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for the Behavioral and Social Sciences**

Research Report 1728

**Cognitive Requirements for Small Unit Leaders in
Military Operations in Urban Terrain**

**Jennifer Phillips, Patricia L. McDermott, Marvin Thordsen,
Michael McCloskey, and Gary Klein
Klein Associates Inc.**

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Research Report 1728

Cognitive Requirements for Small Unit Leaders in Military Operations in Urban Terrain

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FOREWORD

The U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) is conducting research to understand the challenges of Military Operations in Urban Terrain (MOUT). These operations place demands on military personnel for new types of technical skills. They also generate cognitive requirements related to the judgments and decisions necessary in an urban setting. For example, a platoon leader who has learned to estimate the time needed to set up a hasty defense or a movement to contact will have to judge the time/distance relationships for tasks such as building clearings. It is critical that the military be prepared for MOUT because the U.S. is a victim of its own success. Few adversaries will be tempted to engage in conventional warfare against the U.S., and at the same time, urban conflicts offer attractive advantages to adversaries: the potential loss of civilian life, destruction of landmarks, ease of access for media coverage, increased potential to inflict injuries on our soldiers, using relatively unsophisticated weapons systems. To make matters worse, the U.S. military has spent much less time preparing for MOUT than conventional warfare, and has comparatively less expertise to draw upon.

This report describes the result of a pilot study of MOUT, using Cognitive Task Analysis methods to identify the types of expertise needed to make difficult judgments and decisions. The project focused on a single task: clearing a building. The report makes a number of recommendations for developing training that would improve judgment and decision skills. The methodology used in this project will also make it possible to identify training objectives and develop materials for improving cognitive skills for other aspects of urban warfare. The report will be of value as background material for all persons involved with MOUT and will help training developers address decision requirements of tasks that are central to the MOUT environment.

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COGNITIVE REQUIREMENTS FOR SMALL UNIT LEADERS IN MILITARY OPERATIONS IN URBAN TERRAIN

EXECUTIVE SUMMARY

Research Requirement:

In recent years Army combat operations have moved from traditional rural battlefields toward urban settings. These Military Operations in Urban Terrain (MOUT) and their cognitive demands vary considerably from traditional battlefields. Troops now fight within close quarters, against an underdefined enemy, and amongst hostile and non-hostile civilians. The situation is exacerbated by the fact that the U.S. Army as a whole has relatively less MOUT experience than conventional warfare experience. Further, MOUT training tends to emphasize procedural rather than cognitive tasks, and is most often conducted by specialized personnel such as the Rangers and Special Operations Forces.

Procedure:

The focus of the project was restricted to the building-clearing task from the perspective of a platoon leader. Klein Associates conducted a cognitive task analysis (CTA) with seven active duty or retired soldiers of varying ranks (from Sergeant to Colonel) and types of experiences (from MOUT training exercises to actual MOUT missions). In-depth interviews served as the means for data collection. The interview methods used include the Task Diagram, Knowledge Audit, and Critical Decision Method. The interview data were analyzed to identify the cognitive challenges of building clearing operations. These were specified in the form of decision requirements: the critical decisions, difficulties, cues, factors, and strategies used in clearing a building. Identified decision requirements were then presented within Decision Requirement Tables.

Findings:

Nine decision requirements were identified, each of which represents an overarching grouping of similar cognitive demands. Two categories of requirements emerged from the data: *task-focused* decision requirements (those that occurred during a specific stage of the building clearing) and *task-independent* decision requirements (those that were active during all stages of the clearing). The task-focused decision requirements were: determine how to secure the perimeter, determine how to approach the building, determine how to enter the building, determine how to clear the building, and determine how to maintain and extend security. The task-independent decision requirements were: maintain the enemy's perspective, lead subordinates, maintain the big picture and situation awareness, and project into the future. Each of the decision requirements and their related cognitive aspects were represented within Decision Requirement Tables, which were then used to guide recommendations for training development.

Utilization of Findings:

Based on interviews with subject matter experts who were experienced in MOUT tasks such as clearing buildings, the following conclusions were drawn:

- Expertise does exist within the building clearing task.
- CTA is an effective method for capturing decision requirements in MOUT environments.
- There are many critical decisions, cues, factors, difficulties, rules, and strategies used in the building clearing task that are gained with experience but are not currently being addressed in training.
- Once decision requirements are identified, they can be used to directly guide training applications.

The following are recommendations for using the decision requirements identified during the project:

- Training the cognitive aspects of MOUT decision making can best be accomplished through a scenario-based approach that boosts expertise by enabling decision-making practice in context.
- Task-focused decision requirements can provide context for these tactical scenarios.
- Task-independent decision requirements can be used in creating tools to supplement the scenarios by spotlighting cognitive aspects of decision making.
- The CTA could be broadened to include different perspectives, both subordinate (e.g., squad leader) and superior (e.g., company commander) to a platoon leader.
- The CTA could also be broadened to include other MOUT tasks in addition to building clearing.

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COGNITIVE REQUIREMENTS FOR SMALL UNIT LEADERS IN MILITARY OPERATIONS IN URBAN TERRAIN

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Cognitive Requirements for Small Unit Leaders in Military Operations in Urban Terrain

INTRODUCTION

Background: The Problem and Opportunity

The Army is facing an ever increasing frequency of urban-based military operations (Glenn, 1996). Bosnia is one example. Termed Military Operations in Urban Terrain (MOUT), these types of operations and their decision-making requirements vary considerably from the more traditional operations which occur in rural settings. The unique MOUT-related decision challenges are exacerbated by the fact that most Army personnel, with the exception of specialized personnel such as the Rangers and Special Operations Forces, have relatively little actual MOUT experience, and that most institutional and unit training is not MOUT-directed.

Although all Army personnel receive some MOUT training, this MOUT training typically emphasizes the procedural aspects of tasks, such as where each soldier involved in a room clearing operation should stand and the area in the room for which each is responsible. While procedures are very important, especially in tightly restricted operations such as room clearing, they do not prepare soldiers for critical decision-making issues unique to MOUT environments. In most cases, MOUT judgments and decisions are extremely difficult to make. For example, these decisions often must be made under extreme time pressure, with high degrees of uncertainty, and in a setting of high vulnerability. MOUT is not about arranging long distance artillery duels. It is about missions like finding the best way to immediately extricate soldiers from an urban ambush where the threats are operating in three, rather than two, dimensions.

MOUT missions include a wide range of "decision requirements," which specify the cognitive demands facing leaders. One potential reason for the virtual exclusion of decision-making training within instructional programs is that it is so hard to identify the decisions and the cognitive strategies used by skilled soldiers. It is generally only the experts in a field who have a bank of knowledge regarding how to effectively deal with these critical decisions. And, like experts in most fields, they often cannot articulate the tacit knowledge surrounding their decision making without the assistance of an outside party trained in eliciting such information.

The danger here is that soldiers, no matter how well-trained and prepared to carry out difficult actions, cannot be protected from the consequences of their poor decisions. MOUT places platoon leaders in highly demanding situations where they have to operate with a high degree of independence. Thus, relatively junior officers are going to be facing high risks and demanding situations with little preparation for handling the decision requirements of MOUT missions. As we have seen in Chechnya, Mogadishu, Berlin in WWII, Hue City, and many other urban battlefields, the casualty rates can be staggering compared to warfare conducted in open terrain as in Desert Storm (Glenn, 1996; MCIA, 1997).

Among those selected soldiers having substantial levels of MOUT experience, the opportunity exists to capitalize on their uncommon expertise to identify critical cognitive aspects of decision making and to subsequently enhance current Army training programs. Soldiers with extensive experience in actual MOUT missions have learned lessons that cannot be found in any training manuals. By using an arsenal of cognitive task analysis (CTA) methods to elicit these lessons, we can identify the decision requirements of MOUT missions: the critical and challenging decisions and judgments, the informational cues and factors that influence those decisions, the reasons why the decisions and judgments can be so difficult, and the strategies used by expert decision makers (the aspects of expertise). We can then use those decision requirements to formulate training development recommendations for MOUT. Improvements to MOUT training cannot create experts of new platoon leaders overnight, or even within a few months, but they can dramatically ramp up their learning curve and better prepare them for the judgments and decisions they will be required to make when they are given MOUT assignments.

This report details the findings of a CTA conducted with a selected group of seven MOUT-experienced soldiers. From the perspective of a platoon leader, the CTA focused on the task of clearing a building, which was selected for its paramount importance. The report describes how the CTA findings (i.e., the decision requirements) suggest training development issues for lieutenants likely to face MOUT assignments in the future. Recommendations for implementing decision-centered MOUT training are also discussed. The report is organized as follows: The *Introduction* presents the background which underlies this effort as well as the objectives of the study. The *Methods* section describes CTA methods in general terms and details the manner in which they were applied in this research effort. The *Findings* section discusses the decision requirements identified by the CTA, and offers a fictitious account of a building clearing operation in order to better illustrate the findings in context. The *Discussion* describes implications for training and discusses future research directions. *Appendixes A and B* contain the complete CTA data set presented within Decision Requirement Tables (DRTs).

Objectives

The overall objective of this effort was to understand the critical elements of decision making in a MOUT environment, and to employ this understanding to develop recommendations for improved MOUT training. Specifically, we endeavored to explore building clearing operations from the perspective of a platoon leader. Our technical objectives were to conduct a CTA of the building clearing task and to use the CTA findings both to develop MOUT training recommendations for new and inexperienced platoon leaders and to determine the feasibility of using CTA methods to identify and develop training recommendations for other MOUT tasks.

METHODS

Cognitive Task Analysis

The cornerstone of our approach to identifying the MOUT decision-making requirements of platoon leaders in building clearing operations is CTA methodology. CTA is the process of

understanding the cognitive complexities of a task. It provides a set of tools for eliciting and representing general and specific knowledge pertaining to a particular activity, in this case, MOUT building clearing operations. CTA allows us to go beyond procedural knowledge and the behavioral aspects of MOUT operations. The purpose is to get inside the soldier's head, and try to understand the "cognitive map" that guides his decision-making processes. We must understand how both novice and experienced soldiers view their environments, and what critical cues, expectancies, and goals they require to make a good decision in a specific context. Employing CTA methods allow us to understand many of the cognitive aspects involved in the judgment, decision-making, and problem-solving skills that are so critical in the uncertain and ever-changing MOUT environment.

CTA methods evolved from the study of Naturalistic Decision Making (Klein, Orasanu, Calderwood, & Zsombok, 1993; Zsombok & Klein, 1997). They comprise techniques for both eliciting and representing knowledge, and provide a means to identify and articulate the cognitive demands and skills related to a given task. In MOUT environments, proficient task performance places cognitive demands on the platoon leader as well as physical ones. These cognitive demands include such activities as decision making, judging, problem solving, and assessing the situation. These cognitive demands serve as the drivers of the physical tasks. That is, the platoon leader often must make some judgment or decision before knowing which procedure or action to implement. CTA provided us with a set of tools for eliciting general domain knowledge as well as specific knowledge pertaining to the cognitive demands for MOUT environments. (These tools will be discussed in further detail below.) The results of the CTA provide a framework for developing training applications by treating human decision processes explicitly and incorporating them as a basis for the final product.

It is important to note that there are two facets of CTA: knowledge elicitation and knowledge representation. The knowledge elicitation aspect of CTA comprises a "tool kit" used to delve into the MOUT soldier's decision-making environment. The knowledge representation aspect of CTA guides documentation and codification of data into formats that can be used to anchor the design of the training program. We represented the CTA data through Decision Requirement Tables. The Decision Requirement Tables then become the basis for decision-centered training.

Knowledge Elicitation

There are several different knowledge elicitation methods in our toolkit. The methods relevant to this project are the Task Diagram, Critical Decision Method (CDM), and the Knowledge Audit. Each of these are described in detail below.

Task Diagram. The Task Diagram is intended to serve as a road map to the rest of the CTA (Militello & Hutton, in preparation). It acts as an advance organizer, providing an overview of the task and identifying the cognitively complex elements. In conducting the Task Diagram interviews, we ask the interviewee to identify the primary four to six steps involved in the task being studied. Once these steps are elicited, the interviewee is asked to identify which steps require difficult cognitive skills: critical judgments, assessments, and problem solving. The

purpose of the Task Diagram is to provide a very broad overview of the task and an indication of which steps are cognitively challenging. The steps also provide a common frame of reference from which the interviewer and interviewee can work.

Critical Decision Method. The CDM is a knowledge elicitation strategy based on Flanagan's critical incident technique (Flanagan, 1954). Using recollection of a specific incident as its starting point, CDM employs a semi-structured discussion with specific, focused probes designed to elicit particular types of information (Klein, Calderwood, & MacGregor, 1989; Hoffman, Crandall, & Shadbolt, in press). The specific episode carries context with it and reveals how particular aspects and events in the environment impel the decision maker to action.

The incident account is generated by the interviewee in response to a specific open-ended question posed by the interviewer, and it provides the structure for the questioning that follows. Once the participant identifies a relevant incident, he or she recounts the episode in its entirety, with no interruptions from the interviewer. When the report of the incident has been completed, the interviewer conducts three information-gathering sweeps through the incident. These sweeps are: Timeline Verification and Decision Point Identification, to structure and organize the account into ordered segments; Progressive Deepening, to develop a comprehensive, detailed, and context-specific account of the incident from the perspective of the decision maker; and What-if Queries, in which the decision maker discusses the incident in terms of potential errors and expert-novice differences.

Solicited information includes goals that were considered during the incident; options that were generated, evaluated, and eventually chosen; cue utilization; contextual elements; and situation assessment factors specific to particular decisions. CDM protocols provide detailed records of the information gathering, judgments, interventions, and outcomes that surround problem solving, judgment, and decision making in a particular task or domain. CDM interviews last approximately 2 hours.

Knowledge Audit. The Knowledge Audit is a method designed to efficiently survey various aspects of expertise (Militello & Hutton, in preparation). It identifies ways expertise is or is not used in a domain and provides examples based on actual experience. The Knowledge Audit draws directly from the research literature on expert-novice differences (e.g., Chi, Glaser, & Farr, 1988; Ericsson, 1996; Ericsson & Smith, 1991; Feltovich, Ford, & Hoffman, 1997) and our own CDM studies of decision making (e.g., Crandall & Getchell-Reiter, 1993; Crandall, Kyne, Militello, & Klein, 1992; Klinger et al., 1993; Militello & Lim, 1995).

The Knowledge Audit was developed as a relatively inexpensive and simple method for applying CTA to the process of training development. It focuses on the categories of knowledge and skills that distinguish experts from others, using elicited examples that are based on actual experiences. These categories include: diagnosing and predicting, situation awareness, perceptual skills, improvising, metacognition, recognizing anomalies, and compensating for equipment limitations. The Knowledge Audit employs a set of probes which elicit examples of the types of skills used on the job. As training developers, we seek to discover the nature of these skills,

to identify specific events as required, and to determine strategies that capitalize on these skills. This information can then be used to guide the focus of training.

Knowledge Representation

Knowledge collected during the course of this study is represented within Decision Requirement Tables (DRTs), which can be found in Appendixes A and B. The DRT is a format Klein Associates developed to decompose and represent data on judgments and decision making. It does not rely on any single knowledge elicitation method and benefits from multiple data sources.

The DRT organizes detailed and specific data so that one can get an overview across situations and events. DRTs can also provide insights into how tasks are similar or different in terms of the cognitive activities they involve. They can point the way to effective training applications by identifying and decomposing the high-impact (key) decisions involved in proficient performance, and providing direction for training curricula and techniques. It is important to keep in mind that the DRTs are focused on use, rather than abstract analysis. The DRTs permit training developers to center on the judgments and decisions as training objectives (rather than having to make overt behaviors the focus). The DRTs show the training developer the areas of difficulty, and the cues, patterns, and strategies used by skilled decision makers. This front-end CTA work is essential for developing an effective program of instruction.

