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**COMMUNICATION OF INTENT IN
DISTRIBUTED SUPERVISORY CONTROL SYSTEMS**

DISSERTATION

**Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University**

By

Lawrence George Shattuck, B.S., M.S.

*** * * * ***

The Ohio State University

1995

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This Dissertation is dedicated to my Lord and Savior, Jesus Christ who sustained me through the last three years with His strength and wisdom. It is dedicated to my wife, Jill, and my sons, Jason and AJ. Their love and understanding have been my constant companions. It is dedicated to the soldiers of the US Army with whom it has been my privilege to serve in the defense of our nation.

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LIST OF ABBREVIATIONS

AA	Assembly Area or Avenue of Approach
ABF	Attack By Fire
AWC	Army War College
BDE	Brigade
BN	Battalion
BP	Battle Position
CAS3	Combined Arms Staff Service School
CDR	Commander
CO	Company
COA	Course of Action
C2	Command and Control
EA	Engagement Area
MRB	Motorized Rifle Battalion
MRC	Motorized Rifle Company
MRB	Motorized Rifle Platoon
MRR	Motorized Rifle Regiment
NTC	National Training Center
OC	Observer/Controller
OPORD	Operations Order
PL	Phase Line
SBF	Support By Fire
SITREP	Situation Report
SOP	Standard Operating Procedure
TF	Task Force
TM	Team

CHAPTER I

INTRODUCTION AND OVERVIEW

Air traffic control, nuclear power plant control rooms, and military command and control are examples of distributed supervisory control systems. Distributed supervisory control systems are hierarchical and cooperative. They include remote supervisors who work through intelligent local actors to control some process. A remote supervisor typically provides plans and procedures to multiple local actors. These plans and procedures often are inadequate to cope with the unanticipated variability of local situations (Woods and Roth, 1988). As a result, local actors must adapt the plans and procedures to the situation based on their understanding of the remote supervisor's intent. This research investigated how remote supervisors, separated by both time and space from local actors, impart their presence by communicating intent to coordinate and adapt underspecified plans and procedures.

Plans and procedures developed by designers before the system was implemented or by remote supervisors who have an incomplete (or inaccurate) view of the local situation are not always successful. In their field study of a human-intelligent machine system, Roth, Bennett, and Woods (1987) learned that plans and procedures were brittle if technicians followed them rotely. Correct problem solving paths deviated from the predetermined

plans and procedures in 78% of the cases. Deviations were found to be the norm because domain experts and designers are unable to anticipate all possible local conditions. Their plans and procedures were underspecified, requiring technicians to "supply knowledge and act outside of the scope and direction" of the expert system (Roth et al., 1987).

Research by Suchman (1987) confirmed that plans and procedures are interpreted based on the local context of the actor. She wrote that "instructions must be interpreted with respect to a collection of actions and circumstances that they never fully specify." In other words, local actors cannot blindly follow predetermined plans and procedures issued by remote supervisors or system designers without regard for local conditions. They must have the ability to adapt plans and procedures to fit their perspective of the environment.

Local actors need a framework or a context for adapting their plans and procedures in responding to novel situations. They must understand the supervisor's *intent* underlying the plans and procedures. The dictionary describes intent as "a purpose; object; aim" (Webster's New World Dictionary, 1970). In communicating intent, the remote supervisor explains the goals of the system (object or aim) and the reason for pursuing the goals (purpose). This explanation provides a framework for adapting the existing plans and procedures to respond to novel situations. The intent is the means by which the remote supervisor imparts his or her *presence* to the local actors. This sense of presence assists the local actors to respond in the same way that the supervisor would if the supervisor were at the actor's location.

There is an inherent tradeoff for the remote supervisor in establishing the framework for adaptation. Supervisors must determine the latitude or

flexibility they will give their subordinates to adapt plans and procedures to local situations. Supervisors who establish centralized control inhibit local actors. These supervisors show little regard for local situational factors. At the other extreme are supervisors who give local actors complete autonomy. In the latter case, remote supervisors are 'out of the loop' and the response across multiple actors can be uncoordinated and unsynchronized. The system may actually move away from its goals or end state. Somewhere in between these extremes are systems in which local actors are able to implement the appropriate procedures (or even modify them) based on an analysis of local conditions and a sense of the supervisor's presence in order to achieve the intent.

Plans and procedures are designed to function as a surrogate, to provide instructions to the local actors when the supervisor cannot be present, to impart a sense of the supervisor's presence to the local actor. Supervisor intent should guide the implementation of the plans and procedures to meet local conditions and changes. However, in most distributed supervisory control systems, intent is communicated passively. It is implied in procedures and difficult to discern. Woods, O'Brien, and Hanes (1987) found in their studies of nuclear power plants that "good operations require more than rote rule following." They identified two types of errors that can occur when "events demanded a relatively variable sequence of component actions and extensive feedback from the environment in order to adapt to unpredictable constraints or disturbances."

- "Type A problems where rote rule following persisted in the face of changing circumstances that demanded adaptable responses."

- "Type B problems where adaptation to unanticipated conditions was attempted without the complete knowledge or guidance needed to manage resources successfully to meet recovery goals."

Local actors need to understand the implied intent so that they know when and how to adapt plans and procedures.

In the domain of military command and control (C2), senior commanders (remote supervisors) work diligently to develop a statement of intent which is passed to subordinate commanders (local actors) prior to starting a tactical operation. The intent assists subordinate commanders in responding to local situations that were not foreseen by the planners.

In this study, military command and control was investigated as an instance of a distributed supervisory control system. After investigating the domain to learn about the dynamics of intent, five questions were developed to guide the study.

- How do remote supervisors impart their presence to local actors?
- To what extent is the communication of intent a process rather than an event?
- To what extent do remote supervisors empower local actors?
- What information do local actors use in responding to unanticipated situations?
- Does the content of its usefulness to local actors?

A simulation was then developed to observe how local actors responded to unanticipated situations. Four army battalion commanders were asked to respond to anomalies based on plans they had developed and distributed to their subordinate company commanders. By presenting the battalion commanders with situations not specified in the plan they should have

referred to the intent statement (included in the plan) when formulating their response. Battalion commanders completed questionnaires, asking them to predict the performance of their subordinates and to rate their plan in terms of flexibility.

The company commanders (four in each battalion) used a think-aloud protocol and were videotaped as they responded to the same situations. Company commanders also completed questionnaires asking them to predict their performance relative to that of their battalion commanders and to rate the plan in terms of flexibility. The video tapes were then shown to the battalion commanders who judged their subordinates' responses relative to their own responses. Finally, the video tapes were shown to former battalion commanders who served as neutral observers. The neutral observers provided valuable commentary on the intent process within each of the battalions.

Historical Examples

Military history contains countless examples of subordinate commanders attempting to adapt to unanticipated local situations. Three examples are discussed in this section: General Haig on the Somme (World War I); the Israeli Defense Force (IDF) in 1956; and, D-Day, World War II. These examples illustrate different degrees of control and the effects on implementing the intent. Soldiers under the command of General Haig knew what to do but were constrained by rigid plans and procedures. In the 1956 Sinai Campaign, General Dayan provided his subordinate commanders with clear intent and complete autonomy. The result was that General Dayan could no longer influence events and subordinate commanders failed to coordinate their activities. During D-Day, a commander captured a

bridgehead but ultimately let it fall into enemy hands because he chose to pursue another goal - one that was not consistent with goals of his senior commanders.

General Haig On The Somme

General Haig was commander of the British forces opposing Germany Army units near the Somme River in 1916. Haig was determined to eliminate confusion from the battlefield by developing a meticulous, comprehensive plan. Van Creveld (1985) writes:

"Battlefield conditions having allegedly rendered intelligent cooperation between superior and subordinate commanders... impossible, the British hoped to make it superfluous by loading the individual infantryman with vast amounts of equipment and food...and prescribing a slavish adherence to predetermined plans."

Subordinate commanders were forbidden to accompany their soldiers into battle and had no authority to modify the plan. Instead, they were to remain in the rear where they had a greater likelihood of communicating with their higher headquarters.

Israeli Defense Force

The second example comes from the Israeli Defense Force (IDF) during the 1956 Sinai campaign. In preparing for the campaign Dayan (as quoted in Van Creveld, 1985) stated:

"To the commander of an Israeli unit, I can point on a map to the Suez Canal and say: "There's your target and this is your axis of advance. Don't signal me during the fighting for more men, arms, or vehicles. All that we could allocate you've already got, and there isn't any more. Keep signaling your advances. You must reach Suez in forty-eight hours."

With these words, Dayan gave complete freedom to subordinate commanders to wage war as they saw fit. Dayan's ability to influence the developing situation was all but eliminated. On one occasion, an entire brigade watched while two other brigades were fighting to capture an objective. In retrospect, Dayan realized his mistake. He wrote that the heavy emphasis on improvisation and the absence of a strong controlling hand meant that "our capacity for misadventure [was] limitless." And, granted "a huge measure of independence" the brigade commanders failed to coordinate their movements.

Comparing Haig And Dayan

These two examples represent extremes of the military C2 process. Both generals had communicated their intent clearly to their subordinates. Haig's subordinates understood that no matter what happened, they could not deviate from the plan. Dayan's subordinates knew that they could do whatever was necessary to reach the Suez within the specified time.

Through his rigid procedures, Haig had stifled the initiative of his subordinates. His control was completely centralized. He had rendered his subordinate commanders little more than automatons. Haig constrained his subordinates by using procedures that had been developed before the process began based on his prediction of the battlefield environment. The procedures could only be modified by Haig or his staff.

When conditions were different than anticipated, subordinate commanders were unable to adapt the plans to fit the local situation. Subordinate commanders could not exploit success by venturing beyond that day's objective, without permission from Haig himself. Even though Haig

had planned multiple communications systems to provide him feedback on the battle, he was completely isolated from events on the front lines. The communications systems either failed or were so slow and error-prone that the data was useless. On one occasion, a frontline commander had great success. The enemy in front of them retreated. Rather than exploiting the success by continuing the attack, the commander remained in place because he had already achieved his objective for that day and was not permitted to venture beyond that point. The enemy had time to reorganize, reconsolidate, and prepare for what would be a successful counterattack. It is little wonder that many senior officers sat idly at their headquarters while on the front lines 20,000 British soldiers lost their lives in a single day.

Dayan placed a different kind of constraint on his subordinates - get to the Suez in forty-eight hours. But without any further procedures or guidelines to constrain the process, Dayan lost control of his subordinate commanders. They were free to wage war as independent entities, to consider no other view of the environment than their own. There was no requirement to coordinate their actions with adjacent commanders. They were able to respond to local situations without guidance from higher headquarters. Dayan and the IDF learned the effect of completely decentralizing control. Subordinate commanders can lose concern for higher organizational goals and the result can be something that approaches chaos. In spite of this potential for disaster, the swift moving IDF, aided by British and French forces, achieved all of its objectives within seven days.

D-Day, World War II

The third example is described by S. L. A. Marshall (1954). He writes:

"In Normandy, on D-Day, one of the decisive bridgeheads across the Merderet River, by which the American forces would move westward to cut off the Cotentin Peninsula and seal the fate of Cherbourg, was held on four separate occasions by small American forces which then let it slip from their fingers. In two instances these forces marched away from the bridgehead to seek some lesser prize, leaving the bridgehead uncovered. In consequence, the progress of Corps was stalled for four days at the river crossing and victory was finally made certain only after bitter struggle and heavy loss.

These errors were not due to an absolute oversight on the part of any one person. As is usually the case in battle, things went wrong because of little slips along the line. The small tactical forces which walked into the bridgehead and then walked out again had been several times briefed on the importance of the objective. But by their own testimony, the briefing had not given them a conviction that, above all else, they should make certain of the continued defense of the river passage."

At one level of analysis, the unit accomplished its mission - it captured the bridgehead. At another level of analysis, the unit failed miserably. Its failure to maintain possession of the bridgehead resulted in the delay of an entire corps and the unnecessary loss of life.

The fundamental question facing the commander when the unit initially captured the bridgehead was, "What do I do now?" The correct response was, "Stay and wait!" Yet, all indicators within the local situation pointed to following another course of action. Around them they could hear the sounds of war and knew that their fellow soldiers were decisively engaged in battle. The commander determined that he had accomplished his assigned mission and his unit was now free to assist other units in the area.

In this context, coming to the aid of the other units was the wrong response to the local situation based on the goals of the larger organization. However, in the Suez example, coming to the aid of nearby units would have

been the correct response. Local context is not enough on which to base decisions. Subordinate commanders must understand strategic issues as embodied in the senior commander's intent. Woods, et al., (1994) uses the term 'local rationality' to describe the local commander's appropriate, yet erroneous, behavior. He states that behavior can be seen as rational "when viewed from the locality of their knowledge, attentional focus and strategic tradeoffs."

The commander's local rationality was influenced by the mission statement from higher headquarters. Soldiers understood that they were to *capture* the bridgehead but the plan apparently did not make clear that they were to *hold* the bridgehead. The plan failed to specify the role that the bridgehead would play in accomplishing the mission of the higher headquarters. Either the senior commander failed to communicate his intent or the local commander failed to understand it. When the remote supervisor's intent is properly communicated and understood, the local actor can integrate the strategic objectives of the larger system with the reality of the local environment.

Taken together, these three historical examples demonstrate that commander's intent is more than telling subordinates what their mission is and how they should accomplish it. It includes communicating how the mission of the subordinate unit relates to higher order goals. It also includes the concepts of control and balance. Senior commanders must remain sufficiently involved so as to be able to influence the outcome by re-allocating resources or by changing unit missions. Further, they must understand that their view of the operational environment is fundamentally different than the view of their subordinates. To force subordinates to abide by a set of rigid

procedures is to coerce them to base actions on an assessment of conditions that is fundamentally different than what they are experiencing in real time. Subordinate commanders must have the ability to implement and modify their plans based on their understanding of the local situation. Striking a balance between the roles of the senior and subordinate commanders is not a trivial issue. The proper balance depends on a variety of factors, many of which are situation dependent.

Toward A Model Of Distributed Supervisory Control Systems

The military history examples discussed in the previous section are instances of distributed supervisory control systems. Nuclear power plants, air traffic control networks, and many other industries include some form of distributed supervisory control. Although these domains are very different in their specific objectives, there are distinct similarities in their underlying structure and functions used to achieve their objectives. In spite of their ubiquitous nature, very little has been written about the characteristics of these systems. Any model of distributed supervisory control systems that could be applied across diverse domains must address the following scheme:

A remote supervisor uses a communications process to provide local actors with plans and procedures and to impart his presence. The degree of control established by the remote supervisor influences the ability of the local actors to adapt to unanticipated conditions based on their assessment of the local environment.

Remote Supervisor

Advances in communications and automation no longer require supervisors and actors to be at the same location. Supervisors can be

separated by both space and time from their subordinates. Such technology affords greater span of control but has limitations. Supervisors cannot become the equivalent of the local actors. Supervisors are unable to continuously monitor all processes, filter the information, and determine the appropriate course of action. They must remain detached from the details of the local actors in order to evaluate the system's progress relative to the higher order goals.

Prior to controlling a process, the remote supervisors and local actors may engage in cooperative activities, including planning, training, and rehearsals (see Figure 1). During periods of low activity in controlling a process, the need to exchange information between supervisors and actors is minimal. When an unanticipated, time-sensitive event occurs, remote supervisors must rely on local actors to provide them the information they need to assess the situation and to formulate a plan at the very time that the actors are most busy. Woods (1994) describes this ebb and flow of activity as characteristic of systems in which cognitive activity is distributed across multiple agents. If the supervisor's intent is effectively communicated prior to an unanticipated event, actors are more likely to make proper decisions relative to overall system goals. Supervisors will not become mired in one local situation and lose sight of the goals of the system. Thus, during peak periods, actors are able to devote more cognitive resources to managing the local situation and less to the task of updating the supervisor.

A remote supervisor and local actors participate in planning activities prior to controlling the process.

A remote supervisor and local actors can be separated by space, time, and events when they control a process.

Figure 1. Plans and procedures are developed and distributed to local actors prior to initiating control of the process. Once actors begin controlling a process they may be separated by space, time, and events.

Local Actors

A remote supervisor and a local actor have fundamentally different perspectives of the environment. Local actors operate at the sharp end (Reason 1990) where they interact directly with the process being controlled. They have privileged access to a narrow portion of the system. Remote supervisors operate at the blunt end and can only influence the control process indirectly through policies, plans and procedures, and the allocation of resources. They are concerned with broad goals, general trends, and the status and interaction of subsystems.

Local actors have specific goals and are able to continuously monitor local changes in system status. These local conditions, in turn, affect how the actors respond to the plans and procedures of their remote supervisors. For example, if the local actors cannot communicate with the remote supervisor, actors must rely on the plans and procedures provided to them. If local situations are such that the plans are no longer valid, actors must modify and implement the plans on their own. Even then, however, local actors cannot act independently. They must reconcile their actions with their supervisor's intent and coordinate their activities with other local actors. Failure to coordinate their activities with other agents could result in a system failure.

Communications Process

The methods used to communicate between the remote supervisor and the local actors include voice, text, and graphics. Exchanges can occur face to face or electronically. Functions of the communications process include:

- Distributing plans and procedures;
- Specifying the degree of control;

- Imparting presence;
- Updating agents on status of system.

The remote supervisor and the local actor are often separated by both space and time. A remote supervisor will communicate a procedure to the actor. However, the actor is not expected to implement the procedure until later, when the system is in another state. (For example, at time X, implement Procedure Y.) The content of the communication may consist of nothing more than the procedure itself, or it may contain additional information, including system goals, rationale, constraints, and other considerations (Klein, 1993). The latter form of communication is more likely to convey the intentions of the remote supervisor. It is vital that the local actor understand the intent so that when local conditions are different than those envisioned by the remote supervisor, the actor (if given the latitude) can take action that will move the system closer to achieving its goal.

Plans and procedures. All supervisory control systems rely on plans and procedures (or guidelines). It is the means by which a system achieves its objectives. There are several types.

Predetermined plans and procedures. These plans and procedures are developed by designers in conjunction with domain experts long before the system is operational. By their very nature, they are brittle. These plans and procedures attempt to tell actors what to do and how to do it. But, no matter how detailed they are, it is impossible for designers to predict every situation, system state, or set of interactions.

General guidelines. Examples of general guidelines are the military's warfighting doctrine (FM 100-5) or a nuclear power plant's policy to minimize the cost of generating electricity. Although they were also developed prior to

the system becoming operational, they provide some flexibility to the remote supervisor and the local actor in implementing them. They tell actors what to do but not how to do it.

Situation-specific plans and procedures. These are developed just prior to initiating control of a system or during the control process. Situation-specific plans and procedures may be specific or general. For example, an air traffic controller may tell a pilot to descend at time X to altitude Y at rate Z; or the controller can tell the pilot to maintain a safe distance from other aircraft near the airport. The amount of detail in the plans and procedures will determine the flexibility the pilot has in implementing them. In order to develop situation-specific plans and procedures, remote supervisors need an accurate view of the control process. Actors must devote both time and cognitive resources to updating a supervisor's knowledge of the local situation when time is critical and cognitive resources are committed to near capacity.

Degree of control. All remote supervisors demonstrate some degree of control over the local actors. At one extreme, supervisors maintain *absolute control*. Local actors are little more than automatons, implementing procedures exactly as specified; process control is brittle and does not consider the local situation. When an unanticipated event occurs, actors must detect and report it to the remote supervisor and then wait for new instructions. The consequences of this type of control are obvious. Before a remote supervisor can provide instructions to local actors, the system has transitioned to another state. The supervisor and actors lag behind the system as it changes over time..

At the other extreme are supervisors who *relinquish control* by delegating local autonomy to the actors. Dayan demonstrated this approach during the 1956 Sinai Campaign discussed earlier. He lost the ability to influence events, and his subordinate commanders failed to coordinate their activities. Although they achieved their objective, Dayan recognized that the potential for chaos was great.

A more functional approach lies between these two extremes. Remote supervisors provide plans and procedures to local actors along with information about the purpose and the high-level organizational goals. When the plans and procedures no longer apply because the local actors are confronted with unanticipated events, they have the authority to adapt (or even scrap) the plans and procedures. Their response is based on their view of the local situation but within the context of the organization's purpose and goals.

In the early 19th Century, German military doctrine referred to this method of distributed supervisory control as *Auftragstaktik* (Silva, 1989). Loosely translated, *Auftragstaktik* means 'mission-oriented command.' Fundamental to mission-oriented command is the mission order. Silva (1989) explains the relationship between these two concepts:

"The function of mission-oriented command is to bring the collective creativity of the entire army to bear to solve tactical and operational problems. It rewards he who acts and penalizes he who does not. The mission order is merely the manifestation on the battlefield of the wider dimensions of mission-oriented command; the mission order includes the commander's intention as an inherent part of the mission. It leaves the subordinate free to determine not only how to complete his mission, but also demands that he be free to decide when to alter his mission in response to unanticipated events."

Imparting presence. Communication of intent is the means by which remote supervisors impart their presence to local actors. What does it mean to impart presence? It *is not* providing the remote supervisor with access to the same detailed view of the local situation as that of the local actor. Although technology can provide this access, it does not necessarily follow that the performance of a supervisory control system will be improved. Remote supervisors need to maintain a high-level perspective of the control system. Providing them access to detailed views will overload them with data and make it difficult for them to identify and attend to important events. In addition, remote supervisors with detailed local information are likely to become micromanagers - they will engage in tactical decision making at the expense of their strategic responsibilities.

Imparting presence *is not* providing detailed procedures and telling local actors to follow them rote. In distributed supervisory control systems, unanticipated situations are inevitable. Imparted presence should serve as a background for all plans and procedures so that local actors understand how and when to adapt them to achieve the supervisor's intent.

Imparting presence *is not* about second-guessing the performance of the local actor. Supervisors' judgments are biased by their knowledge of the outcome. According to Woods, et al., (1994) " Given knowledge of outcome, reviewers will tend to *simplify* the problem-solving situation that was actually faced by the practitioner. The dilemmas, the uncertainties, the tradeoffs, the attentional demands, the double binds, faced by practitioners may be missed or under-emphasized when an incident is viewed in hindsight" (emphasis in original text).

Imparting presence *is* making the supervisor's knowledge available to the local actors. This knowledge includes the supervisor's understanding of the system's purpose, goals, constraints, and tradeoffs. Skilled supervisors communicate domain expertise and strategic-level information that go beyond brittle plans and procedures. The knowledge can be used by local actors when they make tactical plans, face unanticipated situations or must determine a course of action upon achieving their objective. The process of communicating intent is essential to imparting presence because it increases the probability that local actors will make the same decisions that the remote supervisors would make if they were present in the actor's location and able to view the situation from that perspective. Intent also communicates the degree of freedom or discretion afforded to subordinate commanders by the senior commanders.

As technology allows, more systems will evolve into distributed supervisory control systems. Designers are attempting to develop systems with either humans or intelligent machines in the roles of remote supervisors or local actors. The success of these systems depends on the ability of the supervisor to impart his or her presence to the actor. The local actor must properly interpret and implement the solution based on an accurate understanding of the local situation and must possess an understanding of the supervisor's intent that underlies the plans and procedures so that when the actor encounters surprise, he or she will respond appropriately.

Perspective Of The Environment

Remote supervisors and local actors have different perspectives of the operational environment. Each actor functions in a narrowly focused, detail-oriented, intense world with a specific goal. For example, airline pilots implement flight plans that specify how their aircraft are to travel from their point of origin to their destination. Their view of the environment is limited. They are focused on how events impact their ability to maneuver their aircraft.

At the level of the supervisor, the goals of the actors become sub-goals of the system. The supervisor's interest should not be in the details of the actor's world but in how the actor stands relative to the accomplishment of his or her goal and in the movement of the system toward the accomplishment of the overall goal. Air traffic controllers must move aircraft in and out of the airspace in the vicinity of the airport. They cannot monitor the status of each aircraft at the same level of detail as the pilots. The air traffic controllers need to maintain a high-level perspective so that they can coordinate the movement of all aircraft.

The environmental perspective of the supervisor is important because it influences any attempt to control the system. A supervisor immersed in one subsystem may provide specific, detailed instructions to the local actor but may lose sight of larger system goals. Or, the supervisor may be so focused on implementing the plans and procedures to achieve the system goal that he or she fails to recognize or assist the struggle of an actor relative to the local conditions. In either situation, the remote supervisor is forcing the actor to adopt the supervisor's perspective of the environment rather

than acknowledging the importance of maintaining complementary perspectives.

Contributions Of This Research

Advances in communications and computer technology make it possible, and even desirable, to separate supervisors and actors. Such systems need not employ humans only. Intelligent machines can function as either supervisor or actor. Separating these entities by space and/or time means that the supervisor and the actor will not share the same view of either the current system state or of the system goals.

Technology-centered solutions seek to bring the world of the local actor to the remote supervisor. By providing the supervisor with the information previously available only to the actor, designers can centralize decision making. The supervisor, in essence, becomes 'n' virtual actors (where 'n' represents the number of subsystems). The role of the local actors becomes one of implementing instructions. A remote supervisor can become overloaded with information easily. In addition to making decisions, the supervisor would have to monitor, sort, and filter information, and detect departures from the plan. He or she would run the risk of becoming buried in the details of one subsystem and would lose sight of the higher level goals of the system. The supervisor would be prone to making superficial assessments of local situations that could lead to ineffective or destructive solutions.

Human-centered solutions seek to enhance cooperative problem solving efforts of remote supervisors and local actors. These solutions attempt to provide actors the knowledge and authority they need to respond

to unanticipated local situations within the context of higher level goals. By imparting their presence to actors, supervisors are able to maintain a global perspective and actors are empowered to modify plans and procedures as necessary.

Communicating intent is the primary means for imparting presence and establishing the necessary balance between absolute supervisor control and actor autonomy. Very little research has been conducted on intent as a means of aiding cooperative problem solving. For example, communications theory discusses intention as "an *assumption* which is made about an event allowing us to treat the elements of that event as sign elements in a structure which *imply*, and from which we may *infer, meaning*" (Mortensen, 1979). According to communication theorists, intention permits the speaker to make implications about an event and the listener to make inferences about that event. The field of social cognition also recognizes the importance of communication (Kraut & Higgins, 1984). Researchers investigate the impact of social factors on the process of communication. They recognize conversational maxims and the role that communication plays in mediating interpersonal behavior. However, these researchers do not discuss how humans ought to communicate intent to one another.

Philosophers have written about intention and intentionality for many years. Bratman (1992) states that intention characterizes both our actions and our minds. If we perform an action that was planned, we have done it *intentionally*. If we plan in our mind to perform an action at some future time, we *intend* to do it. Much of the literature discusses how our intentions influence our behavior. Searle (1992) even discusses collective intentions. Rather than analyzing how they are communicated, he focuses his argument

on differentiating between We-Intentions (collective) and I-Intentions (individual). He concludes that We-Intentions are primitive, perhaps even biological - they are not the sum of a set of I-Intentions.

The supervisory control literature investigates domains in which humans interact with complex systems to achieve a goal (Sheridan, 1976). The human supervisors are responsible for monitoring the status of the machines and taking actions which will maintain the system within normal operating parameters. Since these machines have no intelligence, there is no discussion of communicating intent from supervisor to subordinate. The field of artificial intelligence has done some work on intent. However, approaches such as plan recognition (Carberry & Pope, 1993) and intent inferencing (Rouse, Geddes, and Curry, 1987) place the burden of understanding the intent on the machine.

In a distributed supervisory control system, both remote supervisors and local actors are intelligent agents and must work in a cooperative manner in order to accomplish their goals. A clear understanding of the supervisor's intent is essential. In military C2 systems, senior commanders work diligently to construct a statement of intent that will be clear to subordinate commanders. The intent statement is communicated to subordinates and discussed until the senior commander is confident that the subordinate commander understands the intent. Unlike the recent work in AI, communicating intent in C2 systems is a cooperative process. Unlike the characterization of intention in communications theory or philosophy, it is not about implying meaning to an utterance or making an inference from an action. In a C2 system, intent is used to guide the actions of a subordinate

commander, at a future time, when local conditions are different than those envisioned by the senior commander.

System designers need principles that will help them design effective distributed supervisory control systems. Remote supervisors need assessment tools to evaluate their ability to communicate their intent and training tools to enhance the performance of both supervisor and actor. Although this research investigated a military C2 system with human agents, the goal is to extend what is learned to the larger class of distributed supervisory control systems that can include non-human agents.

