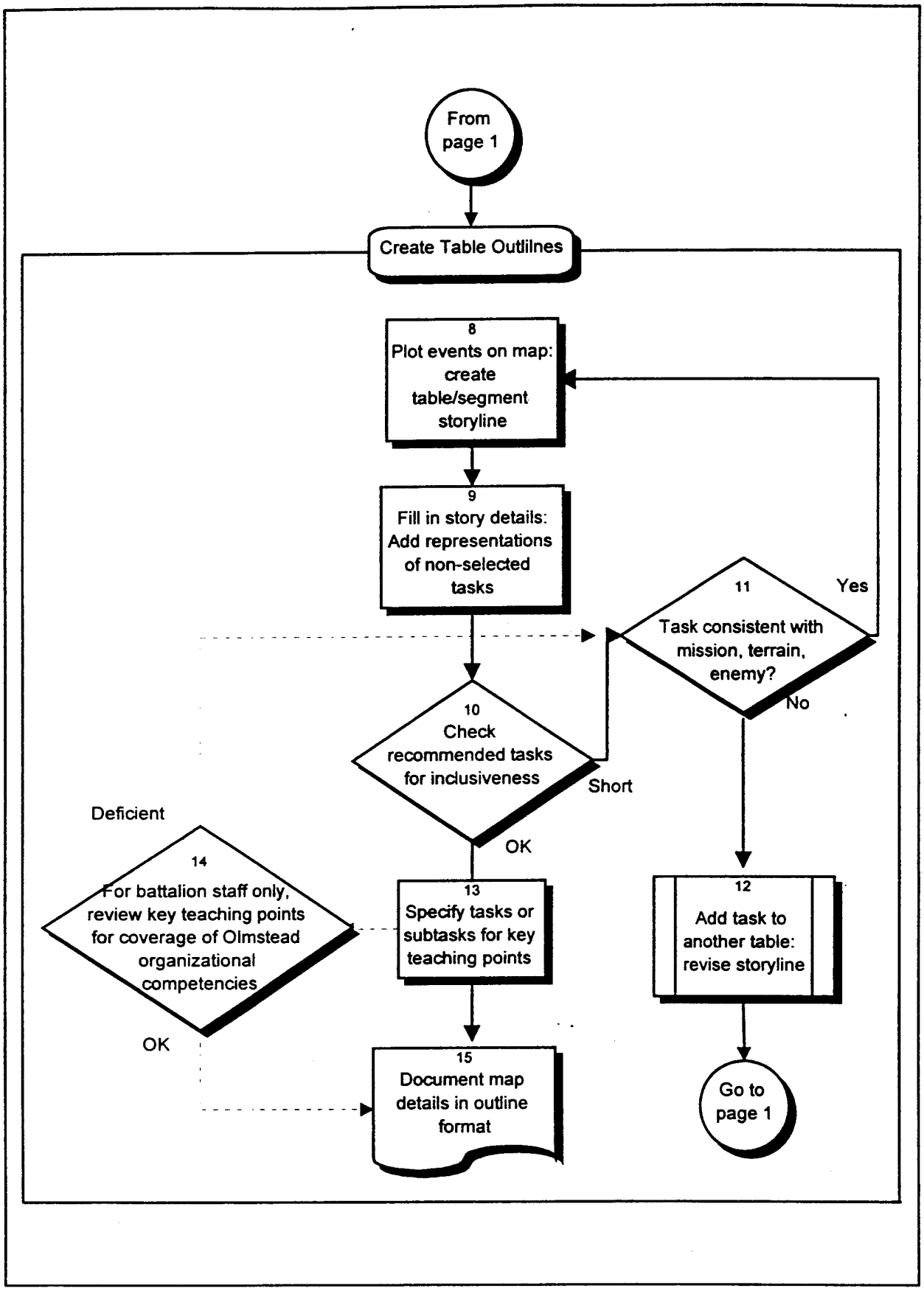

Figure 4 (cont'd). Exercise outline process.

focused on skill attainment per se, unhindered by the demands of continually looking ahead. In the fundamentals tables, skills can be practiced to the point that their execution becomes automatic. To perform a mission successfully, a unit must be capable of acting instantly in performing fundamental tasks. Such automaticity, or rapid response, in the execution of fundamental tasks is critical to successful mission performance and performance of higher-level tasks when leaders and crew must react instantly. Thus, an exercise of three tables was designed to provide maneuver and command and control practice in terrain adjacent to that of the cornerstone mission.

In summary, the design for company training consists of six exercises, each with three tables. One fundamentals exercise was planned to provide practice on basic tasks as preparation and rehearsal for the coming missions. Of the five remaining exercises, three were allocated to the offensive cornerstone mission and two, to the defensive cornerstone mission.

Although the exercises are sequenced in accordance with the battalion story line, training flexibility is allowed by the layout of the offensive tables. Redundancy is built into the tables with tasks repeated in adjacent tables. Accelerated training by short-cutting through the tables is possible with units still receiving practice on all tasks. For example, a proficient unit might begin with Exercise Tables B1 and B2 (see Table 2), then skip to Table C2 and then to Table D2. Other sequences that include all tasks can be discerned by examining the patterns of tasks in Table 2. In general, a unit may skip up to two tables (which results in them skipping from one row to the adjacent cell in the subsequent row) and still train on all tasks.

In contrast to the offensive tables, the defensive tables are not designed for crossover from one exercise to the other. Units are expected to complete the three tables for either set. However, after viewing the demonstration on the Advance Materials (see Chapter 4), units have the background to begin training with either defensive exercise. The SIMNET combat fundamentals tables are optional; although units would be encouraged to use them, they could elect to begin training with an offensive or a defensive exercise.

Training Design of Platoon Exercises

Platoon tables were designed to parallel company tables. Thus, for the armor and mechanized infantry platoons, tables for three offensive exercises, two defensive exercises, and a fundamentals exercise were designed. The contents of the tables were derivatives of the company tables, and included those platoon-level tasks that support company tasks of the matching tables. Tables 4 and 5 present the initial plans for the contents of the armor and mechanized infantry platoon tables.

Because scout platoon actions are controlled by the battalion, scout tables were designed from the battalion story line. Tables for two offensive exercises, one defensive exercise, and a fundamentals exercise were designed. Table 6 presents the initial plan for the contents of the scout tables.

Table 2

Initial Plan for Company Exercises: Offensive

Table CAB1	Table CAB2	Table CAB3
Exercise CA-B: Movement to Contact		
Tactical Road March	Tactical Road March Tactical Movement	Tactical Movement Actions on Contact
Exercise CA-C: Hasty Contact		
Tactical Movement Actions on Contact	Tactical Movement Actions on Contact Employ Indirect Fire Support in the Offense	Tactical Movement Assault Enemy Position Employ Indirect Fire Support in the Offense
Exercise CA-D: Support by Fire		
Tactical Movement Actions on Contact	Tactical Movement Actions on Contact Employ Indirect Fire Support in the Offense	Tactical Movement Support by Fire Employ Indirect Fire Support in the Offense

*Note. Task difficulty increases across columns from left to right, and METT-T conditions become more difficult by row, from top to bottom.

Training Design of Battalion and Battalion Staff Exercises

Following the procedure described above, doctrinal sources were used to identify a sequence of battalion actions likely to occur during MTC and DIS missions. Figure 5 presents the prescribed sequence of tasks for the battalion MTC mission. Only the battalion maneuver tasks are provided. Six maneuver tasks were judged trainable on SIMNET; however, only five were chosen for the exercises; "attack/counterattack by fire" was not

Table 3

Initial Plan for Armor Company Exercises: Defensive

Exercise E: Defend a Battle Position

Table CAE1	Table CAE2	Table CAE3
Defend from Battle Position Conduct Rehearsals	Defend from Battle Position Orchestrate Defense Execute Direct Fire Plan Employ Indirect Fire in the Defense	Maneuver Forces Conduct Counterattack by Fire and Maneuver

Exercise CA-F: Defense in Sector

Table CAF1	Table CAF2	Table CAF3
Defense in Sector (Prep) Conduct Rehearsals	Defense in Sector (Exec) Orchestrate the Defense Execute the Defense Employ Indirect Fire in the Defense	Maneuver Forces Conduct Counterattack by Maneuver

included because it is similar in requirements to "assault." (Assault is more consistent with the division order.) The other tasks trainable on SIMNET (e.g., command and control, fire support) were applicable across all events and were not used to structure the battalion story line.

Battalion defensive operations presented a more difficult problem. There are a variety of ways that a defensive operation may unfold, depending on the success of the friendly unit against the threat. Figure 6 presents the initial assessment of the alternative sequences of action that incorporate the SIMNET trainable tasks. Again, only the maneuver tasks were used to design the sequence of the exercise.

Because the MTC and DIS missions were each represented by only one exercise, there was no requirement for CWR sequencing within any battalion exercise. The NTC OPFOR meeting engagement tactic, however, introduced an increasingly difficult series of actions for the offense in terms of tasks and conditions. Additionally, the SOW required that the

exercises developed for Janus and for the Commander/Staff Trainer (C/ST) and those developed for SIMNET be mutually supporting. This supportive function would be provided by requiring each simulation to incorporate tasks that facilitated the training of the tasks in the other simulations. As a result, Janus and C/ST mediated exercises focused almost exclusively on staff tasks, while SIMNET exercises incorporated maneuver or mission execution tasks as well as staff tasks. In practice, a unit could prepare its staff for a SIMNET exercise by having them train in isolation from the rest of the unit on their specific functions. Furthermore, C/ST exercises would provide even more focused training for staffs that could occur before the Janus exercises. Thus, the presence of a CWR progression for the battalion staff was evident in the design of the battalion C/ST, Janus, and SIMNET exercises.

The SOW and Project Research Plan called for battalion and battalion staff exercises that would last no longer than four hours. Presenting battalion training in a four-hour continuous block presented a problem for maintaining standardization. Over four hours, a unit's decisions and actions may incrementally carry them further and further from the course of action anticipated by the battalion order. As this occurs, the ability for O/Cs and the training system (e.g., performance measurement tools) to anticipate doctrinally acceptable actions is strained. In addition, if units begin performing inappropriate actions, a four-hour delay in providing feedback may be too long to facilitate performance improvement. Therefore, the initial design plan for battalion training was to incorporate interim AARs within the four-hour execution time. These interim AARs were to follow each of the battalion tasks as illustrated in Figures 5 and 6. That is, the battalion exercises consisted of segments similar to the tables for the company and platoon exercises. Interim AARs, however, were optional. If a unit was performing within certain guidelines, they would continue to the next phase of the exercise without an interim AAR.

Step 2. Develop Brigade Courses of Action from NTC Division Order

The NTC provided the SIMUTA Team with division-level offensive and defensive orders complete with their supporting annexes and operational overlays. The SIMUTA Team used these division-level NTC materials to develop doctrinally sound brigade and battalion tactical courses of action. Each brigade and battalion order was designed to structure the assigned mission within the parameters established in the division orders.

An issue arose in preparing the OPORDs concerning plans for enemy actions. The intelligence annex of an OPORD contains an *estimate* of what the enemy is expected to do. Both this estimate and the actual planned enemy actions were written based on Soviet-style doctrine. This doctrine is fairly predictable, but does allow for plans of action to be altered, contingent upon a unit's experiences during the course of a mission. Because of the possibility of the enemy varying from its planned course of action, the scenarios' planned enemy actions needed to be more specific than those actions estimated in the OPORD. For example, combat reconnaissance patrols (CRPs) precede the forward security element (FSE); however, there may be one, two, or three such CRPs and their distance in front of the FSE may vary. Thus, although the OPORD contained the information that there would likely be two CRPs, enemy plans for the exercise specified the exact numbers and routes for the CRPs.

Steps 3-7. Create Cornerstone Story Line

Steps 3 - 7, together, represented the process of creating the NTC-based offensive and defensive story line for the SIMUTA exercises. They constituted a heuristic, as opposed to an algorithmic, process of merging the NTC cornerstone division order with the training table specifications. The NTC foundation provided the higher headquarters missions, terrain constraints, and enemy units and tactics. The training table designs provided a doctrinal basis, consistent with simulation capabilities, for writing a mission story at a battalion level of detail. Steps 3 through 7 represented the mutually supporting interaction of training design with orders development, as the brigade and battalion orders were developed simultaneously with the creation of the story line.

Initially this phase of development was to be based on data from an actual NTC rotation. That is, the start-to-finish story line was to be provided by the historical record of a competent unit performing at NTC. Complete rotation data at the appropriate level of detail were not provided, so the SIMUTA Team developed a story consistent with standard NTC rotations.

Steps 3-7 depict the process as one of developing, on a map, starting locations for both friendly and enemy units, including friendly control measures. Then, using the training tables as guides, courses of action were written for both friendly and enemy units. Particular attention was given to the events needed to cue the occurrence of the tasks selected for training. The various FMs and ARTEPs identified in Table 1 were consulted to insure that actions and reactions depicted for friendly and enemy units were consistent with doctrine.

The double-headed arrows between steps 4, 5, 6, and 7 in Figure 4 indicate that the development of the battalion level story became something of a give-and-take process. That is, company and platoon tables specified sequences of tasks that needed to fit within the battalion orders. In addition, the battalion exercises also specified certain tasks. Therefore, the battalion orders needed to be written to accommodate both platoon and company tables and battalion tasks. At the same time, the SIMUTA battalion order had to be doctrinally sound and consistent with the NTC division orders. This necessitated some reallocation of tasks to tables in order to obtain consistency among the tables, the battalion tasks, the terrain, and the threat. It also created some specific additions for the battalion orders that may not have otherwise been made. For example, the attack mission was created to facilitate the company support-by-fire task. Also, to support company defensive tables, a counterattack mission was added. Finally, mission and terrain constraints led to the reversal of the company and platoon-level defensive exercises. Defense in Sector became the first defensive exercise followed by Defend a Battle Position.

The result of Steps 3-7 was the identification of the placement of the SIMUTA tables and exercises within the context of an NTC-based cornerstone scenario. In several cases, the original allocation of tasks to tables had to be altered to achieve consistency between the NTC foundation and training for the different echelons. In addition, a series of graphically annotated maps were sketched that depicted the basic layout of the battle with indications of where the various tables occur. These became the basis for elaborating the exercise table outlines.

Table 4

Initial Plan for Armor Platoon Exercises

	Fundamental	
Exercise PA-A: Combat Readiness		
Table PAA1	Table PAA2	Table PAA3
Platoon Movement Actions on Contact	Platoon Defense Attack by Fire	Platoon Assault
	Offensive	
Exercise PA-B		
Table PAB1	Table PAB2	Table PAB3
Tactical Road March	Tactical Movement	Actions on Contact
Exercise PA-C		
Table PAC1	Table PAC2	Table PAC3
Tactical Movement	Actions on Contact	Hasty Attack
Exercise PA-D		
Table PAD1	Table PAD2	Table PAD3
Tactical Movement Actions on Contact	Hasty Attack	Hasty Defense
	Defensive	
Exercise PA-E		
Table PAE1	Table PAE2	Table PAE3
Occupy Battle Position	Defend Battle Position	Delay in Sector
Exercise PA-F		
Table PAF1 Defend Battle Position	Table PAF2 Delay in Sector	Table PAF3 Hasty Attack (Counterattack)

Table 5

Initial Plan for Mechanized Infantry Exercises

	Fundamental	
Exercise A: Combat Readiness		
Table PMA1	Table PMA2	Table PMA3
Platoon Movement Actions on Contact	Platoon Defense Support by Fire	Platoon Assault
	Offensive	
Exercise PM-B		
Table PMB1	Table PMB2	Table PAB3
Tactical Road March	Tactical Movement	Actions on Contact
Exercise PM-C		
Table PMC1	Table PMC2	Table PMC3
Tactical Movement	Actions on Contact	Hasty Attack
Exercise PM-D		
Table PMD1	Table PMD2	Table PMD3
Tactical Movement Actions on Contact	Hasty Attack	Hasty Defense
	Defensive	
Exercise PM-E		
Table PME1	Table PME2	Table PME3
Occupy Battle Position	Defend Battle Position	Delay in Sector
Exercise PM-F		
Table PMF1	Table PMF2	Table PMF3
Defend Battle Position	Delay in Sector	Hasty Attack (Counterattack)

Table 6

Initial Plan for Scout Platoon Exercises

	Fundamental	
Exercise PS-A: Combat Readiness		
Table PSA1	Table PSA2	Table PSA3
Tactical Movement	Tactical Movement Actions on Contact	Tactical Movement Actions on Contact
	Offensive	
Exercise PS-B		
Table PSB1	Table PSB2	Table PSB3
Recon Area	Recon Area and Obstacle	Zone Recon
Exercise PS-C		
Table PSC1	Table PSC2	Table PSC3
Screen	Screen Passive Air Defense	Screen Actions on Contact
	Defensive	
Exercise PS-D		
Table PSD1	Table PSD2	Table PSD3
Screen Actions on Contact	Screen Actions on Contact	Screen Actions on Contact (Passage of Lines)

Steps 3-7 were repeated in various orders many times over. Because there is no one perfect OPORD for any one situation, there were numerous alternatives considered for inclusion. Efforts to examine each of these alternatives and their effects on the remainder of the order were so time consuming that the deadlines for the platoon delivery order actually became a driver for bringing the process to a sufficient end point. When the Company/ Platoon Team judged the story line to be sufficient to begin further development of platoon

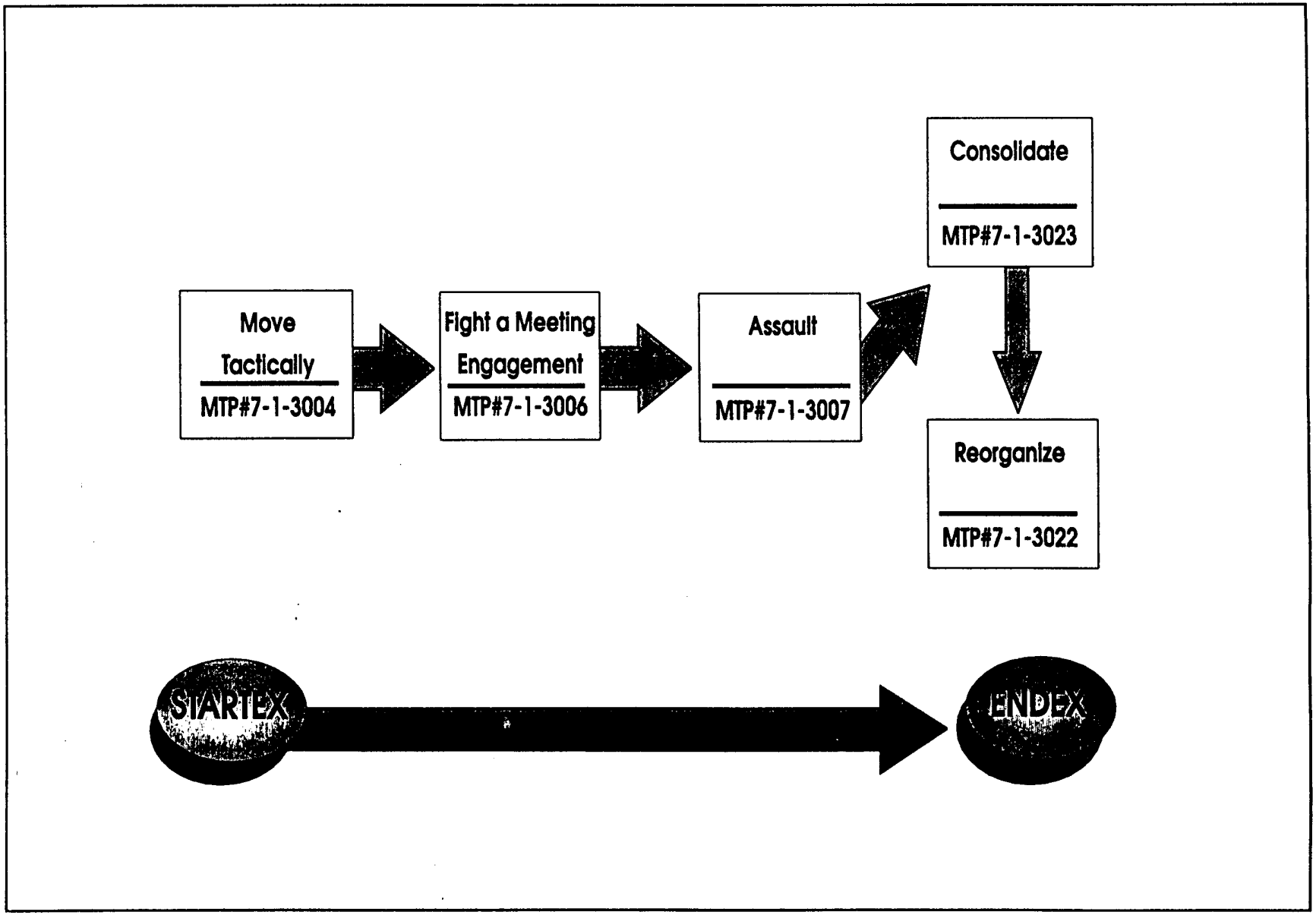

Figure 5. Task sequence for Battalion Movement to Contact.

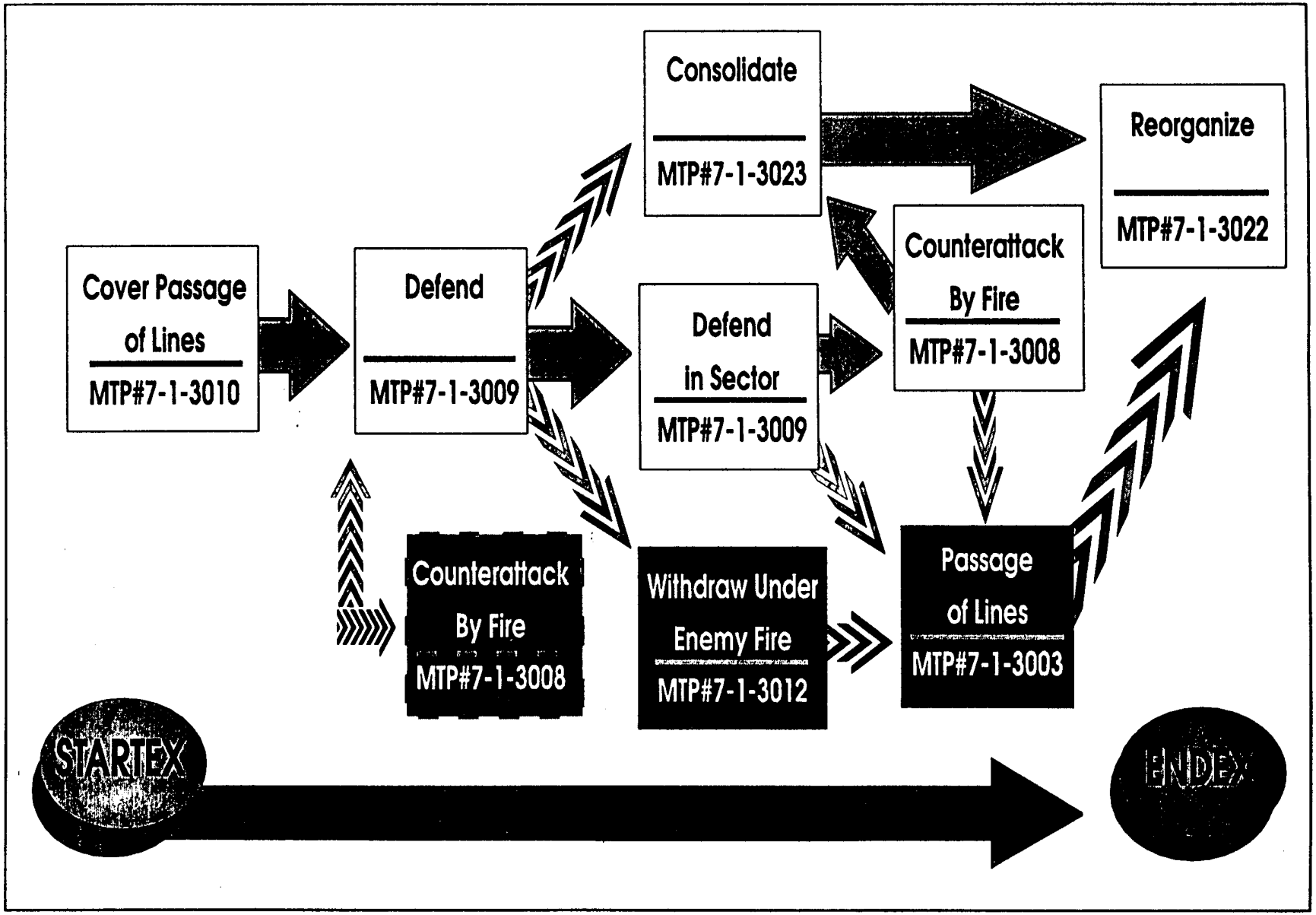

Figure 6. Task sequence for Battalion Defense in Sector.

and company tables, they began writing the training table outlines. While the Company/Platoon Team was creating table outlines, the Battalion Team continued the process of refining the cornerstone story lines and battalion OPORDs. These refinements included changes such as removing an axis and emplacing support by fire positions. None of these later changes were incorporated into the company or platoon exercises.

Steps 8-15. Create Table Outlines

Steps 8-15 depict the process of constructing the story within each table; developing the necessary events, tasks, and locations contained within each table; and then documenting those events, tasks, and locations in training table outlines. Members of the Company/Platoon Team developed the company and platoon table outlines and members of the Battalion Team developed the battalion exercise outlines.

The outline format was provided as a reference for outline development as well as a standard for the evaluation of the individual outline products. Each of three members of the Company/Platoon Team was given the task of developing either the armor platoon, mechanized infantry platoon, or the scout platoon tables. Because the armor company and company team tables were similar, one team member was assigned to develop the outlines for both types of tables. With the assistance of the whole team, he first completed the armor company outlines and then the company team outlines. Because of the extremely high level of similarity between the types of training, the armor company outlines, with only slight modifications, also served as the outlines for the company team tables.

Although a basic outline format was provided, the outline developers were given freedom and encouraged to create the most complete, efficient, and user-friendly outlines possible. This enabled these individuals to employ their expertise in designating the best methods of presenting information within the limits specified by the format provided. A training development specialist supervised the process, facilitating the integration of the best aspects of the individual outlining styles into the final outline product.

The battalion exercise outlines were developed by several combinations of SMEs and training developers from the Battalion Team. Specifically, one group of individuals developed the offensive exercise while another group developed the defensive exercise. A third group was involved in the development of both. Because the exercises were initially segmented to provide additional AAR opportunities, each developer was responsible for certain segments of the exercises. There were five segments incorporated in the offensive exercise, and four in the defensive exercise.

A consideration in the development of the battalion outlines was their conformity with the company and platoon exercises. Before proceeding with the development of the outlines, the outline format was modified to increase the utility of outline format in facilitating the development of complete, yet succinct outlines for the battalion exercises.

Sequence Events

The heart of the story development process was Step 8, in which events were sequenced within the terrain and mission previously specified for the table. An event was defined as the

combination of a cue and the task the unit should perform in response to the cue. Cues were terrain factors, enemy actions, or higher command orders. Events were sequenced in a manner consistent with the battalion order, the given enemy, and doctrinal guidance for tactics and procedures.

The battalion, company, and platoon exercises were all derived from the same missions so that platoon tasks were consistent with company missions and company tasks were consistent with battalion missions. However, the platoon tables did not necessarily represent any one of the particular platoons in the battalion. If the tables were confined to portraying the story of any single platoon, it would not be possible to include all of the events needed to create the opportunities to practice all selected tasks. For any given platoon, there would likely be times when the action was in some other part of the battalion sector. Thus, the story line represented by the platoon tables was developed with sufficient creative license to keep the platoon busy while retaining the battalion mission context. For example, all along the axes of the tables, enemy units were placed to provide the necessary stimuli for platoon training. Although these enemy placements were created within the bounds of the threat doctrine portrayed at the NTC, it would be improbable that the same platoon would meet all of these forces in actual battle. Likewise, enemy placements for the company were made within bounds of threat doctrine; however, the series of company tables did not necessarily replicate the actions of a particular company in the battalion exercise.

Devise "Work-Arounds"

Step 9 is required because some tasks identified as not trainable in simulation were injected into the tables to complete the story line. For example, consolidation and reorganization were added for the platoons, companies, and battalions to give closure to several of the tables even though these tasks are not well suited to SIMNET training. "Work-arounds" (methods of training with low-fidelity representations) were utilized for these tasks. These work-arounds involved, among other things, the creation of scripted radio traffic coming from higher units specifying that the unit perform activities associated with the tasks.

Check Assignment of Tasks to Tables

The process included a double check (Step 10) to insure that all tasks initially allocated to the table during Step 1 were included among the events. In some cases, tasks were removed from a table because terrain, enemy, or mission did not allow a logical fit of an appropriate cue to drive the task (Step 11). These tasks were then discarded or allocated to another table (Step 12).

Specify Key Teaching Points (Critical Subtasks)

Step 13 is the specification of the key teaching points (KTPs) on which each table would focus. KTPs were defined as the subtasks or behaviors that are critical to successful performance of the exercise table and that are frequently omitted or difficult to perform. KTPs were initially identified based on the experience of the SIMUTA staff in consultation with outside SMEs. They provided a focus for the measurement system by emphasizing actions for the O/C's attention (e.g., platoon leader controls movement) so that changes in behavior could be addressed in AARs.

The phrase, "key teaching points," was later replaced by "critical subtasks" to conform to Army convention. Despite this name change, these elements still provided the focus for the tables and training development. The final selection of "critical subtasks" was guided by ARTEP-MTP designations.

Specify Battalion Staff Tasks and Functions

Step 13 also represents the initial identification of staff functions and subtasks within these functions. In the battalion exercises, there is a requirement to approach staff tasks on both a vertical and horizontal plane. The vertical consideration is the battalion mission (i.e., DIS or MTC), which is further segmented by the unit maneuver tasks. These tasks were selected from the ARTEP based on the cornerstone scenario. The horizontal consideration referred to selected battalion elements: the Command Group, Fire Support Element (FSE), Operations (S3) Section, Intelligence (S2) Section, Combat Trains Command Post (CTCP), and the company/teams. These elements must perform certain tasks, subtasks, and parts of tasks--some individual and some collective.

To provide some structure and organization to this information, an analysis was conducted of both the unit maneuver tasks and the individual staff section performance requirements. The analysis was performed by SIMUTA staff experienced in both the mission requirements and the performance requirements of the staff sections. The purpose of the analysis was to identify staff activities associated with specific unit maneuver tasks and then to group similar activities (subtasks and standards). These groups were termed functions. Finally, these functions were given short descriptive names.

Review Comprehensiveness of Functions

Step 14 of the exercise table outlining process introduced a review of the staff functions for coverage of Olmstead's (1992) Organizational Competencies. Our a priori expectations were that subtasks would be identified that exemplify each of Olmstead's Competencies. Plans were made in the event that functions were not found to cover every competency. The plans, however, were limited to analyses to determine whether or not the missing competency seemed consistent with the objectives of the staff functions during each segment of the battalion staff exercise, and, if so, to determine whether or not additional ARTEP subtasks could be designated as KTPs to cover that competency. In fact, our a priori expectations held. All Organizational Competencies were indeed represented in the functions.

Document Graphic Details

The remaining step, Step 15, was to place the details of the training tables, including map details, into the outline formats. Standard outline formats are presented in Figure 7 for company and platoon and Figure 8 for battalion/battalion staff.

Transition to Development

This chapter has described the design phase of the RCVTP development. The primary activities were to (a) determine the tasks required for two missions (movement to contact and defense in sector) at all three echelons of a battalion task force and (b) create the outlines of

story lines built around those two missions that incorporate opportunities to train those tasks. The product of these activities was a set of exercise outlines that provided direction for the development activities that followed. Chapter 4, 5, and 6 provided development details for the construction of complete training packages for platoon and company, battalion and battalion staff, and cavalry troop, respectively. Before describing these activities, Chapter 3 presents the SIMUTA team's formative evaluation design. The team's operational philosophy was that formative evaluation is an integral part of training development. Thus, the "results" of the formative evaluation are the incremental improvements in the training products as they are tested through pilots and trials. Chapter 3 describes the formative evaluation methods. Where appropriate in relaying the developmental history of the project, the remaining chapters describe the formative evaluation results.

EXERCISE

1. **IDENTIFIER:**
   a. Unit:
   b. Exercise:
   c. Version: SAFOR or Fully manned
   d. System: SIMNET/CCTT

2. **TRAINING OBJECTIVES (TASKS):**
   a. Tasks:

   b. References: ARTEP
      FM
      OPORD
   c. Key teaching points:
      (1)
      (2)
      (3)
      (4)
      (5)
      (6)
      (7)

3. **CONTEXT:**
   a. Mission:
   b. Task Organization:
   c. Friendly Situation:
   d. Enemy situation:
   e. Higher unit:
   f. Subordinate units:
   g. Adjacent units:
   h. Supporting units:
   i. Preceding events:
   j. Vehicle/ammo status:
      Vehicles number and type:
      Bumper numbers:
      Maintenance level:
      Fuel:
      Ammo mix/load:
   k. SAFOR parameters:
      (1) Unit type:
      (2) Unit size:
      (3) Location:
      (4) Azimuth:
      (5) RED or BLUE:
      (6) Formation:
      (7) Gunnery level:
      (8) Opening range:
      (9) Remarks :

Figure 7. Company/Platoon exercise outline format.