The DRTs that were developed highlight the considerations experts take into account when making platoon leader decisions in the context of building clearing operations. They indicate the nature of the critical decisions and judgments faced by platoon leaders, the reasons certain decisions are difficult, the typical errors novices make, the subtle cues and other factors that impact the decisions, and the strategies used by or aspects of expertise characteristic of experienced decision makers. This information will guide recommendations for training, and will make the job of curriculum development more tractable.

In formulating a program for training Army platoon leaders to manage MOUT operations, a training developer can go down many different paths, and monopolize the entire course with factual information relevant in these settings. However, consider what happens if we incorporate decision requirements. A host of materials from historical incidents becomes relevant for illustrating issues such as how teams were employed, how routes were determined, and where mistakes were made. Elements can be taught in the context of the cues and factors that are considered when assessing a situation. Scenarios can be developed that pose dilemmas around those decision requirements, create certain types of ambiguity, and require the trainee to judge which types of information are necessary and are easy to obtain within the time constraints. Feedback sessions can be directed at the strategies used to assess a situation, along with the strategies for carrying out the responsibilities. An understanding of decision requirements is important for identifying and framing these types of interventions.

In using decision requirements to guide training, it should be possible to extend current systems approaches to training which concentrate on the *behavioral* tasks to be performed.

Decision requirements will enable us to enhance current approaches by incorporating the cognitive aspects of proficient task performance. And if we can help trainees learn how to size up situations and make decisions, we can do a better job of teaching cognitive skills that can generalize across domains and across contexts.

Data Collection and Analysis

Klein Associates conducted nine semi-structured, two-hour interviews with a total of seven active duty or retired soldiers (two were interviewed twice). These participants were all Ranger qualified, with a wide range of backgrounds and a wealth of experience. During the first round of interviews, we talked with a Sergeant, a First Sergeant, two Lieutenants, and a Captain. The Sergeant had a total of 12 years in the Army including experience in conventional light infantry, in scouts, at the Ranger Training Brigade as an instructor, and in MOUT operations in Somalia, including the "Blackhawk incident" (Bowden, 1997). The First Sergeant had over 18 years experience in the Army. He had been a platoon sergeant and had acted as the platoon leader when the platoon was without a Lieutenant. One of the Lieutenants interviewed participated in Special Forces as an enlisted soldier for approximately three years with training in Belgium, Rwanda, and Denmark. He also had participated in several Joint Readiness Training Center MOUT exercises, and several MOUT exercises at Fort Benning. The other Lieutenant had eight years in the Army, which included MOUT training in England and a deployment to Bosnia. The Captain was an instructor with the Ranger Training Brigade at Fort Benning, with 7 years experience including a year as a platoon leader and deployments to Haiti and Bosnia.

During the second round of interviews, we interviewed a retired Sergeant Major and a retired Colonel. The Sergeant Major had over 26 years experience in the Army with Special Operations deployments to Nicaragua and Grenada. The retired Colonel also had extensive experience in MOUT environments at levels much higher than the platoon, and thus provided aspects of the bigger picture involved in clearing a building. On the third round of interviews we conducted follow-up interviews with two of the previous participants: the First Sergeant from the first round and the Sergeant Major from the second round.

Interviewing MOUT subject matter experts (SMEs) with a wide variety of roles, positions, and experiences allowed us to analyze the building clearing task from different perspectives. The three non-commissioned officers we interviewed had a total of 57 years of experience implementing orders and carrying out missions in places such as Somalia, Germany, Vietnam, Nicaragua, and Grenada. The Captain and Lieutenants were able to discuss building clearing operations from a platoon leader's perspective. The retired Colonel supplemented the data collection by providing information and constraints from the perspective of a platoon leader's superior.

Interview Methods

Our first five interviews were structured by the Task Diagram, one of the knowledge elicitation techniques in the CTA toolkit. The Task Diagram provided us an overview of the

building clearing task and enabled us to identify cognitively complex elements. In conducting the Task Diagram interviews, we asked the interviewees to identify the primary four to six steps involved in clearing a building. Once these steps were elicited the interviewee was asked to identify which steps required difficult cognitive skills: critical judgments, assessments, and problem solving. Once the major tasks in clearing a building had been identified, we used Knowledge Audit and CDM probes to elicit further details about each task.

We developed a list of Knowledge Audit probes designed to describe the nature of perceptual, diagnostic, metacognitive, recognition, and compensation skills. In addition, we elicited the circumstances surrounding specific operational events in which they were required. Probes such as the following were used:

- What is important about the big picture when clearing a building?
- If the platoon leader had to turn over command to a subordinate, what would he tell them?
- What are the major elements a platoon leader has to know and keep track of?
- When clearing a building, have parts of the situation ever “popped out” at you and you noticed things that others didn’t catch?
- Can you think of a time when you noticed an opportunity to do something better?

The strength of the Knowledge Audit is that it enabled us to rapidly survey the nature of expertise in MOUT environments.

The Critical Decision Method probes centered on specific, personally experienced incidents in which the interviewees felt especially challenged while clearing a building. The incidents anchored the interviewees so they could speak in specific terms versus describing a generic building clearing operation. The fact that it was a difficult mission assisted in the recall of specific cues, judgments, decisions, challenges, expectancies, and leverage points. For example, when eliciting critical cues we used probes such as the following:

- What information did you actively seek to make your decisions?
- What cues did you notice that a less-experienced leader would not?
- What did you interpret those cues to mean?
- Describe your situation awareness at different points during the incident.

By probing in the context of a specific building clearing incident we were able to elicit rich contextual information.

The information gathered during the first five interviews was subjected to initial analysis, and the findings were catalogued into DRTs. The two interviews conducted during the second round of interviews used the DRTs as a point of departure. We explained to the interviewees that the tables represented some of the cognitive aspects of clearing a building and that the purpose of the interview was to complete some of the gaps in the tables. These gaps consisted of both information that required expansion and information that was absent. These interviews focused on the cues and patterns of cues that an experienced soldier notices, as well as the implications of

these cues for the mission. For example, when approaching a building the sight of freshly turned dirt may indicate the presence of mines. We walked the interviewees through the different tasks of clearing a building, using Knowledge Audit and CDM probes to reveal cognitive components and elicit concrete examples when possible.

The information from these interviews was then incorporated into the DRTs. These updated tables were used to conduct two additional interviews during the third round of interviews. The DRTs were again used as a stimulus for discussion of concepts and specific incidents, which led to a deeper understanding of the cognitive aspects of clearing a building. The data collected during these interviews was then analyzed and integrated into the existing DRTs.

FINDINGS

The findings of this investigation are represented within DRTs which encompass the data from all nine interviews. Each DRT centers on one identified decision requirement, and the information within the table details the cognitive aspects related to that decision requirement. These cognitive aspects include the critical decisions and judgments relevant to each decision requirement, the unique challenges of each critical decision or judgment (i.e., why the decision is difficult), the subtle cues (i.e., pieces of information that are directly perceived from the environment) and other factors (e.g., pieces of general background knowledge) that shape the decision, and the strategies employed or aspects of expertise possessed by the decision maker.

The decision requirements identified in this effort fall into two distinct, yet related, categories. The first category includes the *task-focused* decision requirements. These requirements are directly related to the subtasks involved in a building clearing operation. They are linear in nature in that the platoon leader will generally address them one at a time and in the order presented below. The task-focused decision requirements are:

- Determine how to secure the perimeter
- Determine how to approach the building
- Determine how to enter the building
- Determine how to clear the building
- Determine how to maintain and extend security

The second category is comprised of *task-independent* decision requirements. These decision requirements encompass the task-focused requirements; they are critical across all stages of a building clearing mission. At any point during the operation all of these decision requirements should be active. The task-independent decision requirements are:

- Maintain the enemy's perspective (Think like the enemy)
- Lead subordinates
- Maintain the big picture and situation awareness
- Project into the future

Figure 1 depicts the relationships among the decision requirements. The decision requirements inside the box are task-focused. The decision requirements in the circles are task-independent, and apply across all of the task-focused decision requirements. While each decision requirement has a distinct nature, there is tremendous overlap among requirements. Placement of perimeter security will influence the decisions made during the approach, entry, and clearing of the building. Information collected during the approach and entry will impact the manner in which the platoon leader instructs the clearing to occur. The method by which the platoon leader decides to clear the building will affect the location and technique by which he will decide to approach and enter the building. Furthermore, the task-independent decision requirements have a large impact on each of the task-focused requirements and on each other. The platoon leader's situation awareness and projection of future events will shape his decision making as he secures the perimeter, approaches, enters, and clears the building, and maintains security within the building. Moreover, his situation awareness will be molded by his ability to think like the enemy, and in turn, his situation awareness will mold his projection of future events. Throughout the mission, the platoon leader's leadership abilities are crucial.

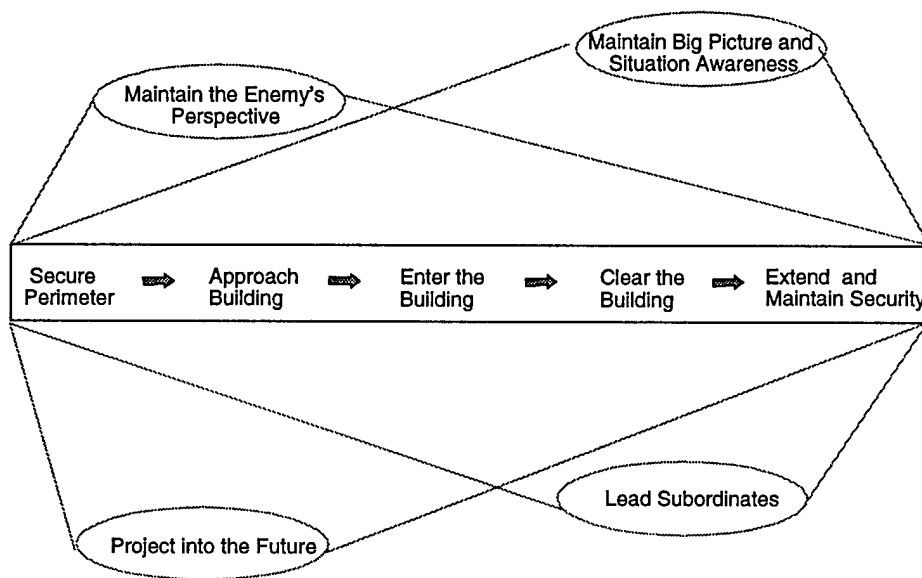


Figure 1. Decision requirements within the building clearing operation. The decision requirements within the rectangle are task-focused. The decision requirements in ovals are task-independent, and are operative across all of the task-focused decision requirements.

Note that each of the nine decision requirements is relevant during pre-mission planning, preparation, and mission execution. In nearly every building clearing operation, the plan developed prior to the mission will break down to some extent during its execution.

Therefore the platoon leader will be forced to adjust the plan on-the-spot, as the environment presents unexpected obstacles or additional information cues. For the purposes of this project, we have focused on the decisions and adjustments a platoon leader must make during mission execution. While the planning and preparation stages present their own variations of these unique challenges, it is during mission execution that decision making becomes time pressured, the situation continuously changes, stakes are high, and uncertainty runs rampant. This is the time when decision making becomes the most challenging for the platoon leader.

"The plan only lasts until the first bullet goes down range."

(This quote and the quotes to follow can be attributed to one of the seven interviewees.)

Task-Focused Decision Requirements

The task-focused decision requirements correspond to distinct stages of the building clearing operation. In this section of the report we introduce the five task-focused decision requirements and provide a discussion of some of their corresponding issues. Due to the immense size of the data set, we do not present all data within the main body of this report. Instead, we introduce the data here and refer interested readers to the unabridged DRTs in Appendix A.

Decision Requirement: Determine how to secure the perimeter

The task addressed by this decision requirement has to do with strategically placing units around the outside of the objective building in order to provide fire support to the clearing units and maintain external security. Depending on the mission, the support element will provide cover and/or backup fire during all stages of the mission (the approach, the entry, and the clearing), will prevent people from entering or exiting the area surrounding the building, and will serve as an overwatch or early warning function for the platoon leader and higher command. Without a secure perimeter, the clearing units and their mission will be in severe jeopardy.

Determining how to secure the perimeter occurs to a great extent during the planning stage prior to the mission. However, given the difficulty of pinpointing the environmental conditions under which the

mission will occur, most plans will require at least minor adjustments once the mission begins. The DRT for this decision requirement, found in Appendix A, presents the critical decisions and judgments related to adjusting perimeter security once the mission has begun, as well as the cues and factors that influence the platoon leader's decisions and strategies that are used to make the determinations. The critical decisions and judgments within this decision requirement include:

"A support by fire position will make or break you."

- *Determine how to seal off the area*
- *Determine where to place security assets*
- *Determine which assets and people to employ*
- *Determine where to concentrate fires*
- *Determine how to synchronize and shift fires*

Sealing off the area is a decision for which the goal is to prevent unwanted people from entering or exiting the area. The first thing a platoon leader must do is determine what the "area" consists of. Experienced platoon leaders know that if the conflict is one of high intensity the area will probably be relatively large, since the company will most likely be clearing more than one building. In lower-intensity conflicts, the sealed off area will generally be smaller. Other factors that come into play when sealing off the area surrounding the building include the enemy's capabilities to engage (i.e., their weapons and their suspected locations) and the proximity of the objective building to other buildings and intersections. For example, if the enemy is known to use relatively long-range weapons, then a larger area surrounding the building might be sealed off. And if the objective building is in close proximity to other buildings, the sealed-off area may be smaller; the buildings within close proximity must be sealed off since they enable observation and firing access to the objective. On the other hand, buildings and areas further from the objective are masked by those which are closer. In this case, even though the area to be sealed off is smaller, a significant number of security personnel would likely be involved due to the increased cover and concealment opportunities offered by the buildings.

Another interesting decision within this decision requirement is the judgment regarding *which assets and people to use for a security position*. A skilled platoon leader will determine the security assets best suited to the situation, and will then match individuals to those assets based on their capabilities, since some soldiers are better with some weapon systems than others. Generally these match-ups occur prior to the mission, but on occasion the situation will call for some switching of personnel and assets within the security element.

Decision Requirement: Determine how to approach the building

The platoon leader's goal in this decision requirement is to get his units to the building in the safest, quickest, and most effective manner. Sometimes the approach will be by air (via helicopter), sometimes by ground (on foot or in vehicles), and sometimes under ground (through sewer systems or tunnels). Although transportation of soldiers may seem simple enough, the challenge occurs when you factor in the will of the enemy to keep friendly forces from accomplishing their mission. This stage of the mission is characterized by high-threat areas (e.g., open areas surrounding the objective, open streets, and intersections) and the potential presence of several hidden threats (e.g., snipers hiding in upper stories of buildings, booby traps, and other obstacles). In addition, as will be discussed, some aspects of expertise related to this decision requirement seem counter-intuitive on the surface, which makes it difficult for less-experienced platoon leaders to effectively approach and gain access to the objective building. The critical decisions and judgments within this decision requirement include:

- *Determine route and/or method of approach*
- *Determine how to navigate streets*
- *Identify hazards, constraints, and constrictions*
- *Determine how to obscure the assault*

Ideally, the decision of *determining the route and method of approach* will occur largely during the planning phase, but will inevitably be altered to some extent during mission execution. The driver for this decision is to maintain the safety of the platoon while accomplishing the mission. This requires avoiding open areas which make soldiers easy targets, taking advantage of cover and concealment opportunities (e.g., wooded areas, walled-in courtyards, and buildings), and choosing the best route possible. In situations where it is difficult to find a safe route, it is important to obscure the assault (which is another critical decision in itself).

While approaching an objective on foot, it is likely that the platoon will be forced to *navigate* to reach the objective. Usually this navigation is through streets. Experts have learned the importance of moving quickly down the streets, as well as the danger involved in hugging heavy-duty walls, such as concrete, while moving down a street. This is one aspect of expertise that seems counter-intuitive to most inexperienced platoon leaders. Typically, soldiers will think of walls as a form of protection, but in reality a wall acts almost as a bullet magnet, since bullets that hit walls tend to ricochet off and travel closely along them.