CHAPTER II

THE DOMAIN OF MILITARY COMMAND AND CONTROL (C2)

Military command and control (C2) was selected for this study to represent the general class of distributed supervisory control systems. From a technology-centered perspective, the system appears to be a collection of computer hardware linked together by communications hardware. From a human-centered perspective, the system is the means by which senior and subordinate commanders coordinate their activities in order to accomplish their goals. Military doctrine forms the foundation for the C2 system. Intent is a recent addition to army doctrine. It first appeared in the army's primary warfighting manual (FM 100-5) in 1982. During the 1970s the trend within the military was to centralize decision making. Events such as the failed hostage rescue mission in Iran¹ (Lanir, Fischhoff, and Johnson, 1986) signaled the need to empower subordinate commanders on the scene. The concept of intent (*Auftragstaktik*) was introduced into the military C2 system by the German army in the early 19th Century. U.S. military leaders embraced the philosophy but have struggled with the implementation. That struggle was evident in the comments made by officers who participated in the present study.

¹ In 1979, President Carter authorized a rescue attempt to free hostages being held in Iran. Satellite communications made it possible to control the operation from the White House. The commander on the ground, Colonel Beckwith, was told to follow the plan precisely. When unanticipated events occurred, the plan was no longer valid. Beckwith had no authority to modify the plan. He had to wait for instructions from the President.

Military C2 Systems As An Instance Of Distributed Supervisory Control

Military C2 Systems As Process Control

Military command and control can be classified as a human-human process control system, though not all would agree. Many view command and control as a system of computers and communications devices that are linked together to provide a commander with the ability to collect data and to disseminate orders. In this view, command and control is synonymous with technology. That this is a popular view is substantiated by the November 1981 issue of *Military Review* dedicated to command and control. All but one of the articles discussed command and control issues as they related to improvements or implementations of hardware.

Herres (1987) has a different view of command and control.

"The single most important characteristic of command and control is the fact that it is a *process* rather than an 'entity' or a 'thing'....[I]t is a fundamental principle of command and control, i.e., that C2 is a dynamic *closed loop process*....While the characteristics of the activities which take place in this process will vary at different levels of a tiered structure and within the dimensions of different missions, the fact that a process does take place is a reality. These activities are interactive - so much so that one must recognize the dynamics of the process with its constant interaction and frequently unpredictable events." (emphasis in original text)

Wickens (1992) classifies a diverse collection of activities as instances of process control systems because they have four elements in common:

- The processes being controlled have long time constants;
- Control of the system is performed in a discrete manner, yet the variables being controlled are essentially analog;
- The processes contain a large number of interrelated variables;
- Many of the processes are characterized by high risk.

Military command and control systems meet these four criteria. A tactical commander and his staff may control a battle that lasts for hours or days. Although commanders move unit symbols on a map in a discrete manner, the actual movement of the unit is continuous. The commander must coordinate several battlefield operating systems (e.g., aviation, artillery, air defense, engineer, intelligence, etc.). When a commander does not effectively control the process, soldiers die.

Military C2 Systems As Distributed Supervisory Control

Military command and control also can be classified as a distributed supervisory control system. Although it shares many features with other distributed supervisory control systems, there are some unique qualities of military C2 systems that must be mentioned.

Similarities.

- (1) Supervisors are separated by time and space from actors.
- (2) System views of supervisors and actors will differ.
- (3) Plans and procedures are used by supervisors to influence actors.
- (4) Plans and procedures are developed by designers or supervisors before a specific problem is encountered.
- (5) Supervisors rely on some method of communications to control actors.
- (6) Supervisors and actors confront unanticipated variability relative to their plans, and uncertainty caused by incomplete information.
- (7) Time constraints exist. Systems cannot be stopped while diagnostic procedures and decision making occur.

Differences.

- (1) Military supervisors face an intelligent, uncooperative, unpredictable enemy.
- (2) Military C2 systems are traditionally hierarchical.
- (3) Cost to humans of failure in C2 systems is extreme.

Communication Within Military C2 Systems

Communication is a neglected part of the command and control process. The perfect decision is of little use unless it is communicated effectively to those who are charged with implementing it. Yet, according to current doctrine (FM 100-5), communication is part of neither the command nor the control functions. Moving from a C2 to a C3 (command, control, and communications) perspective does not improve the situation. The communications portion of C3 is almost always discussed from a technological perspective (i.e., satellite, computer systems, etc.) rather than a cognitive perspective. Other writers have observed this same shortcoming.

"Commanders are likely to presume that decisions clear in their own minds will surely be understood by subordinate commanders. This presumes that the decision is communicated to the subordinate in a timely manner, that the decision as communicated will be clear to the subordinate, and that the conditions on which the decision is based will continue to prevail. But a decision made is not necessarily a decision faithfully communicated or clearly understood unless great care has been taken to create the shared understanding that makes communications effective. This aspect of the command and control process usually is taken for granted, but it should not be." (Snyder, 1987)

"Altogether too often taken for granted is the crucial activity of issuing directives and guidance to the engaging forces. Disseminating force execution directives is often the weak link

in the C2 process, and the criticality of this phase is frequently overlooked or lightly regarded." (Herres, 1987)

Although these writers discuss communication, what they are actually referring to is the coordination process between the senior and subordinate commanders. These commanders coordinate their activities through plans and procedures. When the plans and procedures no longer apply they coordinate their activities through the shared understanding of the senior commander's intent. This coordination transcends the communications structure. Senior and subordinate commanders can continue to coordinate their activities through the use of intent even when there is no functional communications path between them.

Description Of C2 Planning Process

Figure 2 depicts the self-paced planning process that occurs between the commander and his staff. (The higher the level in the chain of command, the more formal the planning process. However, every staff function is present at each level of command.) The brigade commander issues an operations order (OPORD) to the battalion commander. The battalion commander and his staff issue a warning order to alert the company commanders of an impending operation and then they begin a formal planning process (FM 101-5 Final Draft, 1993). During that planning process, the battalion commander backbriefs the brigade commander. In a backbrief, the battalion commander explains how he plans to accomplish his objectives and identifies his resource requirements. The brigade commander provides additional planning guidance if necessary. Once the battalion staff has completed the OPORD it is distributed to the company commanders.

From Planning To Execution

Once the deliberate planning process is complete, each level of command has a set of tasks it is responsible for executing. Execution includes monitoring progress toward the goal, recognizing and responding to system

Figure 2. The military C2 self-paced planning process.

anomalies, and providing higher echelons with information. If the local actors are able to implement the plan as written, the actor's mission will be accomplished and the objectives of higher echelons will be satisfied.

However, plans and procedures are inherently brittle and underspecified. They cannot specify every possible situation that could develop during execution. Figure 3 illustrates the range of possible outcomes when an anomalous event disrupts the execution of the plan.

Figure 3. The possible outcomes when a plan is implemented.

Two of the outcomes are clearly desirable: Mission Accomplished, Higher Order Objective Satisfied; and, Mission NOT Accomplished, Higher Order Objective Satisfied. In the latter instance, a local actor may not be able to complete the task as specified in the plan but still is able to create the conditions necessary for accomplishment of the higher order objective. Viewed another way, the actor is not able to achieve the local goal but acts within the intent of the remote supervisor to achieve the system goal. As an

example, a subordinate commander cannot accomplish his mission of capturing a hill because it is being hit with artillery. However, he can bypass the hill and assist in capturing the town, which was the objective of his senior commander. If the subordinate commander did not understand his senior commander's intent, the outcome could be very different. He may have insisted on capturing the hill. In the end, the hill would have been captured, many soldiers would be dead, and the town would remain in the hands of the enemy (Mission Accomplished, Higher Order Objective NOT Satisfied).

Three Significant Issues In Executing A Plan

There are many issues within the planning and execution processes that are of potential interest. Three of these issues are of particular interest because they directly influence the investigation of communicating intent in a distributed supervisory control system.

The plan. Woods (1993) characterizes plans and procedures as being brittle and underspecified. According to Suchman (1987), the "vagueness of plans is not a fault" unless the organization forces local actors to rigidly adhere to them. If plans and procedures are viewed instead as "resources for action rather than as controlling structures, the outstanding problem is not to improve upon them, but to understand what kind of resource they are." Senior military leaders have begun to encourage commanders to view plans as resources for situated action by incorporating the concept of intent into military doctrine.

Military C2 systems use doctrine, standard operating procedures (SOPs), and operation orders (OPORDs) to communicate plans and procedures to members of an organization. Doctrine and SOPs are developed without

Figure 4. Typical elements included in an operations order.

regard to a particular situation whereas OPORDs are context-specific. OPORDs have a fixed format. They consist of five paragraphs:

- *Situation* (Status of friendly and enemy forces)
- *Mission* (What the organization is supposed to accomplish)
- *Execution* (How the organization is supposed to accomplish its mission. Includes the commander's intent statement and the concept of the operation)
- *Logistics* (How the operations will be supported)
- *Command and Signal* (Includes elements such as location of commander, succession of command, and special communications instructions)

In addition to these five paragraphs, operations orders normally include annexes which describe the tasks to be performed by combat support and combat service support organizations (i.e., fire support, air defense, aviation, engineer, medical, signal, etc.). An operation order, even at battalion-level, can be a thick document (see Figure 4). The most important elements for a subordinate commander, however, are the mission and the execution paragraphs, usually less than a page in length. In these paragraphs, the senior commander establishes the parameters within which the subordinate commander must work.

The decision making process. Earlier in this chapter the distinction was made between self-paced decision making performed prior to controlling the process and event-driven decision making performed while controlling the process. The latter is more relevant to this study because it is the type of decision making that actors must perform when they are faced with a local situation that was not foreseen by planners.

Many researchers theorize that when decision makers are forced to make decisions under conditions of uncertainty, time pressure, and high stakes they use naturalistic decision making methods. According to Klein (1993), decision makers will identify the local situation as similar to a previously experienced event, select a strategy to resolve the problem, and then explore that solution to determine whether it must be modified. There are several different models of naturalistic decision making. Researchers have not determined with certainty which of these models is used by local actors when faced with an unanticipated situation. For this study, more important than identifying the decision making model used is focusing on

the information used to make the decision. What role do plans, procedures, situational factors, and intent play in determining a course of action?

The anomaly. When subordinate commanders implement a plan, they will usually face the unexpected - an event or situation that was not foreseen by the senior commander. (Ashby (1956) refers to these events as disturbances.) In this study, these unexpected events will be called anomalies. Not all anomalies are equal. Those that prevent the subordinate commander from accomplishing the assigned mission are of particular interest. In order to respond properly to such anomalies, the subordinate commander must consider the senior commander's intent. Even though the anomaly prevents the subordinate commander from accomplishing his assigned mission, he may still be able to satisfy the senior commander's intent by making the proper modification to the plan.

Commander's Intent In Doctrine

The Origin Of Commander's Intent

Prussian Army General Gerd von Scharnhorst is credited with introducing *Auftragstaktik* in 1801. The concept was developed in response to the French Revolution and "Napoleon's method of waging war, which swept away the traditional armies with their linear tactics, iron discipline, blind obedience, and intolerance of independent action" (Czeslik, 1991). The term *Auftragstaktik* was not actually introduced until 1912 by General Otto von Moser.

According to Silva (1989), *Auftragstaktik*, or mission-oriented command, was not a set of procedures but a *philosophy*, a social norm within the German army. At its foundation was the realization that "battle is

marked by confusion and ambiguity." The German army leaders "consciously traded assurance of control for assurance of subordinates' self-induced action. They apparently embraced the confusion of battle as an unending source of potential opportunity and built a command and control philosophy to realize that potential through decentralized decisions."

Silva (1989) emphasized that the subordinate commander must seize the initiative and act boldly, but within the intent of the commander.

The emphasis in mission-oriented command is not on *what* the subordinate does but that he *does something* without waiting to be told what to do. The superior can be assured his subordinates will take action to develop the situation by action within the parameters of their mission because the superior has trained them to do so. The superior can then exploit the changed situation resulting from his subordinates freedom of action.

Because German doctrine is regulatory, a subordinate's failure to act in the absence of orders is "illegal" and, at the very least, is inexcusable in the eyes of his peers and superiors. The NCO/officer knows he is expected to act on the situation as he sees it, and he knows his action will be supported, so he does so. Action in the face of uncertainty, and responsibility for it, became a social norm and developed into a near cult form."

Silva (1989) discusses the type of relationship that must be established between senior and subordinate commanders as part of implementing the concept of *Auftragstaktik*. He writes:

"Trust between superior and subordinate is the cornerstone of mission-oriented command. The superior trusts his subordinate to exercise his judgment and creativity, to act as the situation dictates to reach the maximum goal articulated in his mission; the subordinate trusts that whatever action he takes in good faith to contribute to the good of the whole will be supported by his superior.

A superior's confidence in his subordinates will be high or low as a result of his intimate personal knowledge of each

gained through his personal responsibility to train and develop them. The superior knows whom he can trust with more latitude and who need more detailed instructions, but the superior knows that each will act."

Silva makes two important points in this passage that are relevant to distributed supervisory control systems.

Each local actor is unique. The remote supervisor must evaluate the capability of each actor and create an operating environment in which that local actor can function. Establishing the same environment for all local actors amounts to denying that there are individual differences among them.

Remote supervisors must create the proper environment. Supervisors must establish an environment in which actors are not reluctant to respond to the local situations for fear of the repercussions. Within the context of *Auftragstaktik*, that environment is one in which "what was decided was relatively unimportant in training. Instead, the emphasis was on the effect the decision and action had on the whole, not on the method chosen. This technique solicits creative solutions in an environment where there are no formulae" (Silva, 1989).

Auftragstaktik requires that senior commanders provide subordinate commanders with considerable flexibility in responding to unanticipated situations. The number of options available to the subordinate commanders should be commensurate with the number that are available to the enemy.

Variety On The Battlefield

Ashby (1956) developed the Law of Requisite Variety in the field of Cybernetics. This law also has application to the battlefield. Ashby wrote "only variety can destroy variety." If in some game, D can make 10 moves but

R can only make one move, then the variety in the outcomes will be as large as the variety in D 's moves. However, if R can make two moves then the variety of outcomes can be reduced by as much as one-half.

Ashby also applied this law to control systems. Figure 5 is an adaptation of Ashby's Law of Requisite Variety.

Figure 5. Law of Requisite Variety adapted to a military C2 system.

In the figure, the brigade commander (BDE CDR) serves as a controller for several battalion commanders (BN CDR). The function of the controller is to determine the outcome (E). The battalion commander acts as the regulator and must obey the controller. (Note that at a lower echelon the battalion commander also acts as a controller and company commanders (CO CDR) act as a regulators). The outcome chosen by the controller will determine the action selected by the regulator. If the battalion commander is a perfect regulator, then no matter what outcome is chosen by the controller, the regulator will select the action that will result in that outcome.

Ashby states that the arrows also can be viewed as communications channels. The battalion commander receives instructions about the objective or outcome from the brigade commander. The battalion commander also receives information about the enemy (represented in the figure by *D*). Based on this input, the battalion commander selects a course of action that will result in the desired outcome. If the brigade commander is very specific about the methods or the outcome, the choices available to the battalion commander are reduced. It will be more difficult to achieve the desired outcome because the variety of options available to the enemy has not diminished. Thus, subordinate commanders forced to adhere to a rigid plan or to create a specific outcome will have little chance of success in the face of an unpredictable enemy. The concept of *Auftragstaktik* was introduced into the U.S. Army to maximize the variety available to subordinate commanders. Implementing this concept has been a challenge.

Commander's Intent In Practice

In 1982, the army included commander's intent into its primary warfighting manual, FM 100-5. The most recent version (1993) states:

"The commander's intent describes the desired end state. It is a concise expression of the purpose of the operation and must be understood two echelons below the issuing commander. It must clearly state the purpose of the mission. It is the single unifying focus for all subordinate elements. It is not a summary of the concept of the operation. Its purpose is to focus subordinates on the desired end state. Its utility is to focus subordinates on what has to be accomplished in order to achieve success, even when the plan and concept of the operation no longer apply, and to discipline their efforts toward that end.

The intent statement is usually written but can be verbal when time is short. It should be concise and clear; long,

narrative descriptions of how the commander sees the fight tend to inhibit the initiative of the subordinates."

Doctrine Differs From Practice

The doctrine states that intent should include the purpose of the operation and a description of the desired end state. In military schools, however, commanders are taught that intent statements should contain three elements: *purpose*, *method*, and *end state*. Former company commanders who were interviewed at the army's Combined Arms and Staff Service School (CAS3), Fort Leavenworth, Kansas, were quick to characterize intent in terms of the phrase "Purpose - Method - End state." The format has also been included in some non-doctrinal publications (Battle Command Battle Laboratory, 1994). "Purpose - Method - End state" was introduced in recent years to assist young officers in identifying, understanding, and implementing intent. (As one officer at the Army War College phrased it, a commander's intent statement is *Auftragstaktik* made simple for the masses.)

Doctrine makes no mention of incorporating method into the intent statement. Many senior officers recognize this discrepancy between military doctrine and instruction. An officer at the Army War College (AWC) stated:

"Method is not part of the intent. The only place that that resides is in ST 100-9, which is not a doctrinal publication. Our doctrine, Field Manual 100-5 talks about purpose and end state, but says nothing about method."

The doctrine also discourages lengthy statements of intent. Former company commanders emphasized the utility of short intent statements. They wanted something they could commit to memory and recall during the heat of battle when they needed to make an important decision. One officer

stated, "When all else fails, tell me what I'm supposed to do." To him, that was the purpose of commander's intent. Another officer said that when he was given a long intent statement he would highlight or underline what he considered to be the relevant parts. He was, in fact, editing the intent statement to make it useful.

Yet senior officers continue to write long intent statements with detailed explanations of the method subordinates should follow to accomplish their goals. A brigade operations order from a unit training at the National Training Center contained the following intent statement (the method portion of the intent statement has been italicized for emphasis):

"The purpose of X Brigade's operation is to protect the Corps rear and build up of follow-on friendly forces. In support of Division and Corps, we must attack rapidly to the west in the Central Corridor, destroy the lead MRB of the XXX MRR between PL IMPERIAL and PL EXCALIBUR, and then seize defensible terrain along PL EXCALIBUR. To do this, X-X IN (LT) will infiltrate to secure Hill 780 (NK 4411), deny the enemy its use, and block to the west to prevent the enemy's use of the mobility corridor between Hill 780 and the south wall of Central Corridor (Avenue of Approach 3). TF X-XX, the brigade main effort will move to contact in zone, fix the Advance Guard Main Body (AGMB) and destroy it with an enveloping attack in depth. Brigade deep FA fires, CAS, and FASCAM will be designed to attrit the AGMB, delay and disrupt its commitment into the Brigade zone, and force the AGMB into the southern avenue of approach, where TF X-XX can destroy it by direct fires. After destruction of the MRB in zone, TF X-XX will continue the attack to seize defensible terrain along PL EXCALIBUR. End state visualized is lead MRB of XXX MRR destroyed; Brigade with heavy forces in control of BROWN and DEBNAM Passes; and Brigade postured to conduct defensive operations to destroy follow-on enemy regiments."

This example demonstrates clearly that most of the intent statement consists of method, specifying how the unit should achieve its goal. This

information also is repeated in other portions of the operations order (mission, concept of the operation, tasks to subordinate units). Including a specific method in the intent statement defeats the purpose for which it was designed. The intent statement no longer serves as a mechanism to coordinate activities between the senior and the subordinate commander who are separated on the battlefield. As soon as the unit is forced to deviate from the method, the intent statement is no longer valid.

The Concept Of Intent Vs. The Intent Statement

Several Army War College officers also made distinctions between the intent statement and the intent process. The commander's intent statement in an operations order is used to communicate the commander's vision of the impending operation. It is designed to establish operating parameters. However, many officers agreed that there was more to communicating intent than putting words on the page of an operations order. The officers also believed that communicating their intent was something that was done on a daily basis. (This perspective more closely reflects the intentions of the doctrine writers who incorporated the concept of *Auftragstaktik* in U.S. Army tactics in the early 1980's.)

As commanders interact with their subordinates, they are able to communicate their priorities, goals, and preferences. They are using a series of events to build understanding and trust within their subordinates. The longer the period of interaction, the more likely that the subordinate will respond in unanticipated situations the way the senior commander would respond if he were present in the subordinate's location.

The Need For Researching Intent In Military C2 Systems

Halpin (1994) recognizes the need for research on commander's intent when he states, "The concept and role of Commander's Intent is poorly understood." He goes on to state that most discussions of commander's intent are of an academic nature and miss the more important issues of shared understanding, interpersonal communications, and determining how intent is understood and misunderstood.

The field study described in the next chapter was developed to go beyond academic discussions and experimental laboratories. The study used actual domain practitioners to participate in a simulation of tactical planning and decision making processes. The study focused on the role that intent played in coordinating the activities of distributed agents, imparting presence, and establishing parameters for adapting plans and procedures in unanticipated situations.

CHAPTER III

RESEARCH STRATEGY

Cognitive engineering methods were used to investigate the role of intent in a tactical military command and control system. These methods must be used judiciously because the settings that are studied are characterized by dynamism, many highly interacting parts, uncertainty, and risk (Woods and Roth, 1988). The research was conducted in three phases. In Phase One, semi-structured interviews were used to collect information from former battalion and company commanders. In addition, tactical units were observed as they conducted actual training exercises. Phase One ended with the development of five research questions that were used to guide the design of the simulation and the analysis of the data. Phase Two consisted of designing and conducting a simulation. A tactical scenario was written and a taxonomy of anomalies was developed. The taxonomy was used to tailor the simulation to the operations order developed by each of the four battalions that participated in the study. During Phase Three, the data were reviewed by officers at the Army War College serving as neutral observers. As former battalion commanders and trainers, they provided a critique of the simulation and insight into the critical issues in coordinating activities among agents and adapting plans to unanticipated situations. They also

evaluated the latitude the battalion commanders provided their subordinates and the ability of these commanders to communicate their intent.

A Cognitive Systems Engineering Perspective

Woods and Roth (1988) discuss the cognitive engineering approach to complex systems. "If each world is seen as completely unique and must be investigated *tabula rasa*, then cognitive engineering can be no more than a set of techniques that are used to investigate every world anew....To achieve relevance to specific worlds and generalizability across worlds, the cognitive language must be able to escape the language of particular worlds." The challenge, then, for the cognitive systems engineer is this: to become sufficiently grounded in the particular domain so as to be able to view events from the perspective of a practitioner, yet to be able to describe cognitive events in an abstract manner so that a larger class of solutions can be brought to bear on the problem. This research investigated tactical military C² systems as an instance of distributed supervisory control systems. The agents in this system were human. However, technological advances are making human-machine systems a reality on the modern battlefield.

A useful technique for investigating human-machine systems is to study similar human-human systems. Thus, in order to properly design a system in which an intelligent machine plays the role of either remote supervisor or local actor, it is necessary to study distributed supervisory control systems in which humans play both roles.

In his study of command systems, Van Creveld (1985) concludes that "probably one of the most important points to emerge...is that command cannot be understood in isolation." He goes on to list the technological,

organizational, political, and psychological factors that affect command in war. It is not possible to effectively study battle command or commander's intent out of context, in a sterile laboratory. The emerging field of cognitive engineering investigates how people solve problems using tools within a context (Woods, 1994). Woods also states, "Research on problem solving in more complex situations, where significant tools are available to support the human and where experienced domain knowledgeable people are the appropriate study participants, requires a shift in research methodology from typical laboratory studies."

Investigators must choose between studying the target world or a scaled version of that world. Studying the target world is not always practical. The researcher is not able to control events but must wait for them to occur naturally. A common method used to investigate ongoing activity in a target world is the critical incident technique (Flanagan, 1954; Shattuck & Woods, 1994). Other methods include corpus building, direct observation, and elicitation of practitioner descriptions.

In many fields of practice it is more practical to conduct field experiments that investigate "scaled worlds shaped by (but not created by)" the researcher (Woods, 1994). Although a scaled world lacks the fidelity of a naturalistic setting it gives the researcher some degree of control over the events within that world. As the fidelity of the scaled world decreases, the researcher must be careful to frame the findings within the parameters that were used to scale the target world.

Real World Vs. Scaled World

There are several differences between the world of tactical military command and control and the simulation used in this study. First, commanders were not placed in a stressful field environment when they planned their mission or responded to the anomalies. Second, the anomalies presented the commanders with only a snapshot of a dynamic control process. Third, the scenario that initiated the simulation contained conflicting information. In spite of these differences, the simulation was valuable in investigating tactical military command and control and the larger issues of using intent to adapt underspecified plans and procedures in distributed supervisory control systems.

The Setting

The real world setting for battalion and company commanders is the battlefield (or training areas designed to simulate the battlefield.) They travel in tanks or other tactical vehicles which afford little or no protection from the elements. Their command post consists of a tent or a Bradley Fighting Vehicle, usually with poor lighting. The command post normally includes a map, communications equipment, and staff personnel. The commanders often are tired and dirty. They are under pressure to make a quick decision in order to establish the conditions that will lead to success on the battlefield.

In the simulation, battalion and company commanders responded to the tactical scenarios while sitting in a conference room or classroom. In the real world, commanders often are able to view the terrain upon which they will fight. One neutral observer considered this firsthand observation to be a significant difference between the real world and the scaled world.

"Part of the problem we see here is that these guys are doing this off a 1:50,000 map. They're not actually walking the ground. And, in...the maneuver world, ground is everything. The terrain, the vegetation, the inter-visibility, the trafficability, the cover and concealment, and everything else. We're seeing it on this pool-table environment, although you heard the kids talk in there about what they deduced from the map."

Even though the commanders were not physically located on the ground they were asked to defend, they were very familiar with the terrain. Most of the commanders had been to the National Training Center more than once and had maneuvered units on the same terrain.

The simulation did not replicate the high degree of physical or cognitive stress that commanders can face on the battlefield or during training. The practitioners were not cold, wet, or tired. These physical conditions impact a commander's ability to focus his attention on the decision making task at hand. Cognitively, they were not forced to operate under time constraints. They were not distracted by the noisy activity of a tactical operations center or the continual interruptions of staff officers providing more information or looking for additional guidance. Although these conditions can impact cognitive processes, commanders in the field do not always operate in such adverse circumstances. It is important to explore the effects of the most extreme conditions on cognitive processes. It is also necessary to understand how those processes function under more moderate conditions.

A Snapshot Of The Control Process

In the simulation, battalion and company commanders were presented with anomalies and asked to make decisions on what they would do with

their unit in response. The anomalies and the responses represent a snapshot of the control process. In the real world, however, decisions are not made in isolation. As in any dynamic control process, events in a military C2 system unfold over time as the system moves through a problem space from a start state to an end state. Supervisors and actors build a history of interaction with the control process. They watch the events unfold and make decisions which influence the process. These decisions are made in context, based on a knowledge of the system's response to previous decisions.

Battalion and company commanders did not participate in the C2 process that led up to the events depicted in the situation reports. Designing a field study that would let them participate in the preceding process would amount to building a highly complex, real-time simulation, requiring resources beyond those available for this study. However, the situation reports provided to the participants (see Appendices D through G) contained sufficient information for them to envision how the events unfolded up to that point. In addition, their participation in actual training exercises on the terrain used in the field study provided them with an experiential base on which they could rely to fill in any gaps in the situation reports.

The Scenario

A brigade operations order with graphics was used to initiate the simulation. The operations order was developed by an army officer who teaches tactics to battalion and brigade commanders. The operations order, though not perfect, was judged by neutral observers at the Army War College to be typical of an operations order that might be issued by an experienced brigade commander and his staff.

Phase One

Interviews And Observations

In this phase, initial data were collected from knowledgeable domain practitioners. This phase was designed to identify, from a practitioner's point of view, the critical issues within a specific distributed supervisory control system. The interview technique used was based on Klein's (1989) Critical Decision Method (CDM). His procedure includes five steps:

- select incident;
- obtain unstructured incident account;
- construct incident timeline;
- decision point identification;
- decision point probing.

Participants included those that formulate and communicate intent (battalion commanders) and those that receive and interpret intent (company commanders). Eleven army officers (students or faculty members) at the Army War College, Carlisle Barracks, PA, who had commanded armor or infantry battalions were interviewed. In addition, ten students at the Combined Arms Staff Service School, FT Leavenworth, KS who had commanded armor or infantry companies were interviewed. These senior and subordinate commanders were asked to recall situations in which the unit was particularly successful or unsuccessful in accomplishing its mission. Rather than identifying and probing decision points, the commander's intent for that operation was identified and the influence that the intent had on the success or failure of the mission was then probed.

Another source of data during this phase of the research was the direct observation of a brigade command post during field training exercises at the National Training Center (NTC), Fort Irwin, CA. The brigade was observed during a four-day period. During that time, the commander and his staff planned, rehearsed, and executed two tactical missions. The brigade also was critiqued on its performance by NTC observer/controller cadre. The interviews and the observation data were used to formulate five questions that guided the design of the simulation and the analysis of the data.

Research Questions

The interviews and observations conducted provided information about how remote supervisors and local actors use intent to coordinate their activities when they are faced with unanticipated situations and are separated by time and space. This information was used to develop questions and expectations that led to the design of the simulation. These questions and expectations served several functions.

