

# LEVEL II

6

## EXTENDED TASK ANALYSIS PROCEDURE (ETAP)

### TRAINING MATERIALS

#### ORIENTATION LESSON: INTRODUCTION TO ETAP

DTIC  
SELECTED  
APR 1 1981  
S E

AD A 098389

#### INTRODUCTION

The Extended Task Analysis Procedure (ETAP) is just what its name suggests. It incorporates previous task analysis procedures that have proven to be useful, and it includes some new techniques. The new techniques help solve several recently identified problems in task analysis and training. ETAP will help you solve the problems of identifying the critical steps in a procedure, and identifying the basic knowledge necessary to master the steps. It also includes procedures for analyzing transfer, or "soft skill," tasks.

#### BACKGROUND

ETAP has been field tested with 8 MOSs in three Army Schools. The procedure was used by soldiers assigned to task analysis in directorates of training Development, and by civilian analysts working with Army subject matter experts (SMEs). These field tests demonstrated that ETAP works, and that you can learn ETAP from these training materials.

#### CHARACTERISTICS OF ETAP

ETAP is a twelve step process designed to analyze tasks that are primarily procedural in nature, and tasks that are usually called "soft skill" tasks. Soft skill tasks are those that require so many decisions about the appropriate behavior under various circumstances, that the task cannot be reduced to a specified procedure. Examples would include supervisory tasks, and troubleshooting tasks. In these situations, the soldier has to understand basic principles and procedures that transfer to specific situations that are very different from one another in various details. Therefore, in the ETAP processes, these "soft skill" tasks are called transfer tasks to distinguish them from procedural tasks. In procedural tasks, there is a very close, one-to-one, relationship between a set procedure

DTIC FILE COPY

and mastery of the task. In transfer tasks, the soldier must adapt basic principles or "generic" procedures to specific task conditions.

Not all twelve steps of ETAP are used with every task that is analyzed. As you will see, ETAP includes three major types of task analysis processes. The first, called Procedural Analysis, is similar to traditional task analysis techniques for identifying sequences of steps in a duty or task. The second type is called Factor-Transfer Analysis. It is used with more complex tasks that cannot always be divided into a fixed set of steps. When the steps in a procedure have to be modified frequently or unexpectedly due to uncontrollable conditions, then Factor-Transfer Analysis is the appropriate technique for analysis. Finally, ETAP includes a technique called Principle-Transfer Analysis. This is used for tasks that are very difficult to break down into a series of steps. For example, "counselling subordinates" is a duty required of many NCO's and officers, but it is very difficult to proceduralize. Principle-Transfer Analysis helps identify the elements that lead to the successful performance of this type of task.

In summary, ETAP has twelve steps. Built into these steps are three different approaches to analysis depending on the type of task to be analyzed. And, finally, ETAP combines two traditional with two new techniques for task analysis. These four techniques are built into the twelve steps of the procedure.

## TRAINING MATERIALS

### PURPOSE

The purpose of these training materials is to introduce you to ETAP. After finishing these materials, you will understand the general procedure, and you will be ready to practice with the assistance of the User's Manual. Some practice exercises are included in these lessons, but the most important practice occurs after you finish the lessons. This is because we have broken ETAP down into a number of distinct lessons to teach the entire ETAP process. This makes it much easier to learn in a short time. However, in practice ETAP is used as a single, complete procedure.

### ORGANIZATION

These training materials include eight lessons. Lessons 1, 2, and 3 teach the entire process for doing a Procedural Analysis. Lessons 4 and 5 teach the additional

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
	AD-A098 389	
4. TITLE (and Subtitle)	5. TYPE OF REPORT & PERIOD COVERED	
6 Extended Task Analysis Procedure (ETAP): Training Materials, Orientation Lesson: Introduction to ETAP.	9 FINAL REPORT	
7. AUTHOR(s)	6. PERFORMING ORG. REPORT NUMBER	
10 Dr. M. David/Merrill C./Reigeluth/ Dr. R. K./Branson R./Tarr R./Begland/		
9. PERFORMING ORGANIZATION NAME AND ADDRESS	8. CONTRACT OR GRANT NUMBER(s)	
11. CONTROLLING OFFICE NAME AND ADDRESS	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS	
Training Developments Institute ATTN: ATTG-DOR Fort Monroe, VA 23651	12 198	
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	12. REPORT DATE	
Battelle Columbus Laboratories 505 King Avenue Columbus, OH 43201	11 Jul 80	
	13. NUMBER OF PAGES	
	198	
	15. SECURITY CLASS. (of this report)	
	UNCLASSIFIED	
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE	
16. DISTRIBUTION STATEMENT (of this Report)		
Approved for public release; distribution is unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)		
Job/Task Analysis	Procedural Analysis	
Transfer Analysis	Factor-Transfer Analysis	
Extended Task Analysis	Principle-Transfer Analysis	
Soft Skill Analysis	Process Analysis	
	Knowledge Analysis	
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)		
Extended Task Analysis Procedure (ETAP) is a 12 step process designed to analyze tasks that are primarily procedural in nature and tasks that are usually called "soft skill" tasks. This report represents training materials which are introductory to ETAP. Upon completing these materials the student will understand the general ETAP procedure and will be ready to practice using the User's Manual.		

steps that are needed to do a Factor-Transfer Analysis, and Lessons 6 and 7 teach you how to do a Principle-Transfer Analysis.