During the approach, whether by air, land, or underground, the platoon leader must *identify hazards, constraints, and constrictions*. The goal of this decision is to detect threats in order to avoid or neutralize them, thereby maintaining the safety of the unit and the accomplishment of the mission. This can be challenging because the potential threats are numerous and often hidden from view, troops moving on foot are very vulnerable, especially when in open spaces, and accurately determining sectors of fire can be complicated. In order to identify the hazards, the platoon leader must look for specific cues in the environment and interpret the pattern of cues to make a determination as to what is a hazard, whether the hazard must be neutralized or avoided, how to do so, and whether the hazard can be used to his own advantage. For example, the platoon leader might notice a series of obstacles that tend to force (channelize) his unit in a certain direction. He might also notice that the obstacles lead his unit to an intersection or other open area. Or, he might note that one or more tall buildings in the area have windows with line of sight to his unit's location if he allows the obstacles to channelize the unit. In addition, suppose the platoon leader's company has operated in this area for a few weeks, and other platoons have reported instances in which the enemy has led friendly units into ambushes. This pattern of cues and factors suggests a likely enemy ambush. Moreover, suppose the platoon leader has placed his security element in a location that does not have line of sight to the presumed kill zone. This factor makes a potential ambush all the more threatening to the unit since the platoon would have little ability to counter once

"We need to keep an eye on the tall buildings since the enemy might have snipers up there. We also want to look out for anything out of the ordinary that might suggest a trap. For example, freshly dug dirt in an area would make me think there's a booby trap nearby."

engaged. A good platoon leader can use the environmental cues and other factors to build a story (the ambush prepared by the enemy), mentally simulate the next chapter in the story (the platoon's lack of ability to counter), and subsequently make a decision. In this case the platoon leader might choose an alternate route to the objective building. If no alternative exists, he may need to provide this information to his company commander, who may then decide to abort the mission.

Note that this scenario provides a nice example of how the task-independent decision requirements become mandatory in implementing the task-focused decision requirements. In this case, the platoon leader was forced to *view the situation from the enemy's perspective*, and *project events into the future* in addition to identifying the hazards, constraints, and constrictions.

Decision Requirement: Determine how to enter the building

This decision requirement involves determining an entry point. The entry point must be relatively accessible, must provide a good starting point, and must not present a significant threat to the clearing unit. The entry may be from the roof, through a top story window, through a ground level wall, through a door, and even through underground sewer pipes. Given the wide variety of entry point possibilities, the need for mentally representing the MOUT environment in three dimensions becomes apparent. The critical decisions and judgments related to entering the building are:

- *Determine the strengths and vulnerabilities of the building and its inhabitants*
- *Determine the point of entry (where to enter the building)*
- *Determine entry technique, and equipment to be used (how to enter the building)*
- *Consider tradeoffs between stealth and speed*

The platoon leader's first critical assessment in this stage of the mission will be to size up the building in order to *determine its strengths and vulnerabilities*. This is often difficult for the platoon leader as he often has so little time to reconnoiter the area and make an assessment. Instead, he

must rely on subtle cues in the environment to make his assessment. He will look for signs that the building has been fortified (see Table 1) or signs of a potential ambush. He will also watch for aspects of the building (or its inhabitants) that have changed since he last saw it (if he has previously operated in the area), or aspects that seem out of the ordinary. For example, if the local people appear to be avoiding an area around the building, like a patch of ground or the front door, then it is likely that the area is dangerous. In addition to relying on environmental cues to determine the building's strengths and weaknesses, skilled platoon leaders work under a set of rules-of-thumb when the situation allows. One "rule" is to avoid doors altogether. Doors are referred to as "fatal funnels" because the enemy frequently fortifies them heavily with the understanding that they are the most easily accessible entry point for invaders and because doorways act as a frame that allows the enemy to be more likely to hit the assault element.

"If you see that there are people in the building, but they're all avoiding the front door, then the door's probably booby trapped."

Table 1. Indicators of Building Fortification

Cue	Significance
freshly upturned dirt	potential booby trap
broken out windows	enemy firing position
wire behind windows	enemy is preventing grenade attack into that room – potential housing of people or resources
gun ports in wall	enemy firing position
sandbags	reinforced position
stacked materials	reinforced position
gaps in wall	bunker or reinforced position

Once an assessment of the building's strengths and vulnerabilities has been made, the platoon leader can use that assessment to *judge the best entry point* and *determine the entry*

"Don't expect to get in easy. If you do get in easy, expect to find a surprise waiting for you."

technique. Generally the platoon leader will choose an entry point and technique which will shield his soldiers from danger, to the greatest extent possible. If a "safe" entry point does not exist, which happens frequently, then a good platoon leader is likely to choose the point and method that can be executed most quickly, so

that the unit is subject to danger for only a small length of time. In many situations the safest and quickest entry point is the roof of the building. Furthermore, top-down clearing is the preferred method. However, there are situations in which a helodrop onto the roof is not realistic, perhaps because the roof is slanted, or the enemy has strong air defenses, or the unit does not have access to a helicopter transport. When the platoon leader is forced to enter from the ground (whether through a door or window or wall breach), he may take measures to distract and disorient the enemy in order to buy time to enter the building. This disorientation might entail, for example, a feigned attack by another unit or a subset of the leader's own platoon. Another strategy used by experienced leaders is to choose an entry point that is not the most logical one. The idea is to surprise the enemy by entering at a location that is not expected, and thereby gain an advantage over the enemy. One way a platoon leader might foil the enemy's expectation is to choose an entry point and technique different than what his unit and adjacent units have recently employed. A key to a successful entry is the ability to think like the enemy.

Every situation is different, which means that building entry points and entry techniques can vary drastically. What is completely inappropriate in one operation might be the best or *only* option in another operation. For example, one interviewee told of a building clearing in which they helodropped onto the roof of the building, and then hung over the side of the building and

entered through a third floor window. This left them extremely vulnerable to the enemy, but it was their only realistic option.

Decision Requirement: Determine how to clear the building

This decision requirement involves the actual clearing of the building, room by room and floor by floor. Many challenges arise for the platoon leader during this stage of the operation. His job is to orchestrate the clearing, which entails split-second decisions to direct his clearing teams, limited yet critical communication with the clearing and support (outside the building) teams, construction of situation awareness inside and around the building, and judgments of the welfare and morale of the platoon. The DRT for this decision requirement, shown in Appendix A, details the decision-making issues during the actual clearing stage of the operation. The nine critical decisions and judgments within this decision requirement are:

- *Assess the situation within the building*
- *Determine the flow of the clearing*
- *Determine how to employ personnel and teams*
- *Determine how and where to proceed*
- *Communicate directions and information*
- *Determine how and when to evacuate casualties*
- *Determine whether to request reinforcements or call for fire*
- *Determine the mental and physical state of the soldiers*
- *Determine when the clearing is completed*

Assessing the situation within the building is a high-impact decision task. The platoon leader's assessment enables him to continually build his situation awareness and form expectancies about how the remainder of the mission will go. It also assists him as he makes the other eight decisions and judgments. The assessment will influence his determination of the flow of the clearing, employment of personnel, determination of where to proceed, communication with his subordinates, casualty evacuation strategy, calls for reinforcements and fires, and determination of when the clearing is completed.

The assessment task can be quite challenging for an inexperienced platoon leader. It requires him to process visual and auditory cues from the environment and produce a mental picture of the situation. The mental picture must encompass not only what is occurring in the present, but also what is likely to occur in the near future (e.g., What will happen when we move to the next floor? This is related to the task-independent decision requirement, *project into the future*). Given that the platoon leader generally stations himself behind the lead element, much of the information he uses to assess the situation comes through verbal communication with the lead element. Furthermore, voice communication is minimized to prevent the enemy from gaining information about the platoon. Squad and fire team leaders are trained to communicate in quick, short phrases, and only describe what they see rather than attaching an inference to the information. The onus to develop an assessment falls completely on the platoon leader.

As evidenced by the DRT for this requirement, several information cues feed the platoon leader's assessment of the situation. For less-experienced platoon leaders, it is often difficult to attend to and interpret a large number of cues, as well as a wide range of different types of cues. Moreover, platoon leaders are challenged to continually make 'next step' decisions based on their assessment, even as they continue to update that assessment.

The judgment regarding *how and where to proceed* is a 'next step' decision. It is difficult for a number of reasons, most notably the high degree of uncertainty related to each potential move, the challenge of assessing the tradeoff between mission accomplishment and safety of the unit, and the need to prioritize aspects of the clearing effort. The determination is based on the platoon leader's assessment of the overall situation, but especially on the specific cues and factors listed in the DRT for *determining how to clear the building*. One important factor is the mission's objectives. These frame the platoon leader's decision making in that the actions he takes must work toward accomplishment of the objectives. If the objective is to gain control of the entire building, it is likely that the platoon leader will clear every room in every area of the building. If he is conducting a snatch mission in which the objective is to capture a person or persons, he may actually clear only the areas where he believes the suspects are located (while guarding his flanks to address any potential threats from other areas of the building). As discussed above, the cues that will shape the platoon leader's decisions and actions will largely come through verbal communication with his forward clearing team(s), in addition to direct visual cues. An experienced platoon leader will watch and listen for the following:

- Indications of the building's level of fortification
- Weapon and ammunition stores, maps, equipment, and medical supplies
- Reports from clearing teams regarding number of enemy encountered
- Enemy weapons
- Friendly casualty reports
- Reports from the security element regarding whether enemy personnel have exited the building (generally if the enemy is exiting the building, the platoon leader might infer that they are not prepared to stay and defend the building)
- Reactions of civilians within and outside the building

Various combinations of these types of information will mold the platoon leader's judgment of what to expect in an area of the building and thus how to prepare his soldiers accordingly. For example, he may instruct them to change their weapons or ammunition once the enemy's capabilities have been identified. The platoon leader might also make the determination that the threat within the building is too great, and that the clearing must either be aborted or reinforcements must be attached to his unit to complete the mission. (Note that the company commander is the one who actually decides whether to abort the mission or send reinforcements; the platoon leader only makes a recommendation.)

While simultaneously assessing the situation and determining what actions to take to clear the building, the platoon leader also judges *how best to employ his subordinates* in order to accomplish the clearing tasks (e.g., clearing a room, moving down a hallway, or providing security). This decision has to do with determining the number of people required for each task and judging which individuals will be able to accomplish each task. The platoon leader may decide that the threat in the building is relatively low, and subsequently will split an element (i.e., squad) to cover the area more quickly. He will also need to make an assessment of each individual's and team's level of fatigue in order to determine how they can be employed. A skilled platoon leader will go into a mission having

"A soldier's adrenaline is so high when he's clearing rooms that he can get fatigued pretty easily. That's why we leapfrog a fresh team to continue the clearing after the first team has taken care of three or four rooms.... But it will all depend on the situation."

developed a personality profile of sorts for each of his soldiers. He will know which individuals freeze up in the face of danger and which soldiers function well under stressful conditions. While conducting the operation he will judge levels of fatigue based on what the team or individual has encountered thus far, and more importantly, the look in their eyes. An experienced platoon leader can see fear in peoples' eyes and judge whether a person is ready for action or needs a break from the clearing. As a rule, skilled platoon leaders leapfrog clearing elements so that a fresh unit enters the picture every 3-4 rooms, depending on the situation. Also, teams or individuals who are too fatigued may be tasked to provide security in a room or area (see the decision requirement to *extend and maintain security*), rather than continue the extremely physically and mentally exhausting room clearing tasks. If the platoon leader determines that enough of his subordinates are too fatigued to continue clearing in a safe manner, he may decide to request reinforcements from the company commander.

Decision Requirement: Determine how to extend and maintain security

During the process of the actual clearing it is imperative that the clearing unit secure areas of the building that have already been cleared. The overall purpose of this decision requirement is to protect the clearing unit while in the building. The critical decision within this decision requirement is:

- *Determine where to place security elements*

The decision regarding *placement of security elements* serves both to maintain areas that have already been cleared and also protect the platoon from threats in areas that have not yet been cleared (and may not be cleared at all). As discussed in the previous section, the technique frequently used by platoon leaders to maintain security entails tasking one clearing team (generally four soldiers) to clear three or four rooms (depending on the building and the circumstances of the mission) and then remain in or near the rooms to keep them secure. A second clearing team will leapfrog the first and take responsibility for clearing the next set of rooms, securing them, and so on. This technique not only enables good security, but also maximizes the effectiveness of the clearing unit in that it assists in controlling fatigue levels.

The latter purpose, to protect the unit from potential threats in areas that have not been cleared, entails placing small security teams (or individuals) in strategic locations such that they can identify and address threats coming from areas that the clearing team has not reached. For example, imagine a square or rectangular building in which the hallway follows the walls of the building, with rooms on either side of the hallway (see Figure 2). The platoon leader will typically direct the clearing to occur down one hallway at a time, such that the clearing team(s) will end up at the place they started. The platoon leader will probably NOT allow two clearing units to clear simultaneously down different hallways, such that eventually they meet up in the middle of one of the hallways. This would put the platoon at a high risk for fratricide, especially if the enemy threat within the building is high. Given that the clearing will most likely occur in one direction, one hallway at a time, it is imperative that a security unit be placed to address any threats coming from the last hallway to be cleared (i.e., threats that attempt to sneak behind the clearing element). However, the placement of the security element in this case is a bit tricky, because the platoon leader will need to ensure the security personnel do not mistake the clearing team for the enemy. To avoid fratricide here, the platoon leader will designate non-overlapping sectors for the security and clearing elements.

"You can never put a security unit in a position where it'll be approached by a clearing element. Always keep that team one turn back."

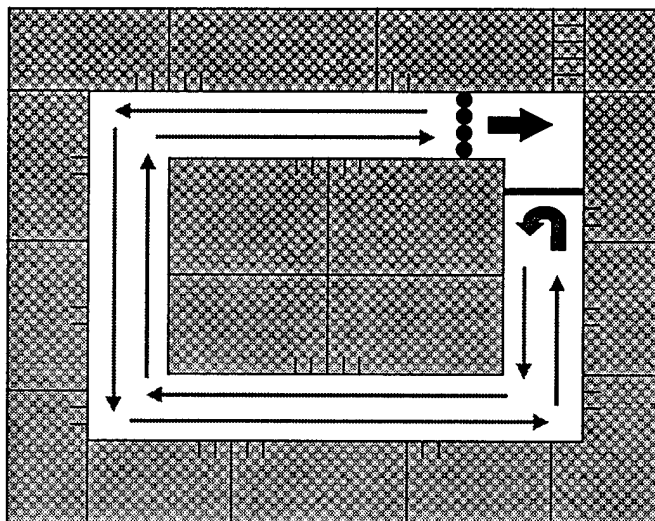


Figure 2. Maintaining security while clearing a floor of a building. The circles and arrow in the upper right hand corner represent the position and orientation of the security element. The arrows circling counterclockwise and then back clockwise represent the direction of the clearing element. Note that the clearing element stops and turns around prior to reaching the security position.

Task-Independent Decision Requirements

The task-independent decision requirements represent judgment and assessment skills that should be operative throughout a building clearing operation and that should shape decision making within each stage of the operation. For this reason, a significant degree of overlap exists between the data in the task-independent and task-focused decision requirements. Still, we discuss the task-independent decision requirements separately in order to highlight their criticality to each and every building clearing operation. In this section we introduce each of these decision requirements; the complete DRTs are presented in Appendix B.