- They focused the study on those characteristics of the intent process deemed to be most important.
- They provided a context in which the process of communicating intent could be evaluated.
- They established a framework for abstracting cross contextual principles to distributed supervisory control systems in other domains.
- They created the opportunity to be surprised when the expectations were not realized or when unexpected events occurred.

Question One: How Do Remote Supervisors Impart Their Presence To Local Actors? Remote supervisors generally have a better understanding of the system, its capabilities, its limitations, and its goals. Yet they must rely on less experienced, less knowledgeable local actors to control the process. Once a distributed supervisory control system enters a period of high-tempo and high-workload, coordinating activities among agents can become difficult. Remote supervisors must coordinate with local actors prior to these cognitively demanding periods by imparting their presence to local actors.

Based on interviews and observations, communicating intent from the remote supervisor to the local actors appeared to be the means by which presence is imparted. Battalion commanders who effectively imparted their presence were expected to have subordinate commanders who made decisions that supported his goals and the goals of the organization. They were expected to use a variety of means to impart their presence, including the commander's intent statement.

Question Two: To What Extent Is Communicating Intent A *Process* Rather Than An *Event*? If communicating intent is an *event* (i.e., intent is communicated in a single episode - a conversation or a written paragraph), then developing methods to improve the communication ought to be emphasized. Intent statements ought to be analyzed for *conventions* or *maxims* (Kraut and Higgins, 1984; Grice, 1975). In addition, the *content* of the intent statement would also be important. Would the use of a generic script, as Klein (1993) suggested, improve the quality of the intent statement? But if communicating intent is a *process* (i.e., the culmination of several events distributed over time), then other type of senior-subordinate interactions are

important, and ought to be included in any strategy designed to aid the communication of intent.

Military C2 practitioners differed in their understanding of intent. Lower ranking, less experienced officers tended to define intent in terms of its components. Former company commanders at the army's Combined Arms and Staff Service School (CAS3) characterized intent as "Purpose - Method - End state." Officers at the Army War College were more experienced by at least ten years. Their assignments and schooling had given them more time to study and practice military doctrine.

These officers did not restrict their definition of intent to the formal statement that is included in an operations order. They believed that communicating their intent was something that was done on a daily basis. As commanders interact with their subordinates, they are able to communicate their priorities, goals, and preferences. They are using a series of events to build a shared understanding with their subordinates. Therefore, the study was expected to demonstrate that communicating intent is *both a process and an event*.

Question Three: To What Extent Do Remote Supervisors Empower Local Actors? Supervisors function along a continuum. At one end of the continuum are supervisors who retain absolute control. At the other end are those who give local actors full autonomy. The balance that remote supervisors ought to strike is this: they should empower actors to counter the full variety within the local environment but retain enough control to coordinate and synchronize the actions of those actors. Subordinate commanders constrained by a senior commander's guidance, standard

operating procedures, or other parameters will not be able to counter the entire array of enemy actions.

Although most intent statements examined during his phase of the study constrained the subordinate commanders, senior commanders support the idea that subordinate commanders must be empowered to respond to all potential enemy courses of action. Nevertheless, it was expected that battalion commanders would develop intent statements which constrained subordinates and limited their ability to respond to the enemy. These senior commanders would believe that they were empowering their subordinates in a manner that permitted them to cope with the full range of possible enemy actions.

Question Four: What Information Do Actors Use In Responding To Unanticipated Situations? In a distributed supervisory control system, local actors can be confronted with unanticipated situations. Their training and the procedures given to them by designers or supervisors will not always help them resolve the problem. Identifying the information used or requested by local actors can aid in understanding what must be communicated in the statement of intent.

In theory, the intent statement was designed to guide the adaptation of plans and procedures. In practice, intent statements have become procedures themselves. The original concept of the purpose and the desired end state evolved into the "Purpose - Method - End state" format taught in many army schools. Students in the classroom and commanders in the field were judged by whether their intent statements included these three elements. Advocating the *philosophy* of empowering subordinates to act by

communicating intent to them was slowly being replaced by emphasizing the *structure* of a specific statement which included both intent and procedural information.

In this study, subordinate commanders were not expected to rely heavily on intent statements to make their decisions in the face of unanticipated situations. Instead, they were expected to base their decisions on other information in the operations order, previous experience, SOPs, and doctrine. These are reasonable sources of information but they do not point to the senior commander's high level goals in the same manner as a clear understanding of intent.

Question Five: Does The Intent Statement's Content Influence Its Usefulness To Local Actors? In interviews conducted with former company commanders at the Combined Arms and Staff Service School, they stated a preference for short intent statements, presumably because they would be easy to remember during periods of high tempo and high stress. Long statements were disregarded. Length, however, is not the relevant issue. An examination of intent statements of commanders at various levels showed that the purpose and end state portions were equivalent in length. The method section ranged from short and very general to long and highly specified.

Long intent statements sometimes are disregarded because the highly specified method sections are not useful. Senior commanders attempt, in a limited space, to list the sequence of events that will lead to a successful outcome. They increase brittleness because they specify a single path through a state space. However, following that path assumes successful transition

from one state to another. If the specified path is blocked it may still be possible to achieve the system goals by another path, but the path specified in the method section must be abandoned.

Company commanders were expected to disregard the 'method' section of the intent statement as soon as the situation forced them off the prescribed path through the problem space. The purpose and end state portions of the intent statement were still expected to be relevant to the company commanders.

Phase Two

The field study conducted during this phase was a mixed-fidelity simulation. (The processes used to plan and disseminate the operations orders were the same as those that would be used during war. However, company commanders were not able to implement their plans and observe the outcome.) Battalion commanders, company commanders, and their staffs developed a plan to conduct a defensive operation. It was designed and advertised as a low-cost, high-yield training opportunity for participating battalions.

Two anomalies were developed for each battalion. The first anomaly prevented the battalion from accomplishing its objective as specified in the plan. The second anomaly indicated that the battalion had successfully accomplished its objective. Participants had to determine what to do next.

In individual sessions, the battalion commander and company commanders responded to both anomalies (see Figure 6). The company commanders used a think-aloud protocol and were videotaped. The battalion

Figure 6. Sequence of events for tactical simulation.

commander reviewed the videotapes of the subordinate company commanders to determine whether the responses of each company commander were the same as the battalion commander's response. If a response was not the same, the battalion commander determined whether the company commander's response was consistent with the battalion commander's intent. If the response was the same or was consistent with the intent it was considered a match. If the responses did not match, then that company commander had not followed the battalion commander's intent. The think-aloud protocols and the questionnaires completed by all commanders provided data that was used in a process tracing analysis.

Participants

Four battalions agreed to participate in the simulation: three at Fort Riley, KS, and one at Fort Carson, CO. Each battalion had four company commanders. Two were armor battalions, one was a mechanized infantry

Figure 7. Labeling scheme for the simulation. Four battalion commanders participated in the study. They each had four company commanders. Each battalion was given two anomalies tailored to their operations orders, resulting in thirty-two distinct episodes.

battalion, and one was a cavalry squadron. Battalion commanders had at least seventeen years of military service and had been in command from eight to twenty months. The company commanders had at least five years of service and had been in command from one week to twenty months. Each battalion and company commander responded to two anomalies. The simulation yielded thirty-two episodes in which the responses of a battalion commander

and a company commander could be compared. Figure 7 shows the labeling scheme used for the participants and the episodes.

Developing the Anomalies

During the planning of the simulation, the brigade operations order was reviewed by ten CAS3 officers. They were asked to describe situations that could occur, which were not covered in the brigade's concept of the operation and which ought to drive subordinate units to the commander's intent. A taxonomy of possible anomalies was developed from the situations described by the CAS3 officers (see Figure 8). Of the three major types of anomalies only one - anomaly addressed in intent statement but not in plan - was of interest. Within this class of anomalies, there are two possibilities

Figure 8. Taxonomy of anomalies.

which were considered: the plan cannot be completed as written; and, the plan is completed and the local actor must determine what to do next. In

either case, the local actor ought to rely on the supervisor's intent statement in deciding what action to take. Depending on the domain, there are potentially many ways to prevent a plan from being accomplished as written. Figure 8 lists three possible anomalies that would block the execution of the plan.

The Sequence Of Events

The initial stimulus for the study was a brigade operations order (OPORD). The operations order was developed by an army officer assigned to the Command and General Staff College, Fort Leavenworth, KS. His job is to teach a refresher course in tactics to army officers prior to them assuming command of battalions or brigades.

Two weeks prior to the study. The battalion commanders were given the brigade operations order and tactical graphics overlay. The commander and his staff were asked to develop a battalion operations order that they could execute with confidence. All battalion commanders were asked to assume the role of the Task Force (TF) 1-77 commander. This self-paced planning process includes a mission analysis, preparation of commander's guidance (including intent), wargaming, and selection of a primary course of action. Battalion commanders were asked to not tell their company commanders that the training was focusing on commander's intent. Most units referred to the training as "Officer Professional Development" or an "Orders Drill."

One week prior to the study. The battalion commander and his staff briefed and issued their operations order to the company commanders. The

company commanders were then directed to develop a company operations order. All company commanders were asked to assume the role of the C Company (or, Team C), TF 1-77 commander. Their planning process was similar in content but less complex. It included briefing the battalion commander on how they planned to execute their assigned missions.

The day prior to the study. Copies of the battalion and company OPORDs and tactical graphic overlays were collected. The operations orders were studied in order to develop anomalies which could be used the next day during the actual simulation. Two anomalies were developed for each battalion. The anomalies were formatted as situation reports (SITREPs), a common way of providing tactical units with information.

The first anomaly depicted a situation in which the plan (as written in the mission and the concept of the operation of the OPORD) could not be completed. However, if the company commanders understood the battalion commander's intent, they would be able to determine the actions necessary to achieve the goals of the battalion and the brigade. The second anomaly, unrelated to the first, depicted a situation in which the battalion had successfully executed the written plan. Company commanders had to determine what they would do next with their unit. Again, with a clear understanding of the battalion commander's intent the company commanders would be able to determine an appropriate action.

The day of the study.

1. The battalion commander was presented with a situation report and asked what action he would take as the TF commander. He could

refer to his operations order, graphics, map, or any other information that would normally be available to him. His response became the accepted solution for that anomaly. The battalion commander's answer and his justification were recorded on audio tape. The commander was presented with a second, unrelated situation report and again asked for his response. Next, the commander was asked to complete a questionnaire (see Appendix A). Among other things, the questionnaire asked about the length of his relationship with each of his subordinate commanders, his prediction of how each commander would perform in this study (relative to his response), and the degree of flexibility he felt he provided them in his operations order.

2. Company commanders were presented individually with the same situation reports and asked what action they would take as the C Company Commander. They were instructed to think aloud during their decision making process (Ericsson & Simon, 1993). Before reading the situation reports, they were given the opportunity to practice thinking aloud by solving a few multiplication problems. Their responses for each situation report were recorded on both audio and video tape. The company commanders also completed a questionnaire (see Appendix B). They were asked to predict how well their responses matched those of their battalion commander, to rank the information available to them in terms of its usefulness in their decision making, and to evaluate the battalion operations order in terms of the flexibility it gave the company commanders.

3. The battalion commander was shown the videotaped responses of the company commanders and asked to determine whether their decisions were close enough to his responses to be considered a match. In other words, he was judging the degree to which the company commanders

followed his intent. The battalion commander was given a copy of the video tape so that he could review it later with his company commanders in order to highlight discrepancies and identify ways to improve the communication of intent within that unit.

Phase Three

As part of the review process, the field study data were presented to ten officers assigned to the Army War College, all of whom had successfully commanded battalions. These officers were asked to serve as neutral observers of the data to provide an independent analysis. Prior to reviewing the data they were given the opportunity to familiarize themselves with the tactical scenario. In a group setting, the officers were shown the mission, concept of the operation, operational graphics, and the intent statement generated by the battalion commander and his staff. They also were shown the situation report that created the anomaly. Next, they watched video tapes of the company commanders determining what action they would take in response to the situation report. After viewing the responses for each situation report, the Army War College officers were encouraged to comment on the intent process within that battalion. Their discussion was recorded using audio tape. Finally, the officers were given copies of the operations orders from each battalion and asked to rate them in terms of the flexibility they provided to the company commanders. They were also asked to justify their ratings.

A Military Primer

This section provides an introduction to the basic terminology and graphics used in the tactical military domain. In addition, an overview of the brigade operations order and the tactical situation presented to the four battalions is provided. The information in this section is essential to understanding the results of the field study.

Figure 9. Structure of friendly forces.

Friendly Forces

Figure 9 describes the organization of the friendly forces in the tactical scenario. The 1st Brigade Combat Team (BCT), a subordinate unit of the 52nd Infantry Division, has been ordered to defend against an attack of an enemy division. The brigade has been assigned a sector to defend by the 52nd Infantry Division. The sector is shown in Figure 10. The brigade sector is approximately 21 kilometers wide (north to south) and 30 kilometers deep (east to west). Enemy forces are attacking from the east.

The 1st Brigade has divided its sector into three smaller sectors and assigned one to each task force. The brigade designated battle positions (BPs) in the two southern sectors. The task forces in the southern sectors (TF 1-2 and TF 1-3) are to occupy battle positions. Since the brigade has not designated any battle positions in the northern sector, TF 1-77 has more latitude in establishing a defense. The brigade has instructed TF 1-77 to set up a defense in depth - that is, to use the entire sector to defend against the enemy. Their sector extends from Phase Line (PL) WHITE to Phase Line GREEN. A phase line is a line drawn on a map, normally following a terrain feature (e.g., a road, a ridge line, or a river) that is used as a point of reference. TF 1-77 was ordered to prevent enemy penetration of PL GREEN.

The 1st Brigade has also designated three engagement areas (EAs), EA Kill, EA HURT, and EA STUN. An engagement area is a pre-determined area in which friendly forces plan to kill the enemy forces. Battle positions have an unobstructed view of the engagement area and weapons systems (e.g., tanks and artillery) have sighted their weapons on selected terrain features (e.g., road junctions) within the engagement area.

Figure 10. Brigade operations graphics.

The dashed arrow labeled Axis CHIEFS indicates that TF 1-77 had to be prepared to launch an attack from their sector into EA HURT. Finally, TF 1-3 was also told by 1st Brigade to occupy BP 1. They also had to be prepared to move along the pre-determined Route RIFLES to BP 3. If most of the enemy forces attacked in the northern sector, TF 1-3 could destroy them in EA STUN.

As mentioned previously, each battalion commander participating in the field study assumed the role of the Task Force 1-77 Commander. Participating battalions were labeled Battalion #1 through Battalion #4. Each company commander in the study assumed the role of the C Company (or Team C) Commander. Company commanders also were labeled #1 through #4. (The coding scheme is shown in Figure 7).

Enemy Forces

The enemy in the tactical scenario is a fictitious force based on Soviet-style doctrine. The structure of the Krasnovian army is somewhat analogous to the structure of the U.S. Army. The enemy forces arrayed against the friendly forces are depicted in Figure 11.

Typical Soviet-style doctrine is to fight in echelons. Within a motorized rifle regiment (MRR) consisting of three motorized rifle battalions (MRBs), two MRBs form the first echelon and the third MRB forms the second echelon. The first echelon begins the attack while second echelon unit waits. The commander of the enemy regiment determines when and where to employ the second echelon based on how the battle unfolds. The same pattern holds true at other levels. A motorized rifle division (MRD)

A combined arms army (CAA) consists of both tank divisions (TDs) and motorized rifle divisions (MRDs). It is equivalent to a corps in the U.S. Army.

A motorized rifle division (MRD) is equivalent to a U.S. Army division. The 41st MRD consists of three motorized rifle regiments and a tank regiment.

A motorized rifle regiment (MRR) or a tank regiment (TR) is equivalent to a brigade in the U.S. Army. A regiment consists of either three or four battalions.

A motorized rifle battalion (MRB) is equivalent to a task force or battalion in the U.S. Army. It normally consists of four motorized rifle companies.

A motorized rifle company (MRC) is equivalent to a company in the U.S. Army. It normally consists of four motorized rifle platoons.

A motorized rifle platoon (MRP) is equivalent to a platoon in the U.S. Army.

Figure 11. Structure of enemy forces.

commander will attack with two MRRs (or tank regiments) in the first echelon and one or two regiments in the second echelon.

CHAPTER IV

FINDINGS OF THE FIELD STUDY

Summary Of Protocols

Four battalions participated in the tactical simulation. The battalion commander and four company commanders from each battalion were given two anomalies in individual sessions and asked to think aloud as they decided how they would respond. Thirty-two cooperative problem-solving episodes were observed. Protocols and questionnaires were analyzed relative to the goal of the study: to investigate how remote supervisors, separated by both time and space from local actors, impart their presence by communicating intent to coordinate their activities and adapt underspecified plans and procedures.

Each protocol can be considered unique based on the differences in the battalion operations orders, the types of anomaly, and the characteristics and experience levels of the battalion and company commanders. However, by focusing on the similarities across protocols, we can understand how intent is used to successfully adapt plans to unanticipated situations. We can also identify common deficiencies among practitioners. Tables 1 through 8 provide summaries of the protocols for the thirty-two episodes. The summaries include the following:

- a description of the anomaly;
- the battalion commander's response to the anomaly;

- a summary of the company commander's response;
- the judgment of the battalion commander on whether or not the company commander's response matched his intent;
- the basis for the company commander's response;
- references by the company commander to coordinate his activity;
- references by the company commander to any element of the plan;
- length of protocol;
- length of time the company and battalion commanders have worked together.

Battalion #1

The battalion commander arrayed his forces around Engagement Area (EA) ONE in a semi-circle as follows: Team A (north of EA), Team D (northwest of EA), Team B (southwest of EA), and Team C (south of EA). (See Appendix D.)

Anomaly 1A. The battalion destroyed two enemy motorized rifle battalions (MRBs) but a third has rendered Team A ineffective and is pushing Team D back toward Phase Line (PL) GREEN. The battalion commander decided to use Team C to counterattack north into the flank of the MRB. Company Commander 1-1 decided to move his company west (instead of north) in order to meet them head-on. Commander 1-2 never committed to a course of action. His protocol was substantially longer than the others because he asked questions and sought additional information. Commander 1-3 matched the battalion commander's intent. Commander 1-4 mentioned two alternatives: counterattack north or counterattack east. The northern

Table 1. Summary of responses to Anomaly 1A by Battalion Commander #1 and his four company commanders.

Situation: Two MRBs were destroyed in Engagement Area ONE. A second echelon MRB is attacking along the northern boundary. Team A is combat ineffective. Team D is moving back towards PL GREEN.

BN Commander's Response: Team C will counterattack north into the flank of the reserve MRB while Team B stays in place. A second, less preferred option is for Team C to move to a position between Teams D and B if the MRB has moved too far west.

CO CDR	1-1	1-2	1-3	1-4
Response Summary	Team C moves west and fires into the flank of the MRB.	Fall back to Delta 2 to assist Team D in defense. Or, maneuver on flank of enemy. Never commits to a course of action.	Team C counterattacks into flank of MRB with Team B.	Team C counterattacks north or northeast. Or, Team C counterattacks east to PL WHITE or southeast along Axis CHIEFS into EA HURT.
Intent Followed?	No	No	Yes	No
Basis For Decision	Misjudges time/distance factors.	Does not make a decision. Seeking more info.	BN and BDE CDR's Intent	BN CDR's Intent
Coordination Attempts	Looks at B & D. Wait for Orders.	Requests permission. Coord w/subordinates.	Coord movement with B CO.	Waits for FRAGO to CATK.
References to Plan	"My orders were not to move."	Intent. No backup plan.	Intent	None
Length of Protocol (# of lines)	12	41	27	9
Time in Command	8 Mo	1 Week	8 Mo	8 Mo

Table 2. Summary of responses to Anomaly 1B by Battalion Commander #1 and his four company commanders.

Situation: The MRR was destroyed by TF 1-77. Teams A and C are at 90% strength. Team B is at 60% and Team D is at 70%. The 127th MRR has dropped into the 1-2 sector to reinforce the 133rd MRR and the 199th TR.

BN Commander's Response: TF 1-77 will prepare to launch a counterattack along Axis CHIEFS into EA HURT. BN CDR will wait for notification from BDE CDR to launch the attack. In the absence of communications he would begin the attack on his own initiative.

CO CDR	1-1	1-2	1-3	1-4
Response Summary	Team C prepares to launch a counterattack along Axis CHIEFS into EA HURT. Will wait for BN order.	Discusses counterattack into EA ONE. Discusses attack along Axis CHIEFS into EA HURT. Never commits to a course of action. Waiting for orders.	Discusses 3 options: remaining in place; catk along CHIEFS into EA HURT; and other offensive operations. Waiting for instructions.	Team C counterattacks along Axis CHIEFS into EA HURT based on BN order.
Intent Followed?	Yes	No	No	Yes
Basis For Decision	BDE CDR's intent.	Seeks more info. Does not make a decision.	Misinterprets BN plan.	BDE CDR's Intent
Coordination Attempts	Waiting for orders from BN.	Waiting for orders. Coord w/subordinates.	Requests instruction from higher.	Waiting for orders.
References to Plan	Mission. "What BDE CDR wanted."	None	BN and BDE CDRs' intent. "Order not clear."	None
Length of Protocol (# of lines)	7	38	20	12
Time in Command	8 Mo	1 Week	8 Mo	8 Mo

attack matched the battalion commander's response but the eastern attack resulted from conflicting information in the operations order.

Anomaly 1B. The enemy motorized rifle regiment (MRR) was destroyed by the battalion (Task Force 1-77). However, another MRR began to attack in the sector south of the battalion. The battalion commander decided to launch a counterattack along Axis CHIEFS into Engagement Area HURT in the southern sector. This counterattack was mentioned in the brigade commander's intent statement but the battalion commander did not include it in his intent statement. Commanders 1-1 and 1-4 referred to the brigade commander's intent and matched the battalion commander's response. Again, Commander 1-2 did not commit to a course of action but sought additional information. Commander 1-3 misinterpreted the battalion operations order. He identified three courses of action and stated that he would call his battalion commander and request further guidance.

Battalion #2

This battalion commander established four engagement areas: EA NORTH (in the northeast part of the battalion sector), EA SOUTH (in the southeast part of the sector), EA SLAM (west of EA NORTH), and EA WEST (west of EA SOUTH). (See Appendix E.) He also established Decision Point (DP) 1. According to the battalion operations order, if the second echelon MRB is moving north at DP 1, then Team C was to move north from Battle Position (BP) 2 to Support By Fire Position 1 (SBF 1) to block.

Anomaly 2A. The battalion defeated one MRB in EA NORTH and one in EA SOUTH. However, there was another MRB moving to the west along the northern border of the battalion's sector and there was an MRR entering

Table 3. Summary of responses to Anomaly 2A by Battalion Commander #2 and his four company commanders.

Situation: The 132nd MRR attacked into the TF 1-77 sector. Two MRBs were destroyed. The third MRB is attacking along the northern boundary. The 199th TR has begun to move into the southern portion of the TF 1-77 sector.

BN Commander's Response: The BN plan called for Team C to move from BP 2 to SBF 1 if the third MRB was attacking in the north. BN CDR will keep Team C at BP 2 because of the 199th TR moving into the southern portion of the sector.

CO CDR	2-1	2-2	2-3	2-4
Response Summary	Team C moves from BP 2 to SBF 1 in reaction to the third MRB moving north. Team C moves back to BP 2 to prepare for 199th TR.	Team C moves from BP 2 to SBF 1 in reaction to the third MRB moving north. Team C moves back to BP 2 to prepare for 199th TR. (Same as CDR 2-1.)	Repositions tank platoon to the north in response to third MRB and reorients the rest of the company to await attack by the 199th TR.	Team C moves from BP 2 to SBF 1 in response to third MRB. CO CDR calls BP 1 and notifies them that 199th TR is on its way.
Intent Followed?	Yes*	Yes*	No	No
Basis For Decision	Assumption of BN CDR's response.	Analysis of enemy's intentions.	Divides his company to fight north and south.	Focuses on third MRB rather than TR.
Coordination Attempts	"I'd get a call to go south..."	"I'm gonna call the [CDR] and ask to displace..."	Seeks info from 'sister' company.	"Cross-talk" with BP 1.
References to Plan	Move to SBF 1 at decision point.	Movement to SBF 1.	None	Movement to SBF 1.
Length of Protocol (# of lines)	14	15	16	10
Time in Command	8 Mo	21 Mo	12 Mo	20 Mo

** Although the BN CDR judged these responses to match his response, they were, in fact, different. These companies moved from BP 2 to SBF 1 when they saw the third MRB moving north. They then had to move south back to BP 2 to defend against the TR.*

Table 4. Summary of responses to Anomaly 2B by Battalion Commander #2 and his four company commanders.

Situation: The 132nd MRR attacked into TF 1-77 sector. Two MRBs were destroyed in the north and one was destroyed in the south. The 127th MRR is moving into the TF 1-2 sector to reinforce the attack of the 133rd MRR and the 199th TR.

BN Commander's Response: The BN CDR calls BDE CDR to report that he has accomplished his mission and asks to attack along Axis CHIEFS into EA HURT. The attack would use the BN arrowhead formation with Team C as the advanced guard.

CO CDR	2-1	2-2	2-3	2-4
Response Summary	Team C moves as the advanced guard of the BN arrowhead formation to counterattack long Axis CHIEFS into EA HURT.	Team C moves as the advanced guard of the BN arrowhead formation to counterattack long Axis CHIEFS into EA HURT.	Team C moves as the advanced guard of the BN arrowhead formation to counterattack long Axis CHIEFS into EA HURT.	Team C moves as the advanced guard of the BN arrowhead formation to counterattack long Axis CHIEFS into EA HURT.
Intent Followed?	Yes	Yes	Yes	Yes
Basis For Decision	Accomplished mission. Counterattack plan.	Enemy destroyed. TF still combat effective.	Based on "instructions given from higher."	All MRBs destroyed. Call to BN CDR.
Coordination Attempts	BN CDR gives order. BN arrowhead formation.*	"When we get the word..." BN arrowhead formation.	"If I was given the orders..." BN arrowhead formation.	Ask about counterattack. BN arrowhead formation.
References to Plan	"One of our plans is to go Axis CHIEFS."	Mentions mission and criteria for executing ctk.	Only mentions counterattack plan.	Only mentions counterattack plan.
Length of Protocol (# of lines)	21	22	21	10
Time in Command	8 Mo	21 Mo	12 Mo	20 Mo

* All CO CDRs referred to the battalion arrowhead formation. This is a well-rehearsed maneuver found in the battalion's tactical SOP.

the southern portion of the sector. The battalion commander decided to keep Team C in BP 2 and to have them prepare to engage the MRR coming into sector. Commanders 2-1 and 2-2 moved Team C from BP 2 to SBF 1 because the MRB was moving to the northern boundary at DP 1, in spite of the MRR attack in the south. Both commanders then moved Team C back to BP 2 before they engaged the MRB in the north. Commander 2-3 split his company by orienting one platoon to the north and the rest to the south. Commander 2-4 moved Team C to SBF 1 and remained there.

Anomaly 2B. The enemy motorized rifle regiment (MRR) was destroyed by the battalion. However, another MRR began to attack in the sector south of the battalion. The battalion commander decided to launch a counterattack along Axis CHIEFS into Engagement Area HURT in the southern sector by using the battalion arrowhead formation. (The arrowhead formation is a well-practiced maneuver found in the battalion's tactical SOP.) All four company commanders stated they would use the arrowhead formation in the counterattack. However, they would not launch the counterattack until they received orders from the battalion commander.

Battalion #3

The battalion commander arrayed his forces around Engagement Area (EA) BLOOD in a semi-circle as follows: Team D (northwest of EA), Team C (west of EA), and Team B (south of EA). (See Appendix F.) Team A was the task force mobile reserve. The reserve was to move among three positions (all of which were approximately five kilometers west of EA BLOOD) every two hours to prevent being targeted by the enemy.

Table 5. Summary of responses to Anomaly 3A by Battalion Commander #3 and his four company commanders.

Situation: The 132nd MRR attacked into the TF 1-77 sector. Two MRBs were destroyed. The third MRB is attacking along the northern boundary. The 199th TR has begun to move into the southern portion of the TF 1-77 sector.

BN Commander's Response: The BN CDR decides to move Team A (task force reserve) from AA 74D to ABF 78. They will wait there and block the attack of the 199th TR. Team C will remain in position but orient the entire company to the north and fire into the flank of the MRB moving along the northern boundary.