Lessons 1-7 are in a definite sequence and should be studied in order. The last lesson (Lesson 8) is different in style and content from the first six. It teaches a standard notation system for numbering the different levels and types of tasks described in ETAP. You should study it carefully when you begin to apply ETAP, and you might want to look at it while you are working on Lessons 1-7.

#### LEARNING ADVICE

In learning how to use ETAP, it is best to begin by learning one basic procedural sequence for a specific type of task. This will provide you with a concrete introduction to the basic process. Then you can begin to add the additional paths that lead to full mastery of the model. This approach has been used for these training materials. The lessons are designed to help you get an overview of the process right from the beginning. Then, as you move through the materials, each lesson will add a new dimension to the preceding lessons. When you finish the entire sequence, you will have obtained all the parts, and you will be ready to practice the entire process with the assistance of ETAP.

You are now ready to begin working on Lesson 1.

<b>Accession For</b>	
NTIS GRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By _____	
Distribution/ _____	
Availability Codes	
Dist	Avail and/or Special
A	

1 4 30 049  
1 4 30 03

## LESSON ONE: SIMPLIFIED PROCEDURAL ANALYSIS

### INTRODUCTION

Two separate kinds of analysis are taught in this lesson: identification of the set of actions the soldier must do in order to complete the task and identification of the information a soldier must know in order to learn how to perform the actions. Process Analysis involves breaking down a procedural activity into its component actions. Knowledge Analysis involves identifying the facts and concepts which must be known before the activity can be learned. This lesson presents a simplified form of ETAP. Later lessons will expand the procedures by adding additional steps.

### OUTLINE OVERVIEW

This simplified version of extended task analysis consists of the following activities:

- Given a procedural task to analyze, identify and list the set of actions which must be performed for that task. (STEP 3.1)
- Arrange the set of actions into the most useful and efficient order for performing the task. Then distinguish between actions that must be performed in a particular sequence and actions that can be performed in any sequence. (STEP 3.4)
- Identify any knowledge that a soldier must learn before he or she can learn to perform each action. (STEP 10.1)
- List each piece of knowledge together with an identifying number that indicates the relationship between the knowledge and the action it supports. (STEP 10.4)
- Identify any steps that have not yet been submitted to knowledge analysis. Analyze each to identify any concepts a soldier must learn before he can learn to perform the step. (STEP 10.10)
- Review the results of the analysis for completeness and accuracy and check with other information

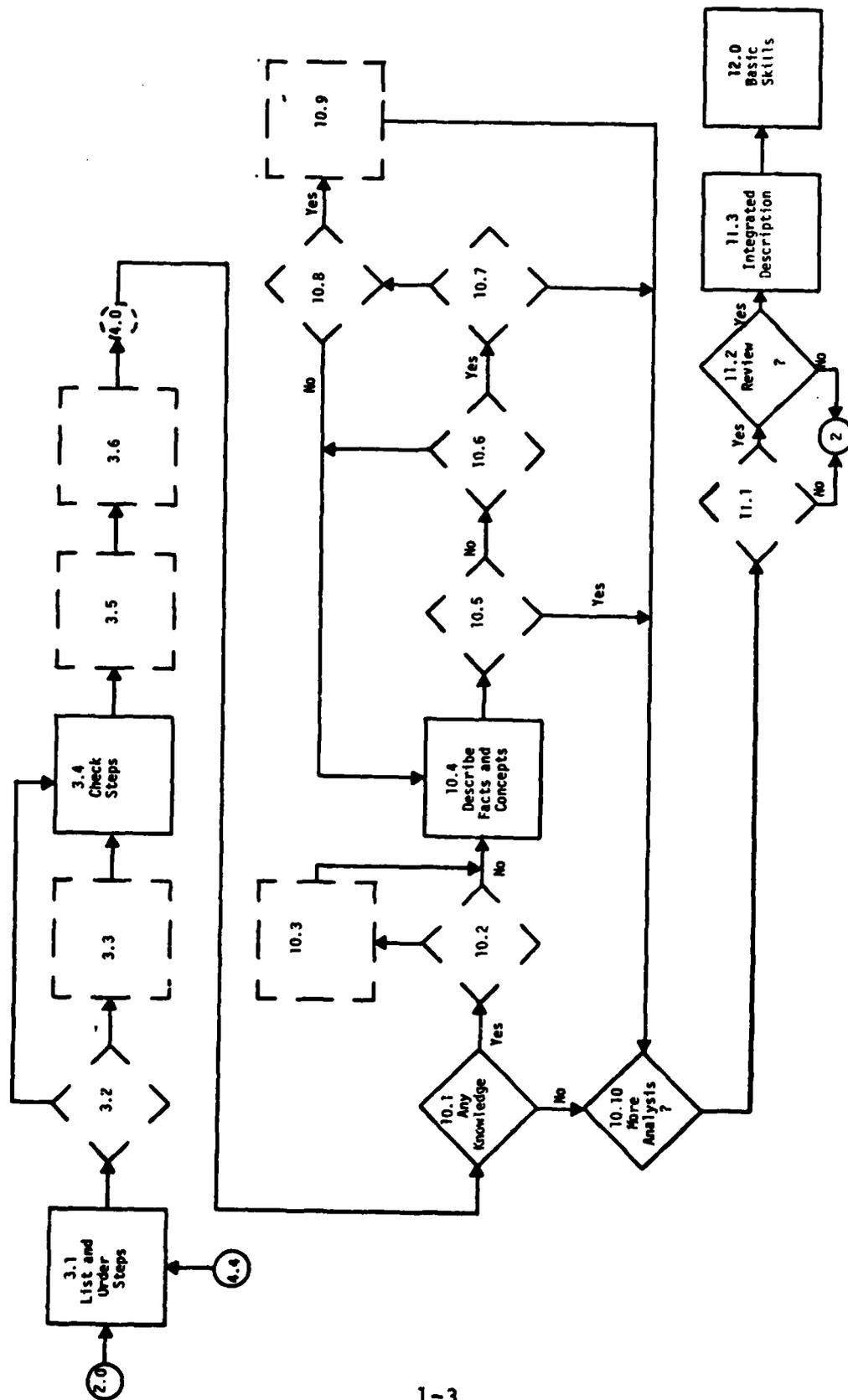
sources such as manuals or other SME's. Make certain that all steps and concepts have been analyzed appropriately and completely. (STEP 11.2)