4. **MAP** (see Map):
   a. BLUE
      (1) Start point:
      (2) End point:
      (3) Movement boundaries:
   b. RED (See SAFOR parameters)

5. **EVENTS/STORY LINE:**
   a. Event 1
      (1) Unit is:
      (2) Cue:
      (3) Tasks:

      (4) Key Teaching Points:

   b. Event 2
      (1) Unit is:
      (2) Cue:
      (3) Tasks:

      (4) Key Teaching Points

6. **ADDITIONAL NOTES:**

Figure 7 (cont'd). Company/Platoon exercise outline format.

1. **IDENTIFIER:**
   a. Unit:
   b. Exercise:
   c. Version:
   d. System:

2. **TRAINING OBJECTIVES (TASKS):**
   a. Unit Maneuver Tasks :
   b. MTP: ARTEP 71-2-MTP
      FM 71-2
      FM 71-123
   c. Key teaching points:

FUNCTION ELEMENT	BN/TF CMD GRP (CDR/S3/FSO)	TOC OPNS (XO)			S1/4 ALOC	SUBORD CMD
		FSE	S3 SECT	S2 SECT		

3. **CONTEXT:**
   a. Mission:
   b. Task Organization:
   c. Friendly Situation:
   d. Enemy Situation:
   e. Higher unit:
   f. Subordinate units:
      (1) Co A
      (2) Co B
      (3) Tm C
      (4) Tm D
      (5) Scout Platoon
      (6) Heavy Mortar Platoon
      (7) Main CP
      (8) Combat Trains
      (9) Task Force Commander
      (10) S3
   g. Adjacent units:
   h. Supporting units:
   i. Coordinating instructions:
   j. Preceding events:

(Figure continues)

Figure 8. Battalion/Task Force exercise outline format.

k. Vehicle/ammo status:
(1) BLUE forces:
(2) RED SAFOR:
(a) FSE:
(b) AGMB:
(c) MRR 2d Echelon:

l. SAFOR Parameters:
(1) BLUE
(a) Direct fire accuracy
(b) Direct fire 2d round engagement
(c) Direct fire range
(2) RED
(a) Direct fire accuracy level
(b) Direct fire 2d round engagement time
(c) Direct fire engagement range

4. **MAP:** See Ops Overlay
a. BLUE Control Measures
(1) Start point (BLUE)
(2) End point (BLUE)
(3) Movement boundaries (BLUE)
b. RED Control Measures
(1) Start point (RED)
(2) End point (RED)
(3) Movement boundaries (RED)

INSERT GRAPHIC HERE

5. **EVENTS/STORY LINE:**
a.
(1) Event:
(2) Cue:
(3) Function/teaching point:
b. Etc.

(Figure continues)

Figure 8 (cont'd). Battalion/Task Force exercise outline format.

6. **BN/TF AAR Structure (BYI3EXID.WP):**

Key teaching points to be addressed in the BN/TF AARs have been reviewed for incorporation of Olmstead's (1992) organizational competencies criteria. Below, functions (i.e. teaching point classifications) are crosswalked against sensing, communicating information, decision making, stabilizing, communicating implementation, coping actions, and feedback. AAR feedback will focus on functional key teaching points.

Olmstead's Organizational Competencies

Functions	Sensing	Communicating Information	Decision Making	Stabilizing	Communicating Implementation	Coping Action	Feedback

INSERT FUNCTION & CROSSWALK INDICATORS

Figure 8 (cont'd). Battalion/Task Force exercise outline format.

CHAPTER III. FORMATIVE EVALUATION OF THE PROJECT

Background

As stated in the Statement of Work (SOW), one technical objective for the Simulation-based Multiechelon Training Program for Armor Units (SIMUTA) project was "...to conduct a formative evaluation of the training program during its initial implementation, in accordance with approved evaluation criteria based on training standards" (p. 2). The SOW also required that the technical portion of the Project Research Plan (BDM Federal Inc., 1993) describe how the contract team would monitor and formatively evaluate the training program implementation (p. 3). Task 6 of the SOW called for the contractor to "...assist in, monitor, and formatively evaluate training program implementation" (p. 9). There were several key phrases in the SOW that guided what the contract team was to accomplish:

> Prior to implementation of each exercise with ARNG [Army National Guard] units, the contractor shall conduct pilot tests or trials using SAFOR [semi-automated forces] and O/Cs [observer/controllers] or other available military personnel. Based on the results of these [pilots] the contractor shall accomplish all required revisions to ensure that each exercise can be run in the specified time period, that all required implementation materials have been developed, and that O/Cs are fully prepared to implement the exercises, and that all potential implementation problems have been resolved. (p. 6)
>
> The contractor shall identify all problems encountered in program implementation and take all approved actions to resolve them and ensure that training standards are met. (p. 9)
>
> The contractor shall monitor and evaluate execution of each training exercise to identify implementation problems, accomplish approved refinements, and monitor and reevaluate execution to identify problems and accomplish additional refinements, as needed and consistent with initial, refined, and final exercise delivery requirements.... (p. 10)

Explicitly, formative evaluation included all tryouts of materials for the Reserve Component Virtual Training Program (RCVTP) both with and without Army National Guard (ARNG) troops. Implicitly, however, the SIMUTA philosophy promoted the continual testing of all its products and procedures. For example, team members spent countless hours in SIMNET checking positions and routes for visibility and maneuverability to insure that specified actions would occur.

It is notably difficult to disentangle the formative evaluation efforts from the development processes. It is, however, helpful to understand the purposes and methods of the formative evaluation prior to examining the effects it had on the development process. Hence, this chapter focuses on (a) the objectives of the formative evaluation, (b) the general formative evaluation plans that guided ARNG trials, and (c) the specific formative evaluation

methodology. Results of the trials plus results of the more informal pilot tests and continual evaluations are integrated in the upcoming chapters that describe development of platoon, company, and battalion exercises.

Evaluation Design

Formative evaluation trials using ARNG units had a four-fold purpose. First, the trials were a double check to show that the simulation technologies were operating as planned. Second, the trials provided opportunities to review all of the various procedures for logical consistency, internally and with regard to accepted training practice. Third, the trials provided an opportunity to check the adequacy of the instructions to observer/controllers (O/Cs) and semi-automated forces (SAFOR) operators and the extent to which they were able to follow training procedures with an actual ARNG population. Fourth, the trials allowed the training design to be evaluated in terms of its interface with ARNG personnel. This fourth purpose included four separate issues: (a) whether the instructions and procedures were clear to ARNG personnel; (b) whether the level of difficulty of the exercises was appropriate for the skills and abilities of ARNG personnel; (c) whether ARNG units improved their performance as a result of RCVTP participation; and (d) ARNG comments and suggestions for improving the RCVTP.

As the work effort evolved, SIMUTA's sponsor, the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI), took charge of investigating the issue of ARNG improvement in performance as a result of the RCVTP. The second, third, and fourth purposes are obviously interrelated. For example, to evaluate program procedures, those procedures had to be implemented by the O/Cs and responded to by the units. However, by articulating three areas--the procedures themselves, the presentation of the procedures to the O/Cs, and the interface of the procedures with the units--the SIMUTA Teams could diagnose what and how materials needed to be altered. These three interrelated purposes were more generally addressed under the topic of program execution.

Operation of the Technologies

The SIMUTA Technical Support Team was charged with monitoring operation of the various technologies used in the RCVTP, including the Simulation Networking (SIMNET) system, Modular SAFOR (ModSAF), the Unit Performance Assessment System (UPAS), and Janus. Members of this team played a dual role. First, they served as the team's in-house equipment experts. In this role, they analyzed equipment documentation and consulted with equipment developers to learn the latest capabilities of the equipment; using that knowledge, they then assisted and advised members of the training development teams on the potential use of the equipment. Second, Technical Support Team members monitored the equipment in operation to determine whether it met technical expectations. When the equipment did not perform as expected, detailed notes were provided to ARI, who forwarded them to the respective proponents for the various pieces of equipment. The following chapters describe some of the results of the Technical Support Team's observations.

Trial Execution of the Program

Trial executions of the program were monitored in three ways: (a) structured observations by SIMUTA Team members, (b) feedback from O/Cs, and (c) feedback, via questionnaires and interviews, from ARNG participating units. The evaluation methods were tailored to each execution by having the Formative Evaluation Team meet with the respective development team leaders prior to each trial to discuss concerns. The Formative Evaluation Team translated these concerns into questions for the questionnaires and interviews that would be conducted with the unit, observation sheets for the observers, and specific notes for the observers. The observation sheets focused observers on collecting data needed to answer questions posed by the SOW and by the developers themselves.

Observations

The Formative Evaluation Team coordinated with the respective development teams to obtain enough observers to cover the areas that needed to be observed for each trial. This was largely dependent on the number and type of units that participated in the training. The Formative Evaluation Team met with the observers to train them on what to observe and how to record the information. At these sessions, the specific focus for the trial was emphasized to the observers. Additionally, the Formative Evaluation Team members gave the observers a list of questions to summarize what they observed (see Figure 9).

Observers were knowledgeable about what should happen during training and were familiar with the material. Their familiarity with the material served as both a plus and a minus. On the positive side, they were able to observe what was being done and to compare it with the material. On the negative side, the observers were not always unbiased and impartial in their evaluations, because they were the developers of the materials.

During the trial executions, SIMUTA staff members observed and recorded events on observation forms designed by the Formative Evaluation Team with input from the developers (see Figure 10). Observers attempted to determine whether the program design was adhered to and the intentions were met. Deviations were discussed with the O/C Team members and the remaining members of the development team. These discussions focused on discovering the reason behind the deviation. In so doing, the SIMUTA Team was able to make changes in the materials and to affect changes in the O/C Team's implementation of the materials.

Questionnaires

Questionnaires were administered to members of the participating units. During the first day of a trial, the Formative Evaluation Team distributed questionnaires to members of the training unit. These questionnaires contained core questions plus specific focus questions for that trial (see Figure 11). They addressed the components of the program from beginning to end and were used to spot weaknesses in the procedures. The team collected the completed questionnaires at the end of each training period.

Interviews

The Formative Evaluation Team coordinated with the O/C Team and the unit to conduct group interviews with members of the training unit. The team tried to schedule these group interviews as close to the end of the trial as possible. For most of the trials, these group interviews were conducted on Saturday evening or at the completion of training Sunday for the weekend trials. The Formative Evaluation Team used a set of core questions for these interviews and added questions based on the focus of the trial (see Figure 12). The open-ended structure of the interviews created discussion and stimulated unit members to present suggestions for changes in the program. The group interviews were usually conducted with fewer than 10 participants and normally lasted from one-half to one hour.

Trials Schedule

The initial and refined trials for the tank, scout, and mechanized platoon, company, company team, JMSE battalion staff, and battalion SIMNET tables were conducted one after the other in relatively rapid succession. These trials started in January 1994, and progressed through May with only a short break in early April corresponding to spring break for local community school system and block leave scheduled for the O/C Team. The lessons learned from one trial were tried out on the subsequent trials. Thus, each of the trials added to or affected the next trial, regardless of type or unit level.

The lessons learned in one trial also influenced the focus of the formative evaluation for the next trial and for subsequent trials. For all project participants, this schedule required rapid learning and quick reactions to prepare for the next trial. Thus, the formative evaluation should be considered a continuous process during this period, with only small differences in procedure caused by the level of the unit or type unit undergoing the trial. An appreciation for the timing of trials can be obtained in Table 7.

Platoon and Company Trials

Platoon and company trials were generally conducted with one or two companies. Thus, for platoon trials, three to six platoons would be present for training, with at least one SIMUTA observer assigned to monitor each platoon. For company training, four to eight observers were required to monitor the trial, with one observer per company workstation and one for each platoon workstation. Additional observers were used to conduct spot checks on the quality of platoon training and to conduct interviews with units.

Battalion Trials

While developing the battalion training package, the Battalion Team determined that controlling events and cues would be far more difficult in the battalion exercises than in the platoon and company exercises. The exception was the Commander/Staff Trainer (C/ST) material, where the Battalion Team could directly control the events and reliably observe reactions. In the Janus Mediated Staff Exercise (JMSE) material, the ability to control the cues was lessened in that events were mediated through Janus interactors (O/C Team) who

QUESTIONS FOR OBSERVERS

UNIT PREPARATION FOR SIMNET

1. Did the unit seem prepared to execute the training (read OPORD)? What leads you to believe that they were prepared or unprepared?

FAMILIARIZATION COURSE

2. Describe how the O/C team conducted the familiarization course? Was it effective?

TABLE PREVIEW

3. How did the O/C conduct the Table Previews? Did he follow our instructions?
4. Comment on the effectiveness of the table previews.

TABLE PREPARATION

5. During prep time, what did platoon do and how long did it take. If they were long, why?
6. Comment on the effectiveness of the table preparation.

TABLE CONDUCT

7. Did the O/C intervene or coach when time was being wasted and if not, describe what was happening so that it can be avoided in the future.
8. If the O/Cs did not use the data collection instruments or other materials provided, ask him why and describe.
9. Comment on the effectiveness of the table conduct.

AFTER ACTION REVIEW

10. Describe how the O/C conducted the AAR discussion:
11. Did O/C facilitate or try to facilitate audience participation or was it a critique and/or a lecture?
12. Was the discussion (or lecture) focused on the reasons for problems and how to improve? If not, on what did O/C focus?
13. Do you think that the crews benefited from the AARs?
14. Comment on the effectiveness of the AARs.
15. Describe any major deviations from the way SIMUTA would like to have the AARs conducted.

GENERAL

16. Provide all comments made by the O/C about the books.
17. Provide all comments made by the O/C about the training program.
18. Describe reasons for any serious delays.
19. Were there any times which the unit did not know what they were supposed to be doing? Were the instructions given by the O/Cs clear and specific enough?
20. Describe instances and circumstances when the O/C had to deviate from the training plan in order accommodate the ARNG unit.
21. Describe any problems with the OCIC/OCEC instructions.
22. Describe anything you feel needs to be documented during the next observation.

SUMMARY

23. Describe any strengths during the trial training.
24. Describe any weaknesses during the trial training.

Figure 9. Questions for observers.

ARMOR PLATOON TABLE OBSERVATION FORM
TABLE PREVIEW

In the left margin of the OCIC Book AND this form, record the start and finish times for Table Preview. In the OCIC book, describe how and indicate whether or not the O/C presented each of the following underlined agenda items. Note if any material was not covered.

AGENDA FOR THE TABLE PREVIEW — TACTICAL SITUATION
TASKS — CRITICAL SUBTASKS
STEALTH OVERVIEW — On poster 1, note how the tasks and critical
TACTICAL SITUATION — subtasks were presented.

	YES	NO
AGENDA AND/OR TASKS		
Did the O/C emphasize that critical subtasks define the performance the unit is **expected to demonstrate**?		
Did the O/C link the critical subtasks for this table with previous tables?		
Did the O/C emphasize that performance on the critical subtasks would be what he would watch for?		
STEALTH OVERVIEW		
Referred to Critical Subtasks?		
Referred to Events?		
Covered tactically important terrain characteristics?		
Covered expected enemy activity?		
Covered appropriate unit action to expected enemy activity?		

Who attended the table preview?

PL		PL WG		PSG WG		PSG	
GNR		GNR		GNR		GNR	
LDR		LDR		LDR		LDR	
DVR		DVR		DVR		DVR	

How was the overview conducted?

_____

Figure 10. Sample formative evaluation observation form.

TABLE PREPARATION
In the left margin of the OCIC Book AND this form, record the start and finish time for table preparation.

Focus during this time will be on documenting any situation that may delay the start of the table conduct, including simulator and technical problems, and other preparation efforts. Observer will ask O/C Team to verify any situations that occur that he/she has any questions about. The observer must verify the most probable cause of any delay. It is recommended that the observer stay with the OCIC during this period. Document any actions taken by the OCIC or the OCEC to ensure that the unit starts the table at the scheduled start time. Also, record the time the action is taken.

TIME	COMMENTS FOR TABLE PREPARATION

Did the O/C allow the unit time to conduct a rehearsal?	YES	NO	
Did the platoon leader discuss the mission with the platoon prior to conducting the table?	YES	NO	
Did the unit conduct a rehearsal prior to conducting the table?	YES	NO	
Did the O/C observe the rehearsal?	YES	NO	NA
Did the O/C assist in the rehearsal?	YES	NO	NA

TABLE CONDUCT:
(See Events Guide in the OCIC Book.)

For all non-scripted communications between the O/Cs and the unit, record the time and subject of the call in the comment block. Note whether or not the comment was made in the context of the mission.

Document instances when non-productive training time seems to be occurring. Record what the unit and O/Cs are doing.

Did events cue platoon to perform critical subtasks listed. Record on Events Guide in OCIC book.

Figure 10 (cont'd). Sample formative evaluation observation form.

PLATOON AFTER ACTION REVIEW
(See AAR Guide in OCIC Book)

Who attended the AAR?

PL		PL WG		PSG WG		PSG	
GNR		GNR		GNR		GNR	
LDR		LDR		LDR		LDR	
DRVR		DRVR		DRVR		DRVR	

OBSERVERS	DUTY POSITION
COMPANY LEVEL	
BATTALION LEVEL	
O/C CHAIN	
VIP	

In the left margin of the AAR Guide AND this form, record the start and finish times of the AAR.

Review Combat Functions and Key Teaching Points.
On the AAR guide or on poster 1, briefly describe how the O/C reviewed the Combat Functions and KTPs.

Scenario Analysis:

A. Leader's Plan

On the AAR guide, briefly describe how the O/C had the leader's plan presented. Did the presenter limit his presentation to the plan and if not, did the O/C take any steps to keep the presentation focused?

B. Enemy Perspective:

On the AAR guide, briefly describe how the O/C presented the Enemy Perspective.

C. Battlefield Execution Summary

On the AAR guide, briefly describe how the O/C presented the Battlefield Execution Summary.

1. Did the OCIC refer to Poster 2 for the Battlefield Execution Summary? YES NO

2. Did the OCIC make use of the stealth? YES NO

Figure 10 (cont'd). Sample formative evaluation observation form.

AAR Discussion

On the AAR Worksheet in the OCIC Book, indicate which event-by-KTP cells were discussed by putting a "+" in cells for which positive feedback was given and a "-" in cells for which corrective discussions were conducted. (You may choose to do this after the AAR when you can review the "topics discussed" below.)

List below the topics that were discussed. What did the OCIC use to assist him in the AAR? How did the OCIC involve those in attendance? How did the O/C use UPAS reports?

Focused first on critical subtasks.	YES	SOME	NO
Linked performance of critical subtasks in this table with previous tables?	YES	SOME	NO
Discussion was event-by-event or by critical subtasks.	EVENT	SPLIT	TASK
Used Stealth to illustrate consequences of unit actions.	YES	SOME	NO
Had unit leaders provide analysis.	YES	SOME	NO
Returned to Combat Functions in closing.	YES	SOME	NO
Had unit do sustain and improve.	YES	SOME	NO
OCIC presented observations of performance on critical subtasks to the Unit Leader.	YES		NO
Did O/C try to facilitate unit participation in discovering problems and how to fix them?	YES	SOME	NO
Who communicated how to correct mistakes (how to improve)?	O/C	BOTH	UNIT

Figure 10 (cont'd). Sample formative evaluation observation form.

Dear Platoon Leader, Platoon Sergeant, or Vehicle Commander,

During this training, your unit will try out platoon level training exercises in the Mounted Warfare Simulation Training Center (MWSTC), formerly SIMNET. The exercises were developed by the Simulation-based Multiechelon Training Program for Armor Units (SIMUTA) team for the Reserve Component Virtual Training Program (RCVTP), but have not been implemented. Your unit will be one of the first to try out these exercises.

The SIMUTA team needs your feedback in order to improve these exercises. We have designed three ways to collect your feedback. First, team members will be with each unit during the training, observing the implementation of the training packages to discover ways to improve the packages. These team members will be open to your comments.

Second, a "hot wash" will be conducted at the end of the company training. This will be an open discussion of the training program.

Finally, we have attached a questionnaire. Review the questionnaire so that you know where we would like you to focus your feedback. During breaks, fill out the questionnaire as your experience with the company training allows. Bring the completed questionnaire to the "hot wash".

Your unit is one of several assisting us in refining the training package. After each unit we will modify the package based on what we discover during the unit's training. Your comments are a vital component of this discovery process.

This sheet will be detached from the questionnaire so that your I.D. will remain confidential. Information obtained from this questionnaire will be used for research purposes only. Neither you nor your unit will be referenced, without your permission, in any publication or briefing.

DIRECTIONS: Please answer each question to the best of your ability. If you are not able to answer any question, make a note as to why you could not answer the question.

To what company do you belong? A B C D

To what platoon do you belong? 1st 2nd 3rd

Circle one: Platoon Leader / Platoon Sergeant / Vehicle Commander

What is your rank?_____

What was your vehicle call sign during the exercises? _____

Figure 11. Sample unit questionnaire.

ON-SITE MOUNTED WARFARE SIMULATION TRAINING CENTER (MWSTC) ORIENTATION

		STRONGLY DISAGREE			NEUTRAL			STRONGLY AGREE
1.	The MWSTC orientation video was useful in preparing me for the simulation.	1	2	3	4	5	6	7

2. Did you receive a hands-on orientation to the simulators? Yes No

		NOT AT ALL HELPFUL			NEUTRAL			EXTREMELY HELPFUL
3.	How helpful was this orientation?	1	2	3	4	5	6	7

		STRONGLY DISAGREE			NEUTRAL			STRONGLY AGREE
4.	Overall, the on-site orientation to the simulators was useful in preparing me for the simulation.	1	2	3	4	5	6	7

5. How could it be improved?

_____

_____

_____

Figure 11 (cont'd). Sample unit questionnaire.

TABLE DESIGN

Each RCVTP platoon table is designed with four parts: preview, conduct, platoon and company after action reviews. The next sections focus on the parts of this table design.

Table Preview.

Please circle the number response that most closely matches your opinion. The scale runs from: **1-Strongly Disagree** to **7-Strongly Agree.**

		STRONGLY DISAGREE			NEUTRAL			STRONGLY AGREE
1.	The stealth overview made me think about the tasks that I would perform in the next table.	1	2	3	4	5	6	7
2.	Table previews emphasized the tasks that I would perform in the next table.	1	2	3	4	5	6	7
3.	Table previews defined the performance my unit was expected to demonstrate in the next table.	1	2	3	4	5	6	7
4.	Table previews emphasized what the O/C would be watching for in the next table.	1	2	3	4	5	6	7
5.	The stealth overview helped me conduct the tables.	1	2	3	4	5	6	7
6.	The table preview, as a whole, helped me conduct the tables.	1	2	3	4	5	6	7

7. What were the **strengths** of the table preview?

_____

_____

8. What were the **weaknesses** of the table preview and what could we do to improve on these weaknesses?

_____

_____

Figure 11 (cont'd). Sample unit questionnaire.

Conduct.
Please circle the number response that most closely matches your opinion.
The scale runs from: **1-Strongly Disagree** to **7-Strongly Agree**.

		STRONGLY DISAGREE			NEUTRAL			STRONGLY AGREE
1.	The tables went from less to more difficult.	1	2	3	4	5	6	7
2.	The progression in difficulty enhanced training effectiveness.	1	2	3	4	5	6	7
3.	The difficulty level of the tables was right for my unit.	1	2	3	4	5	6	7
4.	Repeating tasks from table to table helped me improve my performance.	1	2	3	4	5	6	7
5.	Critical sub-tasks were important concepts that related to task execution.	1	2	3	4	5	6	7
6.	During the exercises, the O/Cs' coaching and comments helped me focus on task performance.	1	2	3	4	5	6	7
7.	The exercises helped my unit master the critical subtasks.	1	2	3	4	5	6	7
		FAR TOO SHORT			ABOUT RIGHT			FAR TOO LONG
8.	In general, execution (sim) time for each table was _?_.	1	2	3	4	5	6	7

9. What were the **strengths** of the table conduct?

_____

_____

10. What were the **weaknesses** of the table conduct and what could we do to improve on these weaknesses?

_____

_____

Figure 11 (cont'd). Sample unit questionnaire.

After Action Review.

Please circle the number response that most closely matches your opinion. The scale runs from: **1-Strongly Disagree** to **7-Strongly Agree**.

		STRONGLY DISAGREE			NEUTRAL			STRONGLY AGREE
1.	The discussion focused on task performance.	1	2	3	4	5	6	7
2.	The O/C helped us focus on improving in the next table.	1	2	3	4	5	6	7
3.	My unit discovered how our actions affected the battle without being told by the O/C.	1	2	3	4	5	6	7
4.	The stealth replay helped me understand my performance.	1	2	3	4	5	6	7
5.	In the discussion, the O/C focused on the critical subtasks which my unit had the most trouble performing.	1	2	3	4	5	6	7
6.	The O/C's comments during the AARs helped my unit master the critical subtasks.	1	2	3	4	5	6	7
7.	My unit's comments during the AARs helped my unit master the critical subtasks.	1	2	3	4	5	6	7

8. What were the **strengths** of the AARs?

_____

_____

9. What were the **weaknesses** of the AARs and what could we do to improve on these weaknesses?

_____

_____

Figure 11 (cont'd). Sample unit questionnaire.

TRAINING BENEFIT

Please circle the number response that most closely matches your opinion.

		NOT PROFICIENT			NEUTRAL			EXTREMELY PROFICIENT
1.	How proficient were you on tasks trained **before** the training?	1	2	3	4	5	6	7
2.	How proficient were you on tasks trained **after** the training?	1	2	3	4	5	6	7

		NOT AT ALL SURE			MODERATELY SURE			VERY SURE
3.	How sure are you of your responses on questions 1 and 2?	1	2	3	4	5	6	7

		NONE			SOME			VERY MUCH
4.	How much did your performance improve as a result of time in the simulators?	1	2	3	4	5	6	7
5.	How much did your performance improve as a result of AARs?	1	2	3	4	5	6	7

OTHER COMMENTS

If there are any other comments you would like to make about the training or the training program, please provide them in the space below or attach them to the questionnaire.

Figure 11 (cont'd). Sample unit questionnaire.

DISCUSSION QUESTIONS FOR VEHICLE COMMANDERS

OFF-SITE PREPARATION

1. What activities or processes did you undertake before you arrived at Ft. Knox in order to prepare for the training?
2. How did this preparation help you in the training?

TABLE PREPARATION

1. Before each table, you may have been given the opportunity to prepare for the mission. What did you do before tables? What could the O/Cs have done to enhance the effectiveness of your troop leading procedures?

EXERCISE CONDUCT

1. Was the level of exercise difficulty appropriate for you? Was it too easy (were you bored)? Too hard (were you frustrated)? Or somewhere in between?
2. During the exercises, did you received too much or too little coaching from the O/Cs?
3. Was there any non-productive time during the exercises?
4. What could we do to eliminate this non-productive time?
5. Do you feel that you were in the simulators too long at any stretch?
6. Do you feel you spent enough time in the simulators?
7. Have you previously participated in RCVTP company training? Compare this training to that in the past in terms of training benefit? Explain.

PLATOON AFTER ACTION REVIEW

1. Were the AARs conducted in such a way that every member of the platoon was able to get involved, or did the discussion focus exclusively on the leaders?
2. Did the O/Cs conduct their AARs so that you were able to discover problems and how to fix them? (Were you able to focus on diagnostic or process information rather than on outcome information?) (Did you discuss **how** to improve your performance?)
3. One concept behind the training is that the critical subtasks are related and repeated throughout the tables in order to allow you to practice them repeatedly and to improve. Were you able to relate your performance on critical subtasks from one table to the next?

TURN KEY CONCEPT

1. Do you feel you received a lot of training for this length of time? How much?

Figure 12. Sample unit interview guide.

provided information to the battalion command group and staff. For the SIMNET material, the battalion command group and especially the battalion staff did not respond directly to cues induced by the simulation; rather, the staff responded to reactions and reports from the individuals in the simulators. The staff had no direct link to and no view into the simulation. Since the staff could only react to, or (more appropriately) anticipate and probe for cues, the developers could not be assured that the cues from the simulation would make it to the command group or the battalion staff to cause or trigger a response. This problem provided the focus of evaluation for battalion trials and is discussed more thoroughly in Chapter 5.

The Formative Evaluation Team decided to place an observer at each of the activity nodes for the battalion exercises. An activity node would be a location where an O/C was positioned. To conserve the number of observers, only one observer was positioned where multiple O/Cs were located. For example, only one observer was assigned to the main command post although three separate O/Cs (S3, S2, and fire support section O/Cs) were designed to be present. The formative evaluation schedule for the SIMNET battalion trials is included in Table 7.

O/C Involvement With Evaluations

In November 1993, the representatives from the training development teams and the Formative Evaluation Team briefed the O/C Team on the upcoming armor company pilot. During this briefing, the O/Cs were asked to provide "evaluations" of the unit based on the unit's performance on the critical subtasks in the exercises. These "evaluations" were designed to be a means of assessing performance and, since most tasks were repeated in other tables, of performance change during the trials. Unfortunately, the O/Cs voiced, in no uncertain terms, their unwillingness to evaluate a unit's performance during RCVTP training.

SIMUTA staff considered avoiding the term "evaluation" in conducting the after-action reviews and preparing take-home packages. However, this discussion implied a deeper rift between the O/C and the SIMUTA Teams. (See Chapter 7 for a further discussion.) Later, the O/Cs consented to providing "observations" of performance ("train to sustain" and "train to improve"); however, the contractor's ability to collect and interpret feedback information was seriously degraded for several months, both in obtaining feedback from the O/C Team and in providing feedback to the O/C Team about the RCVTP.

The Formative Evaluation Team had planned to meet with all the observers immediately after each trial to obtain their observation notes, perceptions, and a brief summary of the trial. The team then planned to meet with the O/C Team with the training developers present to discuss observations from their perspective regarding the trial. These meetings were discontinued after the November meeting. More informal feedback between individual members of the O/C and SIMUTA Teams provided the only feedback loop. Consolidated feedback from the O/C Team returned later during company trials.

After each trial starting in February with the refined mechanized infantry platoon, the Formative Evaluation Team submitted a memorandum to the Contracting Officer's Representative. These memoranda provided a summary of the results of the formative

Table 7

SIMUTA Trial Chronology

Week of:	Company/Platoon Team	Battalion Team
Oct 18	Plt/AAR/ModSAF O/C Tm	----
Oct 25	Plt/AAR/ModSAF O/C Tng (cont) Mech Inf Plt (pilot w/o unit)	----
Nov 1	AR Plt material to O/C Tm AR Sch AAR Tng for O/C Tm AR Plt (Pilot) Sct Plt (Pilot)	----
Nov 29	Deliver Plt Initial Training Package AR Co materials to O/C Tm	----
Dec 6	Co O/C training AR Co (pilot)	Janus Operator training (3)
Dec 13	----	Bn material O/C training Bn Tether Exercise (internal pilot)
Dec 20	----	Bn Tether Exercise (internal pilot) (cont)
Jan 3	AR Plt Trial (initial) (cancelled - weather) Sct Plt Trial (initial) (cancelled - weather)	----
Jan 10	Deliver Co Initial Training Package AR Co Trial (initial) Sct Plt Trial (initial)	----
Jan 17	Mech Inf Plt Trial (initial)	----
Jan 24	----	SIMUTA in-house training on JMSE
Jan 31	Mech Inf Plt Trial (refined) Deliver Refined Plt Training Package	Bn SIMNET and O/C orientation Bn SIMNET (pilot)
Feb 7	Ar Plt Trial (initial) (cancelled - weather) Sct Plt Trial (initial) (cancelled - weather)	JMSE JIVEX (internal pilot)

(*table continues*)

Table 7 (continued)

Week of:	Company/Platoon Team	Battalion Team
Feb 14	Co/Tm Trial (initial)	O/C training on ARPA Janus
Feb 21	AR Co Trial (initial) Sct Plt Trial (initial)	O/C training on JMSE Bn staff JMSE (pilot)
Feb 28	Deliver Refined Co Training Package	O/C training on Army Janus and JMSE material
Mar 7	AR Plt Trial (initial) Sct Plt Trial (refined) AR Co Trial (refined)	Bn Staff JMSE Trial (initial)
Mar 14	----	Bn SIMNET Trial (initial)
Mar 21	Co/Tm Trial (refined A) Co/Tm Trial (refined B)	----
Mar 28	Deliver Final Plt Training Package	----
Apr 11	Sct Plt Trial (initial)	----
Apr 18	----	TF SIMNET Trial (initial)
May 2	Deliver Final Co Training Package	----
May 9	Sct Plt Trial (implementation) AR Plt Trial (refined) AR Co Trial (implementation)	Bn Staff JMSE Trial (refined)
May 16	----	Bn SIMNET Trial (refined)
Jun 13	Cav Trp Trial (demonstration)	----
Jun 20	AR Co (implementation)	----
Jun 27	----	Bn SIMNET Trial (implementation)
Jul 18	Ar Plt (implementation)	----
Jul 25	Ar Plt (implementation)	----

evaluation. Key areas and issues covered were: pre-visit preparation, on-site orientation, table preview, table preparation, table conduct, after action review, technical equipment effectiveness, comparative quality of training, and training benefits and improvements.