CO CDR	3-1	3-2	3-3	3-4
Response Summary	Team C pivots like a revolving door to the south in order to have flanking shots into the TR as it attacks from east to west.	Reorient southern platoon toward BP 71. Northern platoon orients north. Middle platoon orients east.	Team C moves to alt position with fields of fire into EA BLOOD. Must wait to see what TR does before making a decision.	One platoon will orient to the north to assist Team D. One platoon will orient to the south in order to assist Team B.
Intent Followed?	No	No	No	Yes*
Basis For Decision	Focused on TR. Didn't consider TF reserve.	Assumes he can't move even though BN was told to use the entire sector.	Wants info on 199th TR's direction of attack.	Wants to keep enemy from reaching PL GREEN.
Coordination Attempts	"Cross-talk through the different BPs."	Calls for guidance. Coordinates with Team B.	Wants to get status of Teams B and D.	Talks with BN CDR, staff, & other CO CDRs.
References to Plan	None	No one across PL GREEN. Fight based on OPORD.	Mentions preventing enemy from reaching PL GREEN.	Mentions BDE & BN CDRs' intent and mission.
Length of Protocol (# of lines)	30	40	29	55
Time in Command	9 Mo	9 Mo	9 Mo	9 Mo

** Although BN CDR said CO CDR matched his intent, there was a significant discrepancy in their answers. The BN CDR wanted Team C to remain in place but reorient the entire company to the north. CO CDR oriented one platoon to the north and one to the south.*

Table 6. Summary of responses to Anomaly 3B by Battalion Commander #3 and his four company commanders.

Situation: TF 1-77 destroyed the 132nd MRR. Team B was left at 70% strength. Teams A and D are at 80%. Team C is at 90%. The 127th MRR that was trailing the 132nd MRR has dropped to the south and is attacking into the 1-2 sector.

BN Commander's Response: The BN CDR decides to move Team A (task force reserve) from AA 74 to ABF 78. They will hold there until they are told to launch a counterattack along Axis CHIEFS into EA HURT. Teams B and C will remain in place.

CO CDR	3-1	3-2	3-3	3-4
Response Summary	Team C remains in place and waits for more info about the 2nd echelon MRB and the 127th MRR.	Team C will remain in place and continue to carry out its mission.	Team C "needs to be prepared to move to support [TF 1-2] to our south."	CO CDR begins identifying routes for counterattack into EA KILL or west into area near PL GREEN.
Intent Followed?	No*	Yes+	No	No
Basis For Decision	Misinterprets SITREP. MRB was destroyed.	Waiting for more enemy to enter his sector.	Sees 3 MRRs in south. Must prevent penetration of PL GREEN.	Anticipates BDE CDR will use entire TF to calk into 1-2 sector.
Coordination Attempts	Cross-talk with Teams A, B, and D.	"Notification of higher." Contacts Teams B and D.	Wants info/status from other teams.	Talks to Teams B & D over BN Command radio net.
References to Plan	None	No one across PL GREEN. Mentions mission & intent.	Atk along Axis CHIEFS. Keep enemy from PL GREEN.	Mentions counterattack.
Length of Protocol (# of lines)	23	33	23	32
Time in Command	9 Mo	9 Mo	9 Mo	9 Mo

* Although the CO CDR matched the BN CDR's response, he did not match his intent.

+ Although the CO CDR matched the BN CDR's intent by staying in place, he did not mention the TF's counterattack mission.

Anomaly 3A. The battalion defeated two MRBs. However, there was another MRB moving to the west along the northern border of the battalion's sector and there was an MRR entering the southern portion of the sector. The battalion commander decided to keep Team C in its battle position. The team would reorient to the north and fire into the flank of the MRB. Team A, the mobile reserve, would move from its location to a position south of EA BLOOD and prepare to engage the MRR. None of the company commanders considered the reserve company when making their decisions. Commander 3-1 decided to pivot Team C to the south to fire on the MRR. Commanders 3-2 and 3-4 oriented one platoon to the north, one to the east, and one to the west. Commander 3-3 did not commit to a course of action because he wanted additional information.

Anomaly 3B. The enemy motorized rifle regiment (MRR) was destroyed by the battalion. However, another MRR began to attack in the sector south of the battalion. In Battalion #3, Team B was the only company that was to be prepared to counterattack along Axis CHIEFS into EA HURT. However, in this anomaly Team B was left at 70% strength, weak enough to render them ineffective. The battalion commander again chose to use Team A, the battalion reserve and leave Team C in place. Team A was to move to a position south of EA BLOOD and await the order to begin the counterattack. Again, none of the company commanders considered the reserve company when making their decisions. Commander 3-1 misinterpreted the situation and decided to wait for more information on an MRB that had already been destroyed. Commander 3-2 matched the battalion commander's response by choosing to remain in place but never mentioned the counterattack mission. Commander 3-3 decided to use Team C as the counterattack force.

Commander 3-4 began to identify routes into EA KILL (seven kilometers west of EA HURT) and west toward PL GREEN. Although he referred to the brigade commander's intent, he did not understand it.

Battalion #4

The battalion commander divided his area of responsibility into an eastern sector and a western sector. The eastern sector was divided into a northern area (Team C) and a southern area (Team A). Team B was the battalion reserve and located in the western sector. Team D patrolled the area immediately east of Teams C and A. (See Appendix G.)

Anomaly 4A. Team A defeated one MRB and Team C, with help from Team B defeated two MRBs. However, Team C was pushed back into the western portion of the battalion sector. A tank regiment (TR) began moving into the battalion's sector from the east. The battalion commander decided to have Team C hold their positions and tie into the defense established by Team B in the western portion of the battalion's sector. Commanders 4-1 and 4-4 matched the response of the battalion commander by remaining in place, however, they misinterpreted the situation and believed they were still in their portion of the eastern sector. Commander 4-2 decided to counterattack. (He knew of only one contingency plan. When the original plan no longer applied, he implemented the contingency plan.) Commander 4-3 matched the intent of the battalion commander.

Anomaly 4B. The battalion destroyed the task force in their sector. However, in the sector south of the battalion, the enemy made substantial progress and was approaching Phase Line GREEN (the line that the brigade commander did not want the enemy to cross). The battalion commander was

Table 7. Summary of responses to Anomaly 4A by Battalion Commander #4 and his four company commanders.

Situation: The 132nd MRR attacked into the TF 1-77 sector. With the help of Team B, Team C defeated 2 MRBs but both teams were pushed back to between PL BLACK and PL GREEN. The 199th TR has begun to move into the TF 1-77 sector.

BN Commander's Response: The BN CDR will have Team C hold in their positions. He believes there will be a platoon-size element between PL BLACK and PL BLUE. They should remain in place. Elements of Team C between PL BLACK and PL GREEN should tie into the reserve (Team B) and form a backstop.

CO CDR	4-1	4-2	4-3	4-4
Response Summary	Team C will remain in place and continue to attrit the enemy as they move into its sector.	Team C will move to EA HAMMER and begin preparing for a counterattack.	Team C will reinforce Team B between PL BLACK and PL GREEN to prevent an MRC from crossing PL GREEN.	Team C stays in place and continues to attrit.
Intent Followed?	Yes*	No	Yes	Yes*
Basis For Decision	Incorrect belief that CO is between PL BLUE and PL BLACK.	SITREP presented a novel situation. CDR invokes preplanned catk.	Need to attrit 199th TR and prevent enemy from crossing PL GREEN.	Staying in place to attrit the oncoming tank regiment.
Coordination Attempts	Action "would depend on what[the colonel] was gonna say."	Reports to TF CDR and asks for verification of catk plan.	"I told the colonel where I'm postured."	"Unless there are any specific instructions from higher..."
References to Plan	None	Discusses counterattack plan.	Must prevent an MRC from crossing PL GREEN.	None
Length of Protocol (# of lines)	13	18	18	8
Time in Command	13 Mo	3 Mo	20 Mo	21 Mo

* Although the BN CDR said these CO CDRs matched his intent, they actually misinterpreted the situation. They believed they were still between PL BLACK and PL BLUE. The situation indicated that they had been pushed to the area between PL GREEN and PL BLACK.

Table 8. Summary of responses to Anomaly 4B by Battalion Commander #4 and his four company commanders.

Situation: The 132nd MRR attacked into the TF 1-77 sector. Team C destroyed one MRB. Team A destroyed two MRBs with the help of the Team B. In the TF 1-2 sector to the south, the enemy is approaching PL GREEN.

BN Commander's Response: In spite of the westward progress of the enemy in the TF 1-2 sector, the BN CDR decides to implement the counterattack plan as written, leaving it up to his senior commanders to prevent the imminent penetration of PL GREEN.

CO CDR	4-1	4-2	4-3	4-4
Response Summary	Team C counterattacks along Axis CHIEFS into EA HURT or into an area to the west of EA HURT.	Wants to move axis of counterattack and engagement area to the west because the enemy is approaching PL GREEN.	Team C counterattacks along Axis CHIEFS into EA HURT.	Team C remains in place and continues to attrit enemy forces.
Intent Followed?	Yes	Yes*	Yes	No
Basis For Decision	Success in the BN sector and the enemy is close to PL GREEN.	Success in the BN sector and the enemy is close to PL GREEN.	Enemy in BN sector is neutralized and MRR is moving south.	Will continue current action until told to do otherwise.
Coordination Attempts	The order to attack "would have to come from Battalion."	Looking for instructions and modifications to the plan from higher.	"We'd be waiting for the colonel to make the call."	"Go higher for... additional instructions."
References to Plan	Mentions counterattack plan.	Mentions counterattack plan.	Mentions counterattack plan.	None
Length of Protocol (# of lines)	13	17	13	4
Time in Command	13 Mo	3 Mo	20 Mo	21 Mo

** Although this response is different than the BN CDR's response, after the BN CDR listen to the protocol, he chose to consider it as consistent with his intent.*

tempted to alter the counterattack (from southeast along Axis CHIEFS into EA HURT to an Axis either south or southwest). However, he believed the brigade and division commanders would still want him to attack into EA HURT. Commanders 4-1 and 4-3 matched the battalion commander's intent by preparing for an attack into EA HURT. Commander 4-2 decided to plan an attack due south. After the battalion commander listened to his protocol (by watching the videotape), he determined that it was a reasonable response to the situation. The battalion commander considered the course of action to match his intent. Commander 4-3 did not match his battalion commander's intent. He chose to remain in place until he received new orders.

Summary Of Performance

The battalion commanders viewed the videotaped protocols and compared the courses of action developed by the company commanders with their own. They judged that the company commanders' responses matched their intent in seventeen of the thirty-two episodes (53%). In three episodes, however, the responses matched only by coincidence. The company commanders chose to remain in place not because they understood the battalion commander's intent but because they misinterpreted the information available to them. In three other episodes, although the battalion commanders judged the decision of the company commanders to match their own, they were in fact substantially different. Battalion commanders considered them a match because the company commanders were "thinking along the right lines" but the course of action they developed did not meet the commander's intent. If these six episodes are considered mismatches, then the responses matched in only eleven of thirty-two episodes (34%).

Table 9 provides a summary of the performance of the company commanders.

Table 9. Summary of company commanders' performance. A "Yes" indicates the company commander matched the battalion commander's intent. The (*) indicates the response was considered a match by the battalion commander but it was significantly different than the battalion commanders' response.

BN CDR #1			BN CDR #2			BN CDR #3			BN CDR #4		
Anomalies			Anomalies			Anomalies			Anomalies		
CO CDR	1A	1B	CO CDR	2A	2B	CO CDR	3A	3B	CO CDR	4A	4B
1-1	No	Yes	2-1	Yes*	Yes	3-1	No	No	4-1	Yes*	Yes
1-2	No	No	2-2	Yes*	Yes	3-2	No	Yes*	4-2	No	Yes
1-3	Yes	No	2-3	No	Yes	3-3	No	No	4-3	Yes	Yes
1-4	No	Yes	2-4	No	Yes	3-4	Yes*	No	4-4	Yes*	No

In general, the company commanders performed better on the second anomaly. (The first anomaly presented a situation in which the company commanders could not complete the mission as written but had to rely on the intent in order to determine how to achieve the higher level objective. In the second anomaly, the unit had accomplished its mission. Company commanders had to rely on intent in order to determine what to do next.)

Table 10 shows a summary of performance by anomaly.

Table 10. Summary of company commander performance by type of anomaly.

	Response Matches BN CDR's Intent	Response Does Not Match BN CDR's Intent
Anomaly A	7	9
Anomaly B	10	6

The results in Tables 9 and 10 provide general information about the performance of the company commanders. The tables do not give any insight into how the company commanders use their battalion commander's intent to adapt their plans and coordinate their activities. Analyzing the verbal protocols of the company commanders provides this information.

Six categories of verbalizations identified in the protocols are described in the next section. Next, the episodes are grouped together for further analysis. The next section discusses data collected from neutral observers. The final section uses the data to address the five questions developed during Phase One.

The first protocol group consists of the eleven episodes in which the company commanders successfully adapted to the unanticipated situation and matched the battalion commander's intent. One protocol from this group was selected as a normative response and is analyzed in detail. The other six groups consist of the twenty-one episodes in which the company commanders were unsuccessful in adapting to the unanticipated situation and failed to match the battalion commander's intent. Each of these six groups are discussed in detail. The six groups of unsuccessful adaptation are:

- Flawed domain knowledge (2 episodes).
- Situational uncertainty (4 episodes).
- Misassessment (4 episodes).
- Rigid adherence to brittle procedures (3 episodes).
- Faulty perspective of the environment (7 episodes).
- Conflicting information (1 episode).

Verbalizations

During the analysis of the think aloud protocol, six distinct categories of utterances were identified. These categories were used to parse the protocols and to identify the types of information used by the company commanders to respond to the anomalies. The six categories are:

- Need for information - The company commander either requests additional information or states that he needs additional information in order to be confident in the decision he must make.
- System status - The company commander makes a statement concerning the status of enemy forces or friendly forces (to include his own organization).
- Reference to procedures - The company commander refers to a procedure or other information that had been provided to him prior to confronting the events described in the situation report. Information includes contents of the operations order (e.g., mission, concept of the operation, tasks assigned to subordinate units, suspected enemy courses of action, etc.), unit standard operating procedures, and doctrine.
- Reference to intent - The company commander refers to the intent of his senior commander or the intent of the commander two echelons above him.
- Course of action - The commander describes an action that he would take with his unit or that he believes other commanders would take in response to the situation report.
- Coordination - The commander describes efforts he would take to coordinate his activities with other units on the battlefield.

Successful Adaptations

Company commanders successfully adapted to the unanticipated situation in eleven of the thirty-two protocols. The protocol of Company Commander 1-3 for Anomaly 1A was selected as a normative example because he accurately assessed the situation relative to the goals of the organization, reconciled conflicting guidance from his senior commanders, modified the plan, and then coordinated with senior, subordinate, and adjacent organizations. Table 11 provides an analysis of the commander's protocol. His verbalizations are characterized by type and their significance to the decision making process is explained.

The intent statement of Battalion Commander #1 was inconsistent with the brigade commander's intent. The battalion commander began his intent by stating that he wanted "to defeat the MRR by using the terrain and a defense in depth to form an [engagement area] that gets every direct fire system into the fight." He concluded with his vision of the end state. "End state is a defeated MRR in our [engagement area] and our [task force] remaining combat effective." According to this intent statement, if the MRR was not destroyed *within Engagement Area ONE*, the intent had not been met. This requirement conflicted with his earlier statement that mentioned a defense in depth (i.e., using the entire sector to defeat the enemy).

The plan called for the defeat of the enemy in the engagement area and the intent reinforced the plan. When the second echelon MRB moved past the engagement area along the northern boundary, the plan became invalid. The end state of the intent could not be accomplished. Company commanders could no longer use the battalion commander's intent to guide their decisions in the face of this unexpected situation.

Table 11. Analysis of the protocol of Company Commander 1-3.

CO CDR 1-3 Protocol Anomaly 1A	Type of Verbalization	Comments
"They attacked across WHITE, two up, one back, with the one in the back following, apparently some success in the north. Okay. Bear and I killed the southern MRB and we have maintained combat power. And he is pressing along the northern wall. Team A is combat ineffective and Team D is falling back to battle position vicinity Phase Line GREEN.	System Status (Enemy and Friendly Forces)	CO CDR reviews tactical situation to ensure he understands strength and relative position of friendly and enemy forces.
Commander's intent is to destroy the MRR in Engagement Area ONE, to deny them any penetration. In the intent he says for Bravo to deny any penetration.	Reference To Intent (BN CDR's Intent)	Recalls BN CDR's intent to guide his decision making process. Only element of BN CDR's intent recalled is destroying MRR in EA ONE.
We also have second echelon MRR, we're supposed to be looking to, uh, verify that their forward detachment will go on the southern axis there.	Reference To Procedures (BN CDR's Priority Intel Rqmts, Intel Annex)	Priority Intelligence Requirements are what the BN CDR has said he needs to know about the enemy.
Team Alpha which is here apparently is getting overrun by the third MRB that's pressing along the northern wall. Team Delta has fallen back to a battle position back along Phase Line GREEN, which I think is actually back here.	System Status (Friendly Forces)	The BN CDR's intent can no longer be met because the MRR was to be destroyed in EA ONE. Enemy units are now west of EA ONE.
In order to meet the commander's intent and deny that MRB penetration of Phase Line GREEN	Reference To Intent (BDE CDR's Intent)	Since BN CDR's intent no longer applies, CO CDR recalls BDE CDR's intent..
I guess I would recommend to the commander that Team Delta, by virtue of its already having fallen back, maintain its fall back position...and form the backstop here. The enemy, by virtue of terrain... will have to move around like this. This will allow Delta to stop anymore eastward penetration. I think at that point one if not both of Bear and I need to displace out of our battle positions. Bear will have to wait on me. We'll come down off 760, taking my little Route CAVE here and put ourselves on line, execute a hasty attack more or less along this direction...	Course Of Action and Coordination	CO CDR develops a single course of action based on the movement of the enemy, and in conjunction with Team D and Bear [Team B].
I'd put one platoon...worth of TOWs in some kind of overwatch somewhere right in here. I've only got one tank platoon, and then attack more or less with one tank platoon and one Bradley platoon with one Bradley platoon in supporting overwatch."	Course Of Action	After planning the coordinated movements of adjacent units, the CO CDR plans the actions of his subordinate elements..

The protocol of Company Commander 1-3 began with an assessment of the situation. He reviewed the status and location of both friendly and

enemy forces. He then referred to the battalion commander's intent statement:

"Commander's intent is to destroy the MRR in Engagement Area ONE, to deny them any penetration. In the intent he says for [Team B] to deny any penetration."

A few lines later he mentioned again the status of friendly and enemy forces. This time, he focused on the events that invalidated the plan and the intent:

"Team Alpha which is here is apparently getting overrun by the third MRB that's pressing against the northern wall. Team Delta has fallen back along Phase Line GREEN, which I think is actually back here."

Following this, he referred to intent again. However, he was no longer recalling the battalion commander's intent because his intent statement never mentioned Phase Line GREEN. The company commander referenced one of two possible sources. First, the brigade commander's intent statement (also included in the battalion operations order) began with "The purpose of this operation is to defeat the 41st [motorized rifle division] forward of [Phase Line] GREEN." Second, the mission in the battalion operations order stated that the battalion was to "defeat one [motorized rifle regiment] of the 41st [motorized rifle division] forward of [Phase Line] GREEN in order to force the enemy main effort to the south."

The company commander's second reference to commander's intent is significant. Since the battalion commander's intent was no longer valid, he could not use it to adapt the original plan. He needed to refer to some other guidance in order to adapt the plan. The second reference to commander's intent is an appeal to broader, more abstract guidance. The brigade commander's intent is designed to provide this guidance. However, the fact that the company commander could have referenced the battalion's mission

statement, is an indictment against the battalion's intent. The intent statement is provided to assist subordinate commanders in responding to unanticipated situations in which the plan or mission does not apply. In this battalion, however, the mission statement served as a better guide for adapting the plan than the intent.

Unsuccessful Adaptations

Company commanders failed to match the battalion commander's intent in twenty-one of the thirty-two episodes. These episodes are divided into six categories based on the problems encountered in attempting to adapt to the unanticipated situation. Each category is now described in detail.

Flawed Domain Knowledge

Company Commander 1-1 (Anomaly 1A) and Company Commander 2-4 (Anomaly 2A) failed to match the battalion commander's intent because their domain knowledge was flawed. The protocol of Commander 1-1 is used to illustrate this category. A portion of the protocol is shown in Table 12.

In Anomaly 1A (see Table 1), Task Force 1-77 (oriented toward the east) had destroyed two enemy motorized rifle battalions (MRBs) in Engagement Area (EA) ONE. A third MRB was moving westward along the northern boundary of the task force. Team A had already been overrun and Team D was falling back toward Phase Line GREEN. The battalion commander's response to the situation was to have Team C counterattack north into the flank of the third MRB. Company Commander 1-1 realized that he needed to act. However, instead of attacking north, he decided to turn his unit around,

move his company west eight kilometers, then north three kilometers in order to establish a blocking position.

Table 12. Partial protocol of Company Commander 1-1 for Anomaly 1A.

CO CDR 1-1 Protocol	Type of Verbalization	Comments
"My orders were not to move from this location.	Reference To Procedures	BN CDR never intended CO to stay in place. CO CDR inferred this from OPORD.
However, given that Delta is moving back, I would ask first what Bravo was doing.	System Status and Need For Information	
If Bravo is holding then I would probably start formulating a plan to try and get my company back to a position contiguous to where Delta would be....I would start thinking to myself if Delta occupies that [terrain] then I would occupy this key terrain here and try and get flank shots into 'em as they were coming back this way. That would be the first scenario that would come to mind...."	Coordination and Course Of Action	Considers other subsystems in formulating plan. However, plan is inconsistent with BN CDR's solution because CO CDR misjudges response/lag times. CO can not displace west in time to confront a moving enemy.

Although he demonstrated initiative in the face of an unanticipated situation, he did not adapt the plan in a manner acceptable to the battalion commander. His knowledge of tactics and time/distance factors on the battlefield were flawed. He would not have been able to reposition his unit in time to block an enemy that was already moving. A clear understanding of intent is not sufficient to adapt a plan correctly. Accurate domain knowledge is also necessary.

Many of the episodes are rich with data. Although this episode was classified as an example of flawed domain knowledge, it also demonstrates misassessment of information. The company commander begins his verbal

protocol with "My orders were not to move from this location." In reviewing the videotape, his battalion commander stated, "I never told him that - specifically." In spite of the company commander's perception that he was not supposed to move from his location, he developed a course of action that required him to move. Apparently, the company commander determined that the system goal of preventing the westward movement of the enemy superseded his 'orders' that he was not to move.

Situational Uncertainty

In four episodes, protocols indicated that the company commanders had difficulty coping with the uncertainty inherent in the situation. The protocols of Company Commander 1-2 (Anomalies 1A and 1B) illustrate this category. Both protocols were extremely long (41 lines for Anomaly 1A and 38 lines for Anomaly 1B) compared to other commanders in Battalion #1 (combined average length of 14.5 lines). The length of the protocols is attributed to the fact that Company Commander 1-2 asked more questions and sought more information than the other commanders. In addition, rather than identifying a single course of action, he explored several. In the end, however, he did not commit to any course of action. The following partial protocol (Anomaly 1B) illustrates the company commander's struggle with uncertainty. In this anomaly, the battalion had defeated all enemy forces in its sector and should have been preparing for a counterattack along Axis CHIEFS into Engagement Area HURT.

"I need to know now, since we know the...regiment has already gone to the south, we would probably at this time need to find out if they achieved success in the south or not. If they had, would we be falling back or would they have us go ahead and

hold our own where we're at and reconstitute...reorganization and reconsolidation on our objectives? Also, if they try to cross-level within the task force, what kind of strength am I going to lose from my company at this time? Are they gonna try to plus up Delta or Bravo with maybe a platoon or a section of tanks in order to bring them up to combat strength? At this time I also might be looking for enemy remnants moving around in our sector...and we might engage them. Also, if Alpha or Delta cannot counterattack into Engagement Area One at this time, looking at their strength, they might have...Delta or Bravo, looking at the strengths of Alpha and Charlie, they might have that happen also...."

Also significant is that this individual had commanded his company for only one week. He had no previous experience in command. This simulation was his first opportunity to work with his battalion commander in a tactical scenario. Yet even within the span of their short relationship, the battalion commander had realized the company commander's struggle with uncertainty. Before watching the videotapes, the battalion commander was told that Company Commander 1-2 had more difficulty coping with uncertainty when compared to the other commanders. The battalion commander's response was, "That observation is on the mark."

Misassessment

In four episodes, the company commanders failed to match the intent of their battalion commanders because they did not properly assess the information available to them. During Anomaly 1B, Commander 1-3 was confused by the battalion operations order. The battalion commander's response to this anomaly was that the battalion should counterattack along Axis CHIEFS into Engagement Area HURT. However, the company

commander could not decide which of three courses of action he should select. In his protocol he stated:

"At that point, I would probably call the battalion commander, give him my, uh, situational update and request further instructions. If he wanted me to maintain battle positions, um, if he wanted me to link up with the Iron Horse element to execute counterattack or remain in place and prepare for further offensive operations."

The company commander identified the source of his confusion in the protocol:

"The order was a little ambiguous in that it was definite that Team Alpha had a contingency plan to execute a counterattack along Axis CHIEFS. The specified tasks did not read clearly and it was unclear whether or not C Company also had that task to be prepared to conduct counterattack operations along Axis CHIEFS down into the 1-2 sector."

In paragraph 3b (Tasks to Maneuver Units) of the battalion operations order, Team A was given several tasks, including "[be prepared] to conduct offensive operations on Axis CHIEF." In the same paragraph, the tasks assigned to Team C began with "Same as A (BP C instead)." Company Commander 1-3 was not sure which tasks assigned to Team A were also his responsibility. Apparently, this confusion was not resolved (for Commander 1-3) during the wargaming or briefings that occurred prior to the simulation.

Company commanders also failed to match the battalion commander's intent because they improperly assessed the tactical situation. In Anomaly 3B, company commanders were given the following situation report (emphasis added):

132 MRR attacked into 1-77 sector as expected. Screening activity of TM A caused MRR to deploy into attack formation vic PL WHITE with 2 MRBs up, one back. Friendly long range recon also detected elements of 127 MRR trailing 132 MRR. Prior to

reaching PL WHITE, 127 MRR drops to the south in an apparent effort to reinforce attack by 133 MRR and 199 TR.

Templating efforts by 132 MRR apparently identified the TF 1-77 EA. MRBs attempted to bypass EA BLOOD. **TM B destroyed MRB attacking south of EA.** TM B was left at 70% strength. **TM D destroyed MRB attacking north of EA and** (with help from TM A) **also destroyed 2nd echelon MRB.** TMs A and D at 80%. TM C at 90% strength.

Company Commander 3-1 did not realize that all three MRBs had been destroyed. In his protocol, he focused on what he considered to be the missing MRB. He stated:

"So what it looks like here is that I'm dealing with, if the 132nd was attacking with two up and one back, okay, if the one was destroyed here by Team Bravo and the other one was destroyed here by Team Delta, its basically trying to find out where the, uh, the last MRB is. Right now, that's unreported....So I would say is that, uh, I'm just going to hold what I have. Ah, still cross-talk with Team Delta and more than likely Team Alpha and also Team Bravo to see if we can ID where that 3rd MRB is hid..."

Since he did not realize the third MRB had already been destroyed he decided to remain in place until he could locate it. In his response to this anomaly, Battalion Commander #3 chose to use Team A as a counterattack force. All other Teams were to remain in place.

In the first instance, Company Commander 1-3 mentioned three courses of action but remained undecided and needed further guidance from the battalion commander. In the second instance, Company Commander 3-1 made the right decision but for the wrong reason. Rather than remaining in place because he understood that Team A had the mission to counterattack, he did not act because he was unsure of the tactical situation. Both company commanders misassessed the tactical situation and chose to wait in place. Although neither company commander matched his battalion commander's

intent, from outward appearances, it looked as if Company Commander 3-1 matched the intent but Company Commander 1-3 did not.

Rigid Adherence To Brittle Procedures

Three company commanders did not adapt the procedures when they were confronted with an unanticipated situation. Instead, they chose to implement the procedures even though they were not designed as a response to the novel situation. Company Commanders 2-1 and 2-2 responded to Anomaly 1A by moving from one position to another (because a predetermined condition had been satisfied) and then returned back to the original position. Company Commander 4-2 responded to Anomaly 4A by invoking a predetermined contingency plan, even though the conditions for implementing the contingency plan had not been satisfied.

In the operations order developed by Battalion #2, the battalion commander had established a decision point (DP). At the decision point, if the second echelon motorized rifle battalion (MRB) were moving to the northern part of the battalion sector, Team C was to move north from Battle Position (BP) 2 to Support By Fire (SBF) Position 1 to block the MRB. If at the decision point the MRB were in the southern part of the battalion sector, Team C was to remain at BP 2.