Decision Requirement: Maintain the enemy's perspective (Think like the enemy)

According to subject matter experts SMEs, this is one of the most critical yet most difficult decision requirements. Throughout mission execution a good platoon leader will continuously put himself in the enemy's position and think like the enemy in order to guide his own decision making. The critical decisions and judgments within this requirement are:

- *Identify the most likely enemy course of action*
- *Identify the most likely enemy location*
- *Identify how the enemy can exploit friendly vulnerabilities*
- *Anticipate enemy deception techniques*

These judgments will influence every action and decision that the platoon leader makes during the course of the mission. They will serve as additional cues to shape decision making. For example, an experienced platoon leader will use his understanding of the enemy's presumed goals and his assessment of leverage points (e.g., tall buildings or key intersections) within the area to predict enemy actions and positions. In addition, he will use cues from the immediate environment to determine the enemy's plan or location. Signs of fortifications around a building such as wire behind windows or gun ports in the walls may indicate that the building is a strongpoint. By making an educated guess as to what the enemy is doing, platoon leaders can most effectively accomplish their own missions.

One of the most critical skills in taking on the enemy's perspective has to do with thinking about situations in three dimensions. When SMEs talk about the three dimensions of the MOUT battlefield, though, they are referring to more than what most of us think of as three dimensions. Those dimensions are forward and backward, up and down, and left and right. For MOUT platoon leaders, it becomes crucial to mentally *extend* these dimensions. That is, when thinking about what is on one's left and one's right, the platoon leader must be able to expand his visual field to include what is on the other side of the walls. The enemy may be on the other side, or perhaps even friendly soldiers.

Maintaining the enemy perspective is a more complicated decision requirement than it often appears at face value. Soldiers at all experience levels will tell you that it is important to think like the enemy. However,

only those soldiers with extensive practice and experience can do it. The requirement is to actually put oneself in the enemy's presumed mindset and plan from that perspective. What are the vulnerabilities of enemy's enemy (i.e., the friendlies)? How can he best exploit his strengths against those vulnerabilities? What are the key leverage points (e.g., buildings with good vantage points, intersections, or well-constructed buildings) in the environment? These questions mirror the aspects of OCOKA that Rangers use to guide their consideration of the enemy's perspective: observation; cover and concealment; obstacles; key terrain; and avenues of approach. The goal of this decision requirement is to internalize the enemy's objectives and the most promising strategies for achieving those objectives, so that actions can be taken to deny the enemy his objectives.

"You have to put yourself in his shoes. You say to yourself . . . If I was him, what would I do to accomplish my objectives?"

The DRT for this decision requirement presents additional cues and factors that assist platoon leaders in predicting the enemy. The DRT also describes strategies used by experts to maintain the enemy perspective, and lessons that have been learned in terms of assessing enemy actions.

Decision Requirement: Lead subordinates

This decision requirement is about managing a distributed team in order to sustain a contiguous flow of operation. The platoon leader will lose the ability to maintain his situation awareness and orchestrate the operation if he cannot maintain leadership over his subordinates. The critical decisions and judgments within the decision requirement include:

- *Clearly communicate with and direct subordinates*
- *Maintain control of subordinates*
- *Judge the combat effectiveness of individuals*

All three of these critical decisions can be difficult due to the distributed nature of the team, the frequently chaotic environment in which it works, and the tendency for communications gear to break down.

The importance of the first decision task, to *clearly communicate with and direct subordinates*, lies in the need for calibration and integration of the efforts of each squad and fire team. As the platoon approaches the building, all individuals must have a shared understanding of the approximate route to be taken and the role of each team in getting to the building. For example, in a high-threat situation where the platoon is approaching on foot, the platoon leader may designate a certain squad or fire team to support or cover the movement of another. Upon entering the building, all subordinates must have a shared understanding of where and how the entry will take place, which fire team will enter first, and how much time is available to conduct the entry. This last piece of information is crucial, and the platoon leader must have an effective

way of expressing time criticality to his platoon, especially among less-experienced members. During the actual clearing of the building, the platoon leader must impart to his squads and fire teams exactly what their roles are at any given time, and at least an approximate understanding of the roles of other teams. That is, each fire team should know how its current task relates to the tasks of other fire teams, and how the various tasks each support mission accomplishment.

The decision task of *maintaining control of subordinates* comes strongly into play in building clearing because of the chaotic and high-stress nature of the environment. Under these circumstances, subordinates often want to just clear the building and then get out, without waiting for direction from the platoon leader. However, it is the platoon leader's job to make sure this does not happen. On one hand, a clearing conducted without the orchestration of a leader may result in an increased number of friendly casualties (e.g., due to rooms that share a wall being cleared simultaneously) or a loss of potentially critical intelligence (e.g., due to information cues about the enemy being overlooked for the sake of simply finishing the operation and leaving the area). Furthermore, when the platoon leader loses control of his subordinates, they will be forced to make decisions for which they are not responsible and, indeed, are not trained to make.

The final critical judgment within this decision requirement, *judging the combat effectiveness of subordinates*, comes into play especially when the unit has taken casualties. This assessment is judged not only on the physical nature and seriousness of the injuries, but also on the mental toll they have

"You don't really realize you're taking fire until you see a buddy die. Then your feeling of invincibility goes out the window."

taken on the unit. It is important to note here that although the platoon leader makes his assessment of combat effectiveness, the company commander decides how to address the situation by either sending in reinforcements or instructing the platoon to pull out.

Decision Requirement: Maintain the big picture and situation awareness

This decision requirement has to do with keeping track of the events and status within and surrounding your mission. The platoon leader's situation awareness will continually be updated as he takes in additional pieces of information. This information will come from his own visual input, communication with his clearing and support units, communication with his company commander and/or adjacent platoon leaders, and auditory cues from the environment including gunfire, running footsteps, and the like. He will use his situation awareness at all stages of the mission to make decisions. In addition, he will use his situation awareness to set expectancies for what he should or should not encounter, thus projecting into the future. The critical decisions and judgments within this requirement include:

- *Assess mission progress against mission plan and objectives*
- *Assess the big picture situation*
- *Maintain awareness of civilians in the area*
- *Maintain awareness of sectors of fire for all friendly units*
- *Set expectancies*

Assessing mission progress against the plan assists the platoon leader in judging when and how to adjust the plan, and assessing the morale and combat effectiveness of his platoon. His *assessment of the big picture* helps to shape his decisions about future actions and prepares him for what he may encounter next, especially once the clearing is completed and he must exit the building. *Maintaining awareness of civilians in the area* is of great importance because civilians add complexity to MOUT operations, especially when their disposition toward friendlies is unknown or questionable. The platoon leader has to dynamically assess whether civilians are impacting the current operation. He must know their involvement in the past: whether they have been a threat to the platoon (in which case they may be viewed no differently than the enemy), whether they have been an asset (e.g., are willing to collect intelligence for friendlies), or whether they remain neutral. Regardless of their actions in the past, it is always possible their disposition will change, and the platoon leader must keep an eye out for such indications.

"One day you're giving candy to a kid, and the next day he's giving grenades to the enemy."

The decision task to *maintain awareness of friendly sectors of fire* is critical to the prevention of fratricide. While sectors of fire for each platoon generally remain the same throughout the course of a mission, the platoon leader must be prepared for the sectors to change. Finally, the decision task regarding *setting expectancies* is a critical one because it enables the platoon leader to use his situation awareness to project into the future. The importance of projection will be described in the section that follows.

The judgments within this decision requirement tend to be difficult, especially for an inexperienced platoon leader, due to the numerous inputs contributing to situation awareness and the broadness of the big picture, not to mention the high-stress, chaotic nature of close quarters battle. When the platoon is in the building and conducting the clearing, for example, less-experienced leaders tend to focus on aspects of the physical clearing rather than the big picture. That is, they have difficulty juggling all the pieces of information, so they filter out less relevant pieces and attend to the ones that seem to be most relevant to the immediate situation. Those information cues generally have to do with the layout of the building (location of rooms, hallways, and stairwells), potential for fratricide, level of threat, and location of the enemy. The cues they pay less attention to are often communication from units outside the building, or cues inside the building that point to enemy intentions, civilian disposition, or other intelligence that might be useful for setting expectancies in the near or far future.

Furthermore, platoon leaders find that much of the information they use to assess the situation is based on voice communication from subordinates that they must integrate into their mental picture of the situation. When communications gear goes down, so do the opportunities for building situation awareness.

Decision Requirement: Project into the future

At all points during the mission the platoon leader must think ahead to the next steps in the operation. He must consider how current actions are achieving the mission objectives and therefore what subsequent actions must take place to further the accomplishment of the objectives. This entails mentally simulating how current actions will change the situation, and being prepared to make decisions regarding next steps within that new context. In addition, he must mentally simulate the results that might be achieved through the projected next steps to determine whether those are favorable results, and thus adjust his directions to his unit accordingly. Within this decision requirement, the critical decisions and judgments are:

- *Determine where to proceed next*
- *Determine the personnel and unit size necessary for mission accomplishment*
- *Determine where to locate oneself to best direct and support the unit*

It is crucial that these decisions occur well ahead of actual events, otherwise they cannot be implemented in time to have the desired effect.

The difficulty in this decision requirement lies in the inherent challenge of thinking ahead while faced with the urgency and chaos of the immediate situation. However, successful mission accomplishment is contingent on a logical sequence of actions that contributes to the desired end state. One of the errors of less-experienced platoon leaders is an over-reliance on the plan, even when it has become obsolete. It is easy to project and take future actions that are in line with the plan. However, when the plan no longer fits the situation, the prescribed actions fail to have a positive impact.

In addition to the cues and factors listed in the DRT in Appendix B, the decisions within this decision requirement are shaped by the expectancies set by the platoon leader (see decision requirement to maintain the big picture and situation awareness). The function of expectancies is to predict logical next events, whether they have to do with enemy actions, features of the building, or even civilian involvement. And while expectancies will not always be met, they nonetheless provide the best basis from which to anticipate the future and thus determine which actions will best address the future situation. By acting on projected future situations rather than reacting only to the immediate situation, the platoon can stay ahead of the enemy's decision cycle and thereby maintain the edge.

A Mission in Sonaly: One Lieutenant's Experience

The following is a fictitious yet realistic story of a building clearing operation from the perspective of a platoon leader, LT Gasko. The purpose of the story is to enhance the previous sections describing the findings of the CTA, by illustrating a sampling of platoon leader decision requirements within a context-rich tactical scenario. The story's narrative is on the left below. Margin notes are included on the right to indicate decisions, cues, factors, and difficulties identified in the CTA and brought to life in this scenario. See Appendixes A and B for a more detailed description of the decision requirements.

Lieutenant Gasko felt a tightness in his stomach as he walked out of the building where the all too brief meeting had just concluded. His company commander had just informed him and his fellow platoon leaders that a rapid clearing of three buildings on the outskirts of Sonaly had to occur this morning to establish a foothold in the city for the rest of the battalion. The LT was assigned to clear a two-story dwelling directly to the east of his fellow platoon leaders (PLs).

Clearing a building is a tricky deal regardless of the circumstances, but this one was going to be especially tough. The company had just arrived on the edge of the war-torn village of Sonaly the night before. Little intelligence was available on the village. They had used maps to do some rapid planning and coordination among the platoons for the assault, and so they knew the general layout of the buildings, but many things remained uncertain. In what shape were these war-torn buildings? Just how hostile and organized has the local militia become? How will the civilians react to our presence? During their brief planning meeting, the company CO repeatedly answered, "Good question. We'll find out when we get there." Unfortunately, there was no time for certainty on any of these issues. The LT was just going to have to do his reconnaissance online, as the mission unfolded.

The LT spent the next few minutes briefing his squad leaders (SLs) on the situation, and formulating a rough plan. He had one truly seasoned SL, and he chose this squad to conduct the breach. He knew this could be a tricky one, and he wanted his best men to handle it. The LT also spent a few extra minutes with his newest SL, who had limited experience in this area. The LT gave the SL a quick briefing on what supplies the squad should be carrying. He reminded the SL that soldiers will go through water very quickly in these situations. Be sure to bring enough. The LT also had a suspicion that heavy explosives might be necessary for breaching if the doors were not an option, so he told the SL to drop a couple of the shotguns in favor of the explosives.

"It's time to move out!" the LT calls. The platoon moves toward the edge of the city, using a treeline for cover. Surprise is always a good thing to have in these assaults, the LT knows, but, once they reach the city, they may have to compromise surprise for speed. As the platoon nears the edge of town, the LT observes that the buildings are packed tightly together, and seem pretty much intact, and the walls appear to be made of thin concrete. He also notices that there are several metal barrels on both sides of the streets. He calls out to his SLs: "1st squad take the left side of the street, 2nd squad the right! Let's be quick and quiet!" Knowing that bullets would ricochet close to the concrete walls, he also tells his SLs to stay away from the walls. He also reminds them that bullets will go through the barrels, just in case they try to use them for cover.

Receipt of Commander's Intent and Mission Objectives

There is little background information available; the LT will have to depend on cues identified at the building

There is a high degree of uncertainty: type of buildings, organization of militia, attitude of civilians

Imparting Commander's Intent is part of decision requirement to Lead subordinates

Factor: personnel strengths
Implication: assignment of tasks, how much information to impart

Decision: what supplies to take with you

Rule of thumb: each person will drink about a gallon per hour

Decision: how to navigate; how to clearly communicate with subordinates

Conflicting goals: surprise versus speed

Cue: density and makeup of buildings

Implication of concrete: bullets will not penetrate, they will travel along the wall

Cue: metal barrel

Implication: it can be used for concealment but not for cover since bullets can penetrate the barrel

As they approach the building to be cleared, the LT gets his first good look at the objective. His mind is processing at a mile a minute, and in about 10 seconds as they draw closer to the building, the LT considers the following: "One or two civilians around the building, but they'll clear out when they see us. The rest of the civilian populace has been doing the same. No mobs forming; no adverse reaction to our presence; no reason to expect trouble from them. We'll leave them alone for now in accord with the rules of engagement (ROEs)."

"Our plan calls for speed; crashing through the main door, but that's not going to work. We'd be walking into a trap." The LT at once notices many things that tell him this: The civilians are avoiding that door like the plague. There is wire strung all the way around the front of the building except for the door. Other barricades block the other entrances in the front of the building. "The enemy expects us to come through that door," he thinks. "They'll be waiting for us. If I was them, I'd have a bulk of my inside forces – including the AK-47s they tend to use – focused on that door...and maybe some outside forces!" Thinking of where he would put a sniper if he was the enemy, the LT scans the surrounding buildings. He sees the perfect spot: A two-story tower across the intersection from the building. A sniper in that second story would have a perfect vantage point of the main door. "Alright," he thinks, "we can't let that sniper get a shot."

The LT is also looking at the building material. Non-reinforced concrete...not too thick. "We could blow through that," he thinks. Earlier, the LT had planned for such a contingency, and had members of his platoon carry enough explosives to breach the building by blowing a hole in the wall. They had to leave behind some other ammunition, but the LT now sees it was a good trade-off. "If we blow through the wall, we'll catch the enemy inside off-guard, but we'll be exposed outside for a longer time. In this case, the element of surprise is worth the risk."

Decision: maintain awareness of civilians in the area
Cue: civilians clear out, there are no mobs
Implication: civilians are not likely to cause trouble
Factor: ROE must be taken into consideration

Decision: determine strengths and vulnerabilities
Cue: civilians avoiding the door, wire strung around front of the building, other entrances are blocked
Implication: the enemy wants them to enter through the front door
Decision: put self in the enemy's situation
Decision: identify hazards, constraints, and constrictions
Cue: two-story building across from the front door
Implication: likely spot for a sniper

Decision: determine the entry technique and equipment to be used
Cue: non-reinforced concrete
Implication: explosives are needed to breach the wall
Decision: tradeoff between stealth and speed; catching the enemy off guard is worth the risk
Decision: projecting into the future

Only a few seconds have passed since the LT saw his objective for the first time. The platoon is now at the intersection where the building is located. The LT knows that intersections are death traps, so he has the platoon take cover short of the intersection. No movement from the objective or other surrounding buildings can be detected. The LT informs the SLs that the plan has changed. The main door is no longer an option. Since the other platoons are coordinating their actions off the LT's moves, there is no time for a rear assault. The LT has to find another front entry. Observing the intersection, and noticing the possible sniper tower, the LT positions the security squad. He is careful that, in his placement, they can cover all critical areas around the building, given the ranges of their weapons. He is also careful that they are concealed and aren't set up for possible fratricide.