CHAPTER IV. DEVELOPMENT OF PLATOON AND COMPANY TRAINING

The Simulation-Based Multiechelon Training Program for Armor Units (SIMUTA) staff began to consider the design of the platoon and company training management program and exercises in preparation for writing the Project Research Plan (BDM Federal, Inc., 1993). The Statement of Work (SOW) spoke both generally and specifically regarding the training and how it should be developed. The SOW requirements represented the guidance behind the SIMUTA Team's efforts throughout every stage of the training's design and development. The present chapter discusses the history of both the company- and platoon-level training management program and the company and platoon exercises. "Exercise development" refers only to the processes of producing, examining, evaluating, refining, and documenting the contents and structure of the exercises per se. "Training management development" refers to the creation of all products (minus the exercises themselves) that represented and supported the Reserve Component Virtual Training Program (RCVTP). The present chapter describes these two processes separately. A final section describes the reactions of units to these two sets of products.

Development of the Platoon/Company Training Management Program

The SOW stated that the training management program was to be developed at a macro- and a micro-level. The macro-level training management support was to be represented by products relating to the RCVTP training process as a whole, not specific to any one exercise. Macro-level training management products were to provide the following in support of platoon and company training:

1. An introduction to the design and application of the RCVTP.
2. Guidance regarding the selection of missions/tasks to be trained in preparation for the rotation to the RCVTP.
3. An orientation to the take-home package the unit would receive at the end of their RCVTP training.

In contrast, micro-level training management materials were to be products that were table specific. According to the SOW, micro-level training management products were to include the following:

1. Specific guidance for controlling the execution of each exercise.
2. Observational methods, tools, and aids in support of the recording and processing of key information for each exercise.
3. Automated observational aids employing the use of automatic data collection instruments for each exercise.
4. After-action review (AAR) support packages for each exercise.
5. Unit Performance Assessment System (UPAS) screen displays and tables in support of AARs.

In the Project Research Plan (BDM Federal, Inc., 1993), the names "Umbrella Training Management Tools" and "Exercise-Specific Materials" replaced the terms "macro" and "micro," respectively. The plan also defined three types of materials that apply to either level of training management:

1. Advance materials--information, instructions, and procedures required in advance of arriving at the training site.
2. On-site materials--information, instructions, and procedures required at the training site.
3. Training control procedures--information for conducting the AARs and using take-home package materials.

These initial categories proved inadequate once the process of designing and developing the products had begun. The major reason for this was that many of the training management products were multi-purposed; that is, they were applicable to the training during more than one training stage or conceptual portion of the training. It was only after the development of the platoon and company materials that a structure became apparent. As provided in the Executive Summaries for the *Platoon Exercise Package* and *Company Exercise Package*[4], this structure listed every training product under one of the following categories: Advance Materials, O/C Tools and Reference Materials, Exercise Management Materials, and Take-Home Package Materials. Furthermore, each product was cross-referenced to one of the four Training Subsystems: Pre-RCVTP Home Station Training, Conduct of RCVTP Exercises, After Action Review, and Post-RCVTP Home Station Training. The resulting matrix-based structure (see Figure 13) provided an effective strategy for demonstrating how each product fit into the execution of training. It did not however, provide a sufficient structure for describing the history of the development of the training products. Because of the multipurpose nature of the products, it was impossible to describe the development of one category of products or one Training Subsystem in a manner which excluded a description of the development of the other categories or Subsystems. To try to do so would create a massive overlap of development coverage for most, if not all products.

It is important to note that many of the RCVTP training management products, presently discussed in relation to platoon and company training, are also applicable during battalion training. These products will be identified as such in the present chapter. The present chapter discusses the company and platoon products in groups determined by how the products are related to SOW requirements. The SOW requirements can be organized under the following categories:

1. RCVTP Training Preparation.
2. RCVTP Exercise Management.
3. AAR Support.

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[4]Numerous handbooks and references were produced by SIMUTA to drive the various RCVTP exercises. None of these books are published. We cite them in this report only to provide a picture of the components of the RCVTP library.

MATERIALS	TRAINING SUBSYSTEMS			
	PRE-RCVTP HOME STATION TRAINING	CONDUCT OF RCVTP EXERCISES	AFTER ACTION REVIEW	POST-RCVTP HOME STATION TRAINING
Advance Materials				
Guide to RCVTP Preparation	X			
OPORD Narratives	X	X		
Map & Overlays	X	X		
Exercise Descriptions	X			
Overlay Representation	X			X
RCVTP Introduction Videotape	X			
Demonstration Videotape & Workbook	X			X
O/C Tools & Reference Materials				
		X		
Unit Data Sheet		X		
RCVTP Mission Matrix	X			
Task to Table Crosswalk			X	X
Critical Subtasks by Combat Function		X		
		X		
Critical Subtasks (Short Title) Critical Subtasks by Task		X		
Tasks, Critical Subtasks, and Standards		X	X	
Tasks, Critical Subtasks, and Standards by Exercise Table		X		
Exercise Management Materials			X	X
		X	X	
Table Preview			X	
AAR Worksheet			X	
Events Guides		X	X	
AAR Guide			X	
AAR Agenda Poster		X		
Poster 1: Critical Subtasks and Tasks				
Poster 2: Events				
SIMNET Plan Sheets				X
				X
Take-Home Package Materials				
Platoon Overview				
Observations for each Platoon				

Figure 13. RCVTP materials/training subsystems matrix.

RCVTP Training Preparation

The RCVTP training preparation materials are composed of two basic components: home station training preparation and on-site training preparation. During the home station preparation stage, a team of observer/controllers (O/Cs) visits the U.S. Army National Guard (ARNG) training unit at its home station. The intent of this visit is for the O/Cs to help the unit understand the RCVTP training and to explain how to most effectively use, and prepare for, training. During the on-site preparation period, the unit receives an orientation to, and familiarization with SIMNET and the Mounted Warfare Simulation Training Center (MWSTC).

Home Station Training Preparation

The SOW presented the concept of providing support to a unit before its arrival at the training site. It indicated that home station training support was to include a familiarization with SIMNET technology as well as an introduction to the design and application of the RCVTP. In the Project Research Plan (BDM Federal, Inc., 1993), the SIMUTA Team did not specify every event that would occur during the O/C pre-training visits. The team did, however, indicate the types of information that would be provided during the visits--including a complete description of the training library; an early opportunity to focus on the application of doctrine, tactics, techniques, and procedures; aids to help commanders select exercises based on their training requirements; and simulation familiarization materials. SIMUTA Company/Platoon Team members began intensive work on the home station training packages in early August 1993.

The products designed to fulfill the above functions include Exercise Descriptions, Exercise and RCVTP Demonstration Videotapes, exercise selection decision aids, and SIMNET familiarization tools. These products, which later became part of an Orientation Guide, are described below.

Description of the Training Library. The SIMUTA Team initially intended that the Training Library of the exercises be described on Demonstration Videotapes as well as on a set of written Exercise Descriptions. The Exercise Descriptions contained a summary of the content of each exercise, the tasks and critical subtasks contained in each exercise, and the Army Training and Evaluation Program (ARTEP) references from which they were obtained. Throughout the early pilots and trials, the O/Cs carried the Exercise Descriptions with them on their unit visits. The format of the Exercise Descriptions remained fairly constant throughout the development of the RCVTP. In the final program, the table summaries contained in the Exercise Descriptions became a component of the RCVTP Orientation Guide.

RCVTP Demonstration Videotapes. According to the Project Research Plan (BDM Federal, Inc., 1993) and the Final Design Report (Hoffman, 1993), the SIMUTA Team planned to produce videotapes that would serve as doctrinally correct demonstrations of successful performance of the RCVTP exercises. This initiative resulted from Brown's (1992)

suggestion. In effect, the demonstrations would be a set of "a-way" performances of the exercises. These "a-way" demonstrations had three purposes:

1. Provide a model which would guide the execution of ARNG units' training.
2. Provide an AAR mechanism for improving performance.
3. Introduce units to the simulation technology and its training benefits.

In December 1993, as the SIMUTA staff was considering the design of the Demonstration Videotapes, it was determined that including each table in its entirety would be too time consuming and costly. In addition, the average tape length would exceed the 20-minute suggested time limit specified in the Final Design Report (Hoffman, 1993). Finally, to play these tapes during AARs would greatly increase the length of the AARs. Because of these issues, the SIMUTA staff revised the purposes of the Demonstration Videotapes and the means by which the purposes would be accomplished. The new purposes were as follows:

1. Introduce units to the RCVTP as a whole.
2. Aid units in preparing for task performance.
3. Introduce units to the RCVTP training exercises.

The revised videotapes would include two videos (one offense, one defense) for each of five types of exercises: armor platoon, mechanized infantry platoon, scout platoon, company, and battalion. The company video was to be used for both the company and company team exercises, and the battalion tape for both the battalion and battalion task force exercise. Each exercise Demonstration Video would provide selected examples of successful executions of the tasks contained in the exercise. Furthermore, the exercise Demonstration Videos were designed to be viewed by units only as a step in preparing their units for RCVTP training; that is, the videos would not be used during AARs. Although the present section refers specifically to the development of the armor platoon Demonstration Videos, the videos for the other types of exercises were developed by the same process.

Development of the two armor platoon videos began in February 1994. The first task in this process was to determine the contents of, and to write scripts for, the actual demonstration portions of the videos. Each video was to include an introduction to the RCVTP and an introduction to and demonstration of specific exercises. During the initial stages of writing the armor platoon scripts, the RCVTP introduction portion of each tape was removed and a composite RCVTP introduction videotape was created. This introduction video served as a lead-in to all of the exercise Demonstration Videos. The purpose of the RCVTP introduction tape was to provide a brief overview of the activities that units participate in when preparing for and conducting RCVTP training.

SIMUTA management assigned the task of developing this introduction video to a training development specialist on the Company/Platoon Team. This person wrote the script for the video and organized an internal Company/Platoon Team review of the script before the video was actually shot. In addition to this internal review, the Contracting Officer's Representative (COR) reviewed the video's script. Shooting of the RCVTP introduction video began in March 1994. The introduction video was shot and edited by the TV Branch of the Armor School with the assistance of the video developers.

With the RCVTP introduction shot for all versions, there were four major components that were shot for the remaining videos: (a) an introduction to the exercise and its application as a training tool, (b) a preview of the exercise's progression shown on a map with the appropriate graphics, (c) a view of a SIMNET Semi-Automated Forces (SAFOR) unit executing the tasks contained within the exercises, and (d) a wrap up.

The armor platoon Demonstration Video scripts were written by a member of the Company/Platoon Team in February 1994. The largest, or centerpiece, segment of the videos was the third segment, the view of SIMNET SAFOR units executing the exercises. Not every task was selected for demonstration on the videotape; the tasks receiving priority for being included were those that were performed multiple times during the exercise. Scripts provided the exact text for all communications that would be transmitted, as well as doctrinally correct descriptions of task performance to be read by the video's narrator. ARI tasked the O/C Team to review the scripts.

When the scripts were completed and reviewed by ARI and the O/C Team, the SIMUTA staff commenced preparing and shooting the demonstration exercises. Preparation and shooting of the armor platoon demonstration exercises were completed in March 1994. Preparing the exercises involved creating the exercises using Modular Semi-Automated Forces (ModSAF)[5] and saving each exercise into a number of ModSAF files. Files were reviewed, revised, and ModSAF actions recorded to obtain clear representation of the selected tasks.

The TV Branch of the Armor School recorded the demonstration exercises on video and audio tape. As each exercise file was played, the TV Branch recorded the exercise from the Stealth View display.[6] As there was no camera, the SIMUTA video developer manipulated the videotape's field of vision by means of the Stealth View's controlling device, the "spaceball." The audio components of the videos were generated by a group of Company/Platoon Team members. This process involved the use of MWSTC radios and demonstration scripts to verbally role play the units in the videos.

The developer of the SIMUTA demonstration acted as the military subject matter expert (SME) with the TV branch in editing the videos. It was at this time that the TV Branch added the music, the background battlefield sounds, and the narration. The editing of the armor platoon Demonstration Videos was completed in April 1994. The video was then delivered for final review by the project COR and accepted in April 1994.

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[5]ModSAF is the operating system used for the RCVTP exercises. It replicates the outward behavior of simulated units and their component vehicles and weapon systems to a level of realism sufficient for training. Graphic overlays and pre-determined automated unit movements are loaded and stored on ModSAF.

[6]The Stealth View display provides an out-of-the-window view from an invisible (i.e. stealth) vehicle. This vehicle can be moved anywhere within the terrain data base, thereby enabling O/Cs to view performance from any position in three-dimensional space.

Using the same approach, the remaining Demonstration Videos were prepared, including the videos for the battalion exercises. Because the videos could not be produced until after exercises were finalized, the videos could not be incorporated in any of the formative evaluation trials.

Exercise selection decision aid. SIMUTA management initially planned to create a personal computer (PC)-based decision aid to help units prepare for rotations to the RCVTP. Specifically, the decision aid would help unit training managers select appropriate RCVTP exercises. The Project Research Plan (BDM Federal, Inc., 1993) stated that this aid would help commanders select exercises based on their units' training requirements. The concept for this decision aid was based on the early definition of the "crawl, walk, run" (CWR) principle of exercise sequencing, discussed in Chapter 2. This definition held that each exercise would be composed of three tables representing low, intermediate, and high difficulty levels. The difficulty of each table would be determined by the OPFOR's strength and time criticality, but the events and tasks would remain constant. In essence, although the difficulty levels would vary, all three tables within any exercise would represent the same situation.

By mid-August, the CWR concept had evolved from its initial form. The new CWR concept specified that the three tables within each exercise would no longer contain the same basic story line, but would be sequential segments of increasing difficulty within an overall story line. The result was that conducting tables in a progressive order was more beneficial than skipping tables. This limited the ability of the decision aid program to suggest tables based solely on task content, difficulty level, and unit training needs. The SIMUTA Design Team decided that the utility of such a PC-based decision aid did not justify its costs.

As an alternative to the decision aid, the Design Team decided to provide a sufficient amount of information regarding the task content and exercise story lines, so that unit leaders could identify the tables, or parts of the exercises, on which they would most like their units to train. Because SIMNET limits the number of exercises that can be run on the same piece of terrain simultaneously, the O/Cs were given terrain management guidelines for assembling training schedules that best meet the unit's wishes within the SIMNET terrain limitations.

SIMNET familiarization documents. SIMNET familiarization materials were selected from existing documents and videotapes. After examining a variety of possible materials, the SIMUTA staff selected the following for inclusion in the introduction to the RCVTP:

1. *M1 SIMNET Operator Guide* (U.S. Army Armor Training School, 1987).
2. *SIMNET Crew M1 Manual* (Defense Advanced Research Projects Agency [DARPA], 1989).
3. *SIMNET M2/M3 Crew Manual* (DARPA, 1991).
4. *SIMNET User's Guide* (U.S. Army Armor Training School, 1989).
5. *SIMNET Orientation for the M1* (U.S. Army Armor Training School, 1991).
6. *SIMNET Orientation for the M2/M3* (U.S. Army Armor Training School, 1992).

RCVTP Orientation Guide. In June 1994, the SIMUTA Team began the development of the Orientation Guide. The Orientation Guide provides a structure for compiling all the home station training materials for all platoon, company, and battalion exercises. The

purpose of the Orientation Guide is to provide the ARNG leaders whose units are participating in the RCVTP enough information to select the appropriate echelon and level of training. This training can be tailored to fit either a week-end inactive duty training (IDT) period or a two-week annual training (AT) period. The guide includes a cover letter and a copy of the introduction videotape as an enclosure to the unit commander. It is provided at the time the unit signs up for RCVTP training, prior to an O/C visiting the unit. The guide is detailed enough to permit the unit chain of command to select, in conjunction with the O/C Team via telephone, the appropriate echelon and the training content (i.e., the offensive and/or defensive tables). Exact tables/exercises to be used for training may not be determined until the O/Cs visit the unit.

On-Site Training Preparation

The on-site training preparation program was designed to complement the home station training preparation efforts. It includes two elements: an MWSTC Orientation and a SIMNET Familiarization Course, both of which are applicable for every echelon.

MWSTC Orientation. In close coordination with the SIMUTA Team, the O/C Team developed an orientation to the MWSTC and the RCVTP training. The orientation is provided to units upon arrival at the MWSTC by the senior O/C on-site. During the orientation, the unit is welcomed and provided with a brief description of what they will be doing throughout the training period. Additionally, the orientation covers such issues as MWSTC and O/C house rules. During the trials conducted in January and February 1994, SIMUTA staff personnel observed the orientation.

SIMNET Familiarization Course. Although the SOW did not specify a requirement for the SIMUTA Team to develop a SIMNET Familiarization Course, the Project Research Plan anticipated that such a course would facilitate SIMNET training. SIMUTA staff used an existing SIMNET Familiarization Course as a foundation on which to build their own exercise.

As SIMUTA designed the Familiarization Course, a number of important and noticeable differences appeared between their package and the original MWSTC SIMNET familiarization exercise. First, SIMUTA's package was designed with much more structure and detail regarding routes, information the O/Cs were to stress during the introduction, and implementation procedures. Second, SIMUTA staff were able to design their course with the expectation that there would be dedicated qualified instructors (O/Cs) to implement the course. Finally, the RCVTP Familiarization Course was composed of many more routes than were the original exercises.

SIMUTA staff began creating a Familiarization Course in September 1993. They first identified possible routes on the National Training Center (NTC) maps. They then drove each route on the SIMNET NTC database. Finally, after each route was judged to be feasible, they made sure that the course could be fully utilized without any vehicle coming into contact with, or interfering with, any other vehicle. SIMNET Plan Sheets were created and the routes were entered into exercise initiation computer files.

Instructions were added to the familiarization package to provide the information regarding the SIMNET idiosyncracies that units would need to know. Instructions were written for the O/Cs regarding how to conduct the Familiarization Course. A Navigation Familiarization Answer Sheet was provided to help O/Cs evaluate whether each vehicle was executing the course properly and make the unit familiar with operating within the SIMNET environment.

It was believed that, typically, units would arrive at SIMNET in at least platoon-sized entities.[7] Therefore, four of the five courses of which the Familiarization Course was composed contained four lanes (navigation routes), corresponding to the four vehicles in armor and mechanized infantry platoons. The remaining course was composed of five lanes, corresponding to five sections (2 vehicles each) in scout platoons. Because there are four Management Command and Control (MCC) modules at MWSTC, the course can be run up to four times simultaneously without any two vehicles operating on the same route. Within each of the five courses, each vehicle operates independently, but in relatively close proximity to others in its platoon. This allows the O/Cs to monitor each of the vehicles in their platoon.

Throughout the trials, units who had little or no experience with SIMNET took the Familiarization Course. In the early trials, the formative evaluation revealed the need for more specific instructions regarding what information the O/Cs were to cover. Many times, the O/Cs did not remember to tell units about particular SIMNET idiosyncracies. Throughout the course of many executions, it became apparent that the instructions needed to be much more detailed and explicit in order for the O/C Team to process and provide the unit all important information. After several revisions, the course provided each piece of information that the O/Cs needed to communicate to incoming units. The enlarged instructional content, as well as the ability of the course to accommodate a large number of trainees, formed a highly structured course.

Results of the formative evaluation suggested that the Familiarization Course achieves the purposes for which it was designed. Furthermore, the training units greatly appreciated the opportunity to become familiar with the SIMNET environment and the simulators before the start of training. Finally, units with more experience with SIMNET suggested that they needed less familiarization time than did those who were not as familiar with SIMNET. The times for conducting the course ranged from approximately one to two hours. As more ARNG units acquire SIMNET experience through the RCVTP, the average execution time will likely drop to around one hour. The extra time can then be used for the execution of RCVTP training tables.

Company and Platoon On-Site Training Management

Before presenting the company and platoon exercise management materials for company and platoon exercises, it is important to understand the on-site training process as a whole, as well as the basics of the O/Cs' roles in conducting platoon and company level training. The conduct of training was divided into two roles: an Observer/Controller In Charge (OCIC)

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[7]Armor and mechanized infantry platoons consist of four vehicles. Scout platoons consist of five sections, each of which consists of two vehicles for a total of ten vehicles.

position and an Observer/Controller Exercise Controller (OCEC) position. The OCIC is the lead facilitator and instructor, whereas the OCEC assists the OCIC principally by operating the ModSAF workstation. A comprehensive explanation of these roles is provided in the *Handbook for Observer/Controllers and Training Analysts: Company and Company Team Exercises*, and the *Handbook for Observer/Controllers and Training Analysts: Armor, Mechanized Infantry, and Scout Platoon Exercises*.

Throughout the RCVTP's design and development, the general structure of the on-site training process survived without major changes. For this reason, the present section highlights the on-site training structure as it exists in the final packages. Any modifications that were necessary to reach the end-product are identified and discussed as appropriate. The following illustrates the RCVTP activities that occur between the time a unit arrives at the MWSTC and the time at which they complete their RCVTP platoon training.

The Platoon Training Process

The following represents the sequence of planned RCVTP activities for a platoon:

1. Receive MWSTC Orientation.
2. Conduct Familiarization Course if necessary.
3. Prepare for execution.
4. Participate in Table Preview.
5. Conduct troop leading and preparation procedures.
6. Execute table.
7. Break while O/Cs prepare for AARs.
8. Participate in AAR.
9. Repeat Steps 4-8 as time allows.

Units typically arrive at the MWSTC for IDT training on Friday afternoons.[8] If their time of arrival is early enough, the unit is presented with the MWSTC Orientation and conducts the Familiarization Course on Friday evening. This constitutes a good time for the unit to familiarize themselves with the RCVTP training and the O/Cs. If the unit completes the Familiarization Course on Friday evening, they begin the RCVTP tables the next morning.

Before the unit executes any tables, however, it is given time to prepare for the training. The O/C Team provides this time for the unit to review the Operations Order (OPORD) Narratives and overlays even though they fully expect the units to be prepared to conduct training immediately upon their arrival at MWSTC. When the unit has in its possession a complete set of overlays and is ready to execute the tables, the O/Cs conduct the first Table Preview. During this preview, units conduct one final review of the OPORD Narrative and the commander's plan. The O/Cs then describe the tactical situation and mentally prepare the unit to execute the tasks in the table.

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[8]For units who choose to use RCVTP training during their AT periods, the training procedures are modified to accommodate the units' training schedules. Similarly, AC units may choose to participate in RCVTP training during their normal hours.

When the Table Preview is completed, the O/Cs give the unit from 15 to 30 minutes to conduct troop leading procedures. Initially, time for troop leading procedures was to be more limited than designated in the final products. Early on in the trials, however, the O/Cs and units requested more time to conduct walk-through rehearsals and other preparation activities as necessary. As the trials bore out this need, units were given more time (up to 30 minutes). A unit begins its first platoon table when either the platoon leader or the O/C, or both individuals determine that the unit is ready for execution. During the conduct of the table, the O/Cs observe task performance and teach, coach, and mentor as they perceive necessary. At the termination of the exercise, the unit exits the simulators and takes a short break while their O/Cs prepare their AARs. AAR preparation times vary between 10 and 20 minutes for platoon tables.

All platoon members, including individual vehicle crew members, attend the platoon AARs. The AARs are designed to last 30 minutes. During the AARs, the O/C uses instructional techniques based on the discovery learning model (Department of the Army, 1993d). The O/C and unit discuss task performance and methods for improving performance. After the AAR, the O/Cs aid the unit commander in deciding whether he wishes to continue with the next table or repeat the previous table. Tempered by the AAR discussion, the commander makes this decision based on his perceptions of his unit's performance on previous tables as well as on the most recent table. After this decision has been made, the process begins anew with the presentation of another Table Preview.

Depending on the unit's training schedule, a unit trains through Saturday evening, breaks for the night, and resumes training on Sunday morning. Units typically depart from the MWSTC around noon on Sunday.

The Company Training Process

The following represents the sequence of planned RCVTP activities for a company:

1. Receive MWSTC Orientation.
2. Conduct Familiarization Course if necessary.
3. Prepare for execution.
4. Company commander, executive officer (XO), platoon leaders, and tank commanders (TCs) participate in company level Table Preview and crews participate in platoon level Table Previews.
5. Conduct troop leading and preparation procedures at company and platoon level;
6. Execute table.
7. Platoon leaders, TCs and crews attend platoon level AARs conducted by platoon O/Cs.
8. Company commander, XO, platoon leaders, and TCs participate in the company level AAR while crew members discuss crew and platoon execution with platoon O/Cs.
9. Repeat Steps 4-8 as time allows.

The major differences between the platoon and company training processes relate to organizational structures. Recall that training a platoon only requires the presence of one OCIC and one OCEC. Training a company, in contrast, requires the presence of one OCIC and one OCEC at the company workstation, and one OCIC at each of the three other workstations to monitor the platoons. The company O/Cs are responsible for conducting the company level Table Previews and AARs for the company commander, XO, platoon leaders, and TCs. The platoon O/Cs conduct platoon-level Table Previews for their platoon's crews, AARs for platoon leaders and crews, and finally crew-level AARs. Company training is no different from platoon training regarding instructional design characteristics. Both employ the use of the discovery learning model (DA, 1993d).

Initially, the company training was designed with just two types of AARs: the 15-minute platoon AARs and the 30-minute company AARs. During the initial company trial however, SIMUTA observers noticed that several platoon O/Cs were still talking to their platoon's crews during the company AARs. The discussions pertained to both platoon and individual crew tasks and functions. After discussions with the training unit and the O/Cs, SIMUTA staff realized that these crew/individual task-based AARs were beneficial. A short time later, these crew/individual-task AARs became a formal component of the company-level training process.

RCVTP Exercise Management

Consistent with the requirements of the SOW, SIMUTA Company/Platoon Team members developed guidance for controlling the execution of every table, for collecting vital performance information, and for intervening in the conduct of exercises to increase training benefit for the units. The following sections discuss products related to these requirements.

Table Execution Guidance

Instructions were prepared to ensure that each table is conducted in a reliable fashion from one execution to the next. All table-specific O/C behaviors or actions, as well as the exercise contents, were documented in these instructions. Early in the development phase, team members began developing the formats in which the information would be presented to the O/Cs. Initially, the table outlines detailed in Chapter 2 served as the vehicle by which the documentation was accomplished. Later, however, the outline formats were altered to facilitate their use by the O/Cs as training materials.

Two processes were devised to achieve reliability of execution. First, the exercises were documented on paper and presented to the O/Cs as formal guidance regarding the execution of the exercises. Second, the contents of each table were translated into ModSAF data and stored at the O/C workstations. To execute a table then, the O/Cs needed only to recall a ModSAF file and use appropriate paper-based exercise materials. The present section describes the development of the individual paper-based materials which represent the guidance provided to achieve inter-execution reliability. The development of the ModSAF table files is detailed later in this chapter.

The first examples of table execution materials were the Table Initialization Requirements document, the SIMNET Plan Sheets, the Master Events List (MEL), and the AAR Worksheet. These materials were created for the Prototype Exercise Packet. The Table Initialization Requirements provided the table file name information and vehicle placement information. Along with the SIMNET Plan Sheets, they were used to place the simulators on the database and to create all the simulated entities. The format of the plan sheets was modeled after that of the MWSTC's plan sheets. They were developed by the SIMUTA Technical Support Team and preserved throughout the course of the development. The arrival of ModSAF units meant that SMEs could begin to enter the tables into ModSAF files. Although ModSAF did not eliminate the need for the Plan Sheets, it changed their rationale to serve three purposes: (a) backup to ModSAF files, (b) directions for MWSTC site staff to initialize vehicles, and (c) guidance to MWSTC staff in generating SAFOR entities in selected tables. With the introduction of ModSAF, the Table Initialization Requirements were eliminated entirely, although their content was distributed to other SIMUTA products.

The two remaining types of material were unaffected by the implementation of ModSAF. The MEL specified the O/C, unit, and SAFOR actions which were to occur, as well as estimates of the times they should occur. The AAR Worksheet was designed as a one page form allowing the O/C to analyze unit performance across the entire exercise. This worksheet contained columns designated for the O/C's remarks regarding the unit's performance on each event, including written comments and Go/No Go ratings of performance.

In the initial platoon and company deliverables, the quantity of exercise execution materials was expanded, and many of the materials became specific to either the OCIC or the OCEC. To facilitate the O/Cs' conduct of the exercises, specific books were created for the OCIC and the OCEC.

The book, *Supporting Materials for the OCIC* contained the following new exercise execution materials: Exercise Initiation Guidance and Events Guides. The SIMNET Plan Sheet was the only tool remaining from the Prototype Exercise Packet. The Exercise Initiation Guidance contained a general scenario for the exercise and vehicle location grids. In the Exercise Packet, these grids were listed under Table Initialization Requirements. In effect, Events Guides replaced MELs: each Events Guide contained a specific situation for that table, events, appropriate OCIC actions, OCEC actions, platoon/company actions, a time/comments section, and a numerical notation indicating which critical subtasks corresponded to each event. SIMUTA staff decided not to include the event times, citing that there was usually too much variance in the speed with which units conducted the tables. The inclusion of a time/comments section on the Events Guide was in response to recommendations from the O/Cs during the external pilots. Previously, it had been necessary for the OCIC to work from the MELs and the AAR Worksheets simultaneously during execution--that is, conducting the exercise from the MEL and recording information on the AAR Worksheet. With the Events Guide, it was only necessary to have one document for these purposes.

In response to the O/Cs' objections to evaluating units, performance was no longer rated as Go/No Go. Rather, performance on critical subtasks in SIMNET was rated as either "train to sustain" or "train to improve." "Train to sustain" means that the unit performed up to the standards of the subtask, whereas "train to improve" means that performance on one or more of the standards was deficient. In practice, "train to sustain" and "train to improve" are virtually identical to "Go" and "No Go" ratings with the important caveat that performance is in a simulated environment.

The book entitled *Supporting Materials for the OCEC* contained the following exercise execution materials: SIMNET Plan Sheets, Exercise Data Sheets, Exercise Initiation Files, Identification for the O/C Workstation, and Events Guides. The Exercise Initiation Files Identification for the O/C Workstation section provided the OCEC with all the information he would need to set the exercises up on ModSAF. The Events Guide resembled the OCIC's Events Guide except that it contained only the specific situation, the events, the OCIC actions, the OCEC actions, and the Platoon/Company Actions.

In the final company and platoon packages, the exercise execution materials that remained were the OCIC Events Guide (see Figure 14), the OCEC's Events Guide (see Figure 15), and the SIMNET Plan Sheets (see Figure 16). In addition, an RCVTP Mission Matrix provided information regarding the tables to be executed, combat vehicle simulator assignments, radio frequencies, exercise identities, and OCIC and OCEC assignments (see Figure 17). The RCVTP Mission Matrix evolved from, and replaced, the Exercise Data Sheet and the Exercise Initiation Files Identification for the O/C Workstation forms. The Events Guides for the OCIC and OCEC changed in that they now contained the O/Cs' actions and the unit's actions which corresponded to the tables' events. Additionally, the final OCIC Event Guide presented SIMUTA's abbreviated versions of the critical subtasks along with their RCVTP reference number. Next to these numbers was a block to check whether or not the platoon had performed the critical subtask.

Standardized Execution

The initial exercise handbooks provided information regarding the standardization of exercise execution between O/Cs. However, the later versions provided more comprehensive guidance than did the initial versions. The refinement of guidance resulted from observations made during pilots and trials, as well as consulting with the O/C Team. SIMUTA management and staff felt that it was extremely important to integrate feedback from the O/Cs concerning the handbooks into the handbooks themselves. While training development specialists were not willing to compromise on issues that would degrade the utility of the training, the O/Cs contributed many ideas that increased the training's utility.

The platoon and company level handbooks cover the following aspects of exercise execution management for the OCIC:

1. Set-up for training.
2. Activities in the execution of tables.
3. Guidelines for unit requested changes to tables.
4. Table Previews.
5. Exercise conduct and operations.

6. O/C interventions.
7. Exercise problems.
8. After action reviews.

and for the OCEC:

1. Exercise initiation.
2. Exercise operations.
3. OCEC interventions.
4. Exercise problems.
5. Exercise completion.

After the refined platoon and company exercise package deliveries, the O/C Team suggested that increased standardization between O/Cs could be achieved by providing more precise instructions regarding how to execute the exercise materials. The O/C Team desired, however, to have the freedom for each O/C to mold the training to best fit his personality style. They believed that this would allow the O/Cs to provide the best training possible.