In Anomaly 2A, the company commanders were told that the second echelon MRB was moving toward the northern boundary of the battalion sector. They were also told that a tank regiment (consisting of three battalions) was entering the southern portion of the battalion sector. Company Commanders 2-1 and 2-2 responded in the same way (see Figure 12). They moved their companies out of Battle Position (BP) 2 to Support By

Figure 12. Response of Company Commanders 2-1 and 2-2 to Anomaly 2A. Both commanders moved from BP 2 to SBF 1 and then returned to BP 2.

Fire (SBF) Position 1. When they reached SBF 1 they determined that there were insufficient forces in the southern portion of the sector to defend against the enemy and they returned to BP 2. The protocol of Commander 2-2 states:

"Okay, at this point, since the enemy has attacked in the north and we defeated 1 MRB in the north and 1 in the south, and we've already passed this decision point and I'm at Support By Fire 1 with no leakers coming through from EA NORTH, which means BP 4 and 8 picked up everything. And now the enemy has committed the tank regiment down in the south. And at this point, my analysis is that the enemy is going to push this tank regiment, gonna try to push them all the way to BP 3 and I'm gonna call the commander and ask to displace from Support By Fire 1...and I'm gonna request to re-occupy BP 2 which would give me good orientation into what was my primary engagement area...."

The company commanders received all information at the same time in the form of a situation report. The situation report did not portray a temporal sequencing of the events but a snapshot of the current situation. Yet both

these company commanders responded sequentially. They followed the plan because the second echelon MRB was moving toward the northern boundary at the decision point and then developed their own response to a situation not specified in the plan.

Battalion Commander #2 did not want his company commanders to blindly follow the operations order. In response to the anomaly, he wanted Team C to remain at BP 2, reorient the company and prepare to engage the tank regiment. After viewing the responses of the two company commanders the battalion commander stated:

"If both these first two [company commanders] assumed that, by God, come hell or high water when [the enemy] passed the decision point they're going to SBF 1, they have not taken into account there might be some alternate information, another blip on the radar screen like a tank regiment out there. There's no way I would move them north if I've got a tank regiment coming south....They're just died-in-the-wool...the battalion commander says at the decision point this happens, this is what's going to happen. But that's where I would say, 'Uh-uh. I've got some more information.'"

In Anomaly 4A, Company Commander 4-2 used a predetermined procedure even though the conditions for its use had not been satisfied. In this anomaly, Team C had been pushed back from their area to a position behind Phase Line BLACK. A tank regiment began to move into the battalion's sector (see Figure 13 and Table 7). The battalion commander determined that he would have Team C tie into the existing defensive positions west of Phase Line BLACK and establish a backstop to prevent the enemy from reaching Phase Line GREEN.

Company Commander 4-2 decided to move Team C to Attack Position HAMMER (located at the beginning of Axis CHIEFS) and prepare for a

Figure 13. Response of Company Commander 4-2 to Anomaly 4A.

counterattack to Engagement Area HURT. The battalion operations order included one contingency plan - a counterattack. When Team C was pushed out of its sector by the enemy, the plan was no longer valid. The company commander did not refer to the battalion commander's intent. Rather than adapting the existing plan, he chose to implement a contingency plan whose prerequisites had not yet been satisfied. The battalion was not to counterattack until all the enemy in its sector had been destroyed.

Faulty Perspective Of The Environment

In seven episodes, company commanders failed to match their battalion commander's intent because they viewed their local situation from the wrong perspective. Three of these company commanders committed to multiple courses of action. They positioned their units to counteract several threats (diluting their combat power) rather than concentrating their efforts

on one threat. They failed to realize that they were part of a larger organization that could use its resources to meet the other threats. In the other four episodes, company commanders chose a single, wrong course of action. Two examples are discussed.

In Anomaly 3A, the battalion had destroyed two motorized rifle battalions (MRBs). Another MRB was moving westward along the northern boundary and a tank regiment was moving into the southern portion of the sector. The battalion commander's response was to keep Team C in place but reorient it (from east to north) so that it could fire into the flank of the northern MRB. The battalion commander also decided to move his reserve (Team A) into a blocking position to engage the tank regiment.

Prior to receiving the situation report, Company Commander 3-2 had his company oriented to the east, facing Engagement Area BLOOD. After reading the report, he decided to reorient his northern platoon to the north to fire into the flank of the MRB. He reoriented his southern platoon to the south to fire at the tank regiment. The platoon in the middle continued to face the engagement area. He never referred to the battalion reserve in his protocol. Rather than focusing on one problem or acknowledging the resources available to the battalion commander, the company commander tried to use his limited resources to solve all the problems.

In responding to the same anomaly (3A), Company Commander 3-1 chose a single, incorrect course of action. This company commander decided to pivot his company to the south and fire into the flank of the tank regiment as it moved to the west. Again, the company commander did not mention the battalion reserve. He viewed the problem locally. Also, the company commander did not refer to the battalion commander's intent. The intent

statement provided the battalion commander's view of how the reserve force would be employed.

Conflicting Information

In his response to Anomaly 1A, Commander 1-4 illustrates how conflicting information can contribute to a wrong decision. In this anomaly, the second echelon motorized rifle battalion was pressing the attack to the west along the northern boundary. The battalion commander wanted Team C to counterattack to the north into the flank of the enemy. In his protocol, Company Commander 1-4 said:

"Continue to consolidate and reorganize on my battle positions to prepare for an attack one of two ways - either north to northeast to counterattack into the flank of the...second echelon MRB, or hold in position and await orders to counterattack either east to Phase Line WHITE or southeast along CHIEFS to Engagement Area HURT based on a [fragmentary order] on what formation the task force will use for either attack."

The company commander proposed attacks in two directions because the intent of the battalion commander conflicted with the intent of the brigade commander.

In his intent, Battalion Commander #1 wanted to achieve an end state in which the motorized rifle regiment was destroyed *in Engagement Area ONE*. In his intent, the brigade commander wanted to defeat the enemy forward of Phase Line GREEN. He also wanted Task Force 1-77 to be prepared to launch a counterattack along Axis CHIEFS into Engagement Area HURT. Company Commander 1-4 could not achieve the battalion commander's end state. The enemy had already moved west of Engagement Area ONE. He had

to appeal to the brigade commander's intent. Since the brigade commander's intent and the battalion commander's intent conflicted, the company commander was faced with a dilemma. Does he attempt to prevent the enemy from reaching Phase Line GREEN or does he prepare to launch the counterattack into Engagement Area HURT? The company commander failed to adapt the plan because he did not resolve the conflict between the two sources of guidance.

Neutral Observer Results

Officers at the Army War College served as neutral observers. These officers were domain experts. All had commanded battalions and some had also commanded brigades. At least three of the officers had been assigned to an army training center where they observed and instructed units participating in tactical operations. These officers were asked to review the protocols generated by the simulation. Nine officers participated in two group sessions, each lasting approximately two hours. The sessions were audiotaped. The officers were asked to review the videotapes of the protocols and comment on the degree to which the company commanders appeared to be operating within the intent of their battalion commanders. Group sessions were used in order to stimulate discussion among the reviewers, providing a richer source of data. The officers were also asked to rate the battalion operations orders in terms of the degree of flexibility they provided to the company commanders.

Only a few of the thirty-two episodes were shown to the reviewers because the brigade operations order used to drive the simulation created significant discussion. The officers discussed the strengths and weaknesses of

the operations order. They also discussed commander's intent in doctrine and in practice, the need for subordinates to have flexibility in response to local situations, and the need for senior commanders to synchronize events on the battlefield. (Although these discussions were extremely useful in refining the theoretical framework for implementing the concept of intent, little time was left for reviewing the protocols. In retrospect, more time should have been allocated for the review process and at least some individual sessions should have been scheduled.)

Neutral Observer Comments On The Brigade Operations Order

Many of the comments concerning the brigade operations order that drove the simulation were less than favorable. They identified several inconsistencies among the intent statement, concept of the operation, mission statement, tasks assigned to subordinate units, and graphics.

First, in his mission statement, the brigade commander stated he wanted to defend forward in his assigned sector but in his intent statement he said he wanted to defend in depth (i.e., use the width and breadth of the sector). Second, he said he want to defend in sector in the north and the south yet he assigned battle positions in the south. (Assigning battle positions forces the units to fight from those locations rather than establishing a more flexible, mobile defense.) Third, he said in his intent statement that he wanted to shape a brigade engagement area yet his graphics showed only task force engagement areas. According to the Army War College neutral observers, these contradictions would lead to confusion among subordinate commanders. Other comments made by the neutral observers include:

- "This Oporder would give us OCs [officers who evaluate and train tactical units at the army's training centers]...a lot of opportunity to talk for two hours and reflect back on the guy who wrote this thing, upon its adequacy for fighting this fight."
- "The concept and the graphics don't give the company commander a plan for executing the intent, so the intent and the concept are discontinuous to begin with."
- "I would be very very cautious about drawing any conclusions about what those kids thought about intent based on the inherent contradictions of mission, concept, intent, and what I heard them say."
- "If a company commander, he reads [the battalion commander's intent statement] and also the brigade commander's intent, that's a lot of mashed potatoes."
- "[The battalion commander's intent statement is] an example of how not to write an intent statement and the brigade commander's order is how not to write guidance on how he wants to fight."

These comments seem to be a strong indictment against using this particular brigade operations order. Such a poor operations order ought to skew, or even invalidate, the responses of the battalion and company commanders. Yet when asked if this operations order was atypical, the neutral observers responded that it was "*very common*." Given that one of the objectives of this study was to investigate a functional command and control system, using a flawless operations order would not be realistic. The brigade operations order used in this study, though flawed, is typical of those received by battalion commanders. It adds to the complexity of the cognitive tasks that must be performed by the battalion and company commanders. It

complicates the analysis of the data, but it does not invalidate the responses of those commanders.

Flexibility Ratings

Eight officers completed ratings of the four battalion operations orders. They rated the orders on a scale of 1 (highly specified) to 10 (highly flexible). The ratings demonstrated that there is little consistency among expert practitioners as to what constitutes a flexible order. For example, Rater # 3 assigned an '8' to OPORD #3 and a '1' to OPORD #4. Rater #6 assigned a '2' to OPORD #3 and an '8' to OPORD #4. And Rater #8 assigned a '9' to both of the operations orders. The written justification they provided with each rating provided little insight into which elements they were focusing on within the order. A post-rating interview would have been helpful in understanding the rating process used by each officer.

Research Questions

This section uses the data to address the five questions that were formulated in Phase One. The study did not generate a definitive answer to every question. The data pointed to deficiencies in the way the practitioners formulated, communicated, and implemented intent. In addition, the data suggested ways to improve the methods by which practitioners adapt their plans when they are confronted with unanticipated situations.

Question One: How Do Remote Supervisors Impart Their Presence To Local Actors?

This research did not provide a clear answer to the question of *how* remote supervisors impart their presence. An underlying assumption of the

study was that if remote supervisors imparted their presence successfully then the local actors would adapt the plan properly. The actors would select a course of action that coincided with the supervisor's intent. However, a distributed supervisory control system is much more complex than that. Many factors influence the remote supervisor's ability to impart presence and the actor's ability to utilize the supervisor's imparted presence.

This study identified several methods that *can* be used by senior commanders to impart their presence to subordinate commanders. These methods include briefings, backbriefs, rehearsals, leaders' reconnaissance, and on-site visits.

- Briefings. After the operations order is written, if sufficient time exists, subordinate commanders meet face-to-face with the senior commander and his staff. The senior commander explains his intent for the upcoming operation. Subordinate commanders have the opportunity to question the senior commander about his intent.
- Backbriefs. After subordinate commanders have determined how they will achieve their goals, they brief the senior commander on their plan. During this backbrief, the senior commander can check the subordinate's understanding of his intent. The senior commander can tailor his intent to resolve any misunderstanding.
- Rehearsals. Prior to beginning an operation, a senior commander will assemble his subordinate commanders and staff officers to rehearse the plan. Normally, the intelligence officer (staff officer responsible for gathering and interpreting information about the enemy) plays the role of the enemy commander. The senior and subordinate commanders maneuver their forces on a map or a scaled model of the actual terrain and

the intelligence officer responds by maneuvering the enemy forces. The senior commander can assess how well he has imparted his presence and his intent by observing how his subordinate commanders respond to the 'enemy' during the rehearsal.

- **Leader's Reconnaissance.** The senior commander and subordinate commander perform a reconnaissance of the terrain on which they will fight. During the reconnaissance the senior commander explains his vision of how the battle will unfold.
- **On-Site Visits.** Senior commanders visit subordinate units and check on their understanding of the upcoming operation. According to army doctrine, a soldier must understand the intent of the commander two echelons above him. Therefore, during an on-site visit, a commander will ask soldiers two levels below him whether or not they understand his intent. In this way, the senior commander can ensure that his immediate subordinate has understood and reliably transmitted his intent. (Van Creveld (1985) refers to the concept of a *directed telescope* employed by Napoleon. He could direct this 'telescope' "at will, at any part of the enemy forces, the terrain, or his own army in order to bring in information that is not only less structured than that passed on by the normal channels but also tailored to meet his momentary (and specific) needs." The senior commander's on-site visit represents a kind of directed telescope that checks the degree to which presence was imparted.)

In many instances, organizations have insufficient time to perform each of these methods. In the simulation, battalions performed briefings and backbriefs. Since it was not an actual tactical operation, rehearsals, leaders' reconnaissance, and on-site visits were not feasible. Even in tactical settings

these methods are not always used. In an interview at the National Training Center, a brigade commander considered all of these methods to be important. However, the commander was only able to use three of the methods because of severe time constraints.

Question Two: To What Extent Is The Communication Of Intent A Process Rather Than An Event?

Results indicate that distributed supervisory control systems show evidence of both a process and an event. One way to characterize the system is that communicating intent is an event but imparting presence is a process. Communicating intent can be considered an event because within military C2 systems the remote supervisor develops a statement of intent and includes it in the plan that is provided to the local actors. Imparting presence can be considered a process because it contains both tactical (short-range) and strategic (long-range) elements. Tactically, the intent statement is reinforced by other elements of the planning process to impart presence. Strategically, the operational climate established over time impacts a supervisor's ability to impart presence.

Communicating intent is an event. Nearly every military operations order contains an intent statement. Commanders delegate the task of preparing the operations orders to the staff. However, it is the commander who writes the intent statement. Field Marshal Sir William Slim, a commander in the British army during World War II, explained his commitment to personally crafting the intent statement (1956):

"I suppose dozens of operations orders have gone out in my

name, but I never, throughout the war, actually wrote one myself. I always had someone who could do that better than I could. One part of the order I did however, draft myself - the intention. It is usually the shortest of all paragraphs, but always the most important, because it states - or it should - just what the commander intends to achieve. It is the one overriding expression of will by which everything in the order and every action by every commander and soldier in the army must be dominated. It should, therefore, be worded by the commander himself."

Communicating intent can be viewed as an event because commanders rely heavily on the intent statement to influence subordinate commanders. Similar to Field Marshall Slim, all commanders interviewed and observed during this research project considered it their responsibility to write the intent statement. The intent statement served as the embodiment of their vision of the upcoming operation.

There is further evidence that communicating intent is an event. Senior army officers focus heavily on the content of the intent statement. Those responsible for army doctrine work diligently to determine what information should be included in an intent statement, where it should be located in an operations order, its ideal length, and the amount of detail it should contain. In spite of the lack of agreement, commanders are regularly criticized by observers/controllers for the intent statements they develop during training exercises. One neutral observer at the Army War College provided some insight into why it has been difficult for the military to clearly specify the contents of an intent statement:

"The higher you go, the more complex the operation, the harder it is to write intent, you're absolutely right. It's a real art form, a very difficult concept, and you're dealing in an area that is very, very personal to the commander. And so one hesitates to be critical from a doctrinal point of view because what works for that commander and his guys, works."

Imparting presence is a process. Commanders point to the intent statement as the means by which they communicate their intent to subordinate commanders. However, built into the military C2 system are several mechanisms that complement intent and contribute to imparting the senior commander's presence. Research results indicate that there are both tactical (short-range) and strategic (long-range) methods that support the process of imparting presence.

Tactical methods. The commander's intent statement is included in the written operations order, the plan that is to be used to guide the unit in its next interaction with the enemy. Data collected from interviews, observations, and the simulation indicate there are several mechanisms built into the self-paced planning process that verify the accurate communication of intent and contribute to imparting presence. These methods were mentioned in the earlier discussion of how presence is imparted.

- Briefings.
- Backbriefs.
- Rehearsals.
- Leader's Reconnaissance.
- On-Site Visits.

Strategic methods. Some officers at the Army War College did not differentiate between communicating intent and imparting presence. They believed that communicating intent permeates all interactions between a senior commander and his subordinates. Other Army War College officers disagreed. They believe that communication of intent is inextricably linked to a specific operation. Perhaps a more accurate view of intent and presence is

the following: *the communication of intent occurs within the context of a specific problem but imparting the presence that contributes to the effective understanding and implementation of intent happens over time.*

Military doctrine writers refer to the need for establishing a healthy 'command climate.' Halpin (1994) states:

"A positive command climate is essential for human resources development, and for the creative, independent action of subordinate leaders in situations in which they must operate alone. Excessive control, particularly through rules, is contrary to the development of a positive command climate, as is inappropriate use of punitive measures. Both limit the growth of subordinate leader capacity to deal with complex unstructured problems. The senior commander must set the example in building command values respecting the individual dignity and worth of the soldiers within the command." (emphasis added)

A senior commander has several ways to shape the command climate and impart presence. In daily interactions between himself and his subordinate commanders, he can communicate values and a sense of what is important. The cumulative and corporate experiences gained from multiple training events can be used to build mutual trust and confidence. Regularly scheduled officer professional development sessions provide the commander with a forum in which he can develop the technical knowledge of his subordinates and communicate his expectations.

Question Three: To What Extent Do Remote Supervisors Empower Local Actors?

Even in a system in which senior commanders are encouraged by doctrine to empower subordinates, the subordinates are not given unlimited flexibility. Senior commanders had to balance empowering their

subordinates (to provide them flexibility) with centralizing control (to synchronize the activities of their subordinates).

Neutral observers at the Army War College realized the importance of balancing flexibility and synchronization. One observer made these comments:

"There's a fundamental tradeoff to be had between flexibility that you give your subordinates for mission-type orders and synchronization to achieve your effects at a decisive point. There's a tradeoff. The more you go toward synchronization... the less flexibility you're giving your subordinates. The more you go towards mission-type orders and flexibility...the more likely you are to achieve synchronization by accident as opposed to by design. So we are now diverging again doctrinally about what we're trying to do because we're harping on synchronization yet still talking about mission-type orders and commander's intent."

Company commanders tended to concentrate on synchronizing their activities with their battalion commanders and overlook other company commanders. In the simulation, company commanders discussed coordinating their activities with the battalion commanders in 24 of 32 episodes. They discussed coordinating their activities with other company commanders in only 12 of 32 episodes.

Question Four: What Information Do Local Actors Use In Responding To Unanticipated Situations?

In general, the company commanders were not very successful in matching the intent of their battalion commanders, particularly in Anomaly 1 (when they could not complete the mission as written). Less successful company commanders focused on the situation report that described the anomaly. They lingered on the report until they understood the situation it

depicted. In nine of the thirty-two episodes, company commanders never referred to the operations order. They appeared to abandon the plan completely and developed a new plan based on the information in the situation report. Others only alluded to it by mentioning a phase line or an engagement area. It is possible that these company commanders made no direct references to the operations order or intent because these sources of information were included in a mental model they had constructed. If so, their models appeared to be less accurate and less influential than those of the successful company commanders.

Question Five: Does The Content Of The Intent Statement Influence Its Usefulness To Local Actors?

Findings of the simulation suggest that including a statement of intent in a plan does not ensure that the intent will be used. The content of an intent statement influences its usefulness. The results are not conclusive because there are at least two possible reasons that intent was either directly or indirectly referenced in only ten of the thirty-two episodes. Both explanations were suggested by a CAS3 officer interviewed during Phase One of the study. The officer said that when he received a long intent statement he either highlighted it or disregarded it.

By highlighting the intent statement he was not only shortening it to a manageable length, he was transforming it. The information that was eliminated from the condensed version was judged to be not relevant to him. Relevance is based on an agent's understanding or mental model of the system. Actors may incorporate an intent statement into their mental model of the system. When they are confronted with an unanticipated situation they reference the mental model with the intent embedded in it. The data

collection methods used in this study were not designed to access components of the mental model.

It is also possible that company commanders disregarded the intent statements. Constructing an intent statement is an extremely difficult task. The intent statement must guide the actor's adaptation of the plan regardless of the local conditions and without further communication with the remote supervisor. Many intent statements are long because remote supervisors provide detailed instructions to local actors. These instructions are the method portion of the "Purpose - Method - End state" format for military intent statements.

CHAPTER V

DISCUSSION

Military C2 doctrine recognizes the importance of communicating intent from senior to subordinate commanders. Yet, in a distributed supervisory control system where intent is highly valued, local actors had a difficult time in adapting plans in a manner consistent with the remote supervisor's intent. The performance of military C2 practitioners raised several questions which are addressed in this chapter. What factors contributed to the poor performance of the practitioners? How can the performance of these practitioners be improved? How can these ideas for improving performance be generalized to other areas?

This chapter is divided into four sections. The first section uses the results of the simulation to explain the performance of these human-human systems. The next section argues that human-centered solutions are more viable than technology-centered solutions. The third section proposes methods to improve the communication of intent in human-human systems. The final section discusses implications for distributed supervisory control systems which include both humans and machines.

Comments on Performance of Practitioners

This section considers the results of the simulation at a higher level of abstraction. From this perspective, several explanations of practitioner

performance are identified that have application to distributed supervisory control systems within other domains. These explanations include:

- path vs. state-based solutions;
- ambiguity of natural language;
- emphasis on flexibility over synchronization;
- individual differences among practitioners.

Path Vs. State-Based Solutions

All commander's intent statements reviewed during the study contained three elements: purpose, method, and end state. Although the method section is not discussed in doctrine, it was generally the longest portion of the intent statement. An intent statement with a detailed explanation of the method to be used does not guide adaptation of a plan but dictates compliance to it. This type of intent statement becomes as brittle as the plan if a local actor confronts an unanticipated situation.

Figure 14 illustrates the effect of a highly specified intent statement. The intent developed by the remote supervisor defines a canonical path through the problem space. Local actors begin the control process by implementing the portion of the plan that applies to their subsystem. Only when all actors successfully implement their portion of the plan will the entire system achieve its end state. In the figure, Local Actor 1 reaches an impasse between intermediate states 2 and 3. The actor recognizes that a breakdown has occurred and searches the plan for a contingency to overcome the impasse. Since the impasse (or breakdown) had been foreseen by the remote supervisor, a contingency had been developed. The local actor implements the contingency and continues to move toward the end state.

Figure 14. Canonical path through a problem space. Multiple local actors respond to breakdowns in plans and procedures. If the breakdown was not expected, a contingency does not exist. The actor and the supervisor are blocked from achieving the goal.

Local Actor 2 confronts a breakdown that was not anticipated by the remote supervisor. Although the actor recognizes that a breakdown has occurred, the situation goes beyond the literal plan. The intent does not provide guidance for adaptation but functions as a component of the plan. The local actor is blocked from reaching the end state. He or she is forced to ad lib without benefit of a hierarchical context.

Rich and Knight (1991) state that solutions to problems can either be paths or states. The figure above illustrates a path solution. The remote supervisors characterizes his or her intent as a path through the problem space that local actors are required to follow. When the local actors select another path or the path is blocked they cannot achieve the supervisor's intent. An alternative approach is to frame the problem as having a state for the solution. Figure 15 illustrates this approach. The purpose of intent is not to specify a path from the Start State to the End State but to guide the adaptation process of the local actors along the way. The supervisor's intent establishes the *parameters* of the solution space. As long as local actors stay within the solution space they are operating within the intent of the supervisor. Actors can determine their own path to the goal. This flexibility allows them to cope with the unanticipated variability within the environment and to formulate and implement plans (without approval from the supervisor) that overcome local obstacles.

In Figure 15, a local actor begins to implement the plan. When confronted with a breakdown that was anticipated by the remote supervisor, the actor identifies and implements the appropriate contingency and continues toward the end state. When the actor confronts a breakdown that was not anticipated by the remote supervisor, the actor relies on intent to

Figure 15. When confronted with an unexpected breakdown, a local actor relies on intent to define the solution space of acceptable ways in which to adapt the plan.

define the solution space. The actor adapts the plan in a manner that is consistent with the intent of the supervisor.

In the simulation, company commanders matched their battalion commander's intent more often in Anomaly Two. This result supports the idea that the battalion commanders developed intent statements that were path solutions rather than state solutions. In each battalion, Anomaly 1 prevented the company commanders from accomplishing their missions as written in the operations orders. When the solution path was blocked, the highly specified intent statements were no longer valid and the company commanders had nothing to guide their adaptation of the operations order.

In Anomaly 2, however, battalions had successfully accomplished their missions. Included in each operations order (in most cases within the intent statement) was a contingency plan for the counterattack along Axis CHIEFS into EA HURT. The company commanders did not have to adapt a plan based on the parameters provided by the intent. They had to recognize that the conditions required to launch the counterattack had been achieved.

Ambiguity Of Natural Language

Many researchers (Levelt, 1989; Schank and Abelson, 1977; Roth, et al., 1987) have stated that natural language is ambiguous. Misunderstandings can arise when practitioners do not share a common understanding of the terms in use. Suchman (1987) discusses the indexicality of language. According to her, many expressions "rely upon their situation for significance." In describing distributed decision making systems, Fischhoff and Johnson (1990) state that "people need to translate their thoughts into some language before those can be shared with others. Their ability to use the language sets an

upper limit on the system's coordination of decision making, as does the system's procedures for information sharing. They also state "that terms will unwittingly be used differently" by agents within the system. "If such discrepancies go undetected, then the parties' perceptions will drift apart until some dramatic and unpredictable act occurs. *To avoid having that happen at some inopportune time, inconsistencies must be actively sought and resolved*" (emphasis added).

A remote supervisor needs to verify that his or her presence has been imparted and that intent has been understood. When supervisors and local actors fail to resolve inconsistencies, they develop a false sense of confidence that they share complementary perspectives of the system. In the simulation, after they had responded to the anomalies, company commanders were asked to state how confident they were that their responses would match the response of their battalion commander. On a scale of '1' (Not Confident At All) to '5' (Very Confident), only two of the sixteen company commanders rated their confidence level at less than '4.' Most were very confident that they had understood and properly implemented the battalion commander's intent.

Battalion commanders also exhibited overconfidence. They wrongly assumed that their subordinates had a clear understanding of their intent. Battalion Commander #1 was surprised when Company Commander 1-1 mentioned during his protocol that he was told not to move. In the battalion commander's intent he stated that he wanted to "hold the shoulders" (i.e., to prevent the enemy from squeezing between the defensive position and the ridge line). The company commander understood that phrase to mean he was not permitted to move his unit.

Suchman's concept of indexicality is illustrated by the "hold the shoulders" phrase. The phrase was not a source of misunderstanding until it became situated in a particular context. Both the battalion and the company commander believed they understood the phrase. The situation report required the commanders to put the phrase in context relative to enemy movement. The battalion commander's viewed holding the shoulders as important to establishing the initial defense. The company commander believed that holding the shoulders was essential to accomplishing his mission. The battalion commander apparently did not verify the company commander's understanding of this portion of the intent (in context) prior to beginning the simulation.

Emphasis On Flexibility Over Synchronization

While theory and doctrine emphasize flexibility, empirical findings suggest that synchronization is equally important. A clear statement of intent should aid local actors by defining a solution space rather than providing a specific path through the problem space. The intent also should synchronize the activities of local actors.

The concept of *Auftragstaktik* emphasizes flexibility. *Auftragstaktik* "rejects as counterproductive any attempt to control the type of action initiated in combat, and instead inculcates subordinates with the will to act as they deem appropriate in their situations to achieve the desired result" (Silva, 1989). Highly-coupled, technologically-laden systems call for flexible yet synchronized responses to anomalous situations. Ashby's Law of Requisite Variety (Ashby, 1956) also emphasizes flexibility. The greater the potential variability within the environment, the more flexibility a local actor needs to

respond to the environment. A remote supervisor can constrain local actors by limiting the choices available to them.

In a distributed supervisory control system, a remote supervisor oversees multiple actors each controlling a local process. The local processes are not independent. The actions taken by local actors must be synchronized. It is not enough to implement the correct procedure. The procedure must be initiated at the correct time and place relative to the actions of other agents in the system. Decisions made and implemented in isolation can interact in unexpected ways and actually prevent the system from reaching its goals.

An officer at the Army War College stated that the more flexibility a commander gives his subordinate the more likely he will "achieve synchronization by accident as opposed to by design. Recall the Israeli Defense Force incident mentioned in Chapter I. Dayan (as quoted in Van Creveld, 1985) told his commanders they "must reach the Suez in forty-eight hours." Dayan provided maximum flexibility to his subordinate commanders to wage war as they saw fit. Only later did he realize his mistake when he said, "our capacity for misadventure is limitless." By granting the commanders so much independence he lost the ability to coordinate or synchronize their actions.