"Now, getting into the building..." the LT thinks, "We've got to move quickly. There are no other doors nearby and the windows would all require some climbing. With all the heavy gear and climbing, the time to build a step to the window, and a waiting enemy inside, we would be sitting ducks both inside and outside the windows." The LT envisions a breach at a window: The cutting of the wire, and the building of a step, with a chokepoint of soldiers bunched outside the window, while loaded with gear, each man slowly climbs in virtually unprotected to whatever waits inside. He quickly dismisses the idea. He quickly scans the area to the left of the main door...not heavily barricaded...no holes...no windows. The concrete does not appear to be reinforced. "That's it," he decides. "We're blowing a hole 3 meters to the left of the door."

Since they are still making a frontal assault, and since he is concerned about snipers, the LT realizes that they will need to obscure their approach. There is little time for a feigned assault, and the LT does a quick wind and temperature assessment and decides that smoke will conceal the approach well.

"No more time to replan...the rest of the company is waiting for us to go," the LT thinks. "If this mission is going to work, it means that this platoon has to assault this building now." The LT lays aside the multitude of other uncertainties and starts the assault.

Factor: intersections are death traps

Implication: find cover near the intersection so you can defend yourself

Cue: no movement from surrounding buildings

Decision: communicate clearly with subordinates, determine placement of security

Cue: intersection and possible sniper tower

Factor: are all areas covered, possibility of fratricide

Cues: location of doors and windows

Decision: project ahead as to what would happen if they entered through the windows and if they breached a hole near the window

Difficulty: the soldiers are vulnerable waiting to enter building

Cue: no barricades, gun ports, or window left of the main door

Implication: the LT can project ahead and determine this is the optimal entry point

Decision: determine how to obscure the assault

Cue: frontal assault, possibility of snipers, wind, temperature

Implication: obscuring the approach is optimal and smoke will be effective

Decision Requirement: maintain the big picture and situation awareness

The most experienced squad will initiate the breach. 2nd squad is in security positions around the intersection. They launch a series of smoke grenades and thick, gray smoke fills the intersection. The sound of automatic weapons fire fills the air from the building, and the rest of the platoon returns fire. A fire team from 1st squad charges into the smoke, and toward the wall and begins cutting away the wire. Sure enough, a sniper begins to fire into the smoke from the tower across the street. "Gotcha", the LT thinks as his security team quickly returns fire and eliminates the threat.

Decision: determine how to employ personnel
Difficulty: troops are still vulnerable in smoke

A minute later, the fire team from 1st squad returns. The wire has been cut and explosives have been placed on the wall about 3 meters left of the main door. They all wait for the explosion, and when it occurs, the LT sends 1st squad into the clearing smoke. Then he waits for word on the radio.

Decision: the LT must assess the situation and direct subordinates

The smoke is clearing now, and there is scattered fire coming from inside the building. After about 10 very long seconds of fire exchange, the SL calls on the radio. "LT, we have the entrance secured. Three enemy casualties, one apparent civilian casualty, no friendly casualties. Approximately 10 enemy have retreated down the main hallway right in front of me."

Cues: scattered fire inside building, 10 seconds of rapid fire, number of enemy and friendly casualties, layout of hallway

"Nice work sergeant," the LT replies. The LT knows his experienced squad leader well, and can tell by his voice that he has the immediate situation well under control. Based on the SL's report, the enemy appears to have moved down the hallway. The gunfire sounds suggested the enemy had the weapons they were expected to have. The LT decides to let the SL continue to clear the hallway: "Start the clearing, sergeant. Let me know when you've got the first two rooms cleared. Then, I'm coming behind you with 3rd squad," the LT tells the SL.

Decision: assess situation inside building
Cue: level of panic in SL's voice
Implication: situation is currently under control
Cue: weapon sounds
Implication: enemy is using expected weapons
Decision: determine flow of clearing, determine how to employ personnel and teams, maintain control of subordinates

Upon hearing from 1st squad leader, the LT enters the building, and, for the first time, sees part of the internal layout. The main hallway heads south from the entrance, with rooms branching off on both sides. There appears to be a T-intersection at the far end of the hallway, and a stairway heading to the second floor. By this time, 1st squad has cleared the first three rooms and has encountered only frightened civilians. Unfortunately, one of the less-experienced members of 1st squad, with an itchy trigger finger, shot one of the civilians in the shoulder. The LT quickly scans the faces of 1st squad, and, seeing a couple glassy stares, decides a change is due.

Cues: internal layout, number of rooms cleared, status of people in the rooms, civilian casualties
Decision: determine how to employ personnel
Cue: glassy stares
Implication: have a different fire team clear the next few rooms

The LT knows that clearing buildings is about as mentally and physically demanding as any task can be. He quickly considers splitting the squad, having the obviously overstressed members establish security, and letting the rest of the squad continue, but quickly dismisses this thought. When forces are split, they are more likely to accidentally shoot each other, he knows. The LT decides to leapfrog 3rd squad, and have 1st squad maintain and extend security in the rooms they've just cleared. He knows that security is a relatively easy task, and a good relief to clearing.

At this point, the LT envisions 3rd squad getting to the T-intersection. He knows that there is not only a hallway branching off to the east and west, but also a staircase leading to the second floor. He knows that this could be a chaotic, confusing intersection, and communications could get hectic, so he decides to establish some communication protocols. He quickly specifies certain locations within the building as numbered checkpoints. That way, when different teams are facing different directions, and are on different floors, they can quickly share situation assessments and movements by referring to the checkpoints instead of trying to determine directions, floors, or individual lefts and rights. This should help with radio communications, and even reduce confusion should the radios go out, the LT thinks.

The clearing continues with the LT frequently leapfrogging teams when he feels that the clearing teams need breaks. Throughout the clearing, the LT is constantly reassessing the situation within the building. This assessment allows the LT to maintain his situation awareness and make judgments about what resources are needed to complete the job, as well as what should be reported to the company commander. Throughout the operation, the LT is maintaining a picture of where his soldiers are both inside and outside the building. At one point, the LT realizes that his platoon is too spread out. If the enemy were to organize a counter-attack, some of the platoon would be left with too little self-protection. So he reconfigures his personnel and ensures that they can defend themselves.

The LT is also noticing that, although some of the enemy forces have decided to barricade themselves and fight to the bitter end, most of them are continually retreating within the building. Since his mission is to clear the building, and since the LT realizes that a cornered enemy creates a situation that is in no one's favor in this case, he decides to alter the flow of the mission. He redirects the clearing operation, so that it pushes the enemy toward a corner of the building where they have the option of retreating back into the city. Giving the occupants a way out will make the clearing much easier, the LT realizes.

Difficulty: clearing a building is mentally and physically challenging

Decision: determine how to employ personnel and teams, determine whether to split forces, determine where to place security assets

Cue: internal layout

Benefit of experience: a branching hallway and staircase could be a confusing and hectic intersection

Decision Requirement: lead subordinates

Decision: clearly communicate directions and information

Difficulty: radio communications may go down

Decision: determine flow of clearing, determine level of fatigue, assess the situation and maintain situation awareness, determine how to employ personnel

Cue: location of soldiers

Implication: troops are too spread out

Decision: determine how the enemy might counter attack

Cue: whether the enemy are fighting back

Factor: a cornered enemy will fight back harder

Decision: determine flow of the clearing

Fortunately, in this case, most of the enemy eventually retreat back into the city, and in less than an hour, the building is cleared. LT Gasko places security elements in the four upper corners of the building to ensure that all possible entrances are covered, and the building cannot be "unsecured" by the enemy without a fight.

Cue: enemy location
Decision: determine when the clearing is finished

All in all, the LT was relieved. Many things that could have gone wrong did not. His platoon had only one casualty...a surface bullet wound taken by a corporal as he entered one of the last remaining rooms. The LT did not have to deal with the evacuation of friendly casualties. Only one civilian was hit, and that, unfortunately, was fatal. The LT understood, though, that given the chaos of building clearing, they were lucky. His subordinates acted superbly, and when they tired, the LT switched them effectively. The enemy was disorganized, and for the most part, did not want a fight. The enemy had expected the platoon to enter through the front door and fall into their hands. When that did not happen, they fell apart. That would change, the LT knew, for just as he had learned lessons from this experience, so would the enemy. They would not make the same mistakes again, and the next clearing surely would not go off as smoothly.

Cues: friendly casualty,
civilian casualties, fatigue

DISCUSSION

Implications for Training

As previously stated, current Army training does not adequately address the unique considerations of MOUT environments, primarily because the need for such training has only recently become critical. For this reason, one objective of this effort was to identify training requirements for platoon leaders in building clearing operations in order to determine the feasibility of using CTA methods to identify the training requirements of other MOUT tasks.

During this effort we were able to:

- Confirm that expertise does exist within the building-clearing task
- Demonstrate that CTA methods can capture decision requirements in an important MOUT task
- Elicit critical decisions, cues, factors, difficulties, rules, strategies, and other relevant knowledge gained from MOUT experience.

The CTA described in the previous section of this report has identified some of the cognitive challenges faced by platoon leaders during building clearing operations. The identified decision requirements highlight four factors about building clearing operations that are central to the platoon leader's perspective:

- Decisions, judgments, and assessments that are crucial to mission accomplishment
- Aspects of decisions, judgments, and assessments that are difficult for inexperienced platoon leaders
- The critical pieces of information (cues and factors) that platoon leaders should take into account when making decisions and judgments
- The strategies and rules that MOUT experts have developed to improve their decision making and execution.

Each of these items represent knowledge that resides within SMEs, but can also be passed on to less-experienced personnel through appropriate training applications. Therefore, the decision requirements can be used to guide training development recommendations for MOUT. If an instructor wants to teach a lieutenant how to clear a building, the lieutenant must learn how to secure the perimeter, approach the building, enter the building, actually clear the building, and then set up and extend security once areas of the building have been cleared. While conducting each of these steps, the lieutenant must also learn how to think like the enemy, maintain his situation awareness, lead his subordinates, and project into the future. In order for an instructor to teach these cognitive skills to the lieutenant, he can refer to the training points revealed in the DRTs (Appendixes A and B). These points include the cues that the lieutenant will need to notice

and interpret, the factors that he must take into account when making decisions, and the strategies and rules-of-thumb that have been developed by MOUT experts.

Training cognitive aspects of decision making for MOUT operations, in this case the building clearing task, can perhaps be best accomplished by employing a scenario-based instructional approach that can boost the expertise of lieutenants through practice in MOUT decision making. One scenario-based approach that has been employed with units of the U.S. Marine Corps is the Decision Skills Training (DST) program developed by Klein Associates (Klein, 1997; Klein, McCloskey, Pliske, & Schmitt, 1997). The DST program is highly contextual, oriented around decision requirements identified for a specific task and group of people. The decision requirements can be used to guide the development of a series of training scenarios called Tactical Decision Games (TDGs), as well as other training tools that can enhance the use of the TDGs (these are described in more depth in the following sections).

We envision using the identified task-focused decision requirements of this research effort to provide the context for TDG scenarios to be used to train Army platoon leaders. The contextual elements are apparent primarily through the cues that have been identified in each decision requirement. These are the pieces of information a platoon leader must be trained to recognize and interpret, since they will have great impact on each decision. In contrast, the task-independent decision requirements can be used to guide the development of supplemental training tools to be used in conjunction with the TDGs. These decision requirements detail the cognition that must be active throughout the building clearing operation, and therefore would be applicable to each TDG developed, regardless of which task-focused decision requirement is emphasized in a particular TDG.

Tactical Decision Games

TDGs, in their standard form, are low-fidelity, paper-and-pencil simulations of incidents that might occur in battlefield environments. The TDG presents a dilemma, with high levels of uncertainty. Participants have a restricted time limit in which to consider how they would react, which adds time pressure to the exercise. These TDGs are intended to provide indirect experiences, and to allow practice in rapid decision making.

TDGs work in the following manner, as described by John Schmitt, the originator of the TDG:

Playing a tactical decision game is very simple. Putting yourself in the role of the commander, you read (or have described to you) the situation; within an established time limit you decide what plan to adopt and communicate that plan in the form of the orders you would issue to your unit if the situation were "for real." You provide an overlay of your plan. Then -- and this is an important part of the process -- you explain the plan as a means of analyzing why you did what you did (Schmitt, 1994, p. 3).

TDGs have a wide range of potential benefits. Schmitt outlines the key benefits of TDGs as follows:

Not only will you improve your ability to make decisions quickly and effectively through TDGs, but your appreciation and mastery of tactics will improve also... (As you practice), you begin to make sense of situations that made no sense before, you begin to see patterns, and in those patterns you spot opportunities and options that previously did not exist for you. As you become more experienced you become more comfortable with a variety of different situations. You have the opportunity to experiment with different tactical ideas without having to worry about paying the price in terms of casualties. Your tactics become more ambitious... Your tactics become more advanced... A valuable fringe benefit of TDGs is that you become more familiar with weapons capabilities and employment techniques...and other technical details (Schmitt, 1994, p. 3).

In the past, TDGs have been used primarily to train tactical skills and strategies (e.g., how to out-flank the enemy) as well as declarative knowledge (e.g., the firing ranges for different guns). In the DST program developed by Klein Associates, the training value of the TDG has been broadened to include cognitive and decision-making skills. We use TDGs as a framework in which students can practice making difficult decisions and judgments within a wide range of situations. The design of the TDGs is typically guided by an understanding of the cognitive demands of a task. Students gain exposure to the cognitive challenges and practice handling those challenges (e.g., recognizing and interpreting subtle environmental cues), with input from the instructor, in order to become better decision makers.

Subjective measures of the usefulness of TDG training (in the context of the DST program, which also includes supplemental training tools) have been favorable. USMC squad leaders participating in the training rated the usefulness of the TDGs very highly, and their supervisors reported improvement in their decision skills over time. More concrete performance measures for TDG training programs are currently under investigation. These measures address the quality of the participants' decisions within specific TDGs. To judge the usefulness of TDG training, the performance measures for each participant can be compared over time. Presumably, decisions will improve as participants gain practice in TDG decision making. The performance measures that have been tested and show promise include goodness of the plan (or decision), clarity of the description, appropriate level of initiative, fit within the larger plan, and goodness of the rationale (McCloskey, Pliske, Klein, Heaton, & Knight, 1997).

It is important to note that TDGs can provide participants with practice in battlefield decision making in a safe and cost-effective manner. While they can never fully simulate the stresses of real military conflict scenarios, TDGs can expose the participants to a wide range of challenging battlefield decisions, *if they are developed properly*. When development is guided by decision requirements, TDGs appear to be effective training tools.

Supplemental Training Tools

While TDGs emphasize contextual learning and the development of expertise in a well-defined domain, supplemental training exercises enhance the TDGs by spotlighting cognitive aspects of general decision making in order to improve future decisions. The supplemental exercises appropriate for platoon leaders conducting building clearing operations would focus on refining skills on the four task-independent decision requirements: thinking like the enemy, maintaining the big picture and situation awareness, leading subordinates, and projecting into the future. The following are two examples of supplemental training tools that have been designed for and used in DST by U.S. Marines:

The Commander's Intent Exercise. The goal of the Commander's Intent exercise is to improve participant skill in communicating the Commander's Intent (which is the leader's rationale underlying a particular order or plan of action). This exercise is administered in coordination with a TDG. Participants describe their solutions to the TDG in the form of a set of orders to their subordinates and also provide a description of their intent. The facilitator then identifies a plausible, but unexpected, event that will interfere with that plan. The participant role-playing the leader then writes down how he or she expects all of the subordinates to react. At the same time, the subordinates write down how they would actually react. Next, the two interpretations are compared. Typically, everyone is surprised by the different interpretations of intent. This exercise improves Commander's Intent statements, not by providing a checklist of what to say, but rather by providing direct feedback to enable the participants to find out how subordinates are interpreting their orders.