After several discussions, the best course of action appeared to be a compromise. In cases where it appeared that the effectiveness of the training depended on standardization, SIMUTA staff would provide specific instructions. In military terminology, this type of instruction is analogous to a "route". In other areas, however, the O/Cs were able to insert their own individuality into the training. Instructions provided in these instances were analogous to the military term, "axis," in which the O/Cs had the freedom to vary their methods. This approach was followed throughout the development of the platoon and company exercises. The concept was applied to the Table Preview and AAR exercise materials as well as the exercises execution materials.

Observation Procedures

In addition to the manual data collection tools (e.g., the Event Guides and the early paper-based AAR Worksheets), the SOW provided for the inclusion of automated tools. These included the ModSAF DataLogger and the Unit Performance Assessment System (UPAS) developed by ARI (Meliza, Bessemer, Burnside, & Shlechter, 1992). In addition to these technologies, RCVTP employs the Plan-View Display (PVD) and Stealth View function to display unit performance. Each of these systems were to be integrated into the RCVTP to perform the functions of collecting and displaying performance data to training units.

To guide productive AAR discussions, O/Cs should systematically observe and record unit performance. The tools relevant to this requirement included the integrated Stealth View, PVD, DataLogger system, and UPAS. The SOW recognized that O/Cs would also need to use check-lists and suggested that these check-lists be presented on small "electronic-clipboard" computers.

The SIMUTA Design Team recognized that none of these devices constituted a comprehensive performance measurement system. The Stealth View and PVD are only observation windows on unit actions. The UPAS is not programmed to provide any

OCIC Action	*EC Action*	*Plt Action*	*Critical Subtasks*	*Time/Comments*
"Guidons, this is Black 6. Occupy BPs A, B, & C. Keep me informed. Conduct rehearsals, including the displacement to the SP of the displacement route you will use. You have 1-1/2 hours to complete the occupation, rehearse and report set. I want your plt sector sketches in 50 minutes."		(1) The plt occupies BP C and rehearses the operation, keeping the commander informed.	M1 [ ] Column formation M2 [ ] Traveling technique O5 [ ] Pldr directs deliberate occupation	
NOTE: Provide crosstalk: "Guidons, this is Black 6. Black 7 will have LOGPAC set at RP en route to BP 41. If we are displaced under pressure, LOGPAC will be in the rear of BP 41. Priority of service will be tanks, then Bradleys."				
NOTE: Provide crosstalk throughout the time the platoon is preparing for the defense. Role play the other platoons, the ISG, XO, and provide a few intel updates.				

Figure 14. Sample of OCIC Events Guide.

ModSAF File Name: **PAE1**	Overlay File Name: **DEFENSE1**	Datalogger File Name: **PAE1**

OCIC Action	***EC Action***	***Plt Action***
"Guidons, this is Black 6. Occupy BPs A, B, & C. Keep me informed. Conduct rehearsals, including the displacement to the SP of the displacement route you will use. You have 1-1/2 hours to complete the occupation, rehearse and report set. I want your plt sector sketches in 50 minutes."		(1) The plt occupies BP C and rehearses the operation, keeping the commander informed.
NOTE: Provide crosstalk: "Guidons, this is Black 6. Black 7 will have LOGPAC set at RP en route to BP 41. If we are displaced under pressure, LOGPAC will be in the rear of BP 41. Priority of service will be tanks, then Bradleys."		
NOTE: Provide crosstalk throughout the time the platoon is preparing for the defense. Role play the other platoons, the 1SG, XO, and provide a few intel updates.		
NOTE: After 50 minutes from start of exercise, send: "Guidons, this is Black 6. Bring sector sketches to my location."		(2) Pldr takes sector sketch to OCS.

Figure 15. Sample of OCEC Events Guide.

UNIT: TANK PLT
DATE:_____

SIMNET PLAN SHEET
PAE1

EXERCISE ID:_____
TRAINING AREA: NTC
FREQUENCY: _____

PART I. COMBAT ELEMENTS

SIM	UNIT	BMPR #	LOCATION	AZIMUTH	ALIGNMENT	FUEL	AMMO	MAINT	REMARKS
	CO/TM	66 *							
	CO/TM	65 *							
		11*							
		12							
		13							
		14*							
		21*							
		22							
		23							
		24*							
	M1	31*	NK303150	5600	BLUE	FULL	FULL	NEW	PLATOON IN WEDGE FORMATION.
	M1	32	NK302150	5600	BLUE	FULL	FULL	NEW	
	M1	33*	NK305150	5600	BLUE	FULL	FULL	NEW	
	M1	34	NK304150	5600	BLUE	FULL	FULL	NEW	

POC:
TA:

M1:

BFV:

SAF:

ST:

Figure 16. Sample SIMNET Plan Sheet.

UNIT: TANK PLT
DATE:_____

SIMNET PLAN SHEET
PAE1

EXERCISE ID: _____
TRAINING AREA: NTC
FREQUENCY: _____

SAFOR COMBAT ELEMENTS

UNIT TYPE	UNIT SIZE	LOCATION	AZIMUTH	BLUE/RED	FORMATION	GUNNERY LEVEL	OPENING RANGE	REMARKS
HEMTT ID H14	(1)	NK303172	2160	BLUE	N/A	N/A	N/A	PLACED AT TRP 14 AND BURNED OUT.
HEMTT ID H15	(1)	NK289173	0950	BLUE	N/A	N/A	N/A	PLACED AT TRP 15 AND BURNED OUT.
HEMTT ID H18	(1)	NK279167	1170	BLUE	N/A	N/A	N/A	PLACED AT TRP 18 AND BURNED OUT.
M1 ID A2	PLATOON	NK306157	5800	BLUE	LINE	50%	2000m	IN BP B.

Figure 16 (cont'd). Sample SIMNET Plan Sheet.

RCVTP MISSION MATRIX

UNIT	FAM COURSE	TABLES	SIMS	OC/EC	OCS	EX ID	FREQ

Figure 17. Sample RCVTP Mission Matrix.

evaluation of performance; it only presents displays and reports that must be interpreted by an O/C. The design for unit performance assessment should therefore not be driven by the equipment; rather, it should be driven by the critical subtasks targeted for each table. In this light, the Stealth View and PVD allow the O/C to observe subtask performance during execution of the table and allow both the O/C and unit to observe subtask performance during DataLogger playback. UPAS reports can be used as indicators of subtask performance.

ModSAF DataLogger. ModSAF DataLogger refers to the software and digital recording device that record, store, and playback the digitally generated graphical images as well as the radio transmissions produced during an exercise executed in SIMNET. When connected to SIMNET and the Stealth View and PVD elements at a workstation, a DataLogger can become a useful tool during execution of exercises as well as during AARs.

At the time of the first pilots, DataLoggers were located at each O/C workstation. In the pilots and early trials, O/Cs experienced frequent problems with DataLoggers crashing during exercises and AARs. In March 1994, ModSAF 1.0 with its accompanying DataLogger software update was delivered and the O/Cs encountered few problems with DataLoggers afterward. In fact, the only current limitation of the DataLoggers is the limited storage capacity of the host's disk drive.

UPAS. UPAS represents another automated performance data collection device. UPAS collects data packets from the SIMNET Ethernet, stores the information in database format and produces reports, graphs and animated playback of the battle to assist in assessing the performance of a unit undergoing a simulated battle. In the process of integrating UPAS into the RCVTP, the SIMUTA Technical Support Team experienced a variety of difficulties.

Beginning September 1993, SIMUTA staff reviewed all of the animated battle replays offered by UPAS. These replays included the following: Battle Flow, Battle Snapshot, Exercise Timeline, Fire Fight, and Planview. At this juncture, SIMUTA staff were concerned about the unit's ability to see the small UPAS screens during AARs. To address this concern, as well as others, SIMUTA staff examined other replay technologies that had been recently introduced. Comparisons of the quality of playback and RCVTP applicability were discussed. Based on these discussions, SIMUTA management concluded that the newer technologies such as DataLogger and ModSAF provided larger and more beneficial replays than did UPAS. It was noted that the Stealth View provided a clearer picture and more realistic action than did the UPAS playback. Furthermore, the DataLogger was capable of playing back an exercise only seconds after the termination of an exercise. In contrast, UPAS required a relatively long conversion time before it could replay an exercise or provide exercise data.

Subsequent discussions were directed at formulating policy for the development of reports to substantiate the accomplishment of the critical subtasks. During these meetings it was noted that the strength of UPAS was its ability to pinpoint individual/crew accomplishments rather than group collective accomplishments of the critical subtasks.

Another major problem involved the speed of the UPAS processors. The Intel 80386 processors installed in UPAS machines tested early in the contract were not equal to the task of producing reports in a timely manner such as to support the conduct of AARs within the given time frame. In October 1993, new UPAS machines with 80486 processors were

delivered to the MWSTC. Initially, hardware problems caused reliability difficulties and generally rendered UPAS ineffective at collecting data and producing the desired outputs. In May 1994, the UPAS machines were brought up to standard and all machines were collecting and converting data with minimum breakdowns. The 486 processor has since proven to cut the conversion and report generation time in half.

During a trial exercise in June 1994, SIMUTA Technical Support Team members noticed that UPAS was not converting data properly. Specifically, UPAS reported the presence of unknown entities and that Red Force vehicles were firing Blue Force ammunition. Additionally, the vehicle "dead status" count was not accurate; that is, UPAS reported that some dead vehicles were alive. Furthermore, an exercise playback on the DataLogger verified that the vehicles that UPAS had classified as "alive" were, in fact, dead.

The SIMUTA Team proposed running a series of tests to determine the reasons for UPAS's apparent failure to record and produce accurate data. The tests were designed to determine UPAS's accuracy in collecting and reporting basic data elements crucial to the RCVTP structured exercises. The UPAS accuracy tests revealed the existence of minor data base integrity problems, such as placing missiles and vehicles in the same identification category, and providing multiple listings for vehicles. The most important discovery, however, was that UPAS captured all the data packets as it was designed to do. Problems with status assessments lay with the other associated technologies: the MCC, SAFOR, and ModSAF. The accuracy tests revealed that these technologies all contained flaws in the methods with which they handled the SIMNET data packets. All findings of the accuracy tests were relayed to UPAS developers.

From September 1993 through August 1994, SIMUTA Technical Support Team members worked with the O/C Team to determine the most effective way to integrate UPAS into the AAR process. Four output reports were identified to stimulate discussions of related critical subtasks:

1. Fratricide Report - indicates the number of fratricides.
2. Firing Activity by Range - indicates whether a unit engaged the enemy within a prescribed range and if they used the appropriate type of ammunition according to the threat.
3. Vehicle History Report - indicates the status of a vehicle at the start and end of a table, as well as any changes in vehicle status.
4. Engagement Report - depicts all firing activity terminating in a hit or a kill.

As of September 1994, the above reports had yet to be integrated into the AAR process. At this time, SIMUTA Technical Support Team members were waiting on ARI to deliver solutions to problems identified in the series of UPAS accuracy tests conducted by the SIMUTA Team. These solutions, when implemented should allow the UPAS reports to become an operational component of the RCVTP AARs.

Teaching, Coaching, and Mentoring

The O/C exercise intervention guidelines were based on the revised CWR concept. To reiterate, SIMUTA's refined CWR concept holds that each exercise is composed of a crawl, walk, and run table so that, within each exercise, each subsequent table is more difficult than the previous one. Although the RCVTP tables' difficulty levels are no longer explicitly classified with the CWR designations, the CWR definitions are still implicit in SIMUTA's exercise design.

The intervention guidelines were formulated around the expectation that the O/Cs would intervene during exercise conduct to induce correct task performance. This concept is consistent with current O/C actions at the NTC, but only during the planning and preparation stages. The simulated environment allows the transfer of this approach to the execution stages of training. On-line teaching and coaching are used as needed to use simulation practice time productively.

The intervention guidelines, presented in the O/C training handbooks, contain general instructions regarding how to intervene and specific rules regarding when to intervene. The final set of instructions was designed in accordance with observations of O/C interventions during the trial process. By observing the methods by which the O/Cs intervened, the SIMUTA Team was able to increase the specificity of the instructions. Additionally, by observing the situations in which they tended to intervene, the SIMUTA Team was able to focus certain areas in the instructions to provide greater standardization of O/C intervention.

AAR Support Products

The design of the RCVTP AAR was initially addressed in the SOW. The SOW specified that AARs be innovative, yet based on conventional U.S. Army AAR techniques. The SIMUTA AAR/Formative Evaluation Team reviewed doctrine, conventional practice, and other training design efforts targeting the ARNG (e.g., platoon lanes training, U-COFT training) to design an efficient and effective AAR format for RCVTP training. In addition, the following literature was consulted:

1. *TC 25-20, A Leader's Guide to After Action Reviews* (DA, 1993).
2. *Small Group Instruction Training* (Staff Training Center, 1993).
3. *TC 25-6-7, Tactical Engagement Simulation Instructors' Training Guide for Exercise Observer-Controllers* (DA, 1992).
4. *Mech Co. B AAR* (NTC, 1985).

SOW Concepts

The SOW portrayed the AAR component of RCVTP training as the mechanism that would drive the design and development of the RCVTP as a whole. For instance, the SOW asserted that the exercises be derived from a compilation of tasks which were determined to be the most appropriate for inclusion in AARs. This concept was derived from Brown's (1992) concept of prioritization in training. Brown has described an intensified simulation-based training strategy for RC units which depends heavily on the prioritization of training

requirements. According to this strategy, the prioritization of training requirements is achieved through the preparation of baseline AARs. These AARs should focus units on a reduced number of highly critical collective tasks, facilitating the prioritization of training requirements and the operationalization of the turn-key concept. This approach is consistent with the mainstream theory of training development, which maintains that training objectives must be identified prior to, and provide the foundation for, the development of training.

The SOW called for the contractor to develop prototype AAR support packages for each training exercise. These AAR support packages were to be designed so that the AAR could be conducted within the limits specified by a standardized AAR format. The AARs were to include the use of UPAS screen displays and tables, as well as other data collection tools described earlier under exercise execution management. Finally, the SOW stated that the RCVTP AARs were to be designed to last approximately 30 minutes. Along with a 30 minute preparation period and a 60 minute average execution period, the tables were to last approximately 2 hours. Actual AAR, execution, and preparation times vary according to the table being executed and the skill level of the training unit.

AAR Design and Supporting Materials

The history of the AAR design and supporting materials is most manageable when considered in the context of three major milestones: the deliveries of the Prototype Exercise Packet, the initial platoon and company exercises, and the final platoon and company exercises.

Prototype Exercise Packet. From the first discussions, the AAR Guide organized the development process by documenting the specifics of executing a RCVTP AAR. The first AAR Guide appeared in the Prototype Exercise Packet, delivered on August 31, 1993. The AAR Guide provided guidance regarding the format for the platoon AARs. These AAR Guides required the following activities:

1. A table review including a pre-execution presentation of the table's tasks, conditions, and standards.
2. A scenario analysis including a presentation of the commander's plan, what happened, and the OPFOR perspective.
3. A leader's self-assessment.
4. A summary of the critical subtasks for discussion purposes.

In addition to the AAR Guides, the AAR Worksheets (see Figure 18) represented the tool used to record unit performance notes during the conduct of the exercises. This form was used as a memory aid for the O/Cs during the AAR discussions by listing the tasks and critical subtasks by event for each table.

Initial package. The AAR Worksheets were not changed for the initial package. In contrast, the O/C supporting materials were divided into those for the OCIC and those for the OCEC, and for the platoon O/C within company exercises. The evolution of the AAR Guide for the OCIC generally involved renaming components. The new AAR Guides included the following components:

1. A presentation of an AAR Agenda.
2. A presentation of tasks, conditions, and standards.
3. A scenario analysis section including the presentation of the commander's plan, an enemy perspective, and a battlefield execution summary.
4. An AAR discussion conducted from O/C comments and marks on a matrix displaying the table's events by its critical subtasks.
5. A review of the table's standards.

As the OCEC participated in AARs only in a supportive role, there were no AAR support materials for the OCEC. The platoon O/C involved in company training, however, was provided with a Company-to-Platoon Tasks/Critical Subtasks tool. This tool listed the events for each table along with the platoon critical subtasks that were most likely to occur during the unit's execution of that event. Finally, the tool contained a space for remarks for each event. The O/C could use these remarks during his platoon- and crew-level AAR discussions.

Final package. The final versions of the AAR support materials included products for the platoon and company OCICs and the platoon O/Cs during company training. The platoon and company OCICs' AAR Guides included the following activities:

1. A presentation of the AAR Agenda.
2. A presentation of the critical subtasks and tasks for each table.
3. A presentation of the commanders plan, an enemy intent, and a battlefield execution summary.
4. An AAR discussion conducted from the AAR Worksheets and the O/Cs comments on his Events Guide.
5. An identification, by unit members, of which critical subtasks should be sustained and improved in future training.

During company-level training, the platoon O/C conducts a brief AAR by following the platoon AAR Agenda Poster. This agenda should lead the O/C to focus the platoon on the platoon's strengths and weaknesses in a short time.

Development of the Table Preview

Standard AAR guidance such as that found in TC 25-20 (DA, 1993d) calls for a statement of tasks, conditions, and standards at the beginning of the AAR. This statement is intended to guide the focus of AAR discussions. Likewise, learning during each table can be focused by a similar introduction to the tasks prior to table execution. Thus, the function of the Table Preview was to prepare units for table execution by presenting each table's (a) tactical situation, (b) tasks and critical subtasks to be executed, and (c) a stealth overview of the terrain. The stealth overview was originally inserted in place of the to-be-developed demonstration tapes. It functioned like a terrain reconnaissance, providing the unit leader with a chance to mentally rehearse the unit's actions and was soon after adopted as a permanent component of the Table Preview.

AAR WORKSHEET - PAE1

Instructions for using worksheet: During the table, put a **circle** in the event box for critical subtasks that need to be emphasized in the AAR. Put a **check** in the event box for critical subtasks that were performed to standard. In the row labelled **"FINAL"**, put a **circle** or a **check** to indicate performance on the critical subtask at the conclusion of the table.

EVENT	M1	M2	C11	O1
	Column formation.	Traveling technique.	Pldr designates defensive control measures.	Primary fighting positions.
1) Occupation and rehearsal				
2) Sector sketch	X	X	X	X
3) Completion of rehearsal	X	X	X	X
FINAL				
Next Table?	Yes	Yes	No	No

Figure 18. Sample AAR Worksheet.

Take-Home Package

The SIMUTA staff began developing the Take-Home Package in November 1993. The SOW suggested that the Take-Home Package should be modeled after those produced by the combat training centers (CTCs), should be electronically automated to the extent possible, and should include UPAS outputs. As the pilots and trials would start in early November 1993, developers of the Take-Home Package decided to create the core product in a non-automated format, so that it would be available for these pilots and trials. In April 1994, developers began to concentrate on automating the package.

The SIMUTA Take-Home Package was designed to be easily produced by the O/Cs and digested by the training unit. The heart of the Take-Home Package became the O/Cs' observations concerning the critical subtasks (Figure 19). At the end of each table, O/Cs use the same categories described for their event-by-event observations to describe the performance that the unit achieves on each critical subtask. In addition, the O/C reviews the patterns of performance for every subtask across all tables executed in the training period and provides an overall rating for each subtask. Comments identifying specific deficiencies are included for each subtask rated "train to improve." The O/Cs then prepare a short narrative that highlights general areas of performance in three categories: (a) areas that the unit performed well throughout the training period, (b) areas in which the unit improved during the training period, and (c) areas for which the unit did not reach performance standards. Finally, a summary table is generated for the parent unit. That is, for platoon training, a summary table is prepared for the company showing the observations for each platoon. For company-level training, a similar summary table is provided to battalions.

Automated Performance Tracking System

A computer-based system was designed to record and manipulate O/C observations of unit performance. This system, entitled the Automated Performance Tracking System (APTS), in essence replaces the paper materials used by the OCIC to run the table, to record performance observations, to structure an AAR, and to create the Take-Home Package rating reports. A prototype system was developed using FoxPro® (Microsoft Corporation, copyright 1989-1994) and should run on any personal computer (PC) equipped with an 80386 processor or better. The system's data bases contain all of the Event Guide information for all platoon tables and for the company/company team tables. In addition, data bases were constructed to receive records of unit training.

A prototype system was developed that first records a unit's identifying information and their training plan for the training period. Then, the system presents table execution information event-by-event, just like the pages of the exercise Event Guides. These screens also collect O/C ratings of subtask performance and notes about that performance. At the end of the table, event ratings are fed back to the O/C on one screen. This screen, identical in concept to the AAR Worksheet, displays performance trends over the tables and provides a means for the O/C to record his end-of-table ratings of performance. The APTS also generates the summary Take-Home package forms from the end-of-table ratings for each table

TAKE HOME PACKAGE: 1ST PLATOON, COMPANY D, 2ND BATTALION, 52ND ARMOR										7-8 MARCH 1994
Task and Subtask	**ARTEP-MTP PAGE**	**COMBAT FUNCTION CODE**	**TABLE**						**FINAL**	**FINAL COMMENTS**
			A 1	**A 2**	**A 3**	**B 1**	**B 2**	**B 3**		
17-3-0203 - Execute a Column Formation										
Platoon executes the column formation.	5-39	M1	O	\\\	\\\	\\\	\\\	\\\	O	Platoon should practice maintaining intervals
17-3-0207 - Execute a Line Formation										
Platoon executes the line formation.	5-47	M10	✓	\\\	\\\	\\\	\\\	\\\	✓	
17-3-0206 - Execute a Vee Formation										
Platoon executes the vee formation.	5-45	M11	✓	\\\	\\\	\\\	\\\	\\\	✓	
17-3-0204 - Execute a Staggered Column										
Platoon executes the staggered column formation.	5-41	M14	✓	\\\	\\\	\\\	\\\	\\\	✓	
17-3-0202 - Execute a Herringbone Formation										
Platoon executes the herringbone formation.	5-36	M15	✓	\\\	\\\	✓	\\\	\\\	✓	

REFERENCE: ARTEP 17-237-10-MTP, *Mission Training Plan for the Tank Platoon.* 3 October 1988.

Figure 19. Example Take-Home Package performance summary.

executed during the training period. The Take-Home package information can be delivered to the unit on paper or on a PC diskette. As of September 1994, the APTS is nearing the final stages of development.

Observer/Controller Training

The Project Research Plan required the contractor to provide training for the O/Cs on the procedures involved in the conduct of the RCVTP, while the MWSTC site staff was to provide training on the technical equipment located at the O/C workstations. The SOW stipulated that the contractor's training should build upon existing O/C guidelines and materials to develop an O/C training program that would focus on monitoring and evaluating unit performance, as well as on providing appropriate Take-Home Packages.

Because of the fluid nature of the O/C Team, SIMUTA management and ARI agreed that the most effective means of training O/Cs would be to have the new O/Cs review RCVTP materials and practice their execution on-the-job. O/Cs typically arrive and depart from the O/C Team individually, so a comprehensive group-oriented training program would not be practical. In late October 1993, the Company/Platoon Team conducted the initial training for the O/Cs who had arrived at Fort Knox up to that point. The responsibility of training O/Cs who arrived later fell upon the O/C Team.

Development of Platoon and Company Exercises

The Company/Platoon Team was responsible for the development of both the platoon and company exercises. One military SME was assigned to develop company exercises while a combination of four SMEs was assigned to develop the platoon exercises. Although this structure lasted the duration of the contract, each SME contributed to the creation of both company and platoon exercises. Specifications set forth in the SOW guided the development and evaluation of company and platoon exercises for the RCVTP. The SIMUTA Team was to develop six armor platoon, six mechanized infantry platoon, four scout platoon, six armor company, and six company team exercises. SIMUTA staff developed each exercise in three segments, or training tables. Each table in every exercise represented either a crawl, walk, or run difficulty level. In addition, the exercises themselves were progressive in difficulty. Table difficulty levels were determined by a natural progression based upon mission, enemy, troops, terrain, and time available (METT-T). As a part of the formative evaluation effort, SIMUTA Team members validated the progression in difficulty through consultation with training units.

The SOW also stated that criteria were to be established for evaluating the actual difficulty of the exercises. After an extensive, yet fruitless, deliberation regarding the operationalization of these criteria, the Company/Platoon Team opted to rely on expert opinion as a means of determining whether or not the difficulty levels were appropriate for the exercises' design, as well as for training units. The responsibility for making these judgments was assigned to SIMUTA SMEs who observed the performance of units to determine whether individual tables were constructed at an appropriate level of difficulty. In addition, the ARNG units who participated in the pilots and trials were asked for their

perceptions of table difficulty levels. When a table's difficulty level was judged as being inappropriate, the table was modified by changing one or more of the following exercise attributes: enemy vulnerability or lethality, task content, and locations of the table's events.

According to SOW specifications, SIMUTA SMEs designed each table so that each execution would last approximately one hour. The SOW also specified that training be designed to take advantage of the simulation's capabilities to increase training efficiency. This concept of packing as much training as possible into the ARNG's training time is important to ARNG units. ARNG soldiers have only 39 days of training per year, divided into 12 segments. Units participate in 11 IDT weekends for a total of 23 days a year, and one AT period which lasts 16 days.

The most obvious approach to increasing the amount of training provided in an IDT or an AT was to reduce the time between the execution of tables. It originally seemed feasible to reduce preparation time because the units were expected to be able to prepare before they arrived at the MWSTC. After many experiences with units who had not prepared adequately beforehand, more time was allotted to the exercise/table preparation phase. Furthermore, the O/C Team felt that the units needed ample time to rehearse before the execution of each table. Another effort to reduce the time between executions was designing AARs that would require little preparation after the conclusion of the exercises. To diminish AAR preparation time between tables, much of the preparation was designed to occur during the execution itself.

The SOW suggested that "key teaching points" be selected to serve as training objectives and as discussion topics of the AARs. As noted previously, ARTEP critical subtasks served as key teaching points. SIMUTA staff wrote scenarios that triggered the performance of these critical subtasks. The NTC division orders were received much later than expected and were delivered incomplete. As a result, the exercises were designed by first selecting tasks and critical subtasks that could be logically included in an MTC and a DIS scenario. Next, the events within the exercises were created to trigger the performance of the selected critical subtasks. During the development of the exercises, one primary objective was to demonstrate whether individual events would in fact cue the performance of the appropriate critical subtasks.

Development of Exercise Outlines

Platoon and company exercise development began with the completion of the exercise outlines (a history of the outlining process is provided in Chapter 2). The platoon and company exercise outlines provided a format in which to present information vital to the identification, description, and development of the tables. The content included an exercise identifier, tasks, critical subtasks, a mission context, a unit situation, and each table's events. In developing exercise outlines for each of the platoon tables, SIMUTA SMEs created the content foundations for the continuing development of the exercises. In other words, the outlines represented a transitional stage in the development of the final exercises and their documentation.

During the development of the outlines, SIMUTA SMEs initiated many of the activities they would employ throughout the development of the exercises. These included (a) examining the NTC database terrain and NTC maps to determine vehicle positioning and engagement positions; (b) designing platoon graphics/overlays; and (c) meshing sets of tasks, critical subtasks, and events into an effective training scenario. During this time, SMEs spent more time working with maps than working in SIMNET. This was true for two reasons. As discussed below, ModSAF enhancements to SIMNET had yet to be delivered; without the ModSAF features, it was inconvenient to replay exercises on SIMNET. Second, the SMEs knew that there would be other opportunities to re-look the details contained in the outlines. Thus, their focus lay almost exclusively on the timely production of the full set of outlines by the contract delivery date in September 1993, rather than testing those outlines in SIMNET.

From the exercise outlines, SIMUTA Team members created initial, refined, and final versions of the exercises. The initial exercises for the armor, mechanized, and scout platoon tables were delivered in December 1993, whereas the initial company and company team exercises were delivered about one month later. ARI required only an informal delivery of a refined exercise package; and, the Company/Platoon Team conducted trials of refined versions of the materials in five sessions held in February - March 1994. SIMUTA management delivered the final platoon package in April and the final company package in May 1994.

Internal Exercise Pilots with O/C Team

Between the date the table outlines were completed and the date of the internal exercise pilots, MWSTC received the ModSAF units. With ModSAF, the exercise development effort was able to forge ahead. ModSAF allowed the SMEs to enter the contents and specifications of the exercises into computer files which could be saved at the O/C workstations. The ability to do this eliminated the need to use the older Semi-automated Forces (SAFOR) stations to run the tables. With ModSAF, SMEs typically relied on SAFOR stations and the site staff from the MWSTC only for the initialization of simulators. The SMEs could set up and control the exercises from an O/C workstation. They created ModSAF table files and tested many of the tables from the workstations. SMEs ran tables numerous times to test whether the tables worked as designed. This process included checking the operation graphics, simulator starting positions, SAFOR vehicle positions, OPFOR formations and instructions, exercise timing and duration, engagement elements (e.g., opening ranges and intervisibility), ability to maneuver, and event content (e.g., task appropriateness, cues, and critical subtasks).

By late October, SIMUTA staff had been able to partially test the platoon and company tables. Lacking was a full validation that the exercises would provide effective training missions in the SIMNET environment. In addition, some tables remained to be converted to ModSAF files. To continue the process of validating the tables, members of the O/C Team as well as SIMUTA SMEs conducted internal pilots executing the tables at the MWSTC. From late October through November 1993, every available platoon and company table was executed.

The observation and evaluation of the tables were accomplished through two methods. First, the SME in charge of the development of the table monitored the execution of the table from an O/C workstation. The SME was able to observe the table's execution and communicate with the participants. In so doing, he identified problems related to the opportunity for task performance, vehicle positioning, line-of-sight, routes, opposing forces gunnery levels, opening ranges, and so on. Second, focus groups were used to collect feedback from the table participants after each table was completed. The SME in charge asked the participants about any problems they had experienced during the exercises that might decrease the training value of the table. The participants had been forewarned by the SMEs that they might encounter a variety of problems. This piloting process was highly beneficial to the development and validation of platoon exercise content. The majority of the problems identified related to the locations of vehicles on the NTC database and to the gunnery capabilities of simulated forces.

In addition to participating in and monitoring the exercise pilots, SMEs spent a lot of time at MWSTC eliminating the content problems they had discovered. Making revisions in the exercises turned out to be a much more complicated and difficult process than had been anticipated. For instance, when it was discovered that a certain position was not the most effective observation site, either the SMEs or O/Cs had to get in simulators and drive, attempting to find positions that were more appropriate. Furthermore, the tables were written to be consistent with U.S. and Soviet Army doctrines, and to train the specified tasks. Changes were closely scrutinized by other SMEs ensuring that neither of these two conditions was violated. Throughout the course of the project, making revisions remained an arduous process.

External Exercise Pilots

In early November, unplanned pilots were conducted on an ARNG unit that volunteered to try out the platoon armor and scout exercises. These pilots provided an early opportunity to examine the effectiveness of the tables themselves plus other components of the training such as the utility of the exercise materials.

The external piloting process was extremely beneficial to the development and validation of armor and scout platoon exercise content. For the first time, the SIMUTA staff was able to observe the RCVTP exercises conducted in context of the entire training program; that is, in addition to the execution of the tables, O/Cs provided the training units with Table Previews, coaching, and AARs. Furthermore, this was the first time the O/Cs conducted the exercises with external participants. SIMUTA SMEs found that, despite the need for many revisions, the exercises appeared to the unit to be a good training tool. The unit was pleased with the fact that they did not have to create and administer the training themselves. They also appreciated being able to fight against an enemy who behaved in accordance with the appropriate OPFOR's doctrine.

In addition to observations from the SMEs and feedback from the unit, the O/Cs also contributed their thoughts on the design of the tables. There were two methods for this process. First, O/Cs were encouraged to comment on the exercises as they were being

executed. Second, SIMUTA SMEs and individual members of the O/C Team met to discuss table issues shortly after the pilot was over.

Delivery of Initial Platoon and Company Exercises

Following the piloting of the platoon exercises, SMEs revised both the platoon and company tables for the initial platoon and company deliveries scheduled for December 1, 1993 and January 10, 1994, respectively. Because the delivery date for the platoon exercises was so soon after the pilot, the revision of the platoon tables included a one-week marathon session in which a team including all platoon SMEs examined every detail of the exercises, exercise materials, and other platoon relevant training materials. As a result, the platoon and company exercise tables underwent significant changes before the initial delivery date.

Initial Trials

After the exercises were revised, the developers' observational focus shifted more toward evaluating the utility of the exercises and training management materials. SIMUTA observers focused on table timing and duration, how closely the O/Cs were able to follow the training management guidance, and how the data collection tools were implemented. Trials were conducted with ARNG units.

As the trials revealed deficiencies in the usage of the data collection tools and training management materials, re-looking these areas became a post-trial priority. After the initial trials, SIMUTA SMEs spent most of their time making revisions in the training management materials, but continued to focus on revising the exercises as well. In addition to feedback from SIMUTA observers, the formative evaluation effort relied on feedback from the O/Cs. During this time, the O/C Team set in place a feedback mechanism specifying the consolidation of the opinions of team members.