Rather than emphasizing either flexibility or synchronization, remote supervisors should provide local actors with *bounded flexibility*. Actors need enough flexibility to counteract the variety of the local situation. However, remote supervisors cannot provide local actors with so much flexibility that they lose the ability to synchronize the activities of the actors.

Individual Differences Among Practitioners

Another factor that may have influenced the outcome of this study is that battalion commanders tended to treat all local actors as if they were alike. On their questionnaires, the battalion commanders were asked to state the level of confidence they had in each company commander to match the battalion commander's intent. On a scale of '1' (Not Confident At All) to '5' (Very Confident), two of the four battalion commanders expressed the same level of confidence in all of their company commanders.

Both Silva (1989) and Muir (1987) believe that supervisors must be discerning enough to know which subordinates are competent and which may need close supervision. Silva stated:

"A superior's confidence in his subordinates will be high or low as a result of his intimate personal knowledge of each gained through his personal responsibility to train and develop them. The superior knows whom he can trust with more latitude and who needs more detailed instructions, but the superior knows that each will act."

Muir extended her findings on trust in human-humans systems to human-machine systems. Her conclusions were similar to those of Silva. She said, "In human-machine systems in general, a well-calibrated operator is the one who gets the most out of a system; his appropriate trust in competent subsystems allows him to devote his time and effort to compensating for less competent subsystems which he appropriately distrusts."

Although the simulation used actual practitioners in developing the plans and procedures and in responding to the anomalies, the ability of these practitioners varied greatly. One of the company commanders had been in his position for only one week. Others had been commanders for twenty months. In spite of the differences across actors, they were given the same

plans and procedures and the same degree of autonomy. Other individual differences included the following:

- ability to cope with uncertainty;
- willingness to act;
- use of information.

Ability to cope with uncertainty. Battalion commanders and company commanders faced uncertainty from several sources. One source of uncertainty was the plan. Plans are underspecified in that they cannot provide responses for every possible state of the system. Plans can also be vague (as demonstrated by Commander 1-3, Anomaly 1B). And, plans can contain conflicting information, leading to confusion concerning how to adapt them. Another source of uncertainty was the system or the environment. Local actors may have incomplete knowledge about the system because of its dynamic nature or because the actors' window into the system is limited.

The simulation demonstrated that individuals respond differently to uncertainty (see Figure 16). Seeking additional information rather than immediately adapting a plan in some cases is justified. If a local actor does not need additional information but requests it, that actor has a low tolerance for uncertainty. However, if an actor does not request the information but has a legitimate need for it, that actor can be labeled as being naive or overconfident. Either of these two situations are made more difficult by inexperience. An actor who unnecessarily seeks additional information is delaying the decision process. An actor who ought to request information but does not may be guilty of 'not knowing what he doesn't know.'

Figure 16. Possible responses to uncertainty.

Willingness to act. Another individual difference was in the willingness to take action in the face of uncertainty. Distributed supervisory control systems function properly when local actors understand the extent to which they are able to respond to local situations without approval. Given a set of procedures and a clear statement of intent, local actors should be able to recognize when they are operating within the remote supervisor's solution space and when they are not. But even with procedures and intent statements there will be some local actors who, by their nature, will hesitate to act without specific orders. (Several company commanders in the simulation indicated that they would not implement their plan until told to do so.) There will be other actors who will respond impulsively to local situations.

Use of information. Although company commanders had access to the same information they did not use that information in the same way. Some actors focused on the plan and rigidly adhered to it regardless of the local

conditions. Others concentrated on the information in the situation report. Many of these actors did not appear to measure this information against the intent of their commander.

Technology-Centered Vs. Human-Centered Solutions

One might argue that, based on the results of the simulation, system performance would improve if local actors were no longer decision makers but merely information gatherers and decision implementers. Centralizing planning, decision making and control at the level of the remote supervisor through technology will create further problems. This section identifies weaknesses in the technology-centered perspective and argues that the human-centered approach provides the best hope for designing distributed supervisory control systems which function effectively.

The Technology-Centered View

Norman (1993) states, "Today much of science and engineering takes a machine-centered view of the design of machines and, for that matter, the understanding of people. As a result, the technology that is intended to aid human cognition and enjoyment more often interferes and confuses than aids and clarifies." (Norman's machine-centered view is equivalent to what is referred to here as a technology-centered view.)

The systems that are being developed for military command and control provide support for Norman's statement. Researchers are designing equipment to be carried by the individual infantry soldier that will give him the capacity to send digitized information back to his commander. According to one researcher, "The Army leadership is recognizing that the soldier in this

case is essentially a platform" (Glashow, 1994). The soldier is not a decision maker or problem solver - he is a platform, an electronic and weapons system platform.

This technology is designed to bring the world of the local actor back to the remote supervisor. Sheridan's explanation of *telepresence* closely resembles what technologists have planned for the modern battlefield. According to Sheridan (1992), telepresence is when "the human operator receives sufficient information about the teleoperator and the task environment, displayed in a sufficiently natural way, that the operator feels physically present at the remote site." The objective is to provide the remote supervisor with the information he or she needs to make decisions. The local actor only has to implement the decisions made by the supervisor to achieve the systems goals.

Shortcomings Of The Technology-Centered View

Van Creveld (1985) made the following observation concerning designing organizations based on information availability.

"Confronted with a task and having less information available than is needed to perform that task, an organization may react in either of two ways. One is to increase the information-processing capacity, the other to design the organization, and indeed the task itself, in such a way as to enable it to operate on the basis of less information. These approaches are exhaustive; no others are conceivable."

Utilizing local actors as information-gathering platforms strongly suggests that the organization is seeking to increase its information-processing capacity. Having access to additional information does not mean the quality of the decisions will improve. Supervisors can become overloaded with

information. They can become buried in the details of one system and lose sight of the higher level goals for which they are responsible. Alternatively, they can make superficial assessments of local situations that lead to ineffective or destructive solutions.

This highly centralized approach is reminiscent of General Haig's disaster on the Somme discussed in Chapter I. The success of his plan hinged on him receiving information from the front lines so that he and his staff could adapt the plan and provide new instructions to his subordinate commanders. So crucial was the information that he developed at least eight distinct means of communication (Van Creveld, 1985). All of them failed. Subordinate commanders waited, the instructions did not arrive, and thousands of soldiers died.

Technological solutions to distributed supervisory control systems also rely on communication systems. Although the systems are more reliable today than they were in 1914, they are still subject to interference and failure. In addition, technology can introduce several additional problems. First, technologists attempt to increase the reliability of systems by making them robust. Parallel and redundant processes generally increase complexity and make it difficult for local actors to detect and isolate failures.

Second, technology tends to create clumsy systems (see Woods, et. al, 1994). Technology-centered solutions often designed to aid actors during periods of routine activity. During these periods, the cognitive demands placed on local actors are minimal. However, when the system experiences multiple, simultaneous or cascading failures, the cognitive demands on the actors escalate. Lengthy procedures, confusing error messages, or requests from remote supervisors for information increase cognitive demands.

Third, technology cannot change the remote supervisor into 'n' local actors. Remote supervisors and local actors occupy different levels in within the hierarchical system. Supervisors who use technology to view the system from the perspective of the local actors risk losing sight of system goals, forfeit the ability to synchronize activities across actors, and relegate actors to the role of information gatherers.

The Human-Centered View

The Germans who opposed Haig had a different view of warfare. Van Creveld (1985) wrote, "the Germans came to regard confusion as the normal state of the battlefield, and the remedy was sought not in any strict regimentation on the British model but in *further decentralization and the lowering of decision threshold*" (emphasis added). Subordinate commanders were empowered to act according to their view of the local situation. However, they were still constrained by the objectives of the larger organization. The Germans used the concept of *Auftragstaktik* to guide subordinate commanders in adapting their plans. Rather than bringing the battlefield to the senior commander (as in telepresence), the Germans used imparted presence.

A distributed supervisory control system in which supervisors impart their presence to actors represents a human-centered solution. This approach recognizes that plans and procedures are underspecified and brittle. Coordination occurs across time and space as actors, who are best equipped to evaluate the local situation, are guided in adapting their plans. This approach makes full use of the cognitive abilities of the local actors.

Improving The Communication Of Intent In Human-Human Systems

One of the goals of this research was to determine how successful human-human distributed supervisory control systems communicate intent so that those principles could be applied to human-machine systems. Before suggesting design principles for distributed supervisory control systems in which include machines, we must first consider how performance might be improved in human-human system.

The discussion that follows "is not antitechnological, it is prohuman" (Norman, 1993). Technological solutions generally centralize control by providing remote supervisors virtual access to the world of all local actors. An alternative is the human-centered approach in which a remote supervisor aids local actors by imparting his or her presence to them. This section first discusses the value of imparting presence as an alternative, theoretical approach to designing systems and then suggests methods remote supervisors can use to impart presence to local actors. These methods include:

- simulation as a tool for imparting presence;
- proper use of intent statements;
- establishing a cooperative environment;
- allowing for individual differences.

The Value of Imparting Presence

Technology-centered solutions are developed, in part, because remote supervisors understand strategic-level goals, constraints, and tradeoffs. Supervisors can interpret the information collected by local actors and make decisions based on their high-level perspective. However, remote

supervisors are subject to cognitive overload and risk losing their strategic perspective, especially in multi-layered, dynamic systems.

When remote supervisors impart their presence they are equipping local actors with the strategic-level goals, constraints, and tradeoffs of the system. Presence empowers the actor to make decisions similar to those that the supervisor would make if the supervisor were present at the actor's location. The actor can evaluate the situation, adapt the plan, and implement it before the subsystem transitions to another state and the modified plan becomes invalid.

Simulation As A Tool For Imparting Presence

Sheridan (1992) and Fischhoff, et al. (in press) state that a useful learning technique is to allow practitioners to experiment. Fischhoff and his colleagues state that there are three conditions necessary for experimentation:

- "*competence*, described as the ability to execute routine behaviors and preset plans;
- *insight*, defined as the ability to identify potentially useful alternative behaviors;
- *initiative*, defined as the ability to act on these possibilities, both to try them out and to implement those that seem to work."

Sheridan (1992) states that "experimentation must be done in a way that is fail-safe. That way is by mixing simulation with actual system operation."

The low-cost, mixed fidelity simulation in this study is a means for learning by experimentation. Military C2 practitioners are generally competent and are expected to use insight and initiative in reacting to unanticipated situations. The simulation combined actual C2 planning processes and realistic tactical scenarios in a low risk environment. Actual

adaptations to the plans were not implemented yet all participants were aware of whether or not their performance was acceptable.

In his discussion of *Auftragstaktik*, Silva (1989) states that feedback from subordinate commanders improves a senior commander's ability to formulate and communicate intent.

"Subordinates' views of why they each took certain actions are valuable feedback to the superior on the clarity and completeness of his communication; such feedback should lead him to deduce if his original communication of mission was adequate."

If the battalions had more time, another element would have been added to the training. Battalion and company commanders could have watched the protocols together. In cases where the response did not match the intent, the company commander could explain what led him to modify the plan in a particular manner and the battalion commander could clarify his intent.

The simulation in this study can be adapted easily to other types of distributed supervisory control systems. It is particularly suited to assessing and improving the coordination of activities across multiple agents separated by both time and space. It is also an effective method to improve the ability to impart presence from remote supervisors to local actors.

The same simulation can also be used as a tool for research. Woods (1993) stated that field experiments investigate scaled worlds where the behavior under investigation "is seen as a particular instance of a larger class of related situations over which the results can be generalized." The behaviors can be compared not only within the military C2 system, but across domains, as well. Researchers can use this type of simulation to build a greater understanding of distributed supervisory control systems and the process of imparting presence. These results can then be extended to

determine the feasibility of designing systems in which machines play the role of either the remote supervisor or the local actor.

Proper Use Of Intent Statements

Intent statements should play an important role in imparting presence. Unfortunately, many of the intent statements reviewed in the study did not contribute to imparting presence. These intent statements were not a guide to larger system goals but rather a detailed recipe. This section discusses two important factors in the use of intent statements. First, remote supervisors must clearly communicate intent. They should focus on outcome rather than structure or content. They should also consider the perspective of the local actor when they develop their intent. They should use multiple methods to communicate intent and verify that the intent is understood. Second, local actors must be taught how to use intent. They should use intent as a filter and construct an intent hierarchy to aid them in responding to unanticipated situations.

Remote supervisors must clearly communicate their intent. Remote supervisors must focus on outcome rather than content or structure when they develop intent statements. When asked about intent statements, most officers focused on content or structure. Did the intent include purpose, method, and end state? They offered alternative phrasing or more practical end states. Their evaluations were not outcome-based. Their evaluations should have considered how the intent statement influenced the behavior of the subordinate commanders who had to use it.

Intent statements are developed by remote supervisors but used by local actors. The supervisors must consider the perspective of the local actors when they develop their intent. One former company commander interviewed at the Combined Arms and Staff Service School said that he was once given an intent statement in which he was told to "minimize collateral damage." This intent was much too broad to be useful at his level. The intent did not establish clear parameters for the company commander and his subordinates. The company commander wanted his senior commander to operationalize the intent (e.g., "Don't shoot unless they shoot at you first").

Remote supervisors must also verify that the intent is understood by local actors. The simulation developed for this research provides an effective method to check that the intent is understood. However, informal simulations can also be used. In an informal simulation, a remote supervisor can pose a few hypothetical scenarios to a local actor and ask the actor how he or she would respond. For these informal simulations to be effective, the scenarios must depict situations in which the plans and procedures cannot be implemented as written.

When possible, multiple methods should be used to communicate and verify the understanding of intent. The methods used to communicate intent must be active, cooperative, and robust. Remote supervisors must openly declare their intent separate from whatever procedures or guidelines they develop. They must work with their local actors to ensure the intent is understood. And, they must create an organizational atmosphere in which a remote supervisor, over time, imparts a sense of his or her presence to the local actors. This presence improves the ability of the local actors to

understand intent. Problems can arise, however, when the multiple sources contradict rather than complement the remote supervisor's intent.

Local Actors Must Be Taught How To Use Intent. Every company commander who participated in the simulation rated the commander's intent statement as the most important or second most important source of information (out of seven items listed on the questionnaire). These commanders understood that intent was important but their failure to reference it in verbal protocols suggests that they did not know how use it. When the plan did not fit the situation, many company commanders abandoned it. They did not use intent to guide their adaptation so that it was consistent with larger system goals. Local actors should use intent as a filter when assessing the situation and as a parameter when adapting plans and procedures. Constructing an intent hierarchy will aid local actors as they confront unanticipated situations.

Using intent as a filter. The clearest intent statement is of no value unless it is utilized by local actors. Local actors must be encouraged to use intent not only when they are adapting a plan but also when they are assessing the situation. Using intent as a filter will aid local actors in determining when the situation renders the plan invalid. Commander 1-3 (Anomaly 1A) was so successful in matching the intent of both his battalion and brigade commander because he used intent to evaluate the information in the situation report. Successful use of intent includes the following.

- Accurate assessment of the local situation. Actors assess the situation relative to their goals, as well as the goals of (physically or virtually) adjacent actors, the remote supervisor and the organization. Local actors

may no longer be able to achieve their goals because of the local situation but they can still contribute to satisfying the goals of the system.

- Identification of applicable procedures. Based on their assessment of the situation, actors identify the procedure that most closely fits the situation.
- Confirmation of procedure. Local actors use specific information (e.g., the enemy has already bypassed the engagement area) to determine if the procedure can be implemented as written or if it should be modified.
- Adaptation of the procedure. Local actors use the intent communicated to them by the remote supervisor to bound their adaptation of the procedure. Successful company commanders appeared to select one adaptation of the plan and implement it if they believed it would achieve the system goals.

Constructing an intent hierarchy. Remote supervisors and local actors often are nested in a hierarchical system. Each level of hierarchy can generate intent for the next lower level. At the bottom of the hierarchy, local actors can have access to several layers of intent. Local actors should construct a hierarchy of intent statements.

Sacerdoti (1974 and 1979) proposes a method of planning that uses a hierarchy of abstraction spaces. At the highest level of abstraction, the plan is described in general terms, but is still complete. At lower levels, each part of the plan becomes more detailed and preconditions and sequencing issues are resolved. At the lowest level of abstraction is a complete, detailed, well-ordered plan.

The hierarchy of intent that ought to be built by local actors should, in a sense, reverse Sacerdoti's planning hierarchy. Actors ought to view the intent of remote supervisors in levels above them as guides to plan adaptation that are increasingly more abstract. If the intent of their

immediate supervisor cannot be met they should appeal to the intent of the supervisor at the next higher level. When Commander 1-3 (Anomaly 1A) realized that his battalion commander's intent could no longer be met (because the enemy had already passed the battalion's engagement area), he appealed to the brigade commander's intent and correctly adapted the plan.

Establishing A Cooperative Environment

Remote supervisors need to create environments in which cooperation is encouraged, especially across local actors. Clarke and Smyth (1993) list five elements of cooperative relationships: goal-directed behavior; a reward system; distributed responses; coordination; and, social coordination. Each of these elements are found in a distributed supervisory control system and several will influence the ability of a supervisor to impart presence.

For example, a remote supervisor can provide his or her subordinates with a communications path. Some of the officers who participated in the study mentioned that they would "cross-talk" on the Battalion Command radio net. (The Battalion Command radio net is established so that the battalion commander can talk with his subordinate commanders.) Some battalion commanders permit "cross-talk" - allowing company commanders to discuss issues among themselves. The battalion commander can monitor the communication and guide it as necessary. A similar system is discussed by Murray and Cox (1989). They describe a voice loop within NASA's Mission Operations Control Room. Members of the control room coordinated their activities with each other while the Flight Director monitored the loop and kept himself current on the status of the system.

Allowing For Individual Differences

This research identified several differences across local actors. Yet, distributed supervisory control systems are often designed to treat them as if they were the same. To the extent possible, remote supervisors should tailor their intent to account for the strengths and weaknesses of the individual actors. These differences may be a function of experience, personality, or situation. In some cases, the supervisor may have to clarify (with examples) the parameters that guide the adaptation. In other cases, the supervisor may have to provide a narrower solution space because organizational constraints dictate a specific outcome for a particular subsystem.

Combining Humans And Machines In Distributed Supervisory Control Systems

This study of distributed supervisory control systems focused on military C2, where humans fill the role of both remote supervisor and local actors. There are other forms of distributed supervisory control systems. For example, in the nuclear power industry, the power plant operators function as local actors. Their remote supervisors are not just the managers of the plant but also the writers of the procedures used by the operators. It is also easy to envision systems in which machines fill the role of either the local actor or the remote supervisor. Introducing machines into these systems poses several design challenges.

A common approach to designing human-machine systems is to view the machine as a prosthesis - a replacement or a remedy for some human deficiency (Woods and Roth, 1988). Another approach is to allocate as many tasks to the machine as possible and those tasks that are left over (i.e., that

cannot be performed by the machine are assigned to the human. Neither of these approaches will succeed in combining human and machines into a cooperative problem-solving ensemble. The findings of his study suggest that, regardless of the animacy of the agents, remote supervisors need to empower local actors by imparting presence. Actors must use this presence to guide their analysis of the local situation and the adaptation of the plans and procedures.

Machine As Local Actor

In typical supervisory control systems, humans act as supervisors. They interact directly with machines that control a process. The machines may have some 'intelligence' related to controlling the process but they generally respond directly to the input of the human supervisor. If the machine is equipped with some intent inferencing capability it will use the historical input from the human to construct a set of expectations about the goals of the human.

In a distributed supervisory control system, the role of intent is quite different. The human remote supervisor communicates his or her plan and intent to the machine serving as the local actor. The machine begins to control the process according to the plan. When the machine is confronted by a situation not anticipated in the plan, the machine cannot stop or seek additional guidance from the supervisor. It must use the supervisor's intent to analyze the local situation, recognize that the plan is no longer valid, determine how to adapt the plan in a way that is consistent with the intent and coordinate with other agents in the system. These are not trivial

problems. It would appear that one promising approach is to develop machines that can build the intent hierarchies discussed earlier.

Machine As Remote Supervisor

Similar problems arise if the machine is placed in the role of a remote supervisor. The machine must now impart presence, as well as formulate and communicate an intent that will be used at some future time by local actors to adapt a plan. The machine must verify that intent has been understood properly. In addition, the machine must balance centralized control and local actor autonomy. Local actors must have the flexibility to meet all the potential variability of the environment while the machine supervisor orchestrates a synchronized response.

Concluding Comments

Technologists will continue to propose new solutions to the challenges in designing and operating distributed supervisory control systems. The recent developments in military C2 systems demonstrate this trend. However, technological solutions that render local actors little more than information gatherers and decision implementers should be considered with caution. Actors need a clear understanding of the plan and intent of their remote supervisors. These informed actors who are continuously monitoring the local, dynamic process can adapt plans in accordance with the goals of the system. However, before developing design principles that incorporate machines in distributed supervisory control systems further improvements such as those suggested by this study are needed in human-human systems.

APPENDIX A **BATTALION COMMANDER QUESTIONNAIRE**

1. How long have you worked with your subordinate commanders (include previous senior-subordinate relationships)?

Subordinate Unit (A Co, B Co., etc.)	No. of Months
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

2. In this tactical scenario, how confident are you that each of your subordinates will consider your intent statement when deciding how to respond to the given situation? (Circle numbers.)

Subordinate Unit	Not Confident	At All			Very Confident
_____	1	2	3	4	5
_____	1	2	3	4	5
_____	1	2	3	4	5
_____	1	2	3	4	5
_____	1	2	3	4	5

3. In this tactical scenario, how confident are you that each of your subordinates will make the same decision you would make if you were in their situation? (Circle numbers.)

Subordinate Unit	Not Confident	At All			Very Confident
_____	1	2	3	4	5
_____	1	2	3	4	5
_____	1	2	3	4	5
_____	1	2	3	4	5
_____	1	2	3	4	5

4. What information do you think will be most useful to your subordinates in making their decision in this scenario? (Write the letters that correspond to the items below in the order of importance - from most important to least important.)

a. Army Doctrine	d. Unit Tactical SOP
b. Mission Statement	e. Commander's Intent
c. Concept of the Operation	f. Experience from a Similar Situation
	g. Other Information

Subordinate Unit	Information Used							
	Most Important						Least Important	
_____	___	___	___	___	___	___	___	___
_____	___	___	___	___	___	___	___	___
_____	___	___	___	___	___	___	___	___
_____	___	___	___	___	___	___	___	___
_____	___	___	___	___	___	___	___	___

5. In this tactical scenario, how much flexibility did you give your subordinates (based on your concept of the operation and intent statement) to respond to unexpected situations? (Circle number.)

Very Little
Flexibility

A Lot of
Flexibility

1

2

3

4

5

6. Other than the "Commander's Intent" statement in an operations order, how else do you get across your intent to your subordinate commanders?

7. What methods do you use to ensure your intent has been understood by your subordinate commanders?

APPENDIX B

COMPANY COMMANDER QUESTIONNAIRE

1. How long have you worked with your Battalion Commander (include previous senior-subordinate relationships)?

No. of Months: _____

2. In this tactical scenario, how confident are you that you made the same decision your Battalion Commander would have made if he were in your situation? (Circle number.)

Not Confident At All					Very Confident
1	2	3	4	5	

3. What information do you think was most useful in making your decision in this scenario? (Write the letters that correspond to the items below in the order of importance - from most important to least important.)

a. Army Doctrine
b. Mission Statement
c. Concept of the Operation | d. Unit Tactical SOP
e. Commander's Intent
f. Experience from a Similar Situation
g. Other Information |
|---|---|

Most Important						Least Important
---	---	---	---	---	---	---

4. In this tactical scenario, how much flexibility did your Battalion Commander give you to respond to unexpected situations? (Circle number.)

Very Little Flexibility					A Lot of Flexibility
1	2	3	4	5	

5. Explain your answer to Question 4. (Give a justification for your answer from the tactical scenario.)

6. Other than the "Commander's Intent" statement in an operations order, how else does your Battalion Commander get across his intent to his subordinate commanders?

7. What methods does your Battalion Commander use to ensure his intent has been understood by his subordinate commanders?

APPENDIX C

DIVISION AND BRIGADE MISSIONS, INTENT STATEMENTS, AND TASKS TO SUBORDINATE UNITS

Division

Mission

Defend forward in sector NLT 160700 Aug 9X to defeat the 16CAA forward of PL GREEN in order to create conditions for a counterattack.

Commander's Intent

The purpose of this operation is to destroy the 2nd echelon divisions forward in sector in order to contain the enemy penetration and set conditions for a counterattack. The division will defend with two brigades forward and one in depth behind the brigade in the south. The division will weight the defense to block the attack along I-15. At Endstate, we must defeat the remnants of the 16CAA forward of PL GREEN, and [be] prepared to mount offensive operations within 24 hours to restore the neutral zone.

Brigade

Mission

1 Brigade defends forward in sector NLT 160700 Aug 9X to defeat elements of the 41st MRD in order to prevent the envelopment of 3rd Brigade.

Commander's Intent

The Purpose of this operation is to defeat the 41st MRD forward of PL GREEN. I want to defend through the depth of the sector. I want to shape a brigade engagement area. A balanced TF in the north positioned forward in sector will force the enemy into successive Brigade EAs along AA 1. Initially I will show a Brigade reserve at BP 3 and move this reserve to BP 2 under cover of darkness and smoke which will either defend from VIC BP 2 or move to BP 3 and defeat enemy forces vic EA STUN. If the enemy attacks solely on AA 1, I want the northern TF to conduct an attack to enemy forces vic EA HURT. If the enemy attacks solely on AA 2, I will reposition a TF to

BP 3. At Endstate I expect to defeat the 41st MRD in EA HURT and EA KILL, and to retain sufficient combat power (70%) to initiate follow on offensive operations within 24 hours.

Scheme of Maneuver

The Brigade defends in sector with TF 1-77 in the north, TF 1-2 in the south. TF 1-3 behind TF 1-2. The Brigade reserve is TM D 1-3 and located vic BP 2. TF 1-2 and 1-77 will establish CO/TM sized security forces between PL WHITE and BLUE to defeat enemy recon. TF 1-77 defends in sector between PL BLUE and GREEN to defeat a divisional supporting attack and is prepared to counterattack along AXIS CHIEFS. TF 1-2 defends in sector orienting on EAs KILL and HURT, and is the Brigade main effort. TF 1-3 defends from vic BP 1 and assists TF 1-2 in the defeat of the MRD vic EA KILL.

Tasks Assigned to TF 1-77 by Brigade

1. Occupy defensive sector NLT 142200 AUG 9X.
2. Defeat enemy forces between PL WHITE and GREEN.
3. B/P counterattack on AXIS CHIEFS to destroy the DAG and the combined arms reserve (1 tank bn).
4. Maintain contact with 21 ID (L) vic CP 1 and 2.

APPENDIX D
BATTALION #1

Mission

TF 1-77 Mech defends in sector NLT 160700 AUG 9X to defeat one MRR of the 41st MRD forward of PL GREEN in order to force the enemy main effort to the south.

Commander's Intent

My intent is to defeat the MRR by using the terrain and a defense in depth to form an EA that gets every direct fire system into the fight. An aggressive counter-recon effort will deny his ability to template the task force. We will initially show weakness in the north, as I want to draw his main effort north of the east-west range road. Two company teams in the north will prevent penetration, and two company teams in the south will force him to fight in two directions. B Company must block any penetrations and will be the main effort; obstacles and fires must hold the shoulders to force the enemy into our EA. Endstate is a defeated MRR in our EA and our TF remaining combat effective.

Tasks Assigned to TM C by Battalion

Establish defense in BP C NLT 160700 AUG 9X. Two platoons orient N, NE, one platoon orients E. Priority of countermobility effort. B/P to dispatch one platoon to C1 to deny enemy access to southern CO avenue of approach vic Hill 730.

Anomaly 1A

Situation Report

Friendly recon has identified forward elements of 132 MRR as having crossed PL WHITE. The MRR has deployed into TF 1-77 sector with one MRB in south and one in north. The third MRB is following northern MRB into sector.

MRB in south was engaged in EA ONE and rendered combat ineffective with minimal losses to TM B and TM C. MRB in north was engaged by TM A. When attack stalled, reserve MRB passed through and is

now pressing the attack along the northern wall. TM A is combat ineffective and TM D is falling back to BP vicinity PL GREEN.