The Commander's Intent exercise may be a useful training intervention for Army soldiers in MOU environments. We found that one of the challenging key decision requirements for platoon leaders is leading subordinates. This suggests that some aspect of their training should focus on providing clear instructions and ensuring that their orders are understood by subordinates. The Commander's Intent exercise addresses those specific issues.

The Decision Making Critique. Another tool that has been used with Marines is the Decision Making Critique. After completion of a TDG exercise, the decision requirements of the task are highlighted within the context of the Decision Making Critique to show participants what they did right and where they went wrong in making judgments and decisions. Currently, TDG feedback sessions typically concentrate on the specific actions taken. This is important, but it misses the opportunity to use the feedback sessions to teach why the mistakes were made so that the decision makers can learn what they are doing wrong. Without a Decision Making Critique, students can learn poor habits during the exercise, *and* get a chance to practice these poor habits, without ever learning that they are doing things wrong. Because the Decision Making Critique covers the decision process and the way experienced Marines handle decision requirements, the effect of the training exercise is greatly leveraged at little cost. The Decision Making Critique is best employed when it is embedded within the context of the exercises already being run.

Translating MOUT Decision Requirements into Training Interventions

In order to provide a clearer idea of how decision requirements can be translated into meaningful TDG scenarios and training tools, we will discuss an example. Let us start with the task-related decision requirement of determining how to secure the perimeter of a building. As this has been determined to be an important task in MOUT operations, it could be the basis for a series of TDGs. Using the information from the DRT for this task, as well as from general information elicited in SME interviews, we can develop the background for the scenario:

You are an Army platoon leader of XXX UNIT. Your unit has been operating for two weeks as part of a U.N. task force providing security for humanitarian relief efforts. Sonala is a Third World country torn by civil war, the result of which has been a total breakdown of the country's infrastructure creating widespread outbreaks of disease and starvation. There are, known to date, at least three different terrorist organizations, fighting for control of the country. The local populace is rapidly growing weary of the terrorists and are no longer hiding them. Enemy infantry forces have infiltrated and have recently begun occupying defensive positions around the capital city of Mondishu in an effort to seize control of the city and assume power. The capital city contains approximately 50 buildings and has a population of about 1000 people. Intelligence reports that the enemy is operating in 2-4 man assault teams on the outskirts of the city, occupying some of the perimeter buildings. They are equipped with AR-15s and grenades. They seem to have little mutual support between buildings, but do have several sniper teams in the area.

Within this decision requirement of securing the perimeter, there are several critical decisions that must be practiced. The platoon leader must know, for example, how to seal off the area and where to place his security assets. The DRT for securing the perimeter includes these critical decisions and suggests why they are difficult to make, while identifying the cues and factors experienced soldiers use in making such decisions. Using this information, we might construct a scenario that forces participants to deal with these decisions. This might look like the following:

Your platoon has been assigned to clear a building in the war-torn city. You have planned to secure the perimeter by placing your support unit in a partially walled-in courtyard northwest of the building. However, upon reaching the area around the building you find that civilians are running frantically all around the building, and several currently occupy the courtyard. Your support unit will have to provide security from a different location. To make matters worse, you know that enemy snipers could strike at any time in this inflammatory environment, so you will need to get your units in place quickly.

The cues that MOUT SMEs identified as critical when determining how to place their security assets included:

- Whether streets are singular
- Whether foot paths branch off the streets
- Known and suspected enemy locations
- Whether structures can provide concealment, or interfere with firing
- Optimal angles to support fire
- Anticipate layout of the building
- Windows in the building

We can use these cues to develop multiple versions of the scenario to teach the participants the importance of these cues. For example, one version of this TDG may state:

You know that the building to be cleared is surrounded by singular streets. You have also received intelligence reports that enemy snipers have been known to take up positions in the buildings directly to the east and north of the building.

To give participants practice in recognizing these cues, the continuation could read a different way, for example:

The streets to the west and east of the building are two-lane roads with moderate auto traffic. To the north and south are single streets with multiple foot paths running off in all directions.

Again using information from the DRT as guidance, a contingency may then be introduced (i.e., an unexpected event that forces the decision maker into action). This event may be guided by the "Why Difficult?" column of the DRT. For example, suppose this particular task of securing the perimeter is made especially difficult when the rules of engagement state that, under no circumstances may civilians be mistreated. This information could be used to create the following quandary within the TDG:

The civilians around the building are now beginning to form into an organized mob. They are refusing to leave the area, and are starting to pick up sticks and rocks. Suddenly, one of the civilians throws a rock at your 1st squad leader, the leader of the squad designated to provide security. The squad leader has been knocked unconscious. Seeing this, one of your platoon members strikes the rock-thrower, knocking him to the ground. This angers the crowd even more, and as you wonder how you are going to solve this problem, your company commander calls you, instructing you to immediately get that building cleared. What do you do?

This scenario represents a greatly simplified version of how a TDG might develop from the decision requirements of Army platoon leaders. Critical to successful learning from this TDG is good facilitation. The TDGs should be presented in seminar formats in which a facilitator presents the scenario to a group of participants, and the participants develop individual solutions to the problem under time pressure. As participants provide their solutions to the class in the form of orders (to get practice in effective communication), the facilitator questions them regarding their decision-making process, possibly using the Decision Making Critique.

It is important to note here that maps and photographs would be developed as part of the TDGs and provided to the platoon leaders. These visual aids are critical elements of the TDGs. They provide the visual context that cannot be presented within a textual description. The pictures or photographs need to be designed to show the critical cues that are important when making the decisions associated with a particular scenario. Given this requirement, it is easy to understand the need for high fidelity and realism here. Sketched pictures are better for helping the participants envision the situation and recognize critical cues than is text. Photographs are better than sketches. Video is better than photographs because it allows multiple perspectives and can provide visual cues.

In summary, the decision requirements identified in the CTA can guide the development of MOUT TDGs and supplemental training tools aimed at new lieutenants who may serve as platoon leaders. The primary goal of such scenario-based training would be to boost expertise and enhance decision-making skill. A refined understanding of MOUT tactics would likely be a secondary benefit.

Future Directions

This project presents evidence that the building clearing task is highly cognitive in nature. It demonstrates that effective platoon leaders will have to make a number of difficult judgments and decisions, under time pressure and uncertainty. It also suggests that CTA methods can be used to identify the decision requirements of the MOUT building clearing task, and that these decision requirements are directly related to the training requirements for that task. Previously, without a means of specifying cognitive training requirements, training developers have been severely limited in their efforts to support cognitive tasks. No longer must that be the case. This study demonstrates the value of CTA methods for MOUT training development. The remaining piece is to demonstrate that CTA methods also yield materials that can be used in the training program itself.

One potential future direction of this line of research is to broaden the range of study to include other MOUT tasks. This would entail conducting a CTA on each additional MOUT task with the end objective being to identify training requirements for each. A second potential direction is to immediately begin development of a scenario-based MOUT training program aimed at teaching lieutenants the cognitive and decision-making components of building clearing operations from the platoon leader's perspective. Based on DRTs from the present research, this

training program could be developed either in paper-and-pencil form or through the use of multimedia technologies. Another potential direction is to expand the CTA to include information from the perspectives of different echelons. This could include subordinates such as squad leaders or fire team leaders. It could also include higher levels, incorporating the critical decisions and judgments of the company commander. Research into the unique cognitive demands of MOUT environments appears to be both important and potentially fruitful, and could be expanded in any or all of these directions.

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Appendix A:
Task-Focused Decision Requirement Tables

Determine how to secure the perimeter

Critical Decision	Why Difficult?	Cues	Factors	Strategies/Aspects of Expertise
<i>Determine how to seal off the area</i>		<ul style="list-style-type: none"> Proximity to other buildings Opportunities for cover and concealment Enemy activity in area Civilian activity in area 	<ul style="list-style-type: none"> Enemy capabilities to engage Intensity level of the conflict Civilians' feelings toward enemy vs. toward us Proximity to other buildings Size of the area 	<ul style="list-style-type: none"> The goal is to prevent people from entering or exiting the area If it's a high intensity conflict, the unit will probably be trying to clear more than one building; therefore, they will need to secure a larger area
<i>Determine where to place security assets</i>	<ul style="list-style-type: none"> PL cannot be sure about the makeup of interior walls PL might give away his attack plan if the support by fire is too close to the building being assaulted 	<ul style="list-style-type: none"> Whether streets are singular Whether foot paths branch off the streets Enemy locations Whether structures can provide concealment, or interfere with firing Perceived best angle to support fire Anticipated layout of the building Windows in the building 	<ul style="list-style-type: none"> Areas you want to cover Effective ranges of weapons Ability to conceal support element at various locations Angles of fire Enemy weapons 	<ul style="list-style-type: none"> Mission success is largely dependent on the support by fire position; it will make or break you. As a general rule, leave 2-3 window lengths between supporting fires and point of entry Give yourself leeway with regard to angles to make sure you avoid fratricide
<i>Determine which assets and people to employ</i>	<ul style="list-style-type: none"> PL cannot always accurately predict what his platoon will encounter during the mission 	<ul style="list-style-type: none"> Presumed enemy locations Enemy weapons, evident or anticipated 	<ul style="list-style-type: none"> Mission objectives and purpose Enemy's past use of weapons Friendly ability to counteract enemy weapons Assets available Individuals' strengths and training with different weapons ROE (e.g., may need to keep damage to buildings at a minimum) 	<ul style="list-style-type: none"> PL must match weapons and specific people (based on their strengths) to his purpose Put your best shooters on their best weapons

Determine how to secure the perimeter

Critical Decision	Why Difficult?	Cues	Factors	Strategies/Aspects of Expertise
<p><i>Determine where to concentrate fires</i></p> <p>While the clearing team is in the building, the security element will provide external support; this is a decision regarding where each gunner from the security element should fire</p>	<ul style="list-style-type: none"> The gunners will need to shift their fire as the situation progresses: as the clearing team moves through the building and the enemy takes action 	<ul style="list-style-type: none"> Fortifications in and around the building <ul style="list-style-type: none"> materials and equipment stacked behind windows chicken wire on windows glass broken out of windows gun ports in the walls 	<ul style="list-style-type: none"> Mission Day vs night Whether you've got NVGs <ul style="list-style-type: none"> in daytime you can see units move through building; if have NVGs, you can play it the same way at night 	<ul style="list-style-type: none"> The goal is to fire enough to keep enemies' heads down Fire into areas that are fortified because that is where the enemy usually is Prefer OE angle of fire if possible (want to shoot as closely to straight on as possible)
<p><i>Synchronize fire and the shifting of fire</i></p> <p>This is not a tricky decision, but needs to be thought about in the planning process and then adapted in the actual situation. It becomes difficult to make these types of decisions on the spot within the actual situation.</p>	<ul style="list-style-type: none"> MOUT requires a higher expenditure of ammunition, however, the goal is to conserve ammunition in case a great need arises later 		<ul style="list-style-type: none"> Backbriefs with other PLs + higher command ROE 	

Determine how to approach the building

Critical Decision	Why Difficult?	Cues	Factors	Strategies/Aspects of Expertise
<i>Determine route and/or method of approach</i>	<ul style="list-style-type: none"> Difficult to determine potential enemy lines of fire To be effective, PL must be able to think three-dimensionally, and extend his field of vision through walls, buildings, the ground, etc. Open spaces are very dangerous Troops are very vulnerable Threats are often hidden Less experienced PL confuse the difference between cover and concealment; the enemy may not be able to see the unit, but may still be able to engage it 	<ul style="list-style-type: none"> Foot traffic Street size Layout of streets Buildings, their height, location, and window placement Open spaces Hazards and constrictions identified Presence of woodline Fortifications in area <ul style="list-style-type: none"> traces of sandbags fence/wire materials and equipment stacked in rooms freshly dug area Involvement of civilians 	<ul style="list-style-type: none"> How populated area is Economics of area Type of area (res, com, ind) Size of area encompassed by mission Equipment available (e.g., helos) Need for surprise Mission Night vs. day Information from leader recon 	<ul style="list-style-type: none"> The mission will need adjusting 90% of the time PL must react to the specific situation: do not try to maintain an obsolete plan, and do not try to go by the book May decide to sneak into building; may decide to do a direct approach, in which case supporting fire is critical Anticipate enemy locations in order to minimize risk to the platoon Generally want to cut the power for a night operation If possible, avoid doing a frontal assault since the enemy will expect it If you must do a frontal assault, obscure it. Take the shortest unconcealed distance to the building Helodrop can add element of surprise If near a woodline, approach from that area ROE often dictate that you may not damage the building, injure civilians, or incur casualties

Determine how to approach the building

Critical Decision	Why Difficult?	Cues	Factors	Strategies/Aspects of Expertise
<i>Determine how to navigate streets</i>	<ul style="list-style-type: none"> It is not intuitive to stay away from walls, even though it is safer 	<ul style="list-style-type: none"> Obstacles Structures that can be used for cover or concealment Location of buildings 	<ul style="list-style-type: none"> Personnel roles Personnel strengths 	<ul style="list-style-type: none"> Do not place leader up front in moving line Move as quickly as possible Do not rub up against a concrete wall: bullets will ricochet 6-8 inches of f walls and travel right along them Direct 2 elements to move on either side of the street so they can protect each other's flank
<p><i>Identify hazards, constraints, and constrictions</i></p> <p>Identify hazards, constraints, and constrictions in order to adjust the plan to fit the actual situation. Sometimes PL will need to change route of approach to avoid hazards (e.g., choose different route to avoid barricade or an area in which platoon will be channelized). Sometimes PL will need to develop countermeasures to neutralize hazards (e.g., overwatch unit placed in high spot OR friendly snipers to neutralize enemy snipers).</p>		<ul style="list-style-type: none"> Potential booby traps <ul style="list-style-type: none"> freshly dug dirt wire around building obstacles that channelize your troops other abnormalities Potential sniper locations (tall buildings, etc) Plausible location of enemy Layout of roads Location of security element Civilian actions Local populace avoiding an area 	<ul style="list-style-type: none"> History of enemy actions Information from leader recon 	<ul style="list-style-type: none"> The overall goal is to maintain the safety of the unit Avoid intersections: they are killing zones Every obstacle can be a benefit when used to cover and conceal One significant threat is the sniper If the mission spans a large area (e.g., more than one building), PL may want to use a helo as an overwatch

Determine how to approach the building

Critical Decision	Why Difficult?	Cues	Factors	Strategies/Aspects of Expertise
<i>Determine how to obscure the assault</i>	<ul style="list-style-type: none"> • Command and control becomes difficult because vision is obscured also • Challenging to time and synchronize the approach • Smoke is not always available • Smoke may not rise depending on temperature and humidity 	<ul style="list-style-type: none"> • Natural cover and concealment opportunities • Layout of roads • Wind direction • Wind speed • Temperature • Humidity 	<ul style="list-style-type: none"> • Type of mission 	<ul style="list-style-type: none"> • Use smoke, distraction, (e.g., a feint attack elsewhere and land on roof), or stealth • If hostage mission, probably use stealth • If snatch mission, speed is key, so use method besides stealth