The initial scout platoon and mechanized infantry platoon trials occurred as scheduled in January 1994. The initial mechanized infantry platoon trial occurred on January 22-23. The initial armor platoon trial was scheduled for January; however, it did not occur until March because severe winter storms impeded the training unit's traveling to and from Fort Knox. Consequently, the refined armor platoon package was completed before the initial armor platoon trial had been conducted. To compensate, SIMUTA used the lessons learned from the mechanized infantry platoon, scout platoon, company, and company/team trials to revise the armor platoon exercises and materials. The initial company and company team trials were conducted in January and February 1994. The refined exercise packages were completed on February 1, and March 1, 1994 for platoon and company, respectively.

Refined Trials

The refined platoon and company trials represented the last planned evaluation of the exercises before the delivery of final versions to ARI and the start of the implementation phase. The focus of the refined mechanized infantry platoon, scout platoon and company trials remained as it had been during the initial trials: on the quality of the tables as well as the utility of the training management materials. While observing the refined trials, SIMUTA

observers also monitored whether the tables presented ample opportunity for the units to perform, and discuss in the AAR, the critical subtasks. The results of focused and intent observation revealed that, in almost all cases, the opportunities for the units to perform critical subtasks did exist.

The refined scout platoon trials occurred as scheduled in February and March 1994. Although the armor platoon revised trial was scheduled for February, inclement weather conditions delayed the trial until May, after the final platoon exercise packages had been delivered. The refined mechanized infantry platoon and refined company trials occurred as planned in February and March.

Final Platoon and Company Exercises Package

On April 1, 1994, SIMUTA delivered the final platoon exercises to ARI. Similarly, the final company exercises were delivered on May 2, 1994. At this point in their development, the tables were judged to be effective training tools. Even so, SIMUTA SMEs continued to refine the tables throughout the implementation phase. As this was the case, ARI agreed that the term "final exercises" would not be interpreted as the last version of the exercises completed by SIMUTA.

Implementation Trials

The SOW stated that prior to implementation, all implementation materials were to be developed and that all potential implementation problems were to be resolved. As such, the focus of the formative evaluation during the trials shifted to the O/Cs' implementation of the process to an extent. Members of the Company/Platoon Team monitored only the exercises and not the O/Cs' implementation of the training. Two members of the Formative Evaluation Team monitored the O/Cs' implementation. All platoon and company implementations were evaluated in this way.

After the delivery of the final platoon and company exercise packages, SIMUTA conducted three implementation trials of the armor platoon, three of the scout platoon, and two of the company exercises. Armor and scout platoon implementation trials were conducted in July and September 1994, whereas the company implementation trials were conducted in May and June.

Table Walk-Throughs with O/Cs

Throughout the pilot, trial, and implementation processes, the O/Cs provided suggestions for improving the tables. Many of these suggestions dealt with the O/Cs' desire to include additional enemy in the tables. The O/Cs believed that more enemy contact would make the tables more interesting for units; they perceived that units often became bored with performing the tables as designed. SIMUTA staff evaluated the doctrinal appropriateness of each suggested change. Any unwillingness of SIMUTA staff to change the exercises was due to the fact that each table was designed in the context of several exercises in which the enemy presence was already doctrinally correct. That is, a change in the amount of enemy presence could easily invalidate the threat array, from a doctrinal standpoint.

Providing a standardized set of training exercises was one of the major goals of the RCVTP; accordingly, SIMUTA and the O/C Team met and reviewed each table as it was designed by the SIMUTA Team. During these sessions in July, August, and September 1994, the O/Cs were asked to suggest ways in which they thought the tables could be improved. In addition, they were asked to justify, in terms of doctrine, any changes they suggested before the changes would be implemented. Following the completion of the walk-throughs, the sets of platoon and company tables were manipulated into their final form. The contents of the final sets of platoon- and company-level tables are provided in Tables 8, 9, 10, and 11.

It is important to note that the Company/Platoon Team had attempted to set up table walk-throughs throughout the initial and refined trial phases. That effort, however, met with little success. Extensive time demands placed on the O/C Team made scheduling the walk-throughs difficult.

Reactions of the Trial Units

The platoon and company exercises with their associated training management components comprise an intricate set of instructions that drive a comprehensive training program. Because of the program's breadth and the intense involvement of the SIMUTA staff in its development, it was often difficult for the training developers to provide objective evaluations of the effectiveness of the training process as a whole. Judgments of training effectiveness were commensurate with assessments of the benefits received by training units. Thus, training units provided much of that necessary feedback in both formal and informal interviews. These units consisted of armor, mechanized infantry, and scout platoons, armor companies, and company teams.

Every unit that participated in each type of platoon and company pilots, trials, and implementation trials praised the RCVTP training. Positive comments regarding training benefit were directed toward every aspect of the program. One soldier even commented that he felt that the benefit he received just from executing the Familiarization Course was greater than that he had received during his past two visits to SIMNET. Units believed that the program had allowed them to improve their abilities to execute collective tasks in the following areas: maneuver, reporting, radio procedures, navigation, firing techniques, tactics, and command and control. Several units felt that, in order to receive the amount of training they received with the RCVTP, they would have had to spend more than twice the time training in the field. One unit believed that they received, in two RCVTP days, the equivalent of two weeks training in the field. Soldiers at every level, from company commanders to tank crews felt that the training was beneficial and worth much more than the time it required.

Several characteristics of the training seemed particularly impressive to training units. Some units commented that there was a good mix of execution and AAR time. Other units were glad that the program allowed them to focus on execution, and specifically the execution of collective tasks, because they rarely had the opportunity for such a focus. Still another

Table 8

Final Armor Platoon Tables

Table Number	Tasks
PAA1a	Tactical Movement; Battle Drills
PAA1b	Tactical Movement; Battle Drills
PAA2	Tactical Movement; Actions on Contact
PAA3	Defense
PAB1	Tactical Road March
PAB2	Tactical Movement; Actions on Contact
PAB3	Tactical Movement; Actions on Contact
PAC1	Tactical Movement; Actions on Contact
PAC2	Tactical Movement; Actions on Contact
PAC3	Tactical Movement: Attack by Fire
PAD1	Tactical Movement; Actions on Contact
PAD2	Tactical Movement; Actions on Contact
PAD3	Tactical Movement; Hasty Defense
PAE1	Occupy a Battle Position
PAE2	Defend a Battle Position
PAE3	Occupy a Battle Position
PAF1	Defend a Battle Position
PAF2	Defend a Battle Position
PAF3	Hasty Attack (Counterattack)

unit commented on the opportunity they were given to determine whether or not they repeated tables. They felt that this kind of opportunity allowed them to control their own training, enhancing their ability to improve in task execution. Members of one unit said that the progression in table difficulty helped them to gain confidence which helped them to solve problems that surfaced during the training.

Other characteristics considered valuable included the concepts of segmenting missions into tables, task repetition between tables, and training compression. Units liked being able to execute a segment of a mission and then review their performance before executing again. They also commented favorably regarding the task repetition contained in the tables. They felt that having the opportunity to repeat tasks enabled them to improve their performance. Several units reported that they experienced very little wasted time during any phase of the training.

Table 9

Final Mechanized Infantry Platoon Tables

Table Number	Tasks
PMA1a	Tactical Movement
PMA1b	Tactical Movement; Battle Drills
PMA2	Actions on Contact
PMA3	Platoon Defense
PMB1	Tactical Movement
PMB2	Tactical Movement; Actions on Contact
PMB3	Tactical Movement; Actions on Contact
PMC1	Tactical Movement; Actions on Contact
PMC2	Actions on Contact
PMC3	Hasty Attack
PMD1	Tactical Movement; Actions on Contact
PMD2	Tactical Movement; Actions on Contact
PMD3	Hasty Defense
PME1	Occupy a Battle Position
PME2	Defend a Battle Position and Displace to a Subsequent Position
PME3	Occupy a Battle Position
PMF1	Defend a Battle Position
PMF2	Defend a Battle Position
PMF3	Support by Fire (Counterattack)

A final indication of the value of the training was expressed in a comment from one training tank commander; he said that the training was not frustrating, but fun and interesting. Many units wanted to train more. For instance, one platoon who finished their assigned set of tables relatively early expressed the desire to train further into the evening. In addition, several units scheduled return visits before the implementation phase of the RCVTP's development was completed. In respect of all the positive comments, it is fair to say that the training exceeded the expectations of the ARNG and AC units who served as pilot and trial subjects.

The vast majority of the negative comments focused on the perceived inability of SIMNET to reproduce a realistic training environment. First, those units with little previous exposure to SIMNET had trouble navigating within the simulation. This was said to have

Table 10

Final Scout Platoon Tables

Table Number	Tasks
PSA1	Tactical Movement
PSA2	Zone and Route Reconnaissance
PSA3	Screen
PSB1	Zone Reconnaissance
PSB2	Area Reconnaissance
PSB3	Zone Reconnaissance; Screen
PSC1	Screen
PSC2	Screen
PSC3	Zone Reconnaissance; Screen
PSD1	Screen; Battle Handover
PSD2	Screen; Battle Handover
PSD3	Screen; Battle Handover

been a result of the 3500 meter visual range imposed by SIMNET, and the cupula mechanism that requires the commander to rotate the cupola in order to view the battlefield. The 3500 meter vision limitation in SIMNET was said to have also decreased units' abilities to fight successfully. Units reported that they would have been able to react more effectively had they been able to observe enemy presence from a further distance. Each of the above problems were a result of simulation limitations, however, and may be alleviated by future advances in simulation technology. Additionally, the vast majority of units considered the simulation problems minor in comparison to the overall value of the training program. ARNG units were especially pleased that such a program was being created for their own use.

Table 11

Final Company/Team Tables

Table Number	Tasks
CA/TA1	Tactical Road March; Tactical Movement
CA/TA2	Tactical Movement; Actions on Contact
CA/TA3	Defend; Tactical Movement
CA/TB1	Tactical Road March; Perform Attack Position Activities
CA/TB2	Tactical Movement; Actions on Contact; Defend Against Air Attack (Active)
CA/TB3	Tactical Movement; Actions on Contact
CA/TC1	Tactical Movement; Actions on Contact
CA/TC2	Tactical Movement; Actions on Contact
CA/TC3	Tactical Movement; Actions on Contact; Support by Fire
CA/TD1	Tactical Movement; Actions on Contact; Defend Against Air Attack (Active)
CA/TD2	Tactical Movement; Actions on Contact; Employ Indirect Fire in the Offense
CA/TD3	Tactical Movement; Attack by Fire; Employ Indirect Fire in the Offense; Support by Fire
CA/TE1	Defend; Employ Indirect Fire in the Defense
CA/TE2	Defend; Withdraw Not Under Enemy Pressure; Employ Indirect Fire in the Defense
CA/TE3	Defend; Employ Indirect Fire in the Defense
CA/TF1	Defend; Employ Indirect Fire in the Defense
CA/TF2	Defend; Defend Against Air Attack (Active); Employ Indirect Fire in the Defense
CA/TF3	Defend; Consolidate on the Objective; Reorganize on the Objective

CHAPTER V. DEVELOPMENT OF BATTALION/TASK FORCE TRAINING

The development of battalion/task force exercises began before the scheduled start date of November 1, 1993. Initially, the Battalion/Task Force Team was organized by mission. That is, subject matter experts and training development specialists were assigned to one of two groups developing either the Movement to Contact (MTC) or the Defense in Sector (DIS) missions. After the completion of the two cornerstone scenarios, the Battalion Team was reorganized by technology. Three technologies were identified as being relevant to battalion/task force training: the Simulation Networking (SIMNET) system, the Janus technology, and the Combat Vehicle Command and Control (CVCC) test bed, which was later renamed the Commander/Staff Trainer (C/ST). SIMNET training provided the developmental model for other technologies. Training developed for other technologies would take advantage of lessons learned from the SIMNET trials and discoveries.

The present chapter begins with a discussion of general training management issues. It then examines training management and development issues related specifically to the three technologies used to train battalions and task forces in the Reserve Component Virtual Training Program (RCVTP): SIMNET, Janus, and C/ST. The chapter concludes with a short description of the reaction of units to battalion/task force training.

General Training Management Issues

This section describes three training management issues that relate to all training technologies: unit preparation for RCVTP training, after action review (AAR) support products, and Battalion Take-Home Package design.

Unit Preparation for RCVTP Training

The Project Research Plan (BDM Federal, Inc., 1993) designated that unit preparation for the RCVTP battalion exercises was to be conducted in two phases, just as it had been for the platoon and company exercises: home station training preparation and on-site training preparation. Initially, the two development teams worked independently to develop home station training materials. Soon after, however, SIMUTA management decided that the materials relating to exercise selection, introduction to the training, and SIMNET familiarization would be developed in consideration of all echelons of training. These materials are described in Chapter 4. The on-site training preparation materials, which included the MWSTC Orientation and the Familiarization Course were also not specific to any echelon of training. This section discusses the development of the battalion home station and on-site training preparation materials.

Home Station Training Preparation

The initial battalion home station training packages consisted of a visit from observer/controllers (O/C) in which the unit received training preparation materials, and a Home Station Training booklet which was to be mailed to the unit prior to the O/C visit. The booklet acquainted the unit with the overall structure of the program and described the preparation process the unit would conduct in preparation for RCVTP training.

The Home Station Training booklet included: (a) a statement of purpose; (b) an overview of the exercise library, the tactical plan of execution for battalion training, and the O/C Team and its role in the training; (c) an introduction to RCVTP scheduling procedures through the use of a Unit Profile Worksheet and a Unit Simulator Manning Worksheet;[9] (d) exercise manning models by duty position and function; (e) unit equipment requirements; (f) a description of battalion-level training management support including AARs; and (g) the tasks, conditions, and standards executed during battalion exercises. Unit leadership was advised to read the booklet to determine if they desired to conduct RCVTP training and, if so, to prepare for the O/C visit.

It was during this home station visit that the O/Cs assisted the unit leaders in designing and scheduling a rotation of RCVTP training. The Battalion Exercise Guides provided detailed instructions to the O/Cs as to how to make initial contact with training units, how to prepare for the visit, how to conduct the visit, and how to prepare for the unit's arrival at MWSTC. The guides specified that the O/Cs were to conduct the following activities: (a) confirm that the RCVTP battalion-level training is appropriate for the unit, (b) obtain unit information and assist in simulator manning, (c) provide assistance in the unit's preparation efforts, (d) answer all questions, and (e) provide the training materials. These training materials included: operations orders (OPORDs), the RCVTP Battalion Main Command Post (CP) Standard Operating Procedures (SOP), terrain data base maps, SIMNET M1 and M2/M3 orientation handbooks, and lists of tasks and critical subtasks to be trained.

Most refinements made to the home station training materials were minor in nature. One significant change involved the integration of the refined materials into the Orientation Guide referred to in Chapter IV. This consolidation of the battalion materials with the company and platoon materials allowed the O/Cs to send just one set of home station training materials to a unit. Once the unit decided which types of training they wanted to conduct, the O/Cs could provide the units with more extensive preparation materials during their visit to the unit.

Another significant change involved the creation of the Decision Synchronization Matrix (DSM). The DSM is a tool for the commander, battalion executive officer (XO) and staff to help synchronize operations and anticipate future activity during executions of RCVTP battalion or task force exercises. It is also a useful tool to conduct rehearsals in preparation for the exercise execution. Separate, complete instructions and usage recommendations are attached to the DSM for use by the unit for rehearsal and execution of the offensive or defensive tactical scenarios.

On-Site Training Preparation

Although there were no official on-site training preparation materials other than the MWSTC Orientation and the Familiarization Course, battalion training preparation evolved to include on-site rehearsals. After only a few battalion trials, both the SIMUTA and O/C

[9]The Unit Profile Worksheet required the unit to provide a standardized description of itself; the Unit Simulator Manning Worksheet required unit leaders to estimate the number of personnel that would be participating in the training.

Teams became aware of the need for units to conduct rehearsals before conducting battalion exercises. Hence, rehearsals became an activity offered to all units before exercise execution. Throughout the trial and implementation phases of development, units were appreciative of the opportunity to rehearse on-site.

AAR Concepts and Procedures

For the Battalion exercises, AAR issues include content and scheduling. In essence, content design began with the conceptualization of segments for the MTC and DIS missions, the selection of tasks to support those missions, the decision to emphasize execution, and an evaluation of how to organize the presentation of tasks. These content issues are described in Chapter 2; however, the last issue, conceptual organization of battalion tasks, bears elaboration. The development of content organization and scheduling are described below.

Content Organization

The National Training Center (NTC) typically organizes its AARs around the seven Battlefield Operating Systems (BOS): (a) command and control, (b) fire support, (c) maneuver, (d) intelligence, (e) combat service support (CSS), (f) mobility/countermobility/ survivability, and (g) air defense artillery. RCVTP battalion AARs were not grounded in the BOS system for several reasons. First, not all of the BOS are represented at the battalion level. For example, mobility/countermobility/survivability and air defense artillery assets are only partially integrated into the battalion system. Furthermore, there are limits on fire support and intelligence assets at the battalion level. Second, Brown (1992) has called attention to problems of synchronization of the battlefield in terms of a failure to fully appreciate communications and coordination issues that transcend the BOS. Similarly, Olmstead's (1992) analysis of battle staff effectiveness points to the need for military units in battle to successfully handle information flow, information analysis, and decision-making. Third, the battalion ARTEP 71-2-MTP (Department of the Army (DA), 1988e) was the base document for identifying tasks and subtasks most germane to the battalion RCVTP exercises. This document emphasizes maneuver. Thus, the BOS were not adopted as the conceptual scheme for organizing the content of AARs; they were seen as being too broad for the battalion level and, at the same time, too narrow in that they fail to give sufficient emphasis to integration and synchronization issues.

Instead of the BOS, the contents of the AARs were driven by the aforementioned battalion ARTEP (DA, 1988e). This document provided a thorough review down to the subtask and subtask standards levels to identify actions required by the command group (commander, fire support officer [FSO], and S3), the staff sections within the Main CP to include the S3 section, S2 section, and fire support section, and the S1 and S4 elements in the combat trains command post (CTCP). Some subtasks and subtasks standards repeat in identical or nearly identical forms across different tasks within ARTEP 71-2-MTP (DA, 1988e). These redundant subtasks or subtask standards were combined and reworded as necessary to express the action more clearly. This analysis provided lists of activities to be monitored by O/Cs and discussed in AARs. In order to add structure to these lists, they were sorted into four interrelated categories.

1. Command and Control. The authority and direction a maneuver commander exercises over organic and assigned combat power in the accomplishment of the mission.
2. Coordination and Dissemination of Information. The requirement of acquiring, analyzing and using knowledge of the enemy, weather, terrain, and friendly forces that a commander must perform in order to plan, prepare, and conduct combat operations.
3. Control of Direct and Indirect Fires. The employment of direct and indirect fire weapons, platforms, and systems through synchronized movement, fire, and maneuver to achieve a position of advantage in respect to enemy ground forces, in order to accomplish the mission.
4. Reporting. Transmission of information by any means (verbal, written, electronic) from one person to another to provide timely dissemination of critical intelligence to all appropriate members of the combined arms team.

The SOW suggested examining the Combat Critical Functions (CCFs) being developed by BDM Federal, Inc. (Harrison, 1993a, 1993b) as an alternative task source. Two factors limited the utility of these analyses for the RCVTP. First, the CCFs were created as a means of organizing ARTEP tasks to facilitate training need analysis. In the RCVTP, critical tasks were identified by the NTC-based scenarios. Second, the maneuver CCFs were not completed before the deadline for the identification of the battalion training objectives.

Observation lists, organized by the RCVTP combat functions, were created for the command group, the S2 section, S3 section, fire support section in the Main CP. A composite list that covers both S1 and S4 activities was created for the CTCP. A combined list was created for the CTCP so that a single O/C could monitor the CTCP. After battalion SIMNET trials, another observation list was generated for the O/C at the fire support workstation. This O/C controls artillery for the exercise by controlling the simulation equipment and by playing the role of the brigade-level fire support element. These various lists are presented in the respective exercise workbooks for the senior O/C, the Main CP O/C and his assistants, the CTCP O/C, and the fire support O/C. During execution of the battalion SIMNET exercise or Janus-Mediated Staff Exercise (JMSE), O/Cs keep a log that notes performance related to the listed activities. They use these notes to select topics for discussion in their AARs.

These observation lists were used throughout the pilots and trials for both SIMNET and JMSE training. In general, they achieved their purpose of providing guidance and structure to O/Cs in terms of the kinds of performance issues the O/Cs needed to be observing. Two related issues arose, however. First, the O/Cs preferred to conduct their AARs chronologically by major events; the log format of record keeping facilitated this. However, the log made it difficult to summarize performance by combat function. As a remedy, one of the O/Cs constructed a matrix to replace the simple log form. Columns of the matrix represented exercise events and rows represented the various tasks to be observed. Keeping his notes in the cells of this matrix gave the O/C a better feel for the overall performance of the unit. This matrix form is similar in concept to the AAR worksheet used in platoon and company training. Matrices like these were constructed by the O/Cs for the S2 section, S3 section, and Fire Support Section. Second, O/Cs needed to be experts in the area they were

observing and sufficiently familiar with the exercise to recognize the whether the specific behavior being observed was an appropriate application of the actions identified in the observation lists. Given the size and structure of the O/C Team, it was not always possible for every observation assignment to be filled with the requisite O/C.

The observation lists represented a compromise. A more ideal solution, according to Brown (1992), would be to have significant actions listed by event in more explicit detail than that provided by the ARTEP-based actions. These details were to have been derived from the story line that was to have been received from the NTC. An early attempt to create these events without the help of a historical story line failed. After the pilots and trials, another attempt was made to delineate the actions that would be expected for the S2 section, S3 section, Fire Support Element (FSE), XO, and FSO on an event-by-event basis. For example, instead of instructing the S2 section O/C to observe the S2 tracking the OPFOR, the S2 O/C would be instructed to observe whether the S2 reaches a particular prediction or conclusion about the OPFOR after a given event. These staff action-by-event matrices were not completed by the SIMUTA Team by the end of the contract, but the analysis was assumed by the O/C Team for completion.

Note the absence of explicit attention to the battalion commander in the AAR design. A broader discussion of this decision appears in the final chapter of this report, Lessons Learned.

AAR Scheduling

The philosophy adopted to drive platoon and company AARs was adopted to drive SIMNET and JMSE training: AARs should be conducted with a minimum of delay after exercise completion. There are several factors that make it possible to dramatically shorten the AAR time cycle used at the NTC and other Combat Training Centers (CTCs). First, using either SIMNET or JMSE, the O/Cs, as a team, are in a position to see and hear everything that happens. They are in direct communication with each other during the exercise so they can share what they are observing and begin identifying AAR discussion points while the exercise is still ongoing. Therefore, little time is needed after the exercise to assemble as a team to share observations. Second, the SIMNET and JMSE playback capabilities are almost instantaneous. If the O/Cs are keeping notes regarding the timing of significant events, it takes little post-exercise time to structure a quick visual replay review of the battle. Third, the exercises are structured. Certainly, the battalion exercises are less predictable than the platoon and company tables; however, all repetitions of the battalion exercises are driven by the same order against the same OPFOR and the same events lists that structure the brigade role in the exercise. After seeing three or four pilot tests and trial executions of the SIMNET and JMSE missions, the O/Cs began to anticipate the kinds of difficulties typically experienced by units. With each iteration, the O/Cs more rapidly identified topics and structured their AARs. Given these factors, full battalion AARs were started within two hours of the end of an exercise. That leaves little, if any, time for O/Cs to conduct traditional rehearsals of the AAR. By its very design, the discovery process of AARs cannot be fully rehearsed anyway. Therefore, it is the RCVTP philosophy that well-honed O/Cs can conduct quality AARs with minimum delay and maximum payoff in productive training time.

Figures 20 and 21 present two alternative AAR schedules that model the goals of the SIMNET battalion exercises. The shorter "informal" schedule is explicitly intended to get the unit back into the simulation for a second execution of the exercise. If for some reason, a second iteration is not planned (e.g., the Defense in Sector exercise takes four to five hours to execute), the "formal" schedule allows more time for discussion at each echelon.

Figures 20 and 21 also indicate some of the additional scheduling decisions reached regarding the design of the RCVTP battalion SIMNET exercises. AARs are held for the companies, the scout platoon, the Main CP, and the CTCP concurrently. Within the Main CP, all sections are combined; however, issues related to individual sections may be addressed. In addition, informal discussions between section O/Cs and their sections are often held before or after the Main CP AAR. Then Fire Support Teams (FISTs) are dismissed from their companies and the fire support section is dismissed from the Main CP so that a fire support AAR can be conducted. During exercise trials, units did not bring their complete fire support element, so these fire support AARs were not fully executed. The full battalion AAR occurs after the subordinate O/Cs have had time to report back to the Senior O/C regarding some of the discussions in the subordinate AARs. The full AAR is scheduled to last only one hour. During the trials, the Senior O/C tended to lengthen these to 90 minutes. The only danger in lengthening AARs is that the O/C will not be forced to keep the AAR focused and runs the risk of losing the attention of the audience.

Similar scheduling decisions were made for JMSE except that the exercise focused only on the Main CP and the CTCP. Within the Main CP, informal AARs were scheduled for each section. Some confusion was created during the trials because of the ambiguity of the S3's location. On two occasions the S3 did not stay in the Main CP but role-played from a Janus workstation. The designated S3 O/C accompanied him at the workstation. As a result, the S3 section in the Main CP had no observer, and consequently, no AAR. In addition, the senior O/C monitored the overall operation of the Main CP, which implied that he monitored the XO. Given the AAR schedule, the XO's actions were discussed as part of the overall operation of the AAR, but he had no "section" AAR to attend. The new staff action matrices being developed explicitly address the XO actions and will necessitate an alteration in the AAR schedule.

AAR Effectiveness

With each iteration of pilots and trials, the O/C Team increased its sense of timing needed to drive the compressed schedule prescribed for RCVTP AARs. There was no time to waste or delay in executing AARs. Every minute the O/C used for preparation represented a minute that the unit was waiting and could have been using to execute the exercise a second time. The value of rapidly starting AAR discussions was evident as the SIMUTA and O/C Teams observed the excitement and enthusiasm the units had immediately after the end of the exercise. Internal conversation abounded in which unit members conducted their own self-appraisals and self-diagnoses. The longer the wait for the AAR, the more time there was for the O/Cs' "hot issues" to have already been informally discussed by the unit and the post-exercise excitement to wear off.

Data Form	O/C Positions	30 min	60 min		60 min	30 min
7	Senior O/C Senior Asst	All O/Cs brief Senior O/C	Organize, Develop, Rehearse Bn AAR. Discuss AAR topics with Bn Cmd		Senior O/C conducts Bn AAR	Tactical Discussion with Cmd Grp (optional)
	ECC BDE Control OPFOR Team		Support Bn AAR preparation		Support Bn AAR	
Data Form	**O/C Positions**	**30 min**	**30 min**	**30 min**	**1 hour 30 min**	
1 2 2 2 2 3.1 3.2 4 5	Sct Plt O/C- Sct Plt Asst A Co O/C- A Co Asst B Co O/C- B Co Asst C Co O/C- C Co Asst D Co O/C- D Co Asst Main CP Observer; Main CP Assts (S3, S2, FSS) CTCP Observer	**Leaders** brief Senior O/C on subordinate units **Assistants** support AAR prep	**Leaders** conduct subordinate AARs **Assistants** support leaders during AAR		**Leaders** prepare Take-Home Packages **Assistants** conduct PLT Tables	
4	FSS O/C		Assist Bn AAR Prep	Conduct section AAR	Asst Bn AAR	

Figure 20. RCVTP battalion AAR schedule (formal).

Data Form	O/C Positions	15 min	30 min	30 min
7	Senior O/C Senior Asst	All O/Cs brief Senior O/C	Organize, Develop, Rehearse Bn AAR. Discuss AAR topics with Bn Cmd	Senior O/C conducts Bn AAR
	ECC BDE Control OPFOR Team	Support Bn AAR preparation		Support Bn AAR
Data Form	**O/C Positions**	**15 min**	**30 min**	**30 min**
1 2 2 2 2 3.1 3.2 4 5 4	Sct Plt O/C- Sct Plt Asst A Co O/C- A Co Asst B Co O/C- B Co Asst C Co O/C- C Co Asst D Co O/C- D Co Asst Main CP Observer; Main CP Assts (S2, FSS) CTCP Observer FSS O/C	**Leaders** brief Senior O/C on subordinate units **Assistants** support AAR prep	**Leaders** conduct subordinate AARs **Assistants** support leaders during AAR	Attend Bn AAR

Figure 21. RCVTP battalion AAR schedule (informal).

The most productive trial days were those in which units were able to start early and the O/Cs were able to conduct AARs quickly in order to squeeze in two executions of the battalion MTC exercise. Repetition of the exercises, even when shifting from the MTC to the DIS allowed for an effective AAR technique. The O/C focused the unit's discussion on how it would execute problematic actions differently in the next exercise. This focus kept the discussions from dwelling on explanations of the past. The technique was so effective that its absence left a void in the AAR after the final exercise. This void was filled by having the unit identify specific corrective action plans to be implemented after they returned to their home station.

Battalion exercises were originally planned to include the possibility of conducting interim AARs between identified segments of the mission. As the exercises were developed, the idea of interim AARs became increasingly problematic. First, stopping and restarting a SIMNET exercise creates some technical problems. For example, if an exercise is stopped with a ModSAF OPFOR vehicle in contact with a manned simulator, when the exercise is restarted that OPFOR vehicle will engage the manned simulator before the crew in the manned simulator can react. Second, in practice neither the MTC nor the DIS break cleanly between segments, and the coordination of the transition between segments is one of the key functions units must learn to handle effectively. Therefore, the interim AAR concept was not implemented.

Battalion Take-Home Package Design

The battalion Take-Home Package is similar to the Take-Home Package for platoon and company exercises in that the feedback succinctly focuses on the tasks targeted for monitoring by the observation lists. Thus, using the observation lists for each of the respective components of the battalion, O/Cs make comments indicating strengths and weaknesses in the battalion's performance. In addition, a narrative similar to that used for platoon and company feedback was designed to allow O/Cs to discuss more open-ended issues. Other modalities were considered, including videotapes of the AARs and videotapes of Plan View Display (PVD) or stealth views of the exercise. These were rejected from a cost/benefit stand point.

Simulation Networking Exercises

SIMNET exercises focused on training the battalion executing the MTC and DIS exercises. This section describes first the management and then the development of these exercises.

Exercise Management

Conduct of a battalion SIMNET exercise requires up to 26 O/C personnel. Generally, the DIS scenario is more complex than the MTC scenario. However, the most important determinant of manning requirements will be availability of trained personnel. The design of the organization is reflected in Figure 22. While the numbers of total control persons may vary, a requirement for 12 distinct functions generally organized by workstation does not change.

Figure 22 shows the Senior O/C with two cells under him: the Exercise Control Cell and the Unit Observation Cell. The Exercise Controller controls the activities of the three cells under him: the OPFOR Control Cell, the Higher and Adjacent Unit Cell, and the Fire

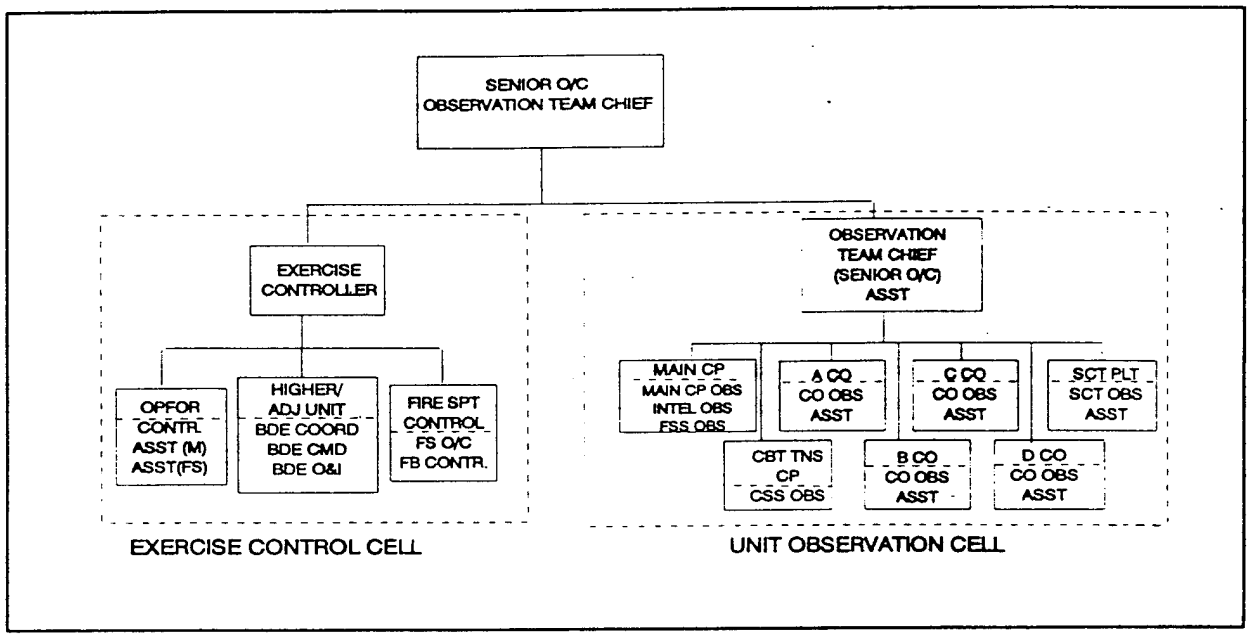

Figure 22. Organization of RCVTP O/C control and observation cells for battalion/task force exercises.