Responses to Anomaly 1A

Battalion Commander #1. "I can't allow the MRB to just outrace us here in the north. So I need TM D to fall back no further than this position that they have already reconned and occupied. I don't want them going all the way back to PL GREEN. I want them to stop no further west than the 43 grid line. If they hold there that allows me to use this terrain feature here and what I'll do is...I want B Company to hold where they are. They'll have to reorient their fires instead of generally east to northeast, reorient their fires almost straight north. We'll build an axis, a counterattack axis for Charlie Company such that they go from their battle position to an objective probably right around where the race track is...probably draw an objective into here...it will be enemy oriented. And I need to get Charlie Company to counterattack into the reserve MRB, otherwise they'll just keep pressing into Delta. Delta won't be able to hold. So my first choice would be to try and continue to take advantage of B Company in their holes and use Charlie as a counterattack into that one reserve MRB. That gives me 2 1/2 companies on a battalion....Charlie becomes a counterattacking company probably into the trail company of the reserve MRB. Otherwise they are out of the fight....Now the only other option would be for them [TM C] to come through their valley here in the south and establish a battle position between Bravo and Delta. That's the least preferred option because then we're still going kind of head to head....I suppose I would have to do that if that trail MRB has gone so far west...What's critical for me at this point, whatever option I use, it's one that keeps Charlie Company in the fight."

Company Commander 1-1. "My orders were not to move from this location. However, given that Delta is moving back, I would ask first what Bravo was doing. If Bravo is holding then I would probably start formulating a plan to try and get my company back to a position contiguous to where Delta would be....I would start thinking to myself if Delta occupies that [terrain] then I would occupy this key terrain here and try and get flank shots into 'em as they were coming back this way. That would be the first scenario that would come to mind. Given that, I would start formulating a plan to move my two Bradley platoons first followed by my tank platoon back to that battle position after being covered by Bravo....I would not move, obviously, until given permission because there is a possibility of another the follow-on regiment could come into sector. I was not given the mission to move."

Company Commander 1-2. "Our intent was to push the enemy north and then destroy them in Engagement Area One. Right now, if Delta's falling back up towards Phase Line GREEN, I would call and request permission...I'd

have to find out what the follow on regiment is doing because there should be two regiments coming to the north. If the follow on regiment is gonna go ahead and do as we thought...the most probable course of action which was shifted main effort to the south then I would request to fall back maybe to Delta 2 and support Delta in their defense of Phase Line GREEN preventing the follow on MRB in the North from penetrating Delta. At the same time I believe Bravo would have to do the same thing and I'd have to have clarification of what Bravo was doing also. Because they would...it would make more sense for Bravo to pull back first being they're closer and could probably support Delta better and quicker than I could. Also another course of action might be pull Bravo back, have Delta try and hold and I could maneuver on the enemy's flank and maybe destroy the enemy that way also. That's a probable course of action....I'd have to call down... and inform my subordinates my platoon leaders what was happening. I also might want to know what the strength of the MRB is that's attacking Delta up to the north, how far have they been attrited? The main thing though is to get some intel on what the enemy, his strength is, and where Delta is and what Delta's strength is. I also need to know what that follow on regiment is gonna do because we still have to try and push them to the south, because...if they perceive they have success in the north here they might go ahead and push that follow on regiment through to the north so we would have to pull back and set up some type of another defense back here. It'd be a hasty defense to try and prevent the follow on regiment from passing through also, somehow. With the battle because of the way we're set up right now...we're set up in this engagement area kind of indepth but we don't have subsequent battle positions as we fall back, like Phase Line GREEN so it's gonna be a hard situation here to determine, okay, where are we gonna defend from, where do we want to set up our next engagement area? Also, if the enemy is already moving up here, I have to play catch up to get in front of him. That's one of the reasons I was thinking I could attack him from his flank and take him out real quick....He would be focused on Delta and...it might be accepting risk, that he might actually have more...strength than I do but at the same time if he's oriented on Delta and concentrating on him, I would have the advantage of surprise plus the enemy would find an enemy in strength in the rear that they weren't prepared for, which would be an advantage. One of the disadvantages of the plan is that we don't have a backup plan if we do have to fall back. So basically what we're doing is defending here, then if they break through then what are we gonna do?"

Company Commander 1-3. "They attacked across WHITE, two up, one back, with the one in the back following, apparently some success in the north. Okay. Bear and I killed the southern MRB and we have maintained combat power. And he is pressing along the northern wall. Team A is combat ineffective and Team D is falling back to battle position vicinity Phase

Line GREEN. Commander's intent is to destroy the MRR in Engagement Area One, to deny them any penetration. In the intent he says for Bravo to deny any penetration. We also have second echelon MRR, we're supposed to be looking to, uh, verify that their forward detachment will go on the southern axis there. Team Alpha which is here apparently is getting overrun by the third MRB that's pressing along the northern wall. Team Delta has fallen back to a battle position back along Phase Line GREEN, which I think is actually back here. In order to meet the commander's intent and deny that MRB penetration of Phase Line GREEN I guess I would recommend to the commander that Team Delta, by virtue of its already having fallen back, maintain its fall back position...and form the backstop here. The enemy, by virtue of terrain...will have to move around like this. This will allow Delta to stop anymore eastward penetration. I think at that point one if not both of Bear and I need to displace out of our battle positions. Bear will have to wait on me. We'll come down off 760, taking my little Route CAVE here and put ourselves on line, execute a hasty attack more or less along this direction, take advantage of some smoke fires, if we can't, get any field artillery, get some mortar fires to give us some smoke as we come down off here, execute a hasty attack in this direction. I'd put one platoon...worth of TOWs in some kind of overwatch somewhere right in here. I've only got one tank platoon, and then attack more or less with one tank platoon and one Bradley platoon with one Bradley platoon in supporting overwatch."

Company Commander 1-4. "Okay, so we've destroyed the southern MRB. I would anticipate the battalion commander shifting Bravo Company's fires to the northern sector, cause that's where the follow on MRB is. Continue to consolidate and reorganize on my battle positions to prepare for an attack one of two ways - either north to northeast to counterattack into the flank of the...second echelon MRB, or hold in position and await orders to counterattack either east to Phase Line WHITE or southeast along CHIEFS to Engagement Area HURT based on a FRAGO on what formation the task force will use for either attack."

Figure 17. Battalion #1 graphics and Anomaly 1A

Anomaly 1B**Situation Report**

132 MRR attacked into TF 1-77 sector with two MRBs up and one back. 127 MRR started the attack behind 132 MRR but prior to reaching PL White, dropped to south to reinforce attack of 133 MRR and 199 TR.

The combination of fires, obstacles, and excellent use of terrain by TM A and TM C (TF 1-77) force MRBs of 132 MRR into EA ONE. MRR was rendered combat ineffective. TM B is at 60% strength. TM D is at 70% strength. TMs A and C are at 90% strength.

Responses to Anomaly 1B

Battalion Commander #1. "We talked about that one [127 MRR dropping from attack into TF 1-77 sector in north to attack into 1-2 sector in the south]....First of all, we have now met the brigade commander's intent in that the brigade commander wanted the main effort to go to the south. That's what he wanted. And by the trail regiment, by the 127th going south, now the brigade commander's plan is viable in his mind because he's postured two task forces down here as his main effort to meet the Krasnovians' main effort. So that's all working. That means we are now postured to execute his counterattack down here along Axis CHIEFS into EA HURT to take on the second echelon regiment that gets committed into the southern portion of the brigade's sector. So I would report my success in the north and I would expect him to make the decision to commit me into a counterattack along Axis CHIEFS into EA HURT. Not my call, clearly. But I think that's what we are postured to do here....[If there were no communications with higher headquarters], in the absence of orders I would launch myself onto Axis CHIEFS. I would go ahead and initiate the counterattack, given all the conditions in the north are right....I would move out onto the counterattack because I know the brigade commander's intent was to take him on here with two task forces I would take on some part of the second echelon regiment and I'm not sure which part that would be."

Company Commander 1-1. "I would say that we, the battalion, had therefore accomplished its mission that is forced the remainder of the division to the south which is what the brigade commander wanted. And then I would start preparing my company to begin this counterattack along Axis CHIEFS. I've got a control measure here too where I would regroup everybody, wait for the battalion FRAGO to move as a battalion along Axis CHIEFS to engage the enemy in I believe that's STUN, which is down here."

Company Commander 1-2. "Basically what's happened is the enemy's played into what we thought they would do and what we were prepared for. I need to know now, since we know the...regiment has already gone to the

south, we would probably at this time need to find out if they achieved success in the south or not. If they had, would we be falling back or would they have us go ahead and hold our own where we're at and reconstitute...reorganization and reconsolidation on our objectives? Also, if they try to cross-level within the task force, what kind of strength am I going to lose from my company at this time? Are they gonna try to plus up Delta or Bravo with maybe a platoon or a section of tanks in order to bring them up to combat strength? At this time I also might be looking for enemy remnants moving around in our sector...and we might engage them. Also, if Alpha or Delta cannot counterattack into Engagement Area One at this time, looking at their strength, they might have...Delta or Bravo, looking at the strengths of Alpha and Charlie, they might have that happen also. So I'd have my platoons prepared for...either we would counter attack in or more than likely it would be Alpha would attack along Axis CAT into Objective HUSKERS to destroy any remnants in Engagement Area One. I'd call up my platoons, make them aware that the enemy has been destroyed pretty much and that that's probably gonna happen and they need to be aware of friendlies moving into our engagement area. That way we can avoid any fratricide that might happen at this time. Also at this time, I'd be having my first sergeant and my maintenance team and my medics, seeing that we lost 10% of our strength, would, ah, be conducting medevac operations at this time also and vehicle recovery operations, depending on what vehicles I lost and state of repair they're in. I'd also be concerned with my platoons...how much ammunition do they each have? How much food, water, who sustained the most damage? Did I sustain all my damage to just maybe my first platoon because they were my flank platoon, maybe they sustained the most damage. We also might be getting ready to attack along Axis CHIEFS. ...If I got that order, I would probably have to FRAGO my platoons. With Alpha and Charlie as our two strongest companies and Delta also still combat effective, Bravo would...more than likely be the reserve. I believe Alpha and Charlie would probably lead to attack the regiments that have gone to our south. That would mean an attack down into Engagement Area HURT, maybe over and come on in, and come in behind them also and flank the enemy, do kind of an envelopment of the enemy from the north if they fixed them down here to finish the destruction of the regiments that have gone to the south."

Company Commander 1-3. "What I'm doing is going back through here, analyzing these situation reports...my initial impression is that we have accomplished the battalion commander's intent and it appears my virtue of...the OPFOR's...moving off to the south that we may have very well have met brigade level intent here too. But I need to go through it again. [Reads through Situation Report again.] We did have a...Team Alpha...actually the order was not real clear and that was an answer that we had for the staff as far as the rehearsal and briefback, that the order was a little ambiguous in that it

was definite that Team Alpha had a contingency plan to execute a counterattack along Axis CHIEFS. The specified tasks did not read clearly and it was unclear whether or not C Company also had that task to be prepared to conduct counterattack operations along Axis CHIEFS down into the 1-2 sector. At this point I would be conducting reconsolidation and reorganization at the company team level through a series of cached ammo and Class V, displace back here by echelon, get back up, bring ourselves up as close as we can to 100% of our unit basic load and Class V. At that point, I would probably call the battalion commander, give him my, uh, situational update and request further instructions. If he wanted me to maintain battle positions, um, if he wanted me to link up with the Iron Horse element to execute counterattack or remain in place and prepare for further offensive operations.

Company Commander 1-4. "Okay, so, based on this report I understand the entire 132nd is combat ineffective in EA ONE. I know the brigade commander wants...if he's been successful in portraying a defense up front, in the north, he wants what has happened here to happen, he wants everything to reinforce to the south to kill the two task forces down there. So based on that I would expect a FRAGO from my battalion commander that says 'Execute an attack on Axis CHIEFS to counterattack by fire and maneuver in Engagement Area HURT.' The fact that I have two teams in the task force at 90%, and one at 60, and one at 70, says that the task force is at about 80% strength and so really at about three teams plus so I would imagine we'd go in a task force wedge along CHIEFS and attack into the northern flank of the 127th MRR.

Figure 18. Battalion #1 graphics and Anomaly 1B.

APPENDIX E

BATTALION #2

Mission

TF 1-77 defends in sector along PL BLUE NLT 160700 AUG 95 to defeat 133 MRR supporting ATK. BPT countatk along Axis CHIEFS.

Commander's Intent

- Purpose: Defeat enemy supporting attack between PL GREEN and BLUE while remaining prepared to conduct BDE CTRATK.
- Method: Defend 3 up, 1 back along PL BLUE.
- Endstate: Enemy destroyed in EA NORTH and/or SOUTH and BN is prepared to CTRATK along Axis CHIEFS.

Tasks Assigned to TM C by Battalion

Occupy BP 2 NLT 142200 AUG 95. Orient on EA WEST. Attach dismounts to Team Bravo. At DP 1, if second echelon MRB is going north, move to SBF 1. During counterattack along Axis CHIEFS, assume advanced guard position in battalion arrowhead formation.

Anomaly 2A

Situation Report

132 MRR attacked into the TF 1-77 sector. The MRR moved to vic PL WHITE before deploying into attack formation with two MRBs up and one back.

One MRB was defeated in EA North and one was defeated in EA South. The second echelon MRB apparently templated the EAs and is pressing the attack along the northern wall. Although the 132 MRR has suffered severe losses, the enemy attack into the TF 1-2 sector has gone well. In an effort to keep from exposing a flank, the enemy begins to move the 199TR into the southern portion of the TF 1-77 sector.

Responses to Anomaly 2A

Battalion Commander #2. "Based on what you gave me here, I would probably not do anything 'cause my concern would be I got one battalion tacked along the northern wall. If that's all I have, I would probably move

my Charlie Team to Support By Fire Position 1 depending on the strength of my two wing companies, one I've got in the north and one I've got in the south. Because the real concern is that now I've got a whole damn tank regiment coming into the southern portion of my sector. So I kind of have to hold what I've got but I can't move the guy on the north wall off the north wall to support to the south because he's got to take on the one MRB which is basically fixing him in the north. So, the easy answer on this is that I would just hold what I got."

Company Commander 2-1. "When this battle occurred my task force commander at decision point 1 was that the 2nd echelon MRB started going north he started pushing me to SBF 1. So about the time the 1st echelon hit the north I started pushing my move on COWBOY occupy SBF 1. There's only an MRB coming in. There's a tank regiment pushing to the south along this axis right through here. I think the battalion commander at this point would know that the two companies already up, Delta and Alpha, they can probably handle the MRB. I'd get a call to go south back into BP 2, which...I have prepared and occupied prior. If not, that would be my recommendation, start move to the south, set up Engagement Area West again, which has 2 platoons oriented between 10 and 60. One between 61 and 10. I'd have 1st Platoon have a FRAGO so they can flex between these 2 pieces of terrain, orient towards TRP 57 for a keyhole shot in case anything penetrates through Engagement Area WEST. At that point, whatever happens, happens."

Company Commander 2-2. "Okay, at this point, since the enemy has attacked in the north and we defeated 1 MRB in the north and 1 in the south, and we've already passed this decision point and I'm at Support By Fire 1 with no leakers coming through from EA NORTH, which means BP 4 and 8 picked up everything. And now the enemy has committed the tank regiment down in the south. And at this point, my analysis is that the enemy is going to push this tank regiment, gonna try to push them all the way to BP 3 and I'm gonna call the commander and ask to displace from Support By Fire 1 and go on a hasty counterattack to try and get portions of this tank regiment in the flank. And I'm gonna request to go...I'm gonna assume the tank regiment now is about at WHITE right against the southern wall, and I'm gonna request to re-occupy BP 2 which would give me good orientation into what was my primary engagement area. And if I move right now, since I've rehearsed all this, I can still occupy and execute EA WEST and orient my northmost platoon a little more south from like 10 to 69."

Company Commander 2-3. "We've effectively destroyed them in the engagement area in the south and in the north and we've got this 2nd echelon pushing to the north. Um, depending on what...my sister company down here in the south is telling me, which is Team Bravo, what the

strengths are coming down here, at that time my first feeling would be to maintain. I'd have to track the battle to see how these unit strengths are doing, north and south. If I knew what their sit temp was that would raise the issue in my mind, okay, should I stay in place, deal with the element coming in from the southern portion, to move into our flank and hold that area, or do I have to kick a platoon up north? What I would probably do is I would go ahead, reposition my tank platoon up into this north, to cover Engagement Area SLAM 'cause he has the rapid fire system that would be able to handle any of the tricklers through on the northern side and I would keep my 2 Bradley platoons situated at BP 2 to cover EA WEST and the southern flank to keep them from bypassing us down there. Sir, I would hold that until further information was developed by higher to me.

Company Commander 2-4. "Based on the information we have the enemy is still moving to the north. At Decision Point 1 we would have been flexed north to... Attack By Fire Position 1 so we'd be set here to defeat the main enemy, uh, remaining motorized rifle battalion as it comes through the north. Additionally, BP 1, cross-talk with them and make sure that they understood that the 1-77 was coming through, correction, that the uh, the enemy tank regiment was coming to the south, come along this area here, or, 199th tank regiment is coming into the south, 'cause they're going to be staying there to fight that battle. And, of course, we want to monitor how things are going with them, eavesdrop on the net."

Anomaly 2B

Situation Report

132 attacked into TF 1-77 sector as expected. Screening activity by 123 CAV caused the MRR to deploy into attack formation vic PL WHITE with two MRBs up and one back. Friendly long range recon also detected elements of 127 MRR trailing 132 MRR. Prior to reaching PL WHITE, 127 MRR drops to the south in an apparent effort to reinforce attack by 133 MRR and 199 TR.

TM A destroyed the northern MRB. And, with the help of Tm D, the second echelon MRB was also destroyed by Tm A in the north. Tm B destroyed the MRB in the south. After the engagement, Tm A is left at 80% strength. Tm B at 70%. Tm C at 90%. Tm D at 80%."

Responses to Anomaly 2B

Battalion Commander #2. "Okay, we destroyed the MRR and we're in pretty good shape....Well, the be prepared mission to attack along Axis CHIEFS into the 1-2 sector to the south would be what I expect to happen at this point 'cause we've got nothing coming into our AO. We've got, you know, 3 regiments attacking in the south, against roughly 2 battalions so they're probably going to need some help. So I think at this point I would radio my boss and say, 'Hey, we've accomplished our mission up here, we're in pretty good order. Do you want me to execute the CHIEFS mission to the south and attack into the flank' of probably the 127th because it appears by the sit report here that the 133rd and the tank regiment have already passed. But based on the strengths and everything, and the way I've got units arrayed, I would not move anything around. Team B in the south is at 70% but they're also backed up by Team C behind them at 90% so there'd be no reason for me to do any reorganization or repositioning. My only move at this point would be to request the status of the CHIEFS mission and prepare to execute....I would lead with...one company, 'cause I'm kind of unsure of the enemy situation down here so I'd have an advanced guard company. The advanced guard company would be Charlie and you have Alpha on the left, Bravo here. What we do is instead of having this guy back, I move him up in a slot. We generally have what we call an arrowhead formation."

Company Commander 2-1. "At this point in the battle it looks like we've pretty much wiped out the 132nd motorized rifle regiment. Three companies up here fight to continue to engage any enemy that's left. Knowing that the enemy is pushing to the south, one of our plans is to go Axis CHIEFS, our counterattack. Doesn't look like there's an MD pushing in so, probably the battalion commander would be giving the order to prepare for CHIEFS. We'd form up in a company wedge, call in ready. Battalion's at a high enough strength here that we can make this attack work. I'm going to be the lead company, the advance guard...Alpha, Delta, and Bravo follow behind, making the battalion arrowhead formation....We'll start pushing to

the north, around north of Team Delta, BP 8, orienting on TRP 09. Have the engineers follow us, marking the minefields as we identify them. Right now we run into none. TRP 5, 51, 40, 21. Start the attack down south into the enemy's flank 'cause they were pushing into the south. Most likely the battle will unfold somewhere support by fire line here and the battalion either does a thunder left, punching into the flank of the enemy. If there's still some enemy victors in the engagement area, platoon size elements...we'd probably do local counterattacks with some of the companies up here. I'd just be remaining back here in reserve, not contributing much to the fight at that time until the platoons are destroyed. At that time we can execute the CHIEFS plan."

Company Commander 2-2. "So we have succeeded in our mission up here which was defeat the enemy in the north and he's pushing his main attack down the 1-2 sector. But the only way that we'd execute CHIEFS was if we had nothing, if nothing came or nothing was left in the north, which is the point we're at now. And we still have Alpha, Bravo, Charlie, and Delta all combat effective, with Bravo being the worst at 70%. So the only question here now is where are they...in the south. And if we execute CHIEFS are we gonna wind up hitting them in the flank or coming up to their rear. But for us to do CHIEFS, 2 things have to be true. One, there are no enemy left and we don't expect any more in the north, and two, we have to be combat effective. I think we met those. So right now I'm gonna prepare to move and execute CHIEFS. And I'll do that on call from the commander. Our only other option, which we discussed but didn't brief in the order, would be to come around the backside and backstop them but that's gonna all be based on how fast this guy is moving and what kind of success 1-2 has in the south. For now, I'm prepared to execute CHIEFS....I know that when we get the word to execute CHIEFS, as Charlie Team I am the task force arrowhead, that is, the advance guard, so I'm traveling 800 meters to a click out in front of the task force as the advance guard. And since I'm at BP 2 now, according to my operations order, I'm moving to 10, 56, to 40 and then down through as the advance guard. And once I've made contact, my job is to fix so the task force can either do a thunder right or a thunder left into the flank of the enemy.

Company Commander 2-3. "Okay, what this tells me is that the forward recon element, we're not expecting that to come through our southern portion which allows me, since I'm still at my BP down here, BP 2, from instructions given from higher, I am to conduct a counter-, be prepared to conduct a counterattack along the southern wall down into EA HURT. If I was given the orders to do that I'd go ahead and move out, tank would lead with my 1st and 2nd mech platoon on the left and right flank in a company wedge. Tank would be out further. We'd come down, come between BP 1 and...BP 6 I believe that one is, cut through at 24, down to 21, move down to

SBF 2, correction, ABF 2, tank in the center and 1st on my left flank and 2nd platoon on my right flank to engage the forces trying to penetrate our southern area and...destroy the enemy at EA HURT....The rest of the battalion would follow off my move. As I moved through...Team Bravo would pick up the...they would pick up the right, they would pick up the right flank about approximately a K to my rear, I'd have ah, Team Alpha would start sliding down and not clear on their route they would come through the obstacle and move in to our, to set on the left flank with uh, Team Delta in reserve. And they would come down and also set up positions also either to the left or right of my...counterattack position. That was the be prepared. There was no, actually no initial plan at battalion level where we were actually going to set up once we got to the engagement area."

Company Commander 2-4. "So the enemy had 3 motorized rifle battalions. All 3 were destroyed. Based on that information, and the enemy attack going here to the south, if I haven't got the word, I'll call the battalion commander, find out if we're still going to execute Axis CHARLIE, do our counterattack. If we move to counterattack I'll be in Attack By Fire Position 1 because we had 2 go to the north as expected. I'll move through my series of checkpoints that I had plotted out which include 09, 54, 40. As I move through, the uh other, the other teams would fall in the battalion arrowhead to conduct our attack, our counterattack along Axis CHARLIE....In the absence of guidance from him we'd execute that."

APPENDIX F

BATTALION #3

Mission

TF 1-77 MECH defends in sector from NK 550200 to NK 580100 NLT 160700 August 9X to destroy enemy reconnaissance elements between PL WHITE and PL BLUE and defeat the 132d MRR between PL WHITE and PL GREEN allowing no penetration of PL GREEN.

Commander's Intent

Our purpose is to destroy enemy recon elements and defeat the 132d MRR in our sector. Initially, I want to screen along PL WHITE and employ hunter-killer teams in depth from PL WHITE to PL BLUE. Our main defense will be anchored by long-range fires from Hill 780 with supporting massed direct fires from the north and south covering our obstacle plan. A mobile reserve will reposition to backstop in the north, or counterattack from the southeast. The critical event is the violent massing of all fires on the enemy main body in our engagement areas. I want the endstate of this battle to leave the enemy at 60% or less strength, denying them protection of PL GREEN and maintain a Task Force combat strength of 80% or better.

Tasks Assigned to TM C by Battalion

1. Occupy BP 72 NLT 142200. Primary orientation TRP 803-806.
2. Assist engineers in preparation of obstacles 473, 474, 475, 476, 486.

Anomaly 3A

Situation Report

132 MRR attacked into TF 1-77 sector. Upon identifying main body, TM A moved along RT Rifles to AA. Current location of TM A is 74D.

132 MRR attacked into sector with two MRBs up, one back. 1st echelon MRBs were destroyed in EA BLOOD with direct fires massed from BPs 71, 72, and 73. 2nd echelon MRB is pressing the attack along the northern wall. Although 132 MRR has suffered severe losses, the enemy attack into the TF 1-2 sector has gone well. In an effort to keep from exposing a flank, the enemy begins to move the 199 TR into the southern portion of the TF 1-77 sector.

Responses to Anomaly 3A

Battalion Commander #3. Team Alpha is the task force reserve. Team Alpha will move from AA 74D to Assault By Fire Position 78. They will wait there to block the attack of the 199th tank regiment movement through Team B and BP 71. Team C will remain in position but orient the entire company to the north. They will fire into the flank of the MRB moving into the Team Delta BP.

Company Commander 3-1. "So, as I read it then, the 132nd came through basically as we wanted them to, right through EA BLOOD, we knocked them out. 1st of the 2nd fight...pressing the north wall is going well and now we're dealing with the 199th which we said that we may have to deal with but they were talking more along like a forward detachment....Uh, so basically if they're coming into the southern sector and I would say...his success based on the way they fight has been denied through EA BLOOD. So I would imagine what he would do is more than likely push down south through this area right here, maybe try to run over BP 71 or cut down through here and maybe even take the Route RIFLES approach and try to get through us along that way. Now if he does that, then I would tell my guys based on...my order...if they're going to move south then I would go ahead and reposition but not until they reached my NAI. I called an NAI...like a trigger point and I'm gonna make a decision because if I'm gonna have a sizable force, basically, an MRC plus, coming along the southern sector making a decision to head this way. Because he's probably going to decide whether he wants to go north or south back here along these NAIs that were given to me by squadron. So I put another one in here for my decision cycle to re-orient my BPs, basically do a wagon wheel, not really a wagon wheel, but like a revolving door. Just bring everybody on line down this way, try to hit him as he came through the gap there. I don't really believe he's going to attack any BP that we're occupying head on or anything so I more than likely think that he's gonna come through the south right here, maybe shoot the Hidden Valley or come back around, swing around through here. 'Cause he's met big resistance here already so I feel that he'd come here. I would not really bring these guys down until I know that he is...this guy basically is getting neutralized, that he is getting run over. I'd be doing that with cross-talk through the different BPs, the guys on BP 71, Team Bravo. Ah, but I would hold my position until I had a good view or good feel for what he was doing by the time he reached NAI SOUTH."

Company Commander 3-2. "Okay, assuming that my combat power is relatively intact, 'cause I hold the high ground and, uh, we have not been forced to, uh, do any massing at long range fires. First of all, I'd call for guidance from higher. Uh...'they are moving into the southern portion of

Task Force 1-77 sector.' Team Bravo's obviously to be getting the brunt of that. Hill 760 is still key and Hill 780. I have already had a position occupied that I was going to fire into the eastern portion of EA BLOOD with, with my, uh, 2nd Platoon, 72 Alpha. They're familiar with that area but I still own the high ground if I stay at 780. First of all, I'm gonna reorient my southern platoon to, toward Battle Position 71, I'd cover him with Bravo. We've already coordinated. The XO was sent over there as part of his tasks to subordinate unit. I'd make sure that was, we knew signals and commo frequencies so I'll find out their situation. And if they need the help, call into higher and ask permission to displace some elements and go help them. We did not get any disengagement criteria in the order. Um, and, because it is a defense in our sector and no one is supposed to penetrate the Phase Line GREEN, I assume I am not to...um, drop back or move from that position or allow anybody to go through. Check the situation one more time. Okay, the 2nd MRB is pressing along the north and now they're bringing up their tank regiment into the southern portion. I can still engage with my long range fires, um, hoping that the obstacle belt is going to keep slowing these guys down as they come in through here. But if they're starting to move that southern direction, again, 3750 is the amount of range I have. I've already aiming staked that out. Lead guys know their trigger points. They can continue to engage at long range fires. I'll call for some mortars 'cause they're on order to harass and disrupt with smoke and HE, although it's not going to destroy much in terms of a tank. And, uh, 'cause I don't have anything bigger than mortars, I can't call for direct fire in. And, I can continue to keep the tanks oriented toward the kill zone here and in EA BLOOD. The northern platoon of mech can orient to the north northeast using their max ranges and TOWs to, uh, engage and destroy along that northern wall they're pressing...if they're coming that far. For the most part, Battle Position 73 is out of our area. It's well out of range, I mean my template only carries barely to the obstacle belt. That's why I had to displace this platoon out. And if I keep my southern platoon mech, again, on Battle Position 72, my max range for TOW fires is going to be just barely to the edge of Battle Position 71. Pending higher guidance, I stand and fight if, uh, that's what, well, based on my original order. However, I would call higher and ask if I'm needed toward Team Bravo or up, if I need to cut a team loose to help out Delta Troop."