Determine how to enter the building

Critical Decision	Why Difficult?	Cues	Factors	Strategies/Aspects of Expertise
<i>Determine the strengths and vulnerabilities of the building and its inhabitants</i>	<ul style="list-style-type: none"> • Often forced to take the most vulnerable route • The PL does not have very much time to reconnoiter 	<ul style="list-style-type: none"> • Fortification of building <ul style="list-style-type: none"> – freshly upturned dirt – broken out windows – wire behind windows – gun ports in walls – sandbags – anything stacked in a room – obstacles that channelize your troops – gaps in walls • Actions of local populace (e.g., avoiding an area) • Location of doors • Location of windows • Characteristics of rooftop • Characteristics of surrounding buildings 	<ul style="list-style-type: none"> • Location of building • Enemy weapons • Number of enemy • Known enemy actions • Known fortification of building • Buildings around that building 	<ul style="list-style-type: none"> • Doors are "fatal funnels": stay away from them • Entrance is expected via doors and windows, so the enemy will probably have them more heavily fortified • Look for things that have changed, differences <ul style="list-style-type: none"> – things out of the ordinary – furniture in windows • Gaps in walls indicate a bunker or reinforced position • Local people avoiding the area may indicate an ambush • People avoiding the front door indicates that the door may be booby-trapped

Determine how to enter the building

Critical Decision	Why Difficult?	Cues	Factors	Strategies/Aspects of Expertise
<p><i>Determine point of entry (where to enter the building)</i></p>	<ul style="list-style-type: none"> The average person only thinks one step at a time, however, this decision requires the PL to think ahead High likelihood of booby traps around the building Doors are easiest to enter, but are kill zones Soldiers are vulnerable entering a window; must climb in and step down, often while shooting; may have to build a step to get to the window at night, have no depth perception with NVGs, which makes the climb more difficult If platoon is in a time crunch, it must do the breach immediately 	<ul style="list-style-type: none"> Terrain Whether and from where the platoon is taking fire Locations where enemy cannot observe the platoon (i.e., concealment opportunities) Locations where enemy cannot engage the platoon (i.e., cover opportunities) Location of windows Dispersion of people around building or desired point of entry Construction of building Fortification of roof 	<ul style="list-style-type: none"> Size of building (large building = gas/power lines in walls) Number of floors Type of mission Proximity to other buildings Available equipment (helicopters, breach materials, etc.) 	<ul style="list-style-type: none"> The goals are to gain a foothold and have the element of surprise Avoid door entry if possible (booby trapped, barricaded, watched closely) Enter building as high as possible: top-down clearing is preferred method When entering a window you need to do some enemy disorientation to buy time and get in If you do go in via doors and windows be prepared for enemy defenses Do not do what's logical or expected by the enemy Look for second floor entries Consider sewer entries Use an indirect approach Grappling hooks are not very useful: very few people can climb a rope much less do it with 60 pounds of gear. Going in the back is more surprising than going through the front of the building Use creative thinking to bypass obstacles It is easier to blow a hole in the roof than in the side of a building An easy route tells you there is a surprise waiting for you

Determine how to enter the building

Critical Decision	Why Difficult?	Cues	Factors	Strategies/Aspects of Expertise
<p><i>Determine entry technique, and equipment to be used</i> <i>(<u>how</u> to enter the building)</i></p>	<ul style="list-style-type: none"> • Outside walls are thick, and difficult to penetrate • Do not want to leave troops in open and vulnerable position for very long • PL is limited by available assets • Shotguns, ramming equipment, and explosives that blow off the hinges require direct contact with the door and leave the soldier vulnerable to enemy fire • Shotguns cannot be aimed cleanly -- to open a door will require 3-4 shots • There is a limit to the amount of breaching resources a platoon can carry; a soldier can only carry 2 weapons • PL must worry about civilian injury and limit collateral damage 	<ul style="list-style-type: none"> • Entry point (door, window, roof, wall breach) • Status of door: unlocked vs. locked • Construction of building walls (tables exist which explain how much explosive to use based on thickness of wall, construction type, reinforcement of the wall, etc.) <ul style="list-style-type: none"> - thatch - wood - concrete - concrete and steel • Type and size of building • Type of door <ul style="list-style-type: none"> - if steel encased, use flex linear explosives with 2 sided tape - if heavy oak, use a crowbar, flex-linear explosives, or a shotgun breach - if flimsy wood, use a ballistic breach 	<ul style="list-style-type: none"> • Type of mission (stealth vs. speed): need for quiet entry, or whether noise is acceptable • Intensity level of conflict • Planned • Resource availability • Weapons capability • Night vs. day • Type and size of building 	<ul style="list-style-type: none"> • The goal is speed, to ensure the safety of troops • Do not establish a pattern (or stick with a pattern) • Use deception if possible (e.g., can throw rocks at door to simulate sound of grenades so that enemy will get down) • Air can provide a nice breach • In larger buildings you need to be aware of potential gas or power lines in the walls; cannot use explosives to breach • An office building will have flimsy doors • An apartment building will have heavy security doors on the outside of the building • Type of grenades PL takes will depend on the type of walls in the structure • If low intensity conflict and door is open, use flash-bang or concussion grenade upon entry • Sometimes the platoon will have to allow the enemy to see it • Enter the building thinking you will be shot at, so even if you are not shot at, you have the same amount of adrenaline and energy

Determine how to enter the building

Critical Decision	Why Difficult?	Cues	Factors	Strategies/Aspects of Expertise
<i>Consider tradeoff between stealth and speed</i>	<ul style="list-style-type: none"> As soon as you start the entry, you have given up stealth 		<ul style="list-style-type: none"> Night vs. day Type of mission 	<ul style="list-style-type: none"> Can be more stealthy at night Hostage retrieval: stealth more appropriate, snatch: speed more appropriate Once you open fire, you tell the enemy where you are so that they can prepare for you

Determine how to clear the building

Critical Decision	Why Difficult?	Cues	Factors	Strategies/Aspects of Expertise
<p><i>Assess the situation within the building</i></p> <p>Assessment of current situation inside building allows PL to maintain his SA, form expectancies about how the remainder of the mission will go, and make decisions regarding how and where to proceed next. His assessment may prompt a decision to abort, call for reinforcements, or continue as planned or with adjustments to the plan. Also note that PL's overall assessment includes the status of the security element outside the building.</p> <p>PL's assessment will need to be communicated back to higher command from time to time</p> <p>This decision could also fall under the task-independent decision requirement to <i>maintain the big picture and situation awareness</i>. We place it under the <i>building clearing</i> decision requirement to emphasize the numerous pieces of information that impact assessment within a building.</p>	<ul style="list-style-type: none"> • PL makes decision based on communications from troops within building • Communications will be minimized to prevent giving information to the enemy • Radios generally do not work well in buildings • Occasionally PL will receive two very similar reports and must judge whether they are the same report or two different reports • Not all cues and factors are absolutes: the enemy could dress a hostage in their uniform, or the enemy could wear civilian clothes 	<ul style="list-style-type: none"> • Signs of enemy <ul style="list-style-type: none"> – Type of clothing – Weapon present – Fortifications – Medical supplies – Ammunition – Maps – Documentation – Equipment in rooms • Signs of civilians <ul style="list-style-type: none"> – Type of clothing – No weapon present • Number and location of enemy (e.g., "2 men at 3 o'clock") • Room more built up than it would normally be • Casualty reports • Cause of casualties • Immediate obstacles • Layout of floors <ul style="list-style-type: none"> – # of rooms – # of hallways ("hallway in front"; "another door to my front") • Rooms that have been secured • Squad location; how far they are into building • Friendly equipment status and ammo count • Whether teams have found what the platoon is interested in • Reports from units outside building (e.g., enemy exiting building) • Platoon's progress (how 	<ul style="list-style-type: none"> • Day vs. night • Mission • Basic deduction • Location of fire support element • Known enemy uniform • Known enemy nationality • Photographs of enemy 	<ul style="list-style-type: none"> • Assess mission progress against plan • Watch for unit to become too thinned out • If two or three friendly non-combatants go down, PL may need to think about switching personnel • If time is critical, PL may have to call for reinforcements • Determine whether anything of interest is in the building: are our suspicions confirmed, or are we in the wrong place? • If a non-combatant goes down, be more alert and listen more closely to what happens in the next rooms • Threat levels can be assessed using these indicators: <ul style="list-style-type: none"> – person holding a detonator is a high threat – person holding an automatic weapon is a medium to high threat – person with a shotgun is a medium to low threat – person holding a revolver is a low threat

Determine how to clear the building

Critical Decision	Why Difficult?	Cues	Factors	Strategies/Aspects of Expertise
		<p>close you are to accomplishing the mission)</p> <ul style="list-style-type: none"> • Extent of threat <ul style="list-style-type: none"> – How weapons are held – Body language – Reaction to your actions • How many soldiers are guarding people • Time that the soldiers have been in the building • Expressions on faces of troops 		
<p><i>Determine flow of the clearing</i></p> <p>The initial plan will describe how the clearing should flow, but the plan may need adjustments given the actual situation once the unit gets to the building.</p> <p>Somalia example: they cleared from the top down to 2nd floor at the same time as they cleared the bottom floor. This prevented people from exiting the building.</p>	<ul style="list-style-type: none"> • It is not always possible to clear top-down, although that is the preferred flow 	<ul style="list-style-type: none"> • Whether the platoon is taking fire, and from where • Ground threats surrounding building • Enemy's line of site (outside building) • Cover and concealment opportunities around building • Size of hallways • Stairways slow things down 	<ul style="list-style-type: none"> • Helicopter landing zones • Number of floors • Fortification of roof • Equipment available • Intel reports of ground threats • Threats to helicopter assaults • Intel reports • Direction you can come from • Commander's Intent • Mission 	<ul style="list-style-type: none"> • Prefer to begin clearing at highest level possible and continue top-down <ul style="list-style-type: none"> – momentum is greater going down – grenades can be thrown down stairwells, not up – fewer security elements are required for "clean" upper floors as opposed to lower floors (enemy cannot enter top behind you) – fatigue will be reduced by clearing down – enemy will stay and fight if given no escape route; top-down clearing gives enemy a place to go, whereas bottom-up clearing does not • If the team must start clearing in the middle of the building, clear downward and secure, then clear the rest of the way up

Determine how to clear the building

Critical Decision	Why Difficult?	Cues	Factors	Strategies/Aspects of Expertise
<p><i>Determine how to employ personnel and teams</i></p> <p>PL must decide how many people to allocate to different tasks (security, clearing, etc.), and whether to split elements or keep them together</p> <p>PL must know the current status of the mission, the characteristics of the building, and how his team is doing in order to make this decision. Due to the nature of the building</p>	<ul style="list-style-type: none"> PL will have no idea how the building is laid out until he gets into it The decision is based in large part on communications from squad and FT leaders inside building Stress will fatigue people faster than the exertions they have to expend In MOUT environments, battles are in close quarters The mission may be different from the training 	<ul style="list-style-type: none"> Fatigue and stress <ul style="list-style-type: none"> the fear in soldiers' eyes Location of enemy in building Enemy weapons Personnel vigilance Status of friendly equipment Supplies Number of enemy Layout of building Immediate obstacles <ul style="list-style-type: none"> concertina wire strung through the halls booby traps 	<ul style="list-style-type: none"> Mission Expected enemy weapons Size of building Knowledge of which soldier tend to freeze up and do nothing; some will freeze up and do what they are told, but nothing else Knowledge of which soldiers are married 	<ul style="list-style-type: none"> Clear rooms in succession, never bypass a threat If taking fire, PL may need to adjust the approach and clear the building by blowing holes through the wall of rooms to get to the next room Bullets can travel down wall, so move down the center of hallways In a stairway, use a 5-man stack pointing aiming up (or down) to the next landing Continue to move until a threat forces the team to stop, and then adjust accordingly Choose the direction that will enable team to maintain only secure areas behind it Speed is essential Long wide hallways (6 feet wide or greater) may afford simultaneous room clearing with two fire teams abreast Generally leapfrog another team after 1st team has cleared 3-4 rooms, then have 1st team maintain security (see Maintain and Extend Security) NEVER let two units approach each other from opposite directions, fratricide potential More people are required for a larger building because people must be left behind for security as the clearing progresses

Determine how to clear the building

<p>Critical Decision</p> <p>clearing mission (physically and mentally exhausting), teams will generally have both room clearing and security roles. Security is a relatively easy role, so it's a good follower to the room clearing role, which expends so much energy.)</p>	<p>Why Difficult?</p> <ul style="list-style-type: none"> • MOUT is personnel intensive • Must also determine how to employ oneself: must determine how you as PL can best support your units; where do you need to be located? 	<p>Cues</p> <ul style="list-style-type: none"> • Location of friendly units inside building 	<p>Factors</p>	<p>Strategies/Aspects of Expertise</p> <ul style="list-style-type: none"> • PL should not enter building until team has a foothold (~ 2 rooms) • Squads can only do one task at a time; the only time PL should separate a squad is if he is relatively sure there is no threat • When forces are split forces, they are more likely to shoot each other • Splitting forces can facilitate momentum • Personnel adrenaline will go up and down as they prepare to clear a room and then find that no one is in the room; it is difficult to maintain vigilance and an adrenaline high if the first rooms they go to clear are empty • Fatigue causes itchy trigger fingers • #1 priority is to accomplish the mission • When soldiers see a buddy die, their morale decreases and their feeling of invincibility disappears
<p><i>Determine how and where to proceed</i></p> <p>This includes the decision regarding whether to abort or continue the mission, and when to exit the building and move to the extraction point</p>	<ul style="list-style-type: none"> • The average person only thinks one step at a time, however, this decision requires the PL to think ahead • Uncertainty is inherent • Unfamiliarity with floor plan • Floor plan not always linear • Resource depletion • The decision is based largely on information from voice 	<ul style="list-style-type: none"> • Degree of fortification of building and rooms (see "Assess situation" cues) • Noise from other floors of building • Civilian reaction (e.g., presence of mob) • Presence of weapons within mob • Whether the platoon is 	<ul style="list-style-type: none"> • Existence of feasible contingency plan • Mission objectives • Original plan • Commander's intent 	<ul style="list-style-type: none"> • If platoon is halfway through the building, it is better to continuing the clearing • If enemy is not exiting building, PL can judge that they will stay and fight • Do not do it 'by the book' if the situation calls for ingenuity; for example, if team is taking fire down

Determine how to clear the building

Critical Decision	Why Difficult?	Cues	Factors	Strategies/Aspects of Expertise
	<ul style="list-style-type: none"> communications from teams inside building Must weigh mission accomplishment against the casualties being taken; judge relative importance of mission vs. worth of troops The element outside the building may only be seeing a portion of the outside of the building Inherent tendency to want to maintain the plan, even when it becomes obsolete 	<ul style="list-style-type: none"> 'committed' to the mission Number of friendly troops available Educated guess as to floor plan in subsequent areas of building Casualty report Enemy weapons Number of enemy Reports of enemy exiting building (from security outside) 		<ul style="list-style-type: none"> hallways, blow holes through the walls of the rooms to get from one to the next If time is critical, PL may have to take some risks and leave some areas unsecured or uncleared
<p><i>Communicate directions and information</i></p> <p>PL must communicate to both his platoon and to higher command</p>	<ul style="list-style-type: none"> May be unable to use radios to communicate with those outside the building It is easy to get disoriented in the building, especially in old buildings in Europe 	<ul style="list-style-type: none"> Compass directions Floor number Call signs of people to the left, right, front, and rear 	<ul style="list-style-type: none"> Pre-established checkpoints such as stairways Trained communications (meanings of words and phrases) 	<ul style="list-style-type: none"> Platoon leader must know the location on his troops at all times Using 'left' or 'right' is dependent on position in the building; PL can also use compass directions, floor number or reference points) Always inform the teams in building of other teams or people about to enter building May have to take the RTO (radio telephone operator) to a window to be able to communicate with the company commander Always make sure you have the call signs to the people to the left and right of you in case you have to talk to them directly Avoid any surprises