Support Control Cell. The functions of each of these cells and the Exercise Controller are described in this section. (The organization and function of the Unit Observation Cell is explained in the AAR section of this chapter.)

Exercise Controller

The Exercise Controller (EC) is responsible for all exercise events, except individual O/C observations and the conduct of AARs. The Exercise Controller must be intimately familiar with the scenarios and input requirements to drive the Main CP and the CTCP. He must maintain constant contact with all internal exercise control cells and must be in constant communication with the O/C observer group located in the Main CP and the CTCP. The EC is normally responsible for displaying battle replay and post exercise information during the battalion AAR. During preparation for the AAR, the EC and Senior O/C or AAR briefer must review the replay and select, rehearse, and coordinate appropriate presentations. A detailed description of the EC's functions are located in the *SIMNET Exercise Controller Workbook*.

Higher Headquarters and Adjacent Unit Cell. This cell consists of three people: a Brigade Coordinator, a Brigade Operations/Engineer Semi-Automated Forces (SAFOR) Controller, and a Brigade Intelligence/Support Controller. This cell is responsible for all message traffic to and from brigade on the brigade command net, the brigade operations and intelligence net, and the brigade administration and logistics net. The cell sends both

prepared message traffic (used to generate battalion CP/CTCP performance) and reacts to traffic originated by the battalion commander and Main CP. At Senior O/C and EC direction, it may also initiate specific brigade commander traffic to keep the training unit on track within the exercise scenario or cause specific situational events to occur.

This cell is primarily a communications operation. It does have a requirement to maintain a log of radio traffic. However, it is important to note the cell is more than just a radio station. These O/Cs must be sufficiently knowledgeable of brigade command, brigade intelligence, and brigade logistics operations to provide realistic input while role playing all three of these entities. In short, they must appear to the Main CP and CTCP as a real higher headquarters. The requirement is for this station to be staffed by a least one individual with knowledge and experience of brigade-level operations. The cell must maintain a situation map with overlays and post exercise events in the brigade and division sector as they occur.

The cell has distinct responsibilities during the preparation of the AAR. They must provide specifics for how the battalion staff performed in providing information to the brigade and responding to requests from brigade. This is done separately for each of the brigade entities: command, intelligence, and logistics. A full description of the functions of this cell are located in the *SIMNET Higher Headquarters and Adjacent Unit Observer/Controller Workbook* .

Fire Support Control Cell. The Fire Support (FS) Control Cell is a two to three-person operation, performed at a Modular SAFOR (ModSAF) workstation. The FS Control Cell functions as both the supporting artillery unit and the Brigade FSO. Except for counter-battery fire, the FS Control Cell will normally not initiate any fire support missions on its own. Because the FS O/C also operates as the Brigade FSO, the FS Control Cell must also coordinate off-line, or over the exercise control net, with the Higher Headquarters and Adjacent Unit Cell.

Artillery is an effective element in SIMNET; however, the concentration of SIMNET is on maneuver and the staff's coordination of all resources. Artillery is one of these resources but it is not meant to be the definitive factor in the exercise. Accordingly, the FS Control Cell operates under a set of restrictive guidelines as to the number of missions it has available, and the types and numbers of rounds available. Under these guidelines, the FS Control Cell, operating as the Brigade FS Headquarters, will deny battalion fire missions on a selected basis.

It is important that the O/C assigned to the FS Control Cell be knowledgeable of fire support procedures, experienced with artillery and mortar operations, and familiar with the employment of precision-guided munitions and Field Artillery Scatterable Mine System (FASCAM). The FS Control Cell participates in the battalion AAR and provides information to the Main CP O/C responsible for the Fire Support Officer (FSO)/Fire Support Element (FSE) portion of the Main CP AAR. After the Main CP AAR, and before the battalion AAR, the FS O/C also conducts a short FS AAR with all unit FSOs. The FS O/C is responsible for providing a synopsis of the relay of fire request information and of the fire support requests and reports to brigade. A full description of the functions of this cell are located in the *SIMNET Fire Support Exercise Guide and Observer/Controller Workbook.*

Observer/Controller Training

The SIMUTA Team presented the O/C Team a three-day training session on battalion-level SIMNET exercises in December. During the first day of training, the SIMUTA Team described and gave an overview of the exercises. They then conducted sessions regarding how to manage and control the exercises. This was followed by a description of how to prepare and conduct the AAR and how to prepare the Take-Home Package. On the second day, the SIMUTA Team took the O/Cs through map exercises of both the MTC and DIS. The third day of training concentrated on fire support operations, the OPFOR, exercise control operations, and Battalion AAR support. After this training, the O/Cs participated in the Tether Exercise (described later) to give them a better understanding of the how to conduct a battalion-level exercise.

Exercise Development

Development of Exercise Outlines

Task selection for the battalion MTC and DIS missions specified that the mission be composed of task-based segments. For the MTC missions, these included the following five segments: (a) Move Tactically, (b) Fight a Meeting Engagement, (c) Hasty Attack, (d) Consolidate, and (e) Reorganize. For the DIS mission, these included the following four segments: (a) Battle Handover, (b) Defeat Motorized Rifle Regiment (MRR) First Echelon, (c) Defeat MRR Second Echelon, and (d) Re-establish Sector.

During late August and early September 1993, the Battalion Team began wargaming these missions by conducting map exercises. These map exercises attempted to verify what tasks should be performed in the exercise segments and to provide a timeline for each of the exercise segments. Additionally, during this timeframe, the developers explored the SIMNET NTC terrain database in an attempt to discover intervisibility lines, verify key terrain, and optimize defensive positions.

Internal Exercise Pilots with O/C Team

In late September and early October of 1993, the SAFOR were tested in the context of the battalion offensive and defensive scenarios. This pilot test had the following six objectives:

1. Check the SIMNET NTC terrain database.
2. Verify and refine the enemy forces (REDFOR) maneuver programmed as SAFOR for both the DIS and MTC missions.
3. Verify the friendly forces (BLUEFOR) order for DIS and MTC missions.
4. Draft the BLUEFOR decision support template (DST) for DIS and MTC missions.
5. Verify consistency between identified training objectives and exercises.
6. Become knowledgeable on using the SIMNET system.

The Battalion Team found that the NTC terrain database replicated the intervisibility lines of the NTC well. Accordingly, they believed that the units would benefit from performing a reconnaissance of proposed battle positions prior to their exercise. The team did find discrepancies between special SIMNET maps produced by the Defense Advanced Research Projects Agency (DARPA) and the actual terrain in the simulation. Because of this, the Battalion Team felt that they must go back and check all routes and battle positions that had been specified to avoid the "slow-go" and "no-go" terrain areas.

The Battalion Team had difficulty moving SAFOR formations larger than a motorized rifle company (MRC) through the Brown/Debman Pass/Ridge complex at the NTC. This led to activating all SAFOR formations except the combat reconnaissance patrols (CRPs) and forward security element (FSE) on the eastern and southeastern side of the ridge complex. This finding also required the Battalion Team to develop specific timelines for activation of the RED SAFOR according to threat doctrine. Control measures were created for the RED forces to signal formation changes, limits of advance, and execution of fires, as well as contingency actions.

The Battalion Team found that the SAFOR scouts did not survive well. To create high reliance of the BLUEFOR on "eyes out front" implied that the scouts must survive initial contact. The Battalion Team also decided that the message traffic from higher headquarters and flank units needed to mirror the anticipated flow of the battle, and that these messages should be keyed to the task forces attainment of checkpoints or phase lines.

At this point, the Battalion Team felt that the MTC mission was 90% completed. This implied that the BLUE order could be replicated with strict controls of BLUEFOR and REDFOR maneuver options. The team estimated that the DIS mission was within 70% of completion. The team thought that the Battle Handover Segment and the routes of the Motorized Rifle Regiment (MRR) main body in the engagement of the MRR first echelon segment needed refinement. Additionally, the REDFOR schedule of fires needed to be synchronized with RED maneuver. The consolidation segments for both the DIS and MTC still needed to be tested.

The Battalion Team was still in the conceptual phase for the BLUEFOR DST. The pilot test stimulated some discussion on decision points but the drafting of the DST was not accomplished during this phase.

As a result of these pilot tests, the team had to make only a minimum number of alterations in the tasks that would be included in the exercises. The lists of supporting tasks for the battalion staff and subordinate units, however, had yet to be finalized. The team thought that a later series of staff exercises would be needed for both the MTC and the DIS scenarios to analyze these activities. The pilots also created debate within the team as to how to collect data for AARs and Take-Home Packages. Based on internal discussions, the team decided they needed to create a draft checklist form for O/C duties.

According to team members, this exercise opened their eyes on the complexity of conducting a battalion-level exercise in SIMNET. Clearly, the team members achieved a better appreciation of the capabilities and the limitations of SIMNET.

Quality Assurance Testing

The Battalion Team planned a series of exercises within SIMNET starting during late October and ending in mid-December of 1993. The purpose of the first of these exercises was to validate the SIMNET planning sheets which detailed starting locations and unit organization. In addition, the Battalion Team would validate the routes and movement formations for the OPFOR. This second round of pilot tests served as special quality assurance tests. During the validation of the SIMNET planning sheets, each of the segments was verified using ModSAF.

The first six sessions were to be 4-hour blocks of time in SIMNET. The objectives of the sessions were to (a) correct the planning sheets for four exercise segments, (b) integrate the artillery fire plans for both offense and defense, (c) test the DIS barrier plan, and (d) explore variants for the FSE fight in the DIS and the advance guard main body attack in the MTC. The problems identified in this first session were used as specific issues in subsequent quality assurance tests.

The first quality assurance test was conducted in November to test the MTC exercise. The objectives were to (a) evaluate the MTC exercise as a staff trainer, (b) evaluate the effectiveness of exercise vertical message traffic, (c) refine brigade message traffic, (d) evaluate Mounted Warfare Simulation Training Center (MWSTC) Main CP mock-up as an effective simulation, and (e) refine the quality assurance method for the Tethered Exercise (Tether EX). From their observations, SIMUTA Team members believed the test supported the following conclusions:

1. The MTC provided sufficient stimulus for effective staff training.
2. More work had to be done on the vertical message traffic.
3. The MWSTC main command post mock-up was an adequate simulation.
4. There were some minor changes needed in the quality assurance methods.

One week later, the team conducted a similar test on the DIS exercise. The team wanted to (a) verify the accuracy of vertical message traffic, (b) validate the sequencing of the counter-reconnaissance battle, and (c) evaluate the diad/triad activities with the battalion staff actions in the main command post. SIMUTA observers reported two problems. First, the exercise elicited little or no bottom-up intelligence during the counter-reconnaissance battle because of the quick death of the scouts. Second, the exercise provided for insufficient amounts of lateral message traffic on the brigade nets; command posts were unable to eavesdrop.

The internal exercise pilot revealed problems with scout survivability and key actions within the DIS exercise. As a result, the team tested the scout portion of the battalion exercise in December 1993. The team focused its efforts on segments A and B in the MTC and segment H of the DIS. Specifically, the questions related to: (a) determining if a "survival differential" exists between SAFOR-generated tethered scouts and manned scouts, (b) evaluating the impact of "man in the loop" on the established exercise planning times, (c) evaluating the effectiveness of combat intelligence generated by the scouts, and (d) determining if opposing forces (OPFOR) SAFOR settings were correct for CRP and FSE

portrayal while helping to counteract the inherent vulnerability of placing scouts in unarmed Bradley vehicles because of SIMNET's lack of High Mobility Multipurpose Wheeled Vehicles (HMMWVs). During the pilot, the team made the following four discoveries:

1. There are ways to increase the survivability rates of the scouts.
2. The scouts were slower in the MTC than the planning times but faster in the Battle Handover (Segment H).
3. Standard reports are sufficient to provide information for the staff to use.
4. Scouts must survive the initial contact with the OPFOR.

In early December, the team also checked key actions in the DIS scenarios. The team wanted to look specifically at the defense at battle position (BP) 12 and the conduct of the battalion local counterattack. In this regard, they reached the following conclusions:

1. A unit can defend in BP12, but a realistic disengagement criterion had not been provided.
2. Some portions of the barrier plan were very effective while other portions required some modifications.
3. The average time for the movement and attack in the counterattack was 40 minutes, which resulted in revising the trigger for launching the counterattack tying it to an obstacle.

The last of the quality assurance checks took place in mid December. During the first phase, the team looked at Segment K to validate the critical subtasks, the tasks of the scout platoon, the battalion movement forward to the original battle position, and to evaluate the staff diads and triads. Later, the team looked at Segments C and D to evaluate D company's tasks and the scout platoon's tasks. The team also looked at Segment H to validate critical subtasks, evaluate the scout platoon tasks, and evaluate the OPFOR courses of action in terms of the artillery and FSE in clearing Brown Pass. Finally, the team looked at segment J to evaluate BP41 and BP43 defense and the counterattack by B Company.

Tethered Exercise

In December 1993, the SIMUTA Team provided the O/C Team training on the battalion materials. As this was the O/C Team's first introduction to the total battalion package, the Battalion Team conducted a scaled-down version of the battalion exercise, called the Tether EX. The general purposes of the Tether EX were to provide a familiarization for the O/Cs, trial the exercises, and investigate the O/Cs' understanding and implementation of the material. The specific objectives for this exercise were to (a) expose the O/C cell personnel to the battalion/task force exercise in a player role; (b) provide an initial trial of O/C cell chain of command and personnel in exercise control capacity; and (c) provide quality assurance test of exercise supplemental materials and the third-generation exercise product. The Tether EX required the participation of selected battalion members in vehicles and in the Main CP. Personnel from the O/C Team, augmented by SIMUTA staff, filled the roles of observers and controllers.

Both the O/C Team and the contractor team discovered some needed changes in the exercise materials. These changes were reviewed for incorporation into the pilot in early February. Unfortunately, the O/C manning level was insufficient to evaluate the O/C structure adequately. The evaluation of this structure would have to wait until the pilot test. The controllers had problems getting tethered vehicles to respond as quickly as a manned platoon, and sending reports from the tethered vehicles. However, the team found that the exercise segment planning times were the same or slightly shorter for this group of players.

After the completion of the Tether EX, the Battalion Team devoted its efforts to preparing for the SIMNET pilot. This preparation consisted of incorporating lessons learned from the Tether EX into the exercise and in developing an O/C Training Guide and an O/C Workbook for each of the nine stations.

External Exercise Pilots

The Armor School made arrangements for an Armor Officer Advanced Course (AOAC) class to assist in the armor battalion pilot test in February 1994. The AOAC officers filled all the positions in the battalion. The AOAC officers switched positions between day one and day two: The officers who were in the simulators the first day switched to staff positions on the second day, and vice versa. The external exercise pilot had six objectives:

1. Exercise MWSTC O/C Team in the role of EC.
2. Conduct trial of battalion exercise initiation process.
3. Evaluate O/C Workstation - SAFOR interface.
4. Exercise AAR data collection tools.
5. Conduct trial of Battalion AAR preparation.
6. Evaluate Battalion AAR format and presentation.

The role of the EC proved to be very complicated and did not meet the expectations of the Battalion Team. The SIMUTA concept was for the EC cell to role-play the brigade command group. Part of the methodology was for the EC cell to mentor and coach the battalion commander and his staff into the flow of the exercise. This concept was neither properly conceived, nor well received by the O/C Team. Nevertheless, the pilot did not change the Battalion Team's concept of the role of the EC cell. The Battalion Team remained convinced of the importance of the cell to function as conceptualized. The result was that the Battalion Team had to re-look its explanation and guidance for the cell.

The battalion exercise initiation process was designed to provide the O/C Team guidance on coordinating all the details of a SIMNET exercise. One of the purposes of the trial was to instruct and provide assistance to the O/C Team in conducting exercises in SIMNET. The exercise initiation process consolidated the lessons learned by many of the SIMUTA staff members who worked with SIMNET in the past. During the pilot, the SIMUTA Team expected the O/C Team to do all the coordinating with the unit and the SIMNET site for the pilot. However, all the necessary coordination was not accomplished by the O/C Team. As a result, the Battalion Team discovered that they needed to work with the O/C Team on the exercise coordination.

During this time frame, the O/C Workstations were still being modified to include ModSAF and DataLogger capabilities, and problems with the software were constantly being identified and corrected. The intent of this evaluation was to check the interface between the O/C workstation system and the SIMNET system. The original concept was to conduct the battalion-level AAR in the large classroom at the MWSTC building by replaying exercise segments on three large-screen televisions; however, the mechanism was not available.

SIMUTA staff noted that the Senior O/C conducted a verbal data exchange with the entire O/C Team at the conclusion of the exercises instead of using the data collection instruments as had been intended. This data exchange was more time consuming than had been anticipated. Throughout the trials, the O/Cs worked to streamline this exchange.

The O/C Team was dependent on the contractor team for the preparation of the playback for the AAR. For the pilot, the wiring of the O/C workstations for the replay of battle segments in the classroom was not yet accomplished. This required the contract team and site technicians to transfer files to the DataLogger system for the replay.

Initial Trials

The purpose of the initial trials was to test all the scenarios with actual unit participation and the O/C Team controlling and providing the training unit with AARs and Take-Home Packages. Following this procedure allowed the Formative Evaluation Team the opportunity to observe the execution and make suggestions for improvements on the material.

Armor battalion initial trial. An Army National Guard (ARNG) armor battalion assisted with the initial SIMNET battalion trials. The unit conducted the MTC exercise twice on March 15 and the DIS exercise once on March 17. Based on interviews and discussions with unit members, the unit did little preparation before the start of their two-week annual training (AT). During their AT, they assisted in platoon, company, and JMSE trials before they executed the battalion-level SIMNET trials. The day before each battalion exercise, the unit conducted a full day of rehearsal, part of which was on SIMNET and the NTC database. There were several areas of the training program in need of revision. These areas were the Higher and Adjacent Unit Cell, the Fire Support Cell, and the entire Combat Service Support (CSS) portion of the exercise.

Armor task force initial trial. An Active Component Army task force assisted with the initial SIMNET task force trials. The unit conducted one MTC exercise on April 19 and one DIS exercise on April 20. The Battalion Team planned to have the O/C Team take more responsibility for controlling the exercises. The Battalion Team was only to observe and was not to take as active a role in controlling the exercise as had been the norm in previous trials. They were, however, to continue assisting the O/C Team in preparing for and conducting the AAR.

The trial resulted in the identification of deficiencies in the same areas that had been identified in the previous trial as needing work. These areas were the Higher and Adjacent Unit Cell, the FS Cell, and the CSS portion of the exercise. The FS Cell was not thoroughly tested during this trial because the unit did not fully staff their fire support section.

The CSS portion was expanded from the previous trials but much of the material was still being developed. This material included the message traffic from brigade and the adjacent units on the administration and logistics (A&L) net. Additionally, the Battalion Team was still working on a means of generating information for the units to report to the CTCP. This included a means of assessing casualties and determining whether vehicles were damaged or destroyed. This information would provide the units the ability to report this information to the CTCP.

The execution of the concept for the Higher and Adjacent Unit Cell still did not meet the Battalion Team's expectations. Some additional material had been developed and put into the Cell's workbook. This material was used but the concept of role-playing was still not fully executed.

Refined Trials

The refined trials provided the SIMUTA Team an opportunity to observe the modified exercises conducted with actual units. They had an opportunity to check the modifications and determine if any additional changes would be required for the final product.

Armor battalion refined trial. An ARNG battalion and an active-duty, armor battalion assisted with the refined SIMNET Battalion Trials. The ARNG battalion provided the units (companies and scout platoon). The active-duty battalion provided the battalion staff and battalion commander. The combined unit conducted one DIS exercise on May 16 and one MTC exercise on May 17.

The Battalion Team delivered updated training material to the O/C Team prior to the trial. These books incorporated all the changes that had been completed in the battalion material since the last trial. The Battalion Team still had not completed all the material for the CSS portion, nor had they completed all of the Higher and Adjacent Unit Cell material.

The AAR/Formative Evaluation Team found the same weak areas as were found in the initial battalion trial and the initial task force trial. The Fire Support Cell material again was not thoroughly tested because the unit had not fully staffed their fire support section. A battle rostering method was tested in the CSS arena. This method was not totally successful nor was it tested as designed. However, the Battalion Team realized that further modifications were necessary to allow the unit to train on CSS. The Higher and Adjacent Unit Cell was still not staffed nor equipped as suggested by the SIMUTA Team. This cell did use the enlarged message traffic but did not role-play as a higher or adjacent unit. As a result, the material for this cell could not be adequately evaluated.

Armor task force refined trial. The Project Research Plan (BDM Federal, Inc., 1993) called for an armor task force refined trial to be conducted on about June 11, 1994. No unit could be obtained for this trial. Therefore, no refined task force trial was conducted. Modifications were made to the final package based upon the lessons learned from the battalion trials.

Final Battalion/Task Force Exercises Package

The draft final RCVTP Battalion SIMNET training package was delivered to the U.S. Army Research Institute for the Behavioral and Socials Sciences (ARI) on August 25, 1994. This training package incorporated all the suggestions and corrections made to the previous material. It consisted of 12 separate guides and workbooks that covered the entire exercise design.

Janus-Mediated Staff Exercises

The SOW called for the SIMUTA Team to develop exercises for the Army version of Janus, based on methods already shown by the Army to be effective. An early change to the work was the substitution of a new Janus system, sponsored by ARPA, to replace the Army version. On September 30, members of the SIMUTA Team received their initial orientation to Janus from the Directorate of Combat Development. Although the ARPA Janus hardware and software did not arrive at Fort Knox until December 1993, the SIMUTA Team continued to investigate how Janus could be used to train a battalion staff. The team examined the tasks that needed to be trained and determined which tasks could be cued by Janus.

In early November 1993, the SIMUTA staff briefed ARI on the Janus Mediated Staff Exercise (JMSE) concept. According to this concept, the Janus simulation provided the events through the simulation and the O/C Team reported the events to the staff in the tactical operations center (TOC). In this way, Janus would be the creator of a master events list (MEL) that would change based on the decisions and actions of the commander and his staff as input by the O/Cs. The key to a successful JMSE would be the role-playing of the O/Cs serving as the company commanders, scout platoon leaders, and other personnel who would actually interact with the simulation. ARI approved this concept for development.

JMSE Management

JMSE training is a battalion staff-only exercise organized around two scenarios: Movement to Contact and Defense in Sector. Both scenarios are designed around a single option organization--a tank heavy task force. Combat support and combat service support are likewise pre-designed. As a staff exercise, the tactical outcome of JMSE is only an incidental adjunct to the training objectives. Although the battalion commander plays an important, active role in JMSE, the focus is on the battalion staff's actions, not the commander's. In particular, the emphasis is on what the staff does or does not do with the information it receives and on the picture of the battlefield that staff members are able to portray.

JMSE is not just a command post exercise (CPX). The battlefield events are generated by actual occurrences within Janus; that is, they are not predetermined or pre-controlled. JMSE is also interactive in that operators respond to directions and instructions from the CP/CTCP much like real units would. The staff must cope with and respond to the "fog of war," which is simulated in JMSE. Because the execution of the scenarios is done on an interactive basis with real participants, no two executions of JMSE are the same.

There are four main components in JMSE: the CP/CTCP, the commander, the Exercise Control (EC) Group, and the Observers. This section deals with the EC Group. See Figure 23 for a conceptual portrayal of the JMSE components. This schema also portrays the EC and observer numbers and assignments that represent the baseline JMSE configuration.

The individuals working at the Janus site location are all EC personnel, performing directly under the control of the Janus Exercise Controller (JEC). The JEC is the single most important entity in the JMSE; he must exert control over the entire EC group. This group is the force that drives what occurs at the CP/CTCP location. The line companies, scouts, combat service support, and fire support are all played out by EC personnel on Janus workstations. OPFOR maneuver and fire support are likewise played on Janus workstations, collocated with, but separate from, the BLUEFOR Janus workstations. A Janus Controller Workstation (CONWOR) is available to the JEC to view both Blue and Red Janus forces during the exercise. A Brigade Control Cell provides communication links for brigade command, brigade operations and intelligence, and brigade administration and logistics interactions with the participating unit battalion. This cell also inputs considerable prepared message traffic according to the higher headquarters and adjacent units master events list (MEL). The Brigade Control Cell has access to the JEC's CONWOR in order to time and coordinate message input. Instructions for the Brigade Control Cell are provided in the *JMSE Brigade Control Cell Workbook.*

The JMSE scenarios are input to Janus based on a predetermined armor heavy task force organization and at pre-specified initial locations. Likewise, OPFOR organization is based on U.S. Army Combined Arms Command and Fort Leavenworth Pamphlet 350-1, *Heavy Opposing Force (OPFOR) Organization Guide* (September 1993). Initial movement routes for all force elements are also included; these may be modified once the exercise is initialized. As the scenario unfolds, Blue interactors[10] report status, phase lines, situation reports (SITREPs), and spot reports (SPOTREPs) over the command net as they normally would occur. In turn, they react to requests for information, fragmentary orders (FRAGOs), and Command and Control (C^2) by manipulating the icons under their control and interacting with the commander and CP/CTCP by the simulated FM communications links. It is important that interactors (both Blue and Red) understand their roles: They should provide input to, and generate events in the CP/CTCP. Although they are operating under JEC control, it is important that interactors each fully understand that gamesmanship and "winning" is not the purpose of their role. This is particularly important for both Red and Blue fire support. Red fire support is prescribed in the instructions contained in the *JMSE OPFOR Controller Workbook.* The Blue Fire Support workstation interactor is also the brigade fire support officer (FSO). The training unit will be limited in the number of missions and types of artillery it can employ. It is the responsibility of the Blue Fire Support Controller, acting as the brigade FSO, to broker the fire support assets honestly and realistically. Specific guidance for Blue fire support are contained in the mission OPORDs and the *JMSE Fire Support Controller Workbook.*

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[10]Interactors represent O/C personnel who play roles during training that would otherwise be filled by unit personnel.

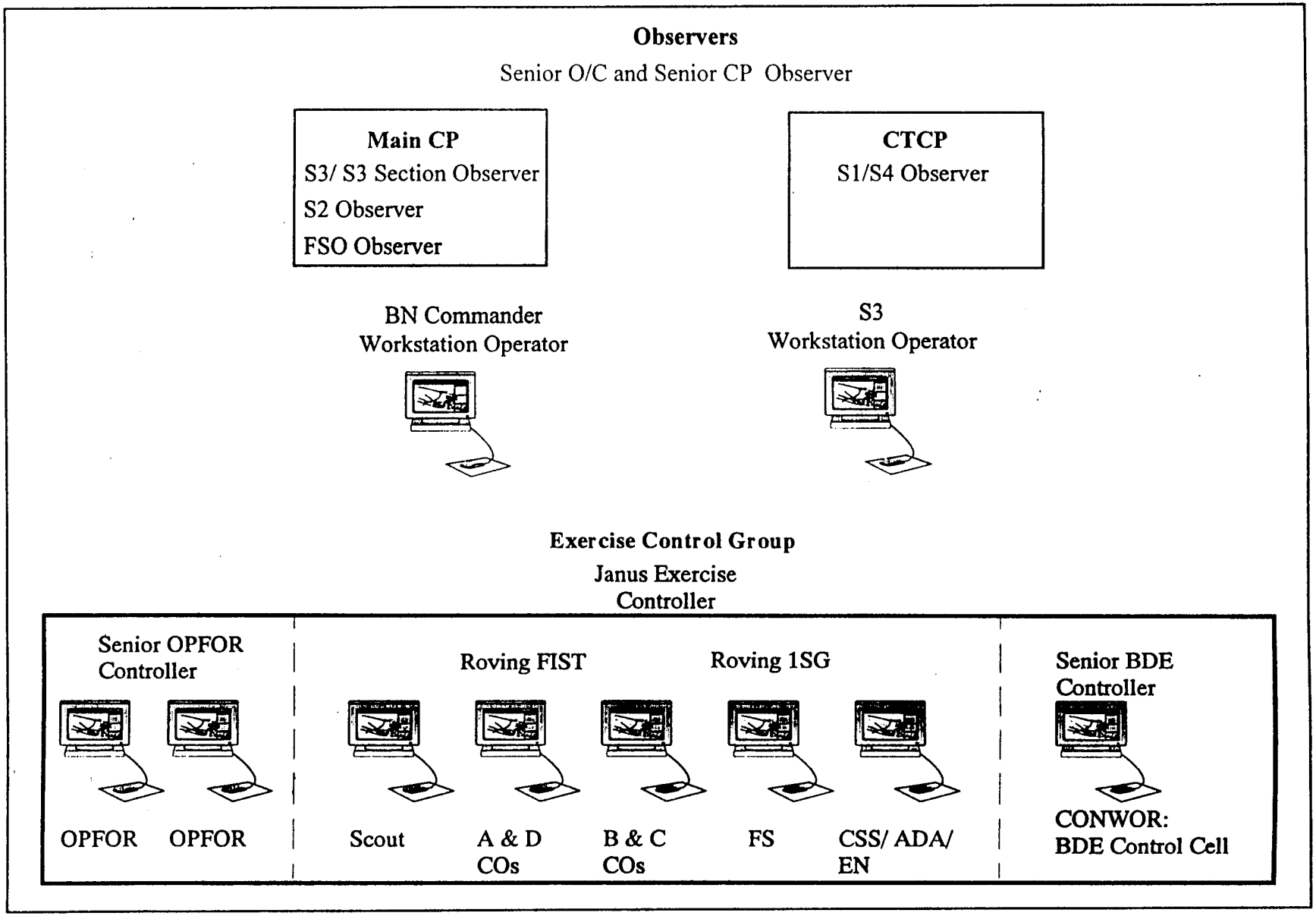

Figure 23. JMSE training components.

The JEC is completely and solely responsible for all phases of the exercise apart from the actual observation of the participating unit staff actions. The JEC has two principal subordinate exercise controllers: the Senior Brigade Control Cell Controller and the Senior OPFOR Controller. Both of these individuals have responsibilities that impose special demands over and above those imposed on other interactors. A sample schedule for JMSE weekend is provided at Figure 24.

Friday Night	
• Receive orientation from the RCVTP JMSE team	1.0 hour
• Begin preparing the JMSE CP/CTCP for the exercise	
• Review orders and plans	
Saturday	
• Complete CP/CTCP preparation	1.0 hour
• Conduct orders brief/rehearsals	1.0 hour
• Execute JMSE Movement to Contact Exercise	1.5-2.0 hours
• Conduct AARs	2.5 hours
Sunday	
• Complete CP/CTCP preparation	1.0 hour
• Conduct orders brief/rehearsals	1.0 hour
• Execute JMSE Defense in Sector Exercise	3.0-3.5 hours
• Conduct AARs	2.5 hours
• Clear facilities	
• Redeploy	

Figure 24. Sample of MUTA 5 IDT weekend for JMSE.

Observer/Controller Training

In mid February, SIMUTA training developers scheduled a three-day training session for the O/C Team on JMSE: The first day of this training was to cover the JMSE concept and the conduct of the exercises; the second two days were devoted to hands-on training on the Janus system. On the first day, the O/C Team was called away to conduct a RCVTP SIMNET exercise demonstration. This training was never made up by the entire team. For the hands-on Janus training, the O/C Team was divided into two groups. Each group attended one day of the training. The members of the O/C Team who would be more involved in JMSE attended both days of the hands-on training.

Development of the Exercise Training Packages

Development of Exercise Outlines

In preparation for the delivery of the ARPA Janus suite, representatives from the Battalion Team attended the Janus operator training at Fort Bliss, Texas in December 1993. This provided the SIMUTA Team the level of expertise necessary to develop the exercises on Janus once the equipment arrived.

Once the ARPA Janus was delivered, the Janus group on the Battalion Team started building the necessary data base for the exercises. The primary data base consisted of the friendly and enemy orders of battle and the unit routes. However, ARPA Janus had a very limited terrain data base, which included the contour lines but none of the man-made features (roads, building, etc.) that may be necessary to conduct the exercises. The SIMUTA Team members added essential man-made features to the data base. Additionally, the ARPA Janus did not have a grid overlay, whereas the Army Janus did have the overlay.

The Janus group conducted in-house training of JMSE for other members of the SIMUTA Team in January 1994. The team members were first trained to be Janus interactors. The training then progressed into exercise rehearsals. Each time through the exercise, additions were made to the simulation. At first, the exercise consisted of only maneuver; later, artillery was added. The amount of detail and complexity was gradually increased. After this training, the Battalion Team members continued to develop the JMSE training.

In February, the SIMUTA Team conducted an in-house Janus Initial Validation Exercise (JIVEX). In this exercise, SIMUTA personnel served as Janus interactors, exercise controllers, and a skeleton primary battalion staff. The Janus training developers had prepared a Janus Guidebook for the operators based on the National Simulation Center Janus 3.X training materials, but adapted to ARPA Janus characteristics. Although the staff was very small, the developers could observe system capabilities and areas where the materials need to be expanded or improved.