Company Commander 3-3. "Okay, sounds like, uh, Team, I guess it's Delta Company minus up in the north has got their hands full already in what's almost a separate attack. As far as the, uh, 3rd MRB is concerned, in the 132nd, uh, I don't know what my strength is and I don't know what, uh, Team Bravo's strength is on Hill 7, what's that, 760. I need to talk to Team Bravo and to find out what their strength is or monitor their strength on the net. Make sure they, uh, can identify a decision point somewhere out here by

NAI 5 so I know whether or not that tank regiment looks like its going to come to the north of their position or try and skirt the southern wall. Um, it says southern portion of the sector for the task force but it doesn't say exactly whether he's gonna go on the north side or the south side of that hill. That's uh, the key decision right now the enemy's gotta make. And that's gonna affect, obviously how I've positioned my forces, if I have to move anything. Um...I need to find out what the status is from Delta Company in the north, whether or not they think they're going to need assistance in destroying that 3rd battalion of the 132nd before we consider the 199th, based on the time-distance considerations between that, uh, 2nd echelon MRB and the tank regiment. At this point, I'm standing by for information from Team Bravo on the 199th, uh, assuming that my position has been compromised by the lead battalions, I'm gonna have to move my elements to alternate positions and still have fires onto Engagement Area BLOOD, probably already done that a couple of times. Uh, and I need to get a status on ammunition. If we've already killed two battalions, odds are we're fairly low down in the ready racks in the tanks and the Bradleys have fired up quite a few rounds. So, emergency resupply may become an issue before we hit the tank regiments so we'll have enough ammo to destroy. And, as I said before, the decision point's out there by NAI 5 for the enemy. And I'll need to get word from Team Bravo in order to make a decision how to use my forces best to prevent them from getting through to GREEN."

Company Commander 3-4. "The first thing I'm gonna do is I'm gonna look at, uh, my BP in 72, my battle positions. I've pushed forward in Engagement Area BLOOD from the night before. I would have coordinated that with the Three, because I couldn't provide any covering fires into EA BLOOD from the battle position I was currently at, so I wanted to move forward. Also, uh, reading into the commander's intent and understanding it and the brigade commander's mission and intent, we are the backstop force for the battalion, which means we are gonna, we've got priority of effort. I understand I've got 15 holes...so I'll use those to dig in all of my combat vehicles. I can successfully cover all the obstacles and prevent any penetration there, and with the linear target out forward, to head 'em off in the engagement area. With this situation, Engagement Area BLOOD's been successful with 2 MRBs destroyed. We've got one running the northern wall now into BP 73. So I'm gonna get a hold of, uh, Delta Company first to find out what their actual situation is. I have subsequent positions here to see if I need to shift to provide flanking fire if he tries to run the northern wall. Now with the tankers that are coming in, my main concern is that I'm still gonna have to maintain this backstop. So I want to know what is up with Bulldog. I'll get a hold of him over the Squadron Command Net and I'll need to talk to him to find out what his position is and what his situation is, as far as combat strength. Uh, after destroying 2 MRBs my, uh, XO should be

reloading out of 2 cache pits that we used behind Hill 780, to do cross leveling of ammo for the tanks and also for the Bradleys for the TOW missiles. I'd make the recommendation to the Squadron Commander, based on if Delta Company's still holding the wall, I may shift only one platoon out of EA BLOOD. But I'm in good position if Bravo down in the south is set, to go ahead and continue to hold. My losses haven't been heavy. I'm nowhere near the strength requirement of 80%. I'm doing very well. I don't need to go anywhere and I can assist in the mission of not having any enemy penetration of Phase Line GREEN by staying where I'm at. As long as Bulldog and Delta are holding out I'll stay where I'm at and use those positions. I may have to reposition one platoon to the north to cut off that, uh...if...Delta's having problems. I'd do this all over the Squadron Command Net. It's the easiest way to do it. Talk to those two...company commanders, find out where they're at, let the boss jump in anytime he feels that we're not doing, uh, what he needs done. The tank regiment, the only thing I may have to do is shift the tanks down in the south, er, correction, the, uh, Bradley platoon down in the south...engagement area and open it up, in fields of fire, into 802, a little bit, and do a little reorientation. But besides that, I shouldn't have to change too much with EA BLOOD. The only thing I'm gonna say with the tank regiment coming is stay down in the holes, one Sabot round for them, TOW missiles from the flanks once the tanks open up, and I'll probably use this linear target again to cut off his forces that come up through obstacles trying to do any kind of bypass. The Bradleys already know, 2 Bradley platoons, that anybody pulls off first, well, we would probably pull Bulldog through us. Then I'll collapse from the south to the north. And I've got subsequent positions in BP 3. I'll talk about that to the Squadron Commander as my, uh, recommendation if we do have to move back to stop the penetration of Phase Line GREEN. That's gonna depend on what the Brigade Commander has done with his task force, if he's moved it up to occupy BP 3 or not. Main concern is if I've gotta pull up out of my holes, I'm very concerned about the fratricide issue and that's why the 1st Platoon would be tied in very well with Bulldog, uh, for the recognition signals, 'cause he's almost doing a rearward passage of lines through my position, which is fine. Uh, but right now with that situation I'd probably stay exactly where I'm at."

Anomaly 3B**Situation Report**

132 MRR attacked into 1-77 sector as expected. Screening activity of TM A caused MRR to deploy into attack formation vic PL WHITE with 2 MRBs up, one back. Friendly long range recon also detected elements of 127 MRR trailing 132 MRR. Prior to reaching PL WHITE, 127 MRR drops to the south in an apparent effort to reinforce attack by 133 MRR and 199 TR.

Templating efforts by 132 MRR apparently identified the TF 1-77 EA. MRBs attempted to bypass EA BLOOD. TM B destroyed MRB attacking south of EA. TM B was left at 70% strength. TM D destroyed MRB attacking north of EA and (with help from TM A) also destroyed 2nd echelon MRB. TMs A and D at 80%. TM C at 90% strength.

Responses to Anomaly 3B

Battalion Commander #3. Team Alpha will move from AA 74 to Assault By Fire Position 78. They will hold there until they are told to launch a counterattack along Axis CHIEFS into EA HURT. Team Bravo will hold its position. Team Charlie will also remain in place.

Company Commander 3-1. "So what it looks like here is that I'm dealing with, if the 132nd was attacking with two up and one back, okay, if the one was destroyed here by Team Bravo and the other one was destroyed here by Team Delta, its basically trying to find out where the, uh, the last MRB is. Right now, that's unreported. So if we know that they have already deployed to battle formation basically at Phase Line WHITE, they identified the EA BLOOD right in here, then one MRB destroyed here, one MRB destroyed here, then the other one is yet to be found. We know the trail, 127th, has dropped to the south to enforce the 133rd. So I would say is that, uh, I'm just going to hold what I have. Ah, still cross-talk with Team Delta and more than likely Team Alpha and also Team Bravo to see if we can ID where that 3rd MRB is hid. Now the 127th, I don't believe...right now, based on what I've got, I just want to know what the 127th is doing, and I want to know what the 3rd battalion of the 132nd is doing, 'cause I may more than likely...right now I'm just gonna hold what I've got unless I get reports from Team Bravo or Team Delta, anything about the, uh, the 3rd MRB. That's what my concern would be, would be the 3rd MRB. 'Cause where is he? Yeah, he may decide to shoot south or north but based on these two, you know, denials by Team Delta and Team Bravo and Team Alpha, then it's more than likely he's not gonna try there, skirt through the engagement area and become a big dirt...like the other two MRBs did. The 127th, I'm not really sure if that's going to affect me. It just depends on where he's going. That's what I would be looking for."

Company Commander 3-2. "Alright, my battle strength is still above what the commander's end strength was supposed to be and if I am not mistaken I think that was 80%. That's right. Deny them penetration of Phase Line GREEN. They haven't gotten that far past. Um, but they have identified our engagement area. By now, ah, looks like probably we'd have to restock from our caches up from behind. Um...making sure I've got a good cross-level across the board on ammo for tanks and Brads and TOWs. Also, ah, obstacles are probably being depleted so if they identified EA BLOOD they probably identified the engagement belt. They're going to be finding routes around here...if they're intent on passing through to Phase Line GREEN or in that direction. Again, notification of higher. 'Sir, we have the enemy in sight.' I know the capability of their weapons systems. Uh, the tanks are going to be carrying, their T-80s, they have the AT-8 which can range 4000 meters and the AT-3 which can go out to 3000. Uh, there's artillery with them. We haven't been picked up yet by the spot reports so that's no factor and we are dug in. Um, I can still range out with TOWs to 3750, main gun...shoot, it's a crap shoot in there, we're still holding the high ground and not attrited that badly. And we're still above endstate. Continue the situation, sir, continue to engage....Double check something here. 'MRBs attempted to bypass EA BLOOD.' So they're being channelized around Hill 760 and the obstacles. The obstacles...are doing their job. Probably a good time to call up a JAT mission if we had it available and slow them down with some harassing fires. Again, smoke disrupts and has a tendency to make a vehicle stop. Still well out of my range, though, if they are still even with or slightly east of 760. I have to wait until they get closer. If they're coming around behind the battle position, Team Bravo is still at...I'd make a phone call to Bravo to see what their situation is, see how quickly they can engage the troops that are stopped up in front of them and if they're being bypassed to the south or the east. It appears that Team Delta is holding their own okay. Again, making contact with them from my northern platoon, tying in and realigning on the engagement area as we need to. I'm still intact, still got good ammo and still on the high ground. They haven't passed by me yet and we're still meeting the commander's mission and his intent."

Company Commander 3-3. "Again, I need to talk to the lead team commander and find out what contacts he has with the 127th MRR. Um, it says, 'apparent effort to reinforce in the south.' If, uh, if three regiments are going to come into the south, I need to give my guys a warning order, uh, to be prepared to move out of BP 72, uh, perhaps into a position where we could support Task Force 1-2 to our south. Uh, I need to again, get a hard read, if I can, from the aeroscouts, and the, uh, Charlie 123 CAV. Those guys are still out there, they can get the earliest read and let me know where it looks like the main body of this 127th regiment is going. It sounds as if the 132nd's about had it and our task force is now looking for more bad guys. The best

way for us to help out in preventing Phase Line GREEN from being penetrated, et cetera, is to provide some reinforcing fires. Uh, according to the order, I think the task force was supposed to be prepared to attack along Axis CHIEFS...I don't see it right now....Nonetheless, I would say, uh, with the MRBs of the 132nd destroyed, uh, my company team needs to be prepared to move to support the 1st of the 2nd to our south, either by coming through by Hill 781 to the south through Siberia, or coming through the John Wayne pass to reinforce them in some way. It depends on the location and positioning of their company teams. I don't know where that is. Uh, but again we need confirmation from the aeroscouts and 123 CAV or from Team Bravo which is to our front that they are in fact doing that and that there's not another echelon behind them before we give up our positions to try and assist the 1st of the 2nd."

Company Commander 3-4. "What it sounds like is, uh, their intel was real well, uh, very good. They identified our battle positions. I'm still considered the backstop force. But, uh, since he's pushing to the south it looks like Task Force 1-2 is gonna have it a lot rougher job. Uh, that means that this area down at GREEN is going to be, this task force would be down to BP 1. First thing I'm going to anticipate is, uh, our battalion is outstanding strength right now. Alpha and Delta is still at 80%, which is the success criteria. But for the brigade commander, he's probably gonna be looking for help, possible counterattack routes, uh, down Axis, uh, CHICKS or probably through here somewhere. So I'll probably cut loose my 1st, uh, Platoon, at least one section and start looking for counterattack routes into BP 4 for Engagement Area KILL or all the way around to the flanks and, uh, start thinking ahead for that. I don't anticipate sitting there - too valuable of an asset with that much power, plus, uh, if he's identified it, its no good to us where we're at then. So, I would probably cut also one section from the 2nd Platoon back to check out BP 3, counterattacks into the Bicycle Lake area. Um, that coordination, I'll just let the, I'd do that without telling the boss probably. I'd just get a hold of Bravo and Delta, think, see if they agree, try and double up that effort. Um, but I would be planning on moving out. Uh, probably don't have to worry about too much of the cache of ammo. I'd have to look at uh, my ammo should be pretty well since, uh, they tried to bypass through EA BLOOD. Uh, but I'd just make sure I had the full up load and I'd be ready to move. And that was the FRAGO that I would give to the troops and I'd FRAGO them off the check points I've got listed, uh, that we had put on and, uh, just make that suggestion, talk to those 2 commanders over the Squadron Command Net, um, 'cause I'm sure the Commander's gonna get something from the Brigade Commander to go ahead and pull that task force into a counterattack role. So, that's what I'd be starting to look at and think about. It'd be, it sounds like it was an easy day for the task force so I'm sure the Brigade Commander wouldn't leave us out. He's got a full-up task force that

can do a lot of damage and help out 1-2. So that's what I'd be preparing to do at that time."

Figure 22. Battalion #3 graphics and Anomaly 3B.

APPENDIX G

BATTALION #4

Mission

TF 1-77 IN defends in sector NLT 160700 AUG 95 between PL WHITE and PL GREEN to defeat a divisional supporting attack, the 132 MRR, in order to assist the 1st Brigade in the defeat of the 41st MRD.

Commander's Intent

The task force will defend with a weighted company team in the covering force area, two company-sized elements in the main battle area, and a strong, mobile reserve. I want to engage the enemy throughout the depth of our battlespace, latching on to him early, forcing him to deploy, and denying him regimental avenues along the north and south walls. In the main battle area we will continue to attrit the enemy from subsequent positions throughout the sector designed to take maximum advantage of flanking fires. Commitment of the reserve, either by mobile counterattack, or counterattack by fire will complete the enemy's destruction. At endstate we will have destroyed an enemy regiment allowing no more than MRP penetration through our sector while maintaining sufficient combat power to rapidly transition to offensive operations.

Tasks Assigned to TM C by Battalion

1. Defend in sector from 420127 to 410165 to 486188 to 509135 to attrit enemy forces through the depth of your sector and prevent more than two MRCs from crossing PL BLACK.
2. Begin attriting enemy in EA DOE.
3. Emplace Obstacles 004 and 005 and 006 in your sector.
4. Emplace dismounts to the rear of Obstacle 004 to protect the northern flank.
5. Coordinate with Alpha for fire plan and location of units.
6. Turn in company fire plan NLT N+4 of occupation.
7. Be prepared to occupy Attack Position HAMMER at 12 o'clock, with 12 o'clock being east, to prepare to CATK along Axis CHIEFS to destroy enemy DAG and tank battalion in EA HURT.

Anomaly 4A

Situation Report

The 132 MRR attacked into the TF 1-77 sector after forward recon elements defeated TM D between PL WHITE and PL RED. TM D is combat ineffective and remnants have moved along RT FAST to BP 22.

The 132 MRR deployed into attack formation vic of PL BLUE. The MRB attacking into the C/1-77 sector was defeated prior to PL BLACK. The follow-on MRB also attacked into the C/1-77 sector. With the help of TM B, the second echelon MRB was also defeated. TM C is at 80% strength. TM B is at 90% strength. TM C and TM B are located between PL BLACK and GREEN. TM A defeated the MRB in their sector. However, the 199 TR has moved from the southern (TF 1-2) avenue of approach into the TM A sector in order to protect the flank of the 133 MRR. The 199 TR has just crossed PL BLUE.

Responses to Anomaly 4A

Battalion Commander #4. "Okay, so we've got a little bit of a salient there in the north. And the 199th Tank Regiment has just been inserted in our sector....Okay, based on what I've told my company commanders, uh, prior to the start of the engagement was the scenario that you've just painted with me in this sit rep kind of defines success for the initial order. That, uh, it seems to me we have defeated the motorized rifle regiment. I still have a team, actually a tank company, that looks like it's in pretty good shape. My, uh, Team Alpha in the south still holds its sector and it's defeated an MRB and they're at about 90% strength. My Team Charlie, with the help of the reserve, has defeated 2 MRBs and they're still at 80% strength. So, ah, based on that, I think I've done my job for the brigade commander. I've taken out a motorized rifle regiment and, ah, had the tank regiment not been inserted in my sector, I would have been prepared to counterattack, probably on short order. If he had had more success down in the south, I could have picked up pretty rapidly and started moving out on him, you know, and attack in Engagement Area HURT. The wrinkle in this now, and I can't read what's gone on in the south, but it sounds to me what's happened is there's been more relative success in my sector than there has been in the, uh, 2nd, er, the, uh, Task Force 1-2 sector. And so the tank regiment, rather than reinforcing failure down in Engagement Area KILL, it looks like to me they're going to slip up north and try to reinforce in the salient that's been created in my sector. It looks to me like in, ah, in Team Alpha's sector, I'm pushing forward almost to BLUE and my set's probably still pretty good. The terrain there is, he's probably slipping up, not across boundaries but he's probably already been diverted at some decision point further out to the east. So he's probably gonna take a route along the high speed avenue of approach or even try to hug the northern wall, uh, because he knows he's already cleared out most of the forces in Charlie's sector along that northern rim. And so he's probably going to have a more high speed avenue of approach through my

sector to the north. I told my guys first of all, I don't want to chase with a lot of artillery. Ah, I also told them I don't want to get into a displacement battle through the corridor, that if they've got good keyhole shots, I want them to hold. If they have units, small units that have been bypassed, I don't want them to pick up out of their holes and try to displace to the west and beat the enemy through the sector. I want them to stay fast, keep their calm, and continue to engage. So, in this read, at 80%, I would suspect that even though you've told me Charlie is mostly between Phase Line GREEN and BLACK, I still probably have about a platoon of Team Charlie that's still situated between BLACK and BLUE and they're still in keyhole shots oriented more north - south, ah, tied into the wadis coming out of the high ground. I would expect Team Charlie, in the absence of orders from me, not to displace those guys, to continue to get the kill shots on the tank regiment going through. Um, right now Team Delta's probably a loss and I can't use them for much of anything. Um, Team Bravo would be my reserve at this point. Basically, my orders to Team Charlie would be to hold fast, uh, report the tank regiment coming through. Um, I think the obstacle work in the south would still...force them up north, up almost towards Engagement Area Doe and then he would head west at probably a high rate of speed. I think at this point I'm still positioned that if I just stay fast, don't displace anything, and remain calm, I'm in a position where I can take on that tank regiment with flanking shots from, ah, from Team Alpha. And, um, I would probably give the order to Team Charlie to try to tie in with my reserve at this point, which is Bravo Tank, in vicinity of Battle Position 11 as a block. And...block with Team Charlie and...Bravo Tank, with flanking shots coming from Team Alpha. I don't think I'd do much repositioning at this point."

Company Commander 4-1. "I'm still holding the high ground in the Charlie sector. Uh, we've got a tank regiment attacking Team Alpha. Uh, possibly, Team Alpha is at, uh, they've defeated an MRB. What's their strength right now? It doesn't list their percent strength. But I think the colonel's going to hold me in my position and look for a flow off of Team Alpha into my sector and then I'll just continue to hold and fire my tank shots from Charlie One and, uh, TOW and, uh, Bradleys from Charlie Two and Charlie Three....I don't have a problem with what's going on right now. They're not in my sector but I do think they'll probably be an overflow into it where I'll get some shots. And I'm gonna continue to attrit 'em throughout the, uh, the sector....The only other thing the colonel might ask is for a counterattack, which I guess could be possible, too. It really would depend on what he was gonna say."

Company Commander 4-2. "At this time, uh, our plan called for an on order counterattack. I would, uh, report to the task force commander and, uh, request verification on any modification of counterattack plan. Initially we

would, ah, would have moved into attack position HAMMER, went into a tactical assembly area and moved out into a, a task force diamond formation with Charlie Company on the eastern flank in a , uh, company wedge. Prior to, ah, the LD out of here I was to receive that tank platoon from, uh, Delta 1-77. That's one thing I would confirm is am I still receiving that tank platoon and what's it's, uh, current strength and capabilities. Once I got a, uh, an update from the task force commander my assumption would be we would plan to counterattack into or against task force 199th, correction, 199th tank regiment. And, uh, what I would be looking for is any modification of the plan. Ah, seeing that Team Delta did take some losses when they fought the counter-recon battle...what their current strength is, how it would affect any of the task force plans for the counterattack. Right now I'm seeing, uh, Team Charlie, Team Bravo, Team Alpha, all above 80% strength, well within having the combat power to continue an offensive operation against the tank regiment down here."

Company Commander 4-3. "So assuming Team Alpha defeated these that are moving into Team Alpha's sector now, and I'm back here with Bravo Company and I'm probably postured somewhere in this mountain area between Phase Line BLACK and Phase Line GREEN in a choke point right there. Well at this point, the way I read it, we've destroyed 2 battalions and that regiment's pretty much decimated. You've got the 199th coming into our sector. We're not able to counterattack right now. I would have to prevent the 199th from...actually, we've tied them up and we've done what we've got to do here. We've prevented them from moving in and enveloping the rest of the brigade. We should be able to hold them and attrit them there from Phase Line BLACK to Phase Line GREEN. For my course of action, obviously a lot of things have happened. I've pulled out of my position back to Phase Line BLACK. I told the colonel where I'm postured, probably reinforcing somewhere in between Hill 786 and Battle Position 11. Battle Position 22 and Bravo Company and Alpha Company are still fighting the fight. [The course of action for Charlie Company] is to reinforce Bravo Company basically so we can prevent an MRC from passing Phase Line GREEN."

Company Commander 4-4. "Team Charlie is at 80% strength, that's me. I'm located between Phase Line Black and BLUE. I'm in the same location that I was at. There's a tank regiment crossing Phase Line BLUE. I'm gonna stay where I'm at. I'm gonna maintain my positions, keyhole against the, against the northern wall and continue to attrit as the 199th and follow-on forces come by....Unless there are any specific instructions from higher that I should assume from this, I would maintain my position there and continue to attrit."

Anomaly 4B**Situation Report**

The 132 MRR launched an attack into the TF 1-77 area at 170700 AUG 9X. D/1-77 was successful in identifying forward recon elements and defeating them between PL WHITE and PL RED. This caused the MRR to deploy into battle formation vic PL WHITE. TM D has returned to BP 22 along RT FAST and is at 80% strength.

The 132 MRR attacked with one MRB in the north and one in the south. TM C used a combination of fires, obstacles, and maneuver to defeat the MRB prior to them reaching PL BLACK. TM C is now at 85% strength.

TM A was able to defeat the MRB in their sector but it was a more difficult fight. In addition, the 2nd echelon MRB attacked into TM A's sector, requiring the commitment of the TF reserve (TM B). TM A is at 60% strength, TM B is at 70%, but the second echelon MRB was rendered combat ineffective.

In the 1-2 sector, however, the attack by 133 MRR and 199TR has moved quickly. Forward elements of the MRR are approaching PL GREEN in spite of the commitment of the BDE reserve (TF 1-3).

Responses to Anomaly 4B

Battalion Commander #4. "This one is causing me more to think from the standpoint of the uh, of the brigade and the division commander. It sounds to me like Team Delta's been successful in a covering force and the counter-reconnaissance mission are relatively successful. And my main battle area fight in both sectors, north and south have gone relatively well. Um, task force 1-2 to my south, though, sounds like they got their butts kicked, and even though the commitment of the reserve was initiated in that sector, it didn't have much effect on the motorized rifle regiment to the south and they're closing in on Phase Line GREEN. Um, I have been concerned throughout with the command and control of this from brigade and division sector. The mountain range that splits Task Force 1-77 from Task Force 1-2 and 1-3 is pretty significant on retrans and that sort of thing. And its almost like two separate fights, geographically. You know, a quarter in the north and a quarter in the south. I told you in my own sector I was concerned about being able to laterally reposition ahead of a successful enemy and I that if I started getting in that mode I felt that I'd really compromised all the engineer work that had been done on survivability positions and I would have abandoned all of my obstacle work and really gotten in almost a movement to contact to the west between two moving forces. That I thought that by the time I could read unsuccess in my sector, from the first echelon standpoint it would be too late to get up out of the holes and chase 'em. I think that analysis is also true from a brigade and a divisional perspective. Uh, one of my first reactions would be, 'oh, shit, things are going to hell in the south. I probably am gonna have to pick up and move west to try to get to some kind

of block before there's disaster from a divisional perspective.' But I don't think that's a right way to react. I think what the division commander's gonna have to do in this case is he's probably gonna have to commit the 4th brigade. And there's gonna be some heavy attack helicopter work that's gonna be vectored down into this successful motorized rifle attack in the south of my sector. I think what my brigade and division commander are gonna want me to do is they're gonna realize my task force has been successful. I'm still at about 80% plus strength on the northern shoulder and I'm in a great position for a counterattack into the 2nd echelons of the division coming through. So I think what the division commander's gonna do is he's gonna block the success in the south with his 4th brigade and he's probably gonna give me a FRAGO to be prepared for a counterattack, picking up rapidly and counterattacking into the flank of the second echelons of the division that's having success in the south. I think the enemy sees great success in the south and no success in the north so the 2nd echelons of the division are gonna be committed along that route to the south. So, the FRAGO that I would give to my guys is be prepared to counterattack. Uh, we have a...they have an on order counterattack mission and I would hope that the read that my Charlie Company would get from this is he's gonna move to the eastern sector of the attack position in an attack by fire position to provide flank security for the task force as the rest of the task force gets into position to be prepared to execute the counterattack. Uh, of course there's gonna be some localized mopping up that we gotta do as we move forward. But, I would think Charlie Company, based on this read, uh, he's probably gonna await orders. But in the absence of orders, I would think that he's doing, you know, things that are necessary to prepare his forces to pick up, occupy that attack by fire position to provide flank security, anticipating we're gonna get the FRAGO for a counterattack into the 2nd echelons of the division to the south [along Axis CHIEFS into EA HURT]."

Company Commander 4-1. "So, we've got, uh, the MRR is starting to, in the south, the main effort is cutting us off. It seems to be they're crossing Phase Line GREEN and, uh, the brigade's probably unable to stop them at this time. Uh, what do I think's gonna happen? Uh, possibly what we would do here then is, uh, gather our forces in the counterattack plan, probably modified from going into EA HURT. We'd do something along those lines. But again, it would have to come from battalion....It seems everything is dead in the zone in our sector, and, uh, we've got problems with guys, we're not going to be able to pull pitch from where we are and, uh, and counterattack forward. If anything, with the terrain here, we're gonna have to, uh, and brigade wants to pull a bold move like that, we'd have to counterattack, either stick with the plan down into EA HURT or we'd have to modify the counterattack and come through the, uh, Siberian."

Company Commander 4-2. "Initial assessment in this report, Task Force 1-77 was successful in its sector. Therefore, it would...lead me to believe that we would be ordered to continue with our mission...which would be putting us moving out of the sector, uh, down to MSR WARRIOR into Attack Position HAMMER, uh, to await, uh, directions for a counterattack along Axis CHIEF. However, since the enemy's lead elements are over on Phase Line GREEN, it would lead me to believe that if we are going to counterattack that we may want to change our assembly area to a more favorable position to allow us to, uh, assemble our combat power faster. And second, I would be under the assumption that we would, ah, also have a change to the graphics on Axis CHIEFS and, ah, possibly a new engagement area. We may end up, this may be, uh, a meeting engagement or a movement to contact. Um, I'd initiate at the team level, getting a read on our current status to verify it. I'd go back up to task force, uh, for further instructions on one, if we're gonna continue, change from the defense to the offense and the counterattack and then look for modifications into that plan to adapt to the new enemy situation."

Company Commander 4-3. "Okay, well, making the assumption that, ah, any follow-on forces has been fairly neutralized and are started to move south to add, uh, speed to the 133rd MRR and 199th, it appears they've gone south....Then I would, if everything's policed up here and they're at 60, I would, I guess we'd be waiting for the colonel to make the call. Actually, we'd, he'd probably get a call from the brigade commander at this point to go ahead and prepare to counterattack into the...133rd who's probably moving south into our, uh, Engagement Area HURT along Axis CHIEFS. So, we'd probably at this point move into a battle position where I'm on the , uh, eastern flank. I'd get the, uh, company, er, platoon of tanks from Bravo Company chopped over to me to protect the flank. From the battle position, we move on Axis CHIEFS into EA HURT in a preparation for a counterattack."

Company Commander 4-4. "Delta's moved back to Battle Position 22. I'm at 85% strength. Again, I would stay exactly where I'm at and continue to attrit....I would stay in position, continue to attrit, uh, go higher for, uh, additional instructions."

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