Determine how to clear the building

Critical Decision	Why Difficult?	Cues	Factors	Strategies/Aspects of Expertise
<i>Determine how and when to evacuate casualties</i>	<ul style="list-style-type: none"> Need to prioritize between mission accomplishment and welfare of injured troops When a fire team takes two casualties, it becomes a problem for the fire team When in a fire fight, a soldier cannot stop to give first aid 	<ul style="list-style-type: none"> Type of casualties Assessment of situation (see <i>Assess the situation within the building</i>) Medic's recommendation 	<ul style="list-style-type: none"> Evacuation assets available Relative importance of mission 	<ul style="list-style-type: none"> Try to pass the injured back to the squads in the rear until they reach to the medical area
<i>Determine whether to request reinforcements or call for fire</i> When taking heavy casualties, PL may want to call in mortars, more troops, etc. to support the platoon so they're able to complete the mission.	<ul style="list-style-type: none"> Difficult to judge the line between needing and not needing support to accomplish the mission Difficult for PL to remember what resources, organic and non-organic, he has available to him (e.g., helicopter, armor, arty, etc.) 	<ul style="list-style-type: none"> Number of hallways Number of stairwells Location of stairwells Number of rooms Resistance encountered Number of people from your unit available to perform additional tasks Size of building Layout of building Casualty report Obstacles and booby traps 	<ul style="list-style-type: none"> Reinforcements and resources/assets available Assessment of platoon's abilities and tolerance 	<ul style="list-style-type: none"> If PL must do a simultaneous entry of more than 6 rooms, he will need to request reinforcements If platoon has massive casualties, PL should inform the company commander that they are combat ineffective, and the company commander will decide whether to send in more people or pull back Larger buildings, and buildings with many rooms and hallways and stairwells will require additional personnel to maintain security during the clearing, especially if the clearing is not flowing top-down
<i>Determine the mental and physical state of the soldiers</i> See also the decision requirement to Lead subordinates	<ul style="list-style-type: none"> This requires real experience to recognize 	<ul style="list-style-type: none"> The look in the soldiers' eyes Soldiers' uniforms torn, bloody, and smudged The weight of the load a soldier has to carry 	<ul style="list-style-type: none"> Experience and maturity of soldiers 	<ul style="list-style-type: none"> Stress, excitement, and fear wear people out, even if they are not carrying anything The 1000 yard stare - hollow eyes staring into space - indicates the soldier will continue like a robot, not sharply There is a tradeoff between youth (physically capable) and experience (wisdom)

Determine how to clear the building

Critical Decision	Why Difficult?	Cues	Factors	Strategies/Aspects of Expertise
<p><i>Determine when the clearing is completed</i></p> <p>Need to tell platoon when to exit the building and start for the extraction point</p>	<ul style="list-style-type: none"> When the mission has been successful, this is not a difficult decision, but when the PL has to decide to stop the mission due to loss of personnel or inability to meet the objectives, this is a more difficult judgment 	<ul style="list-style-type: none"> Number of rooms cleared Number of rooms in the building Number of enemy remaining Number of your people remaining Overall assessment of the situation in the building (see the situation within the building) 	<ul style="list-style-type: none"> Mission objectives 	<ul style="list-style-type: none"> When zero enemy remain, the clearing is completed When mission objective has been accomplished, the clearing is completed When the PL runs out of combat effective people, the clearing is essentially done If it is a snatch mission, the mission is complete once the snatch is made

Determine how to maintain and extend security

Critical Decision	Why Difficult?	Cues	Factors	Strategies/Aspects of Expertise
Determine where to place security elements	<ul style="list-style-type: none"> Requires many people Requires three-dimensional thought regarding where enemy might come from 	<ul style="list-style-type: none"> Number of hallways Locations of hallways Characteristics of rooms Number of stairwells Location of stairwells Current locations of other friendlies within building <ul style="list-style-type: none"> Chance of fratricide Flow of the clearing (top-down vs. bottom-up) 	<ul style="list-style-type: none"> Intel reports 	<ul style="list-style-type: none"> The goal is to ensure that enemy does not have access to your clean areas and cannot sneak in behind the clearing team Typically place security elements in rooms that have just been cleared; one strategy is to have the team that secured 3-4 rooms maintain security in those rooms before the platoon moves to the next sector of the building Never place a security unit where it will be approached by a clearing unit Always keep one team "one turn back" Security is generally not needed on upper floors that are cleared Never bypass a threat If the room has a window that an enemy could enter, it needs to be secured Secure all elevator shafts The perimeter security should cover fire escapes Look for locations that offer good vantage points of key areas Enable security elements to direct additional friendly traffic that enters building Listen on the radio for additional rooms, stairs, trap doors, etc. that were unexpected

Determine how to maintain and extend security

Critical Decision	Why Difficult?	Cues	Factors	Strategies/Aspects of Expertise
				<ul style="list-style-type: none"> The narrow hallways and penetrable walls in a house may cause PL to alter the clearing flow or process

Appendix B:
Task-Independent Decision Requirement Tables

Maintain the enemy's perspective (Think like the enemy)

Critical Decision	Why Difficult?	Cues	Factors	Strategies/Aspects of Expertise
<i>Identify the most likely enemy course of action</i>	<ul style="list-style-type: none"> • Inherent uncertainty • Requires much experience/expertise to truly think like the enemy • Tendency to underestimate enemy and overestimate own forces • Must think outside the box to outsmart the enemy 	<ul style="list-style-type: none"> • Signs of fortification (see prior DRTs) 	<ul style="list-style-type: none"> • Expected enemy objectives • Leverage points within the city and around the building 	<ul style="list-style-type: none"> • If the enemy is very tenacious, expect it to be hard fought • Think three-dimensionally: not only forward/backward, left/right, and up/down, but extend those dimensions past visual range into the next room or next floor of the building
<i>Identify the most likely enemy location</i>	<ul style="list-style-type: none"> • Inherent uncertainty • Enemy location is dynamic 	<ul style="list-style-type: none"> • Windows knocked out • Gun ports in sides of building • Wire over windows (so grenades cannot be thrown in) • Shots fired and scrambling noises 	<ul style="list-style-type: none"> • Buildings that control intersections • Buildings that control long stretches of streets • Highest buildings • Level of intensity of conflict 	<ul style="list-style-type: none"> • Enemy is likely to put snipers or arty observers in high buildings (e.g., church towers) • In high intensity conflict, enemy is more likely to try to control buildings with good vantage points on intersections and long stretches of roads • Enemy might mine tops of buildings to deter helicopter assault; this is less likely in lower intensity conflicts

Maintain the enemy's perspective (Think like the enemy)

Critical Decision	Why Difficult?	Cues	Factors	Strategies/Aspects of Expertise
<i>Identify how enemy can exploit friendly vulnerabilities</i>	<ul style="list-style-type: none"> Must assess one's own vulnerabilities, although the tendency is to overestimate one's strength and readiness 	<ul style="list-style-type: none"> Number and location of hallways Number and location of stairwells Building layout Number of friendlies in building Number of enemy 	<ul style="list-style-type: none"> Friendly weapons capabilities Enemy weapons capabilities Training and preparation Mission plan 	<ul style="list-style-type: none"> Enemy often booby traps areas where they think you might enter a building, e.g., doors and windows Refrain from establishing patterns the enemy could learn <ul style="list-style-type: none"> blow off door hinges (bang), throw grenades (bang), go in with controlled shooting (shoot, shoot). If the enemy learns this pattern, they will hide until the second bang, then come up shooting Enemy will try to sneak behind you, into your "clean" area PL should use his assessment to determine how to protect his platoon
<i>Anticipate enemy deception techniques</i> PL must actively search for cues that suggest deceptive techniques by the enemy. When the cues are noticed, expectancies can be formed and actions can be taken to avoid potential hazards	<ul style="list-style-type: none"> Deception is inherently hard to recognize This judgment is more difficult when the PL has little experience with that particular enemy 	<ul style="list-style-type: none"> Wires on the ground Suspicious person dressed in civilian clothes Sniper drawing you toward him Areas you would attack if you were the enemy 	<ul style="list-style-type: none"> Items deemed important by friendlies Past enemy practices and techniques 	<ul style="list-style-type: none"> Enemy may booby trap items that they know we will be looking for (e.g., a box of radios) Enemy may dress as a civilian Sniper may attempt to draw platoon into an ambush Wires laying on the ground may indicate a booby trap, or the enemy's tendency to use booby traps

Lead Subordinates

Critical Decision	Why Difficult?	Cues	Factors	Strategies/Aspects of Expertise
<p><i>Clearly communicate with and direct subordinates</i></p>	<ul style="list-style-type: none"> • Radio communication is difficult within the building • Units are spread out in building • Need to minimize communications to maintain element of surprise • Must account for both clearing unit inside building and security element outside building • Once the clearing has begun, it is difficult for PL to think of anything but the clearing (it is difficult for him to keep up communications) 	<ul style="list-style-type: none"> • Physical layout of building • Enemy locations in building • Obstacles and threats • Current situation 	<ul style="list-style-type: none"> • Hand signals and other non-verbal communications that are trained • Mission plan 	<ul style="list-style-type: none"> • Tell subordinates to report what they see with no interpretations <ul style="list-style-type: none"> – “there is a stairway up ahead”; “there is a T intersection and a stairwell”; “I hear footsteps above me traveling from my right to my left” • If subordinates know the objective, they will more readily accomplish it • PL must tell subordinates his critical information requirements for the mission
<p><i>Maintain control of subordinates</i></p> <p>The PL must ensure that subordinates will not get ahead of themselves and the rest of the platoon</p>	<ul style="list-style-type: none"> • Tendency for subordinates to clear the building without direction from PL, because they are so well-trained that they could accomplish the clearing on their own • Subordinates can forget to communicate back to PL • Soldiers have the tendency to let their guard down when no sign of the enemy exists 	<ul style="list-style-type: none"> • Frequency of communications • Subordinates’ actions <ul style="list-style-type: none"> – where are they now, and is that where they are supposed to be • Personnel vigilance • Situation within building (see <i>Assess the situation within the building</i>) 		<ul style="list-style-type: none"> • Do not want subordinates making decisions they are not responsible for • PL must ensure that subordinates remain vigilant

Lead Subordinates

Critical Decision	Why Difficult?	Cues	Factors	Strategies/Aspects of Expertise
<i>Judge the combat effectiveness of individuals</i>	<ul style="list-style-type: none"> PL must judge not only the physical state of his unit but also the mental state, which is generally not visually apparent 	<ul style="list-style-type: none"> Current situation Relative difficulty of the mission thus far The look on a person's face Injuries Ammunition remaining Weapon status 	<ul style="list-style-type: none"> Individual personalities Past experiences with individuals Training 	<ul style="list-style-type: none"> The goal is to maintain the safety of the unit PL must be honest with himself: he cannot tell higher that his unit can do the mission if they are not trained or ready for it Bottom-up clearing is more fatiguing than top-down Switch out the lead element if they get too fatigued

Maintain the big picture and situation awareness

Critical Decision	Why Difficult?	Cues	Factors	Strategies/Aspects of Expertise
<p><i>Assess mission progress against mission plan and objectives</i></p>	<ul style="list-style-type: none"> • PL must paint a picture of the situation using primarily voice communications from other people • It is possible to • fall in love with the plan” and not realize it is no longer useful as is • It is difficult to think of the big picture while focusing at the task at hand 	<ul style="list-style-type: none"> • Situation assessment (see <i>Assess the situation within the building</i>) • Number of rooms cleared • Enemy resistance • Civilian involvement • Number of friendly casualties 	<ul style="list-style-type: none"> • Mission plan • Mission objectives 	
<p><i>Assess the big picture situation</i></p> <p>This decision task is mainly about keeping track of what is going on around and within your mission: what is the status of the troops? What is the enemy up to? What are the civilians up to? How are adjacent friendly units doing? Together, these form the PL's overall SA. His SA is used as a factor in every decision he will make. It is also used to set expectancies and project ahead into future</p>	<ul style="list-style-type: none"> • If PL is too close into the building he cannot see the big picture 	<ul style="list-style-type: none"> • Reports from overwatch or security unit • Civilian activity 	<ul style="list-style-type: none"> • Locals' status and attitudes whether they like friendlies whether they will try to clear the building behind you? • Other platoons' missions 	<ul style="list-style-type: none"> • The PL's actions will change drastically if civilians are seen as a threat vs. being on the friendlies' side. Example: unit will lock & load in an otherwise non-threatening situation if civilians have a history of acting against them. • Situations that require close and quick coordination between PLs include: <ul style="list-style-type: none"> - when one platoon is limit of advance - if they are both going to retrograde and need to determine who will cover while the other moves back - if soldiers were lost and linked up with another platoon, the lost soldier's platoon needs to know
<p><i>Maintain awareness of civilians in the area</i></p>	<ul style="list-style-type: none"> • There will <u>always</u> be uncertainty as to how many civilians are present 	<ul style="list-style-type: none"> • Civilians foot traffic • Known type of building 	<ul style="list-style-type: none"> • Type of area (e.g., residential district vs. industrial district) • Expected building type 	

Maintain the big picture and situation awareness

Critical Decision	Why Difficult?	Cues	Factors	Strategies/Aspects of Expertise
<i>Maintain awareness of sectors of fire for all friendly units</i>		<ul style="list-style-type: none"> Communications during mission regarding adjustments to plans 	<ul style="list-style-type: none"> Company's mission Commander's intent Other platoons' plans (from pre-operation briefings) 	
<i>Set expectancies</i>	<ul style="list-style-type: none"> Enemy is unpredictable 	<ul style="list-style-type: none"> Layout of building floors Locations of halls and stairwells Enemy equipment, ammunition, documents, etc. found in rooms Enemy/civilian level of resistance 	<ul style="list-style-type: none"> Platoon's mission Other PL's missions Level of intensity of conflict Whether local population likes or dislikes you 	<ul style="list-style-type: none"> Will have to mentally simulate what to expect around each 'corner'

Project into the future

Critical Decision	Why Difficult?	Cues	Factors	Strategies/Aspects of Expertise
<i>Determine where to proceed next</i>	<ul style="list-style-type: none"> • Rely primarily on verbal communications to form picture of current situation • Less experienced PL's (or low confidence ones) tend not to react to the situation like they should. Instead they stick to the plan or go by their training. 	<ul style="list-style-type: none"> • Number of hallways • Location of hallways • Number of stairwells • Location of stairwells • Number of friendly casualties • Number of enemy • Enemy weapons • Other characteristics of enemy (e.g., uniforms) • Unit morale and level of fatigue • Layout of building • Relative importance of certain areas of the building • Noise from enemy • Guessimate of floor plan on next floor 	<ul style="list-style-type: none"> • Friendly capability compared to enemy capability • Mission plan • Mission objectives 	<ul style="list-style-type: none"> • Assume the worst with regard to the enemy • Do not just follow the plan, or 'fire and forget'; be thinking ahead as to what to do next • Determine how building could make you vulnerable, then cover those vulnerabilities
<i>Determine the personnel and unit size necessary for mission accomplishment</i>	<ul style="list-style-type: none"> • Inherent uncertainty as to what the platoon will encounter 	<ul style="list-style-type: none"> • Known building size • Flow of clearing • Number of room, hallways, and stairwells • Enemy resistance • Civilian involvement 	<ul style="list-style-type: none"> • Mission objectives • Mission plan 	<ul style="list-style-type: none"> • A squad plus (~12 men) is a minimum; platoon is generally a maximum • Fewer people are required for top-down clearing (do not need to secure upper floors after they are cleared) • The larger the building, the more personnel required • Too many people can actually be detrimental to the mission

Project into the future

Critical Decision	Why Difficult?	Cues	Factors	Strategies/Aspects of Expertise
<p><i>Determine where to locate oneself to best support unit</i></p> <p>This decision is important in situations like the following: two squads are sucked into a fire fight in two different locations. Each of them calls for support from the PL. Where do you go? Which one do you go to help?</p>	<ul style="list-style-type: none"> • PL must prioritize, and sometimes it's not clear from verbal communications which location is more critical 	<ul style="list-style-type: none"> • Voice communications/reports from squads • Urgency in voice • Casualty reports 	<ul style="list-style-type: none"> • Mission objectives • Abilities of each unit 	