Internal Exercise Pilots with O/C Team

The O/C Team assisted by the SIMUTA Team conducted two days of JMSE rehearsals and then two days of pilot exercises (MTC and DIS) with an active duty battalion during four consecutive days in February. During the rehearsals and pilots, the O/C Team filled the roles of staff observers, exercise controllers, and Janus interactors. SIMUTA personnel shadowed the O/C Team to observe, train, and assist. Because of the short time between the JIVEX and the delivery of the initial training package, the SIMUTA Team was not able to make improvements to the material. Consequently, the SIMUTA Team members attempted to verbally convey the new concepts and ideas to the O/C Team.

The exercises ran well, but were hindered by system crashes on the ARPA Janus. At the completion of the pilot, the SIMUTA Team asked for permission to switch to the Army Janus system. This permission was granted and the SIMUTA Team completed the conversion to Army Janus on March 3. SIMUTA used Army Janus for the remaining trials.

As a result of the pilot, the Battalion Team felt that no significant changes were required in the exercise. The developers knew that they had to add more detail to the material and felt that the Brigade Control Cell needed the most reinforcement. However, because of the switch from ARPA Janus to Army Janus and the short period of time available, very little improvement was possible in the training materials prior to the initial trials. The developers devoted time to improving the Brigade Control Cell material and decided that one of the members of the SIMUTA Team would model the functioning of the brigade cell for the initial trial. Additionally, SIMUTA developers wanted to increase the CSS play in the exercise. The developers proposed using a roving First Sergeant (1SG) to provide the personnel and logistics reports from all the companies and scouts to the CTCP. This concept, although not totally fleshed out would also be tried during the initial trial. The developers also proposed to have one O/C make all calls for fire (i.e., a roving company FSO).

Delivery of Initial Battalion/Task Force Exercises

The SIMUTA Team delivered the initial training package of the JMSE material to ARI on February 15, 1994. This training package consisted of the *JMSE Exercise Book*, which was the forerunner of the current *JMSE Training Guide*. This base document included the training objectives, the required O/C cell structure, the unit requirements, and the AAR procedures. Still, the developers considered the initial training package as being very rough--the general structure was in place but the detail was still being developed. The developers were still learning the system and its capabilities because of the three-month delay in the arrival of the system at Fort Knox.

Initial Trials

The initial trials were conducted in March 1993, with one day devoted to the MTC scenario and one day to the DIS scenario. The O/C Team conducted an exercise rehearsal the day before each exercise. SIMUTA observers were satisfied with the concept and the exercises, but realized more detail was needed for the controllers and observers.

Refined Battalion/Task Force Package

The developers prepared a list of design issues upon which they sought agreement from the O/C Team. Members of the SIMUTA Battalion and Project Management Teams met in March to discuss these issues. This group reaffirmed the concept and made decisions regarding the design. Over the next several weeks, SIMUTA developers worked on the training package and delivered the refined package to ARI on May 10, 1994. The training package now consisted of the second generation exercise book (now called the *Training Guide*) and first generation workbooks. Workbooks were prepared for the Janus EC, brigade cell, fire support, maneuver companies, OPFOR, CS/CSS, roving 1SG, and roving company FSO.

Refined Trials

The Battalion Team delivered the refined packages to the O/C Team on April 29 to allow the O/C Team time to review and become familiar with it prior to the refined trials in

mid-May. The refined trials were the first time the O/C Team used the workbooks. The SIMUTA Team asked for specific, detailed feedback on the books so that all the corrections could be made for the final delivery. Unfortunately, only personnel from the brigade cell provided any feedback on the workbooks. Although considerably more information and guidance had been put into this workbook, the brigade cell wanted still more guidance plus some reformatting of the information to make it easier to use. Through direct observation, SIMUTA developers discovered several other areas that needed to be enhanced and refined.

Final Battalion/Task Force Exercises Package

The developers took this information and went to work on the final product. In late July, SIMUTA management made a decision that the JMSE should be a stand-alone product without referencing any other RCVTP materials. This decision necessitated the addition of materials on home station orientation and preparation, take-home package, AAR and workbooks for the observers in the Main CP and the CTCP. A separate *JMSE Orders Book* was also prepared. This final draft product of thirteen volumes was delivered to ARI on September 9, 1994.

Commander/Staff Trainer

Concept Formulation

In late September 1993, SIMUTA management briefed ARI on three concepts for using the Combat Vehicle Command and Control (CVCC) technology in the SIMUTA project: (a) CVCC TOC Workstations as exercise drivers; (b) CVCC TOC Workstations as part-task trainers for primary battalion staff; and (c) CVCC as the vehicle for soldier-in-the-loop simulations for mission rehearsals, war gaming, execution, and AARs. ARI indicated that they wanted the training to focus on information processing.

SIMUTA management briefed ARI again in late October 1993 on the proposed Commander/Staff Trainer (C/ST) design. (C/ST was the new name for the CVCC technology used to train commanders and staffs.) This briefing was developed based on ARI's earlier comments and on the concept of training information processing using the CVCC technology.

The SIMUTA staff gave a revised briefing of the C/ST design based upon the feedback received from the initial briefing and other developments in the SIMUTA project. In this briefing, the staff detailed what would be trained on C/ST, the layout of the command post, unresolved challenges, training design requirements, and milestones.

The SIMUTA staff briefed ARI on the final concept of how the C/ST would be used in late April 1994. This concept called for C/ST to have the following characteristics:

1. Be the crawl phase of battalion crawl, walk, and run.
2. Be used for execution rather than incorporating planning and wargaming.
3. Be used to train information management skills.
4. Be operated by trainees rather than O/Cs.
5. Limit training to principle staff officers and battalion commander.

6. Use pre-recorded scenario, with staff decisions not affecting execution of scenario.
7. Be limited to the movement to contact scenario because of time restraints.
8. Use workstation capabilities like position navigation (POSNAV) and operational effectiveness in AAR only, not in execution.
9. Have the battalion commander in the dual role of trainee and trainer.
10. Recognize that C/ST workstations are different from CVCC TOC workstations in their intention--training versus research.

During the summer of 1994, the two net configuration was changed to a seven net configuration, more closely approximating the number of nets and nodes used in an actual command post. This new configuration required participants to transfer information received on one net to another net. Additionally, the participants are able to send information to a single station rather than to everyone.

Government Furnished Equipment

One of the major difficulties with the development of the C/ST training package was obtaining access to the equipment. The original delivery date of the equipment (CVCC TOC Workstations) for the MWSTC was November 1993. However, this date was revised four times before the CVCC TOC Workstations were finally delivered in May 1994. The software engineering contract to modify the CVCC software into a training package began in May 1994, which was also later than had been originally planned. After these initial delays, the software development progressed on schedule.

The C/ST hardware at the MWSTC was to replicate of the hardware at the Mounted Warfare Test Bed (MWTB). However, the MWTB workstations were IPX machines, which were no longer available. As a result, a newer type of workstation called a SPARC 5 had to be purchased. This change in equipment contributed to delays in obtaining the equipment and added a requirement to do some modification to adapt the software.

Training Development Schedule

The SIMUTA Team was originally scheduled to deliver the initial C/ST training package on February 1, 1994. Because of the delays in obtaining the workstations and the software, the delivery date was changed three times. During the delays, ARI and the SIMUTA Team modified the requirement of the initial C/ST training package. The delivery of the initial training guide occurred on June 30, 1994. In addition to changes in the training guide delivery date, changes were made in the date upon which the "debugged" software was to be delivered. The delivery of the debugged software was finally scheduled for mid-September.

The first in-house pilot for the C/ST was scheduled in January 1994. Because of the aforementioned delays, no piloting of the material on the equipment was possible until September 1994. When this report was written, the in-house pilot was scheduled for Sept 26-

27. A joint contractor and O/C trial was scheduled for October 17-20. All other deliveries for the contract were suspended or were dependent upon developments resulting from the pilots.

Reactions of the Trial Units

The Battalion Team, as had the Company/Platoon Team, relied on feedback from the trial units for an objective assessment of whether the SIMNET and JMSE training provided effective training. The feedback received from the participating pure armor battalions and battalion task forces was positive, indicating that both types of training, SIMNET and JMSE, had helped the units to improve skills necessary for successful task performance. In fact, one unit expressed the excitement of being able to witness improvements in their performance after transitioning from JMSE to SIMNET exercises. The unit said that JMSE had provided good practice for the SIMNET exercises in that their staff sections were able to perform more proficiently.

Overall, units said that the RCVTP SIMNET training provided much more training benefit than had past SIMNET training experiences. One unit believed that the JMSE training improved their ability to work together in the Main Command Post. Furthermore, the quantity of training the unit felt they received from the JMSE training was evident when they indicated that it had been over 3 years since they had last conducted a command post exercise, much less one as realistic as JMSE. Units can typically execute at least two JMSEs in an inactive duty training (IDT) weekend.

According to the trial units, the battalion exercises contained a number of strengths. Many of these strengths regarded the execution and AAR phases. Units reported that the AARs helped them focus on how to improve. In fact, many soldiers voluntarily provided written and spoken comments regarding how the focus on improvement had been a strength of the SIMNET AARs. They believed that the AARs created an environment that encouraged participation, questions, and learning from mistakes. One unit said that members of the staff's sections felt comfortable discussing mistakes in the small group atmosphere provided in the JMSE section AARs. One soldier reported that the AARs provided a forum in which the O/Cs could communicate valuable insights. Other strengths included the professionalism of the O/Cs and the integration of the stealth playback into AAR discussions.

In evaluating the effectiveness of the execution phases of SIMNET and JMSE training, units confirmed several strengths of the execution phases. In SIMNET, units found the opportunity for soldiers who had been "killed" to observe the remainder of the exercise a plus. One unit's leaders said that the OPFOR was far better than what they would have been able to design and provide themselves. Units also felt that the exercise difficulty level was appropriate; one unit believed that it was almost perfect. Finally, units enjoyed the opportunity to train with a simulated higher headquarters.

Another often cited strength was the incorporation of the turn-key concept. One unit commander reported that his battalion was able to focus on the training because they did not have to worry about running the exercises themselves. Another unit believed the support

provided by the O/C Team enhanced the training and that the Team went far beyond their resources to do so.

Negative comments were consistent with those expressed by units who participated in platoon and company training. They related to visual range limitations, cupola inefficiencies, and navigation difficulties. In addition, however, several units remarked that the decreased survivability of the scouts, in SIMNET, rendered their battalion less effective than they would have normally been. In the battalion SIMNET exercises, scouts were often killed before they were able to report enemy contact. This problem resulted from the inability to attain concealment from enemy forces. Again, these simulation-related issues are theoretically rectifiable upon the development of more advanced simulation technologies; and as indicated by the numerous positive comments received from units, the battalion training was still extremely beneficial. A final comment representative of the overall sentiment of training units expressed that the program provided tactical training at all echelons from tank crew to battalion level. Units were grateful for being able to participate.

CHAPTER VI. CAVALRY TROOP EXTENSION

Four cavalry troop exercises were created in order to validate the methodology, process, and products developed for the Reserve Component Virtual Training Program (RCVTP). Their creation was a test to determine whether the established developmental processes could be applied to the development of additional types of exercises. Hence, the design and development of the cavalry troop exercises commenced in earnest after the delivery of the final company exercises on May 2, 1994. In addition to simply validating the established process, SIMUTA was to apply lessons learned from the formative evaluation of the company and platoon exercises. Finally, SIMUTA was to develop extension guidelines for the creation of additional exercises.

Design

The design effort was scheduled to begin upon the receipt of several examples of successful cavalry troop missions from the National Training Center (NTC). Inquiries to the NTC resulted in only a few examples of cavalry operations. The orders and overlays provided were incomplete and included the liberal employment of air cavalry, which is inappropriate in SIMNET. As a result, the design process began with an examination of Field Manual (FM) 17-97 (U.S. Army Armor Center and School, 1994) and the Army Training and Evaluation Program (ARTEP) Mission Training Plan (MTP) 17-487-30 (DA, 1991). Each of the possible missions in these manuals was reviewed. At the time of these reviews, FM 17-97 was still in initial draft form. Furthermore, ARTEP 17-487-30 MTP was actually designed for regimental cavalry troops. The RCVTP cavalry troop exercises were to be designed for the new M1/M3 divisional cavalry troops composed of two scout and two tank platoons, a 2 X 2 organization for which there was no MTP. Under these limitations, SIMUTA identified missions consistent with the scope of the RCVTP.

The next step in the design of the cavalry exercises involved applying the Burnside (1990) method of filtering ARTEP tasks for applicability to SIMNET. A team of military subject matter experts (SMEs) evaluated the tasks contained in the ARTEP 17-487-30 MTP (DA, 1991) to determine which ones could be best supported in SIMNET training.

To provide a basis for selecting the final set of missions, SIMUTA SMEs developed a tactical scenario. This scenario was developed for the NTC terrain database and entailed the standard opposing forces (OPFOR) order of battle. After the specification of the tactical scenario, the missions that were deemed appropriate for that scenario, and for the RCVTP, were evaluated on the basis of the types of tasks the missions included. Missions that included tasks judged as being inappropriate for SIMNET were not selected. OPORD Narratives and overlays were then more fully developed.

SIMUTA staff composed a background scenario which provided a hypothetical history leading up to the conflicts that would occur during the exercises. As was typical of the design efforts, the execution of this task overlapped many others. The creation of the background scenario was begun prior to the filtering of ARTEP tasks and standards according to SIMNET enhancements. It was not fully developed, however, until the specifics of the tactical scenario had been sufficiently determined.

From the background scenario and OPORD Narratives, SIMUTA sequenced the selected missions and tasks within each mission to create tables. By this point, SIMUTA had selected four types of cavalry operations they believed were appropriate for the RCVTP: reconnaissance, security, offensive, and defensive operations. The process of creating tables still followed the crawl, walk, run (CWR) criteria as it had been for the platoon and company exercises. This step was the last of the design phase and it represented the forming of tables from missions and tasks.

In addition to designing cavalry exercises composed of missions sequenced in line with a background and tactical scenario, SIMUTA developed fundamental tables. Four fundamental tables were created; one representing each type of cavalry operation. The purpose of designing fundamental tables was to cover the basic skills and missions that would be encountered in the other exercises and gave units the opportunity to prepare for more contextually complete exercises.

Development

At this point, SIMUTA staff began to create exercises and tables. One exercise was created for each of the four operations. The exercises, in turn, consisted of four tables, except for the security exercise which consisted of three tables. As for the previous material, the Statement of Work (SOW) required the developed products to be limited to one hour in execution time and to be sequenced in accord with the CWR concept. The cavalry training management materials were primarily modeled after the company/team materials. Because the materials' formats were already designed, their development was a much easier and quicker task to complete. The initial cavalry troop exercise package was delivered to ARI in June 1994.

Only one trial was planned and conducted for the cavalry exercises. This trial occurred on June 14-16, 1994. Cavalry SMEs indicated that one trial would have been sufficient due to the application of lessons learned from the company/team exercises. During the trial, however, time constraints precluded the training unit from executing every table. After the trial, observer/controllers (O/Cs) and SMEs got together to evaluate and refine these tables. The final cavalry troop exercise package was delivered to the Army Research Institute for the Behavioral and Social Sciences (ARI) in August 1994. Table 12 provides the entire set of Cavalry Troop Tables.

Reactions of the Trial Unit

The trial unit provided feedback regarding the utility of the cavalry troop training. Specifically, the feedback highlighted the benefits in light of the opportunities provided at the NTC. In essence, they communicated their optimism over the fact that the RCVTP training was capable of complimenting NTC training. They believed that conducting the RCVTP training immediately before going to the NTC would allow units to take advantage of the opportunities provided by the NTC. In this case, the unit would have a good foundation in task performance before they arrived at the NTC.

Table 12

Final Cavalry Troop Tables

Table Number	Tasks
TCA1a	Reconnaissance (Route)
TCA1b	Reconnaissance (Zone)
TCA2	Offense
TCA3	Security
TCA4	Defense/Delay
TCB1	Tactical Road March
TCB2	Route Reconnaissance
TCB3	Zone Reconnaissance
TCC1	Movement to Contact (I)
TCC2	Movement to Contact (II)
TCC3	Hasty Attack
TCC4	Screen (Stationary)
TCD1	Screen (Stationary)
TCD2	Delay in Troop Sector
TCD3	Defend in Troop Sector
TCD4	Counterattack

CHAPTER VII. LESSONS LEARNED

Development of products for the Reserve Component Virtual Training Program (RCVTP) was grounded in several concepts, most notably the introduction of structured, multiechelon training. These concepts represented new ideas that needed to be demonstrated by the implementation and formative evaluation efforts of the project. Chapters 4, 5, and 6 document much of what was learned about each of the respective training packages. From a wider perspective, however, other insights emerged. This section describes a number of broader lessons that were learned by the contractor team while developing the RCVTP products.

Structured Training

The RCVTP represented the introduction of prepackaged, structured training to the SIMNET environment. The RCVTP was designed to be implemented like training at a Combat Training Center (CTC), particularly the National Training Center (NTC). At the NTC, for example, participating units are given a division order. They then develop their own operation orders (OPORDs), brigade and below, and execute their mission against an NTC OPFOR. NTC observer/controllers (O/Cs) monitor the unit's performance and provide feedback in a series of after-action reviews (AARs). The RCVTP also provides the higher level order, and RCVTP O/Cs monitor unit performance and provide AARs.

The RCVTP, however, adds more structure to the training. The unit can choose to execute exercises from a standardized set of exercises; then, given that choice, RCVTP provides OPORDs or OPORD Narratives at the level of the training unit and targets specific training objectives. In addition, for company and platoon tables, the missions are divided into segments, called tables, which last approximately one hour each. AARs follow each table. Explicit expectations for unit performance are delineated for each table, and these are monitored by the O/C during execution and discussed in AARs after each table. The RCVTP, therefore, takes on the methodical character of traditional individual-level training, crew training, or even platoon-level lanes training. But again, the structure goes one step beyond lanes training by defining the traditional tactical factors of METT-T (except, of course, the training level of troops), which are simulated by SIMNET Semi-Automated Forces (SAFOR). The structure that has been achieved, however, is not precisely the structure that was envisioned at the beginning of the project.

Creation of the Structure

The structured training concept of the RCVTP was stimulated by Brown's (1991, 1992) "a-way" concept. In a totally constructed simulation environment, the training developer can completely define the events that cue friendly units. Given such precision, SMEs can determine the probable courses of action that a proficient unit would take. These courses of action constitute an "a-way" model for approaching the tactical situation. The performance of units in training can then be compared to the a-way model in AAR discussions.

This concept was to be implemented by a top-down development strategy. First, the battalion a-way model was to be defined by a well-executed NTC battalion exercise. The a-way was to have presented the orders that started the mission, plus all of the enemy actions, FRAGOs, unit maneuvers, fire coordination, and staff processes that occurred during the execution of the mission. The a-way model was not necessarily to have been a perfect execution, but rather a highly successful execution that would reveal the critical performance components for success. Company actions were to be extracted from battalion actions, and in turn, platoon actions from company actions. In addition, staff actions would be culled out of the battalion's mission history. For a number of reasons (discussed below), this development pattern could not be followed.

Without an explicit battalion example from the NTC and only an NTC division order to work from, the SIMUTA Team was required to write brigade and battalion orders. This focused attention away from describing an explicit course of events (an a-way) and toward the generation of doctrinally sound orders. For the battalion exercises, the orders, in essence, became the a-way model. In addition, because of the crawl-walk-run (CWR) training concept that emerged (see Chapter 2 and the next section of this chapter) more hours of training and therefore more events were needed for platoon and company tables than for the corresponding battalion training. As a result, company and platoon actions could not be directly derived from battalion actions as originally planned. For platoon and company tables, events provide units with practice in METT-T conditions that extend beyond the bounds for those of the battalion. For example, armor platoon Movement to Contact (MTC) tables contain more reconnaissance units than observed in the battalion MTC, and the platoon's contact with the forward security element (FSE) and advance guard main body (AGMB) occurs later and further west on the terrain than the battalion's contact (friendly movement is east to west).

The a-way concept, thus, has a different meaning for different echelons. At higher echelons, the a-way is tied to the execution of a model order. For the lower echelons (company and platoon), the a-way is execution of appropriate tasks. For example, in the case of company and platoon tables, the a-way concept was implemented by insuring that tasks from Army Training and Evaluation Program (ARTEP)-Mission Training Plans (MTPs) and Field Manuals (FMs) prescribed as being supportive of the battalion/task force MTC and Defense in Sector (DIS) missions were systematically incorporated in the tables. There is, however, a great deal of continuity within all exercises because they are based on consistent METT-T.

For staff training, having a model order to describe an a-way was insufficient. The staff is engaged in battalion-supportive actions that are less well codified in the ARTEPs and FMs than the maneuver elements. As a result, SIMUTA subject matter experts (SMEs) were reluctant to specify expected staff actions. Basic ARTEP-MTP subtasks and subtask standards were identified for each staff section in the main command post (Main CP) and the combat trains command post (CTCP). However, most of these were worded at a rather abstract level. Battalion exercise trials were conducted with these subtasks and subtask standards. After running the exercises and receiving a request from the O/Cs for more explicit information about expected staff action, the training development team became more willing to specify staff processes and to link them to events in the battalion missions. Appropriate behaviors could not always be derived from training or doctrine manuals.

Justification for the specified actions was therefore grounded in the exercise itself. Decision support templates (DSTs) for the missions were constructed to augment the detailed battalion orders in justifying expected staff actions. These resulted in a-way models of staff performance expressed in staff action-by-event matrices. To date, the staff matrices that describe the event-by-event actions of the staff have not yet been validated as describing effective patterns of behavior, nor have they been demonstrated to be useful tools to drive AAR discussions. Although promising, their utility will not be determined until they are implemented as observation and feedback tools.

Reaction to the Structure

At the company and platoon levels, the structured RCVTP tables have been favorably received by participating ARNG units because they provide an efficient training process that takes full advantage of the available training time. Again, they are comparable to platoon lanes training or the tactical tables described in previous versions of FM 17-12-1 (Department of the Army [DA], 1986). The control and repetition of simulation, however, affords more focused attention to detailed training objectives. Compared to field training, there are fewer distractions that direct attention away from the intended objectives (e.g., preparing the equipment, repairing equipment, and traveling to starting locations).

At the battalion level, Army culture encourages a wide latitude for battalion commander creativity (ST 101-5, CGSC, 1994). This culture works counter to the a-way training concept. The typical reaction of participating units to having a prepackaged battalion order is surprise at not being able to write their own order. Even given an explicit order, there is freedom for the commander to adjust and create after the unit crosses the line of departure (LD) on the offense. In the defensive scenario, there is time during defensive preparation to reposition units and create alternate routes and maneuver schemes. In fact, a-way training at the battalion level has not yet been fully tested. Battalions have had difficulty with and/or expressed resistance toward running either the MTC or DIS missions as written in the orders. For the MTC, battalion commanders often try their own maneuver ideas through FRAGOs after crossing the LD. The DIS order is typically resisted for its perceived complexity. In practice, then, the RCVTP order represents little more than graphics, some constraints on equipment and support, and a plan for the OPFOR execution. Within those parameters, units essentially do "write their own orders."

This culture of creativity also strongly influenced instructional designers and the O/C Team. It created pressure to avoid AAR discussions of tactics, in spite of the RCVTP's explicit statement of a tactical solution to the given METT-T. Feedback on tactics was assigned to informal discussions between the senior O/C and the battalion commander. Battalion AARs have shifted away from maneuver decisions per se to the processes executed to support those decisions. Brown's (1992) concept of the AAR focusing its discussion on a comparison between the a-way model and how the unit executed did not emerge. An additional factor for the failed emergence of the a-way model is the ethic that battalion commanders should not be embarrassed in an AAR by having their decisions questioned. This ethic persists in spite of the "no thin skins" rule by which AARs are to be conducted (DA, 1993d), and despite the fact that the performance of leaders at company and platoon levels is discussed in AARs. Again, the cultural norm of creativity for the battalion

commander seems to have an impact. Platoon leaders and company commanders have less freedom and, therefore, their actions are more prescribed. As a result, the O/C has a more solid doctrinal ground from which to instruct. In contrast, the battalion a-way is not doctrinal and therefore is riskier for the O/C, who also does not want to embarrass himself or the commander being trained.

The lesson learned is that the a-way training concept is more congruent with the Army culture at lower-level echelons (i.e., company and below) than higher-level echelons. As a result, formal battalion AARs focus on information flow and topics such as "battlefield awareness" rather than on the quality of the battalion's scheme of maneuver. Without reference to explicit battalion maneuver, discussion of information flow cannot be as explicit as Brown envisioned. This does not necessarily mean that training is less effective or efficient than desired. The battalion information process issues that are covered in the formal AAR are important topics; and by conducting the discussion on a more general level, learning is transferable to more settings. The battalion commander's decisions per se are appropriately discussed one-on-one with the battalion commander or in a small group setting that includes only the battalion commander and his senior staff (e.g., his executive officer [XO], operations officer [S3], and fire support officer [FSO]).

The battalion package provides an elaborate support system within which battalion commanders, staffs, and maneuver elements can practice and hone their skills. The training emphasis is on battalion execution of coordination and synchronization processes. A tactical model is given for the battalion to copy. Tactical execution, however, cannot be divorced from the exercise, and the battalion commander's motivation to test his tactical skills cannot be repressed. Thus, training is conducted on two levels. For the battalion as a whole, the formal AAR focuses on process issues. For the battalion commander, tactical learning occurs through the execution itself and through more informal discussions with his own staff and with the senior O/C. Nevertheless, the package provides a well-orchestrated arena for battalions to practice their skills.

Creating Mission Equivalence across Echelons

One design objective of the project was to create platoon, company, and battalion training exercises that were all segments of the same cornerstone missions--one for offense and one for defense. The interaction of several factors created less consistency among training exercises at different echelons than was originally anticipated. The early view was that platoon exercises would consist of actions that replicate, at a more detailed level, the actions of the superordinate company exercise. Likewise, company exercises were to consist of actions that replicate at a more detailed level the actions of the battalion exercise. Three factors precluded this: (a) the definition of CWR that guided development of platoon and company exercises; (b) the delivery time-line specifying that the order of training development be platoon, then company, then battalion; and (c) the delayed delivery of NTC cornerstone information. These last two factors resulted in the battalion orders not being completed, reviewed, and edited until platoon and company exercises were nearing their initial trials.

The lesson learned here is not simple. Even if the training development schedules were to allow battalion orders to be locked in before platoon and company training design begins, the need for training efficiency and the CWR definition used for platoon and company tables precluded exact matches of lower and upper echelon exercises. That is, platoon exercises could not simply follow the actions of one of the platoons from the battalion exercise because any one platoon would have too much inactivity. Furthermore, the CWR definition increased the length of mission time needed for training. Therefore, platoon and company tables were developed similar to and supportive of battalion exercises, but the sequence of platoon or company actions across tables does not represent the sequence of platoon or company actions in the battalion exercise. This raises two questions:

1. How important is a matching between battalion, company, and platoon exercises?
2. Does our crawl/walk/run definition achieve its purpose?

Benefits of Matching Missions

Two related benefits were expected from the concept of developing training at all echelons from a single cornerstone mission. First, training would be mutually supporting: Platoon training would facilitate company training which in turn would support battalion training. Furthermore, creating equivalency among platoon, company, and battalion missions would focus training of only those tasks needed to support battalion actions. The second reason for using a common mission stems from Brown's (1991) concept of immersion. That is, a unifying mission would help soldiers to become psychologically identified with the mission and therefore heighten their motivation to perform. These assumptions turned out to be somewhat inaccurate.

Within platoon and company echelons, consistent missions were created across offensive and defensive tables and soldiers did become engrossed in these mission activities. At the battalion level, the point is moot--the exercise is run as one continuous event. Reactions were less favorable as far as the effects of immersion across echelons. There were two occasions in which Army National Guard (ARNG) units completed a progression of platoon, company, and then battalion training during their two-week Annual Training (AT). The OPORD Narratives for platoon and company versus the orders for battalion were different, yet sufficiently similar, to create some confusion in the unit about the need for two sets of graphics. Some of the lower-level units were using the company/platoon graphics during the battalion exercise. In addition, involvement in a single mission was beginning to get too repetitious. By the time soldiers got to the battalion exercise, many of them were ready for a different mission. On the positive side, the company and platoon tables were similar enough to the battalion exercises, in terms of the tasks and subtasks they contained, to facilitate the unit's performance in the battalion exercise.

Given the issue of boredom from too many repetitions of the same mission, the question becomes: How similar do the exercises need to be? Certainly, if the training objective is to teach a precise mission, all echelons should train that mission. On the other hand, if the goal is more general, that is, to teach performance on missions *like* the given mission, then some amount of dissimilarity between echelons will facilitate generalizing performance to a broader array of mission conditions and at the same time reduce boredom.

Note that an underlying issue here concerns the level of preparation needed by platoons in order for company training to be beneficial, and similarly, the level of preparation needed by companies in order for battalion training to be beneficial. The implicit assumption that seems to prevail is that the lower echelon must be "trained" (meaning "be proficient") before the higher level echelon can be "trained" (meaning "participate in a training event"). Insufficient thinking has gone into defining the level of proficiency needed at the lower level in order to have beneficial training at the higher level. Without the advantages of simulation, that question has been unimportant. For the ARNG platoon training is difficult, company training improbable, and full battalion training essentially unheard of. With simulation, we have clearly demonstrated the feasibility of providing training to all three levels within the course of a two-week AT. Thus, the question of when to transition between levels of training becomes significant.

The two AT periods in which units used RCVTP materials also demonstrated that platoons do not have to be fully proficient in order for company-level training to be beneficial, and similarly, companies do not have to be fully proficient in order for battalion-level training to be beneficial. Obviously, some minimum proficiency is needed at the lower echelon levels prior to attempting higher level training. However, there is no need to be "fully" proficient. In fact, battalion-level training may have a positive impact on future company-level training. That is, there is probably a point at which companies should shift from company to battalion training in order to diagnose company deficiencies with the intent of moving back to company training to correct those deficiencies. The parallel argument holds that platoon level training would probably benefit by training company level exercises. Thus, the platoon, company, battalion training sequence should be viewed as a back-and-forth strategy rather than as a strict lower-to-higher level strategy. A back-and-forth strategy can be implemented with exercises that are mutually supportive because they are based on the same basic mission and train the same tasks, but those exercises can be couched in varying METT-T conditions.

The conclusion that seems to follow is that immersion via a constant mission can be carried too far. Based on our interviews and discussions with participants, boredom was not an issue during our typical weekend training sessions. On the other hand, during the training trials that took place at AT, boredom with the mission became a factor after three or four days of the same mission. Furthermore, constancy of missions across echelons may not be needed if the training strategy is to alternate units back and forth between echelons over an AT or equivalent training period. Some diversity in the conditions, such as evolved in the RCVTP tables, increases the generalizability of the training.

An important caveat is in order. We have not tested implementation of the platoon-to-company-to-battalion progression spaced over IDT weekends. Replicating the AT sequencing schedule in which platoons trained for two full days, the companies trained for two full days, and the battalion rehearsed a day prior to executing an exercise would obviously take a number of IDT weekends spaced over several months. In that length of time, performance decrements from forgetting may very well eliminate any effects of boredom with the scenario. Thus, we are not recommending that the use of a common order be eliminated. However, alternative exercises are needed to enhance the generalizability of RCVTP training and overcome boredom during AT applications of the RCVTP.

Effects of the Crawl-Walk-Run Definition

As described above, our CWR definition precluded having platoon and company tables being more detailed replicas of battalion actions. The discussion also questioned the need for exact matching of actions between echelons. Therefore, questioning the impact of our CWR definition on these grounds is pointless. On the other hand, there is an important issue to be discussed regarding our implementation of the CWR progression of training.

Our original concept for implementing a CWR progression called for repeating segments of the mission with increasing demands on the unit. Demands on the unit were to be manipulated with three variables: (a) difficulty level of the tasks, (b) task load (number of simultaneous tasks and speed of execution), and (c) amount of coaching. Instead, the scenarios themselves, in which enemy contact increases in strength, were used to drive the CWR progression. This progression retained the first two variables: task difficulty and task load. The third variable, an explicitly designed teaching/coaching/mentoring strategy, was lost. While instructions to O/Cs acknowledge the need for alternative modes for the O/C to use in interacting with the units, the instructions were not as forceful as would have been the original CWR concept of explicitly incorporating coaching as part of the training progression.

Because there are not explicit "teach" and "coach" tables followed by replication of the same exercise with O/C as mentor, O/Cs decided when to intervene with teaching or coaching and when to let the unit work out its own problems. As a result, O/Cs varied considerably in the amount of intervention they gave. With the little guidance they were given, we observed that some O/Cs tended to be hesitant to teach and coach during execution. O/C intervention practices need to be examined systematically to determine when it is more efficient to intervene during the execution and when it is more efficient to let the units work problems out on their own.

Similarly, in AARs, different instructional techniques may be more effective depending on a variety of characteristics of unit members, including their knowledge levels, their recent experiences in instructional settings, their motivations, and their openness to learn. While the questioning technique advocated for AARs by TC 25-20 (DA, 1993d) is a good general purpose technique for the Army population, it cannot be assumed that it is always the best. This is particularly a concern for the ARNG which has a different training perspective by virtue of only forming together as a group once a month.

There is an interesting paradox related to the use of discovery learning. Verbally, the Army culture advocates the use of discovery learning. In practice, the questioning techniques required for effective discovery learning are difficult to execute and instructors can easily become impatient with slow progress. There is a strong tendency to revert to lecturing when the discussion is not going in the intended direction or when time is limited. There are times, in fact, when direct instruction is appropriate. Nonetheless, there need to be systematic guidelines about when the O/Cs should use which technique. Direct teaching and discovery questioning are each appropriate but at different times. To move beyond a one-size-fits-all model of instruction will necessitate training O/Cs in diagnostic skills and a variety of instructional skills. There are more lessons to be learned about the most efficient learning processes and the RCVTP provides a laboratory to learn those lessons.

Thus, impact of the CWR definition on the equivalence of platoon and company tables to the battalion exercise turned out to be of minor significance. More important was the loss of focus on explicitly defining teach, coach, and mentor as alternative instructional modes. CWR, as implemented, does appear to systematically build the skills of platoon and companies, at least as evidenced in SIMNET. Furthermore, the design does allow the repetition of tables. Therefore, an initial execution of any table can be heavily coached by the O/C, if needed, with a subsequent repetition giving less coaching. The lesson is that more guidance is needed for the O/Cs to most efficiently implement the "teaching, coaching, and mentoring" strategy.

Integration of Development Efforts

In order for RCVTP structured training to become a completely functioning, integrated package, the instructions and supporting materials for its implementation had to be detailed and complex. Creating all of the interrelated parts was a management challenge. The SIMUTA Team began with an innovative vision and built an efficiently functioning multiechelon training system. In addition, the methodology for creating new exercises has been captured, refined, and codified (C. Campbell, R. Campbell, Sanders, & Flynn, in preparation). If additional exercises are created in the future, there are some lessons learned concerning development sequence and the structure of developmental teams.

Development Sequence

The SIMUTA delivery schedule called for the completion of platoon exercises first, followed by company, and then battalion exercises. Given the complexity of the development task, that development schedule appeared logical. The materials for the lowest echelon were expected to be relatively simple and were therefore to be created first, with the more complicated materials for the higher echelons created later. In theory, lessons learned during platoon development could have assisted development of company exercises and lessons learned from both could have assisted battalion exercises. In practice, development of the platoon and company tables was mutually supportive, but battalion exercises were sufficiently different that learning experiences during platoon and company development did not significantly impact battalion development. Thus, the positive impact of developing platoon exercises first was less than expected.

The development sequence also assumed the exercises at all three levels were going to be derived from detailed histories of an actual NTC rotation. By being derived from a common history, platoon, company, and battalion exercises would be parallel. As indicated earlier, those cornerstone scenarios were not received, and detailed battalion orders needed to be written to drive the integration of platoon-, company-, and battalion-level training. There are several lessons learned related to the development of orders.

Most obviously, until the NTC, or another CTC, fully captures a well executed battle to use as a model for training, an important step in producing integrated, multiechelon training will necessarily involve developing a set of orders. Doctrinally sound orders are not easy to produce, particularly when they are being used to drive training. They must represent sound tactics and incorporate sufficient activity to allow practice on tasks appropriate to the mission

as defined by FMs and ARTEP-MTPs. They must consider the training needs of all echelons: platoon, company, and battalion. If orders are based on considerations for only one level of training, there will undoubtedly be decisions that are not the most advantageous for the training of other levels. Furthermore, the orders must be compatible with the artificial aspects of the simulation. It is not possible to write all details, particularly control measures and enemy routes, in advance without pilot testing the actions. Orders are only a training vehicle and not an end in themselves. In short, simultaneous (rather than sequential), development of platoon, company, and battalion orders *and* exercises may facilitate integration of training across echelons. Platoon and company tables were in fact developed together and not in the sequence of the delivery schedule. Although this required back-and-forth coordination and negotiation among exercise writers, both sets of tables are coherent, functional, and mutually supportive.

Organization of the Development Team

Because of our suggestion to integrate the development of battalion, company, and platoon training materials, consideration must be given to the organization of the development team. The SIMUTA Team was initially divided into four functional teams with an integrating Design Team. These included a team of SME and training design personnel to develop platoon and company tables, and a parallel team to develop battalion exercises. In addition, there were two support teams: a Technical Support Team to provide consulting expertise on the simulations, and a AAR/Formative Evaluation Team to develop measurement and feedback systems for training (i.e., the AAR) and about training (i.e., the formative evaluation). In addition, in the early stages of the project, a core group, largely composed of team managers, was formed as the Design Team.

In general, the SIMUTA Team organization functioned quite well with one exception: the integration of the battalion exercises with the platoon and company tables. The cross-team coordination was not sufficient. This was exacerbated by the delivery schedule. The Company/Platoon Team was pressed to develop exercises much more quickly than the Battalion Team. The deadlines on the Company/Platoon Team also diminished their time and energy for coordinating with the Battalion Team. As a result, after an initial order was developed, the Company/Platoon Team began exercise development in earnest. The Battalion Team, with more time, continued to refine and embellish the order. The Battalion Team became the "owners" of the orders which further separated development efforts of the two teams.

It may be instructive to examine the Company/Platoon Team. Again, the Company/Platoon Team, like the Battalion Team, was composed of armor SMEs and training design specialists. Furthermore, the training design personnel were all experienced in Army training development. In addition, two persons from the AAR/Formative Evaluation team were permanently placed on the Company Platoon Team. Although these two persons consulted with the AAR/Formative Evaluation team chief, they were physically and functionally integrated into the Company Platoon Team.

The Company/Platoon Team was responsible for developing exercises for company and company team and for three types of platoons. At 12 to 18 tables per echelon and unit type, the Company/Platoon Team was charged with constructing 84 different, yet interrelated, tables. The tables needed to be built with a single format to facilitate their implementation. In addition, the team developed all of the supporting materials, including O/C instructions for everything from planning a unit's training period, making arrangements for the SIMNET site, and providing Take-Home Packages at the end of the training period. There were no formats or road maps of what information was needed or how to present it. So the team had to both design and produce these outputs. With that volume of production and nine persons involved in the process, team management was a significant challenge. During the most intense early days of design and development, while formats and contents were being debated, the team invested considerable time in task-oriented problem solving on the one hand, and team relations building on the other. The results were an integrated team that produced a coherent collection of training materials. The extra efforts to create teamwork were necessary and beneficial.

Less time and energy were spent integrating battalion and platoon/company products. The SIMUTA contractor leadership was too decentralized. The Design Team, which was to have been responsible for integration, did not function well. Left on their own, the battalion and platoon/company development teams focused on their respective domains and did not carve out time for mutual problem solving on common issues. On the other hand, complete integration of the two teams would have been too ambitious; there were too many echelon-specific issues. If there are future efforts of this magnitude, a strong integration team, both conceptually and managerially, needs to keep almost daily contact with developments among all teams. Whenever discontinuities arise, the Design Team, acting as an integrator, must resolve the conflicts through joint negotiations with representatives of both teams.

O/C Requirements and Responsibilities

The O/C Team is an integral part of the RCVTP. They are the delivery agents for the program and played an integral in program design. In various ways, their knowledge, their cultural or socialization experiences, and their attitudes had a major impact on the program.

Knowledge

To successfully deliver the RCVTP, O/Cs must be knowledgeable in three areas: content, technology, and instructional techniques.

Content

It seems obvious that O/Cs must be experts in the content area they are teaching. Thus, O/Cs must study the areas in which they are not abreast of current practice. Based on the SIMUTA teams personal experiences, it is also wise to separate out two kinds of knowledge: experiential and doctrinal. The first type of knowledge is built up through experience. The second can be acquired through classes and the study of written materials (particularly ARTEPs and FMs). Although the two types of knowledge should be consistent, they will be different in organization and in nuances. Experiences among any given set of experts (i.e.,

highly experienced people) tend to vary, and their experience-based understanding and organization of the same content differ accordingly. Training and doctrine manuals are the source books that hold together a common basis for the Army's knowledge. The RCVTP tables could not be based solely on the experiences of developers, but had to be grounded in the Army's published references. This forced SIMUTA team members, including the two-thirds of the team with Army careers, to read and study the relevant field manuals, training circulars, ARTEP-MTPs, and so on. A common observation among these former Army personnel was that the SIMUTA project created more opportunity and motivation to read these publications than they ever had during their active duty time. This observation supports the contention that, whereas the RCVTP exercises are based on doctrine and training manuals, the expertise of active duty soldiers is primarily experiential.

The distinction between experiential and doctrinal knowledge leads to the following lesson learned for active duty personnel assigned as O/Cs: Their experiential knowledge base must be refined with study of the doctrine and training manuals. This certainly does not mean that their experiences are invalid. Rather, it means those experiences must be shared in the language and organization of the ARTEP-MTPs and FMs if they are to be readily accepted by the training audience and by the Army communities who will be judging the quality of the program. To illustrate, one important impetus for the SIMUTA Team to use the language and concepts of ARTEP subtasks was the request to explain how we chose training objectives for each table. ARTEP-MTP subtasks were the most defensible solution. Additionally, we found that ARNG units interviewed during formative evaluation trials wanted feedback about their performance in terms of ARTEP-MTP tasks.

Technology

The O/Cs must be knowledgeable with the technology they are using. For the most part, O/Cs will not come to the O/C Team with any prior SIMNET workstation or Janus operator experience. The key lesson here is that there is a skill component involved in operating this equipment. Practice is required for the operator to become proficient. This is particularly important because the O/C operators will be engaged in several tasks simultaneously. Operating the equipment needs to become automatic so that O/Cs can at the same time provide coaching, act as the higher level commander, and observe unit performance. In addition, two operators are needed to effectively operate the SIMNET Modular SAFOR (ModSAF) workstations. Team work and coordination between the operators also requires practice.

Instructional Techniques

Mention has already been made of the need for more guidance in teaching, coaching, and mentoring. These are not easy skills to perform and the O/Cs need instruction, including practice and feedback. The Armor Center provided the O/C Team with AAR training; however, many of the O/Cs were not yet assigned when that training was given. Makeup training would have seemed appropriate, but in the future, as O/Cs rotate in and out of the assignment in ones and twos, block training may never be feasible. On the other hand, the

RCVTP setting affords an accessible arena for O/Cs to be observed and coached. A systematic on-the-job training program for teaching instructional techniques coupled with a monitoring and improvement-planning system is strongly recommended.

Cultural Experiences

Members of the O/C Team had a variety of previous training delivery experiences, including NTC and Combat Maneuver Training Center (CMTC) experience. Because a stated goal for RCVTP was to provide a CTC-like experience, the NTC/CMTC cultural norms provide a powerful influence on how the O/Cs conceptualize and deliver RCVTP training. There are some practices at the NTC that the RCVTP does not adopt, however, and these became a source of conflict between the O/Cs and program developers. One particular NTC practice will be highlighted.

The NTC can not, by the nature of the field training, control events as can the RCVTP. Each NTC battle is a one-shot opportunity for the unit to perform, and the NTC O/C Team reacts to whatever they see. AARs are built around the problems that occur. There is no preplanned strategy or sequence for addressing tasks. O/Cs, particularly at echelons below battalion, discuss what they want to discuss. In contrast, the RCVTP prescribes the topics of AAR discussion for each table. Thus, there is a cultural conflict between the structure of the RCVTP and the spontaneous approach at the NTC.

Attitudes

The RCVTP is breaking some new ground in terms of pre-packaged, structured delivery of collective training. There are two implications. First, as indicated above, some portions of the RCVTP design may run counter to more traditional expectations. Second, the detailed structuring of the RCVTP program is very intricate. As a result, the O/Cs delivering the program needed to be open to change in terms of both their past practices and to the changes inherent in the repeated trials that were needed to flesh out all of the RCVTP details.

Furthermore, there should be continued monitoring and improvements in the program. Thus, in addition to being open to change, the O/C Team should also have an appreciation of the importance of sharing ideas and keeping track of those ideas that seem to work and those that do not, both within a framework of controlled experimentation. We do not mean necessarily applying rigid scientific experimental design standards; rather, "experimentation" is meant to imply that continued developments be purposeful and documented. This requires a kind of discipline that is not easily compatible with the NTC O/C style nor with the ethic of freedom and creativity that was discussed above in relation to Army leadership. In short, an O/C Team culture is required that places value on (a) obtaining knowledge (of instructional processes) beyond the surface level, (b) controlled experimentation and innovation, and (c) shared learning about the instructional process.

A potential strategy for gaining more rapid acceptance of the RCVTP program by the O/Cs would have been to have them more heavily involved in the development process, thereby creating a feeling of "ownership." There are two interrelated factors that diminish the value of this suggestion, and both hinge on the Army culture. That is, given the

competitiveness of the Army and the drive soldiers have to establish themselves, the O/Cs have had a tendency to reject each others' ideas as well as those of the SIMUTA contractor team.[11] The O/Cs arrived a few at a time over the period of six or more months. Even if the early arriving O/Cs had been full day-to-day partners in RCVTP design, those initial developments may well have been received with the same skepticism by the later arriving O/Cs as was the design developed by the contractor team. Furthermore, there will always be soldiers rotating in and out of the RCVTP O/C assignment. While future O/Cs may have the opportunity to refine the program, they will never have the opportunity to design the program. Therefore, creating ownership by involving the O/Cs in the design process is an incomplete argument.

Nevertheless, indoctrinating O/Cs to accept the premises, objectives, and procedures of the RCVTP is critical to the long-term success of the program. A key ingredient will be the interest and ability of the Armor School leadership to embrace RCVTP principles and encourage their continuation. A second ingredient will be to stimulate the vision that the RCVTP was created to meet the unique needs of the ARNG and that the uniqueness, in many ways, requires a new approach to training. The assimilation of new O/Cs into the program will not be automatic. Without systematic attention to these issues, there will be a natural tendency over time for the RCVTP to revert to the Army's common training practices.

Relationships Between SIMUTA Contractors and Army O/Cs

The above discussion does not mean that the O/C Team failed to make valuable contributions. They have made worthwhile suggestions in numerous areas and generally have come to accept the program goals and procedures. However, the relationship between the O/Cs and contractor team was not always smooth. The SIMUTA Team put its perceptions of needs of the program sponsors ahead of the desires of the O/Cs. Furthermore, being responsible for program success, the SIMUTA Team tended to trust its own judgment over that of the O/Cs, particularly during the earliest phases of development. Thus, the O/Cs were surprised by lack of freedom they were given in program implementation. the SIMUTA Team was surprised that the O/Cs were surprised, and the resulting conflict was inevitable. The relationship between the SIMUTA Team and the O/C Team was further complicated by the time lines and schedules for both teams. O/Cs were not on board and available until the fifth month of the project. By then, the SIMUTA Team had made numerous decisions, many of which had been required early enough that they were no longer issues by the fifth month. Time was tight and conducting lengthy debates with the O/Cs was not a priority. The SIMUTA Team felt sufficiently "in charge" that they expected the O/Cs to accept the design. The O/Cs, on the other hand, felt that they should be more "in charge," but they did not have time to devote to development.

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[11]Other individualistic, competitive organizations suffer the same flaw: quick criticism of other's ideas leading to a pattern of rejection and starting over rather than continually improving the existing products (Nahavandi & Aranda, 1994).

Given that greater integration of O/C Team and contractor team is desirable, the lessons here are that:

1. The O/C Team needs to be available from the beginning of development.
2. Time for coordination must be scheduled.
3. The roles and responsibilities of both teams needs to be clearly communicated to those teams.

On the other hand, greater integration of the two teams in the design of the program may not be in the best interest of achieving innovative solutions for the RCVTP. Certainly as implementors of the program, O/Cs' acceptance of the design is critical. That issue was discussed above. However, the RCVTP was charged with creating innovative solutions. A contractor team, being at least one step removed from the Army culture, may more readily be able to break prevailing mind sets. For example, the O/C Team summarily rejected the idea of conducting AARs immediately after the end of a table. However, they tried it, and with some practice, they discovered that it was possible. In other words, creative solutions themselves may cause conflicts. Therefore, the contractor team and O/C Team should perhaps expect to have to live with that conflict. At the same time, the O/Cs must be willing to give innovative ideas a fair test. Equally important, it then becomes incumbent on the contractor team to keep its innovations within reasonable bounds.

Program Control, Ownership, and Quality Management

Related to the above is the issue of program control. The SIMUTA Team operated under the assumption that, during development and trials, the team owned the program. Indeed, the SIMUTA Team was instructed early in the project that it was, in essence, writing the O/C's job description. Initially, the O/Cs were not given that same guidance. This raises a broader issue concerning the ownership and control of the project, including continued monitoring to insure that the quality of the program does not erode over time.

The project was reviewed periodically by a steering committee composed of the Chief of the ARI Armored Forces Research Unit, representatives from the Advanced Research Project Agency (ARPA), and two representatives (at the O-6 level) from the Armor Center, one being a special liaison for ARNG affairs. This committee served as a sounding board and provided a protective membrane for the SIMUTA Team by holding in the historical objectives of the project and filtering out extraneous influences. The SIMUTA Team seemed to gain the trust of the steering committee early in the project and was given considerable latitude in achieving program objectives. The chain of command for the O/C Team, at the O-6 level, was not, however, included on the steering committee. The O/C Team, therefore, had as many as three sets of "supervisors" vying for their time and attention: (a) their direct chain of command, (b) the steering committee, and (c) the SIMUTA Team. This contributed to two problems: (a) the O/Cs' time, during RCVTP development, was extremely committed, and (b) final responsibility for the quality of program implementation remained unclear.

Army Resources, Review, and Support

Although much of the SIMUTA Team was composed of well-seasoned former Army officers, there remained a need to base the RCVTP in Army doctrine and training literature and then to have the materials reviewed by the Army. Neither of these was as simple as it sounds.

Training and Doctrine Literature

The ARTEP-MTPs for each type and echelon of organization included in the RCVTP were the primary choice for resource documentation. However, these documents vary in coherence and consistency in ways that created documentation problems for the development team. First, within any particular ARTEP-MTP, the level of detail for tasks and subtasks was not consistently codified. For example, the armor platoon ARTEP-17-237-10-MTP (DA, 1988c) treats traveling, traveling overwatch, and bounding overwatch as separate tasks. In the mechanized infantry ARTEP-7-247-11-MTP (DA, 1987a), the task "Move Mounted" (7-3-4024) has as its subtasks these three types of movement. Second, the ARTEP-7-247-11 MTP and the scout ARTEP-17-57-10 MTP (DA, 1988i) were incomplete in the sense that some tasks performed by armor platoons have parallel requirements for mechanized infantry and for scouts but these were not in the respective ARTEPs. FMs were then used as backup documents. For example, FM 7-7J (DA, 1993a) for mechanized infantry platoons contains a series of "Battle Drills" which were used as the source of several of the mechanized infantry critical subtasks. Third, the armor battalion task force ARTEP-71-2-MTP (DA, 1988e) identifies company level tasks required to support battalion missions; similarly, the armor company/company team ARTEP-71-1-MTP (DA, 1988d) identifies platoons tasks that support company missions. However, these interlocking structures are not complete with respect to mechanized infantry and scout platoons.

For an effort like SIMUTA, which cuts across echelons and types of organizations, these inconsistencies in the ARTEP-MTPs require program developers to spend excessive development time with basic task identification. While the SIMUTA contract specified that no task analysis efforts be conducted, and in the formal sense none were, informally SIMUTA developers were required to use their previous experiences to insure that (within and between echelons and types of organizations) tasks identified for training covered the domain of tasks needed to support a battalion MTC and DIS, at least within the limits of the technologies.

Review of RCVTP materials

Although the SIMUTA Team was highly experienced in terms of time spent in Army careers and time spent conducting Army research, the team was nevertheless a contractor team. Therefore, RCVTP materials needed to be reviewed by the Army for technical adequacy.

Obtaining Army review of materials is difficult for two related reasons. First, the Army comprises numerous agencies even within a single agency such as the Armor School. There is no singular "the Army" to review materials. While it seems obvious that Army *representatives* will be the ones to review materials, finding appropriate representatives is not

always easy. Second, the SIMUTA materials are voluminous and tightly interrelated. Thus, for SIMUTA, the O/C Team members were the only Army personnel sufficiently familiar with the RCVTP program to review the vast quantity of materials. As noted above, their time was limited and because of their past experiences, they had some biases that did not always match the directions given to the program. As a result, "reviews" became a series of negotiations that lasted from the early trials until near the end of the project, weeks after "final" deliverables of platoon and company materials were made. However, the reviews were based on experiences with the program and were not simply arm-chair reactions. Given the complexity of the package this is probably the only way to conduct an adequate review.

Technical Support

The decision to have technical expertise within the SIMUTA Team turned out to be crucial. The technical SIMNET skills that team members brought were vital to designing, testing, and implementing SIMNET exercises. The site support contractors did not have the time nor license within the scope of their contract to meet all of the needs of SIMUTA. We simply could not have achieved the same ends if we had been dependent on only site support contractors.

SIMUTA Team members gained the technical expertise needed to operate other related systems, including Unit Performance Assessment System (UPAS), Command/Staff Trainer (C/ST), and Janus. For UPAS, expertise extended to the analysis and testing of software handling of SIMNET data packets and programming to utilize that data. For C/ST, team members with previous experience on the original Combat Vehicle Command and Control (CVCC) system worked hand-in-hand with programmers to develop software functions needed for converting the system from a research tool to a training device. Finally, for Janus, SIMUTA Team members were among the first persons at Ft. Knox to learn to use the ARPA version of Janus. The lesson here is that a training development team cannot have too much technical expertise. Particularly with emerging technologies such as these, no documentation can completely detail the nuances of a system as they relate to the needs for training development.

The Development of Training on Emerging Technology

ModSAF, the ARPA version of Janus, and the UPAS system were all under technological development during the course of RCVTP training development. However, the transition of the CVCC research system into the C/ST training system represented the most extreme case of simultaneous development of training and technology. The following discussion focuses on C/ST development but provides some general insights.

When development of the C/ST began, the network-based computer system did not exist. The training for principal battalion staff officers was initially developed based on the capabilities of a prototype system (the CVCC) that existed in the Mounted Warfare Test Bed (MWTB). Furthermore, the C/ST exercises were to take place on a different terrain database than was currently loaded on the MWTB system. Therefore, early training development was based on several assumptions of how the C/ST training developers thought the system would operate.

The capabilities of the MWTB system influenced the initial identification of training objectives that were developed for C/ST. These capabilities directed the development of C/ST toward that of an information processing trainer. The data storage and tracking capabilities of the parent CVCC system allow trainers to record all of the actions taken on messages coming into the Main CP, messages generated there, or the messages relayed from there. Also, the system allows the user to build overlays to illustrate the action on the battlefield as interpreted through the message traffic. The overlays prepared by a participant during an exercise could then be compared to the actual battlefield occurrences. The basic concept of the skills that would be trained did not change very much from the initial concepts, but capabilities of the hardware and software for the C/ST system have evolved.

Several technical problems affected the conceptualization of how C/ST training would be conducted. First of all, the MWTB system was designed to serve as a "digital" Tactical Operation Center. The messages from the simulated battlefield originated from simulators with Intervehicular Information System (IVIS) capabilities. This would not be the case with C/ST; messages received in the Main CP and CTCP are supposed to replicate radio nets. Secondly, the MWTB system was not designed as a trainer. Although there are many features of the MWTB system that are useful in training, many software changes had to be implemented for C/ST to provide "transparent" functionality, data collection, and AAR capabilities.

What was first considered as a drawback to developing C/ST exercises became incorporated as a useful training concept. This initial "drawback" was the fact that SAFOR, the software used to produce vehicles on the SIMNET terrain database, did not interface with the C/ST network. As a result, vehicle icons would not appear on the C/ST workstations and automated reports were not produced. To produce the necessary message traffic, it was decided that SAFOR battles would be recorded and rerun on a Plan View Display (PVD). Then, all message traffic would be scripted by SMEs watching the battle unfold on the PVD. There were several advantages to this technique. First, the training was standardized so that the message traffic for a particular exercise is always the same. Secondly, as opposed to running a SAFOR battle "live" during an exercise (which would produce different message traffic each time it was run), the scripted message traffic can be augmented and routing solutions can be generated by SMEs and input into the C/ST system, allowing specific feedback to be presented to participants during the AAR.

The influence of technology on training design was not a one-way street, however. Several revisions in C/ST software were made at the request of the SIMUTA training developers. For example, message handling software was reprogrammed to replicate the multiple radio nets that flow through the Main CP. Technology, however, is not infinitely malleable. Thus, training developers need to be very flexible with regard to how data will be collected, how critical subtasks will be addressed, what the technology will do versus what the human trainers will do. Simultaneous development of training with technology development is both a blessing and a curse. The curse is that deadlines may be hard to meet when training and technology contractors are working on different schedules. The blessing is that there is a chance for training developers to influence technology design. Given parallel development efforts, the training developer should press technology developers to design

systems that (a) make the technology as transparent as possible if the technology is not directly relevant to training, and (b) use technology to replace human trainers whenever possible to reduce overhead and standardize delivery.

Utility of Formative Evaluation

It should go without saying that formative evaluation is critical to designing optimum training because it provides the chance to try out and change training procedures based on experience. At the same time, formative evaluation is too often disregarded as programs are pushed into premature summative evaluations or implementation. Technology-based training seems particularly vulnerable perhaps because technologies, like SIMNET, tend to be so dazzling that little reflection is given to their implementation.

The structured training of the RCVTP is driven by a set of instructions which are highly detailed to insure that training events provide the unit with practice and feedback on targeted tasks. The instructions cut across tables and echelons, detailing procedures for operating (at a user level) the technology and for interacting with the training unit. The instructions present countless decisions concerning target training objectives, Table Previews and AARs, O/C actions to cue events, enemy locations and movements, starting positions for friendly units, and so on. Just writing specifications for ModSAF OPFOR vehicles required over a dozen separate decisions per vehicle. Given the intricacy of the program, ironing out all the wrinkles required full trials with O/Cs conducting training with ARNG units. The detailed scrutiny that the RCVTP products received during these trials enabled the SIMUTA Team to fine tune the products to run smoothly, producing the simulation and instructional cues in a timely manner. Without these trials, it would not have been possible achieve the level of efficiency obtained.

There is a cost, however. Formative evaluation takes time. Hundreds of person hours were spent monitoring training, with instructional developers comparing actual execution of training processes to intended execution and then determining the causes of disconnects. Countless hours were spent conducting formal interviews, having informal discussions, and gathering questionnaire responses from training units to insure that the program was meeting ARNG needs. Formative evaluation is not an activity that is overlaid onto training development. It must become part of training development for the formative evaluation feedback to effect positive changes in the program.

Comment, Summary, and Conclusion

The lessons learned covered topics that included the training media, the trainers, the training developers, the training media developers, and the sponsors of all these. The lessons were written from the perspective of having completed the project. In general, they represent the surprises that occurred, rather than confirmation of expectations. The lessons are intended to provide guidance to future training developers working with, and in, a complex of ideas and agencies.

The production of a collective training program such as the structured RCVTP is an intricate task. The development system, as well as the training itself, are models containing multiple interacting parts. Failure to attend to any of the parts can have consequences that reverberate throughout the entire program. Attention to detail is a must and expecting the unexpected should be routine. A good sense of humor also helps. In an effort of this magnitude, there will be false starts along the way. These false starts are part of the learning process needed for innovative design activities. Successes will also be commonplace. These should be celebrated in order to keep the frustrations in perspective.

Summary

The discussion of lessons learned began by highlighting discoveries related to developing and implementing structured training for platoons, companies, and battalions. The training structure was provided by developing complete scenario details and identifying tasks associated with the events of those scenarios. Scenarios for all echelons were derived from the contractor team's military expertise and knowledge of the typical NTC missions of movement to contact and defense in sector. Furthermore, relevant ARTEP-MTPs were used as backup documentation.

The contractors designed the scenarios so that units at all levels were able to train within the context of the scenarios. At the platoon and company levels, preparation time was minimal; that is, units only had to copy overlays and conduct brief rehearsals. To execute battalion scenarios, units spent more time conducting rehearsals. Through rehearsing, battalion leaders were able to revise their plans and customize the RCVTP orders for their units and standard operating procedures (SOPs). The RCVTP orders provided a starting place for units and a structure for the O/Cs who controlled the exercises.

Initially, the contractor team expected platoon, company, and battalion exercises to be derived from the same battalion story line. The exercises were mutually supportive in terms of tasks and missions, but the battalion exercise storylines were not identical to those of the platoon and company exercises. The primary reason for the divergence in storylines was related to differences in delivery schedules between the battalion and lower echelon exercises; initial versions of the lower echelon exercises were delivered prior to the completion of the battalion orders. The divergence was minimal, however, and even beneficial. Variations in missions increased the generalizability of the training by prohibiting units from becoming dependent on ever present and constant METT-T conditions.

Within echelons, contractors designed training to focus on one mission rather than training of disconnected tasks. The mission concept appeared to keep soldiers psychologically involved in the exercise. By increasing difficulty in a natural progression, the tables allow a crawl-walk-run strategy to be carried out without undo repetition and tedium. The program could be strengthened by more explicit examination of which teaching strategy -- teaching, coaching, or mentoring -- should be applied during each of the crawl, walk, and run levels of training. Neither the SIMUTA Team nor the Army serviced the O/Cs well in terms of providing them with sufficient instruction and feedback in these instructional techniques.

Integration of the development efforts was discussed in view of the delivery schedule and the organization of the SIMUTA Team. Two points are worth restating. First, the training development process is not linear. The SIMUTA Team wrote brigade and battalion orders as the initial step in training development; they expected that the completed set of orders would be sufficient to develop the training exercises. There were two problems. Well developed orders have an elegance that is difficult to achieve. Thus, as long as there is time for revision, revisions tend to be made. The battalion developers had more time than platoon and company exercise developers and continued to revise the order after the platoon and company developers began writing their exercises. In addition, orders to be used in simulation cannot be written without considering the idiosyncrasies of the simulation. The orders and the simulation technology are both training vehicles. They need to be synchronized to most efficiently and effectively support training by allowing the events to occur which provide practice on needed skills.

Second, integration of training developments also implies integration of development team activities. The lesson learned, and one which should not have been surprising, is that as time constraints increase, the efforts needed to maintain integration of efforts increases.

A number of lessons learned related to the O/C Team which implemented the RCVTP were discussed. The O/C's were given a challenging job. Furthermore, they were introduced to the program in less than ideal conditions. That is, all but a small number came into the program some four or five months after its design and production was underway. As implementers of the program, they needed to feel "ownership" of the program, however, the basic philosophy and the initial execution plans were already in place when they arrived. Their opportunities to meaningfully become involved in program design were further constrained by time limitations imposed on their team.

Finally, conducting the training is demanding on the O/Cs. It requires them to be experts in the content material they are training, practiced in the simulations they are using, and skilled in teaching, coaching, and mentoring skills. While the program is "turn-key" for the units being trained, it is not for the O/Cs. The training support materials provided are significant job aids, but the O/C is required to make numerous decisions to facilitate the learning of the unit. The training is also intended to compress training time and achieve the most learning in the least time possible. The O/C is put in charge of maintaining that compression of time. These factors make a typical training day very full.

Conclusion

One final question needs to be addressed: "Were the objectives of the program achieved?" Overall, the project appears to have been successful. Certainly, the RCVTP schedule is full with ARNG units who have voluntarily chosen to include the RCVTP in their training schedules. In addition, success is also indicated through a review of the touchstones of Brown's (1991) four principles. The words that appear in Chapter 1 are repeated, not as statements of intent as they were originally written, but as statements of accomplishment:

1. To compress training. The program (a) established an improvement in training efficiency through the development of multimedia advance materials for use at

home station; (b) focused on execution by creating short repeatable exercises with maximum time spent in the simulators, and (c) developed a turn-key training management component that freed the unit's chain-of-command from the administrative burden of developing and managing the program.

2. To distribute training. The program (a) increased training efficiency and effectiveness by the development and distribution of advance materials to support mission planning and preparation by the unit; (b) prepared a Take-Home Package design that summarizes performance on critical tasks and subtasks observed during RCVTP training, and suggests areas for training concentration; and (c) is exportable to mobile SIMNETs (partially for company level training; fully for platoon level training) and ARPA Janus sites.
3. To modernize training support. The program leverages existing networked simulation and other emerging technologies to provide an advanced environment for conducting tactical exercises at the platoon, company, and battalion levels. The program intensifies the training experience by immersing ARNG units in a realistic "virtual" combat environment.
4. To focus on critical tasks. Every aspect of the program, from demonstration tapes, table previews, on-line coaching, AARs, and Take Home Packages is designed and developed to achieve the goal of focusing the unit on improving their execution of critical subtasks.

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