- Combine the results of the process analysis and knowledge analysis into a single description of the task, using identifying numbers and flow diagrams as needed. (STEP 11.3)
- Ask an experienced instructor to review the final task description to identify all basic skills and knowledge that must be taught before training in specific tasks can be conducted. (STEP 12)

#### COMMENTS

Before a task can be taught or learned, it must be broken into a set of separate actions that the soldier can master individually. Process Analysis is the means by which this can be accomplished. Therefore, it is important to use Process Analysis to separate a task into its component activities and to describe the best order for them.

In addition, Knowledge Analysis provides a way of identifying knowledge a soldier must use in order to perform each action. When used together, Process Analysis and Knowledge Analysis permit the identification of all skills and knowledge required in a task. In this way, training needs can be determined both for all tasks within an MOS and for basic skills and knowledge which a soldier must acquire before being ready to enter MOS training programs. Since one of the major goals of the task analysis program is to identify these basic skills and knowledge, the combined approach of Process Analysis and Knowledge Analysis represents an important step toward that goal.



## STEP 3.1

### STEP DESCRIPTION

STEP 3.1 Given a procedural activity to be analyzed (STEP 1), have the SME describe the activity at the next more detailed level of description for performing the activity.

Note: To reach the next more detailed level of description, have the SME think of a typical situation in which the task is performed. Have the SME list about 5-10 steps that must be followed to perform the task in that particular situation. Ask the SME to identify the best order for performing those steps.

---

### VOCABULARY SUPPORT

Step (written in lowercase) - a mental or physical action performed as a part of a task. A procedural task consists of several steps performed in some specified order. Each step is described as a direction to act, using an action verb.

STEP (written in caps) - a mental or physical action performed as a part of the Extended Task Analysis Procedure.

Level of Description - the amount of detail and specificity with which a task is described. The more general and fundamental the level, the less detail provided. A single, general statement can be used to describe an entire task or duty. Then each step comprising the task or duty can be described separately in a single statement. Next, each step can be broken down into its component activities and each of those activities described in separate statements. As the process of breaking down each step continues, the level of description becomes more detailed and specific as the actions become more narrow and specific. Note that this lesson requires you to identify steps at only one lower level of description. In later lessons, you will learn to analyze each step into its component substeps and to analyze each substep as necessary.

Process Analysis - that kind of analysis during which the task is broken down into a set of separate steps. The result is a sequence of ordered steps that the soldier

follows in completing the task.

One goal of this procedure is to describe the set of steps in enough detail that a soldier can perform the steps without training.

EXAMPLE: STEP 3.1

(The procedural task selected for analysis is in the MOS Signal Security Specialist. "Identify Improper ECCM Techniques Contained in Monitored Radiotelephone Traffic." The analyst will help the SME to identify the specific actions required in performing the task. This task will be used in all examples for this lesson.)

ANALYST: What I'd like to do first is have you describe the actions involved in performing the task. Please think of a typical situation in which the task would be performed. Keeping that situation in mind, what are the things you must do to complete that task?

SME: Well, you copy the traffic on the Mill. You're also recording it-- at the same time. Then you take the hard copy and identify all ECCM techniques that have been used. You mark any techniques you consider improper and indicate what kind of error was made for each. Then, after you've finished a shift, you take all the annotated copy to the analyst for verification. Usually the traffic's coming in pretty heavily so you don't have time to do anything but copy. So, on a break or after a shift, you go through it all to mark the discrepancies and annotate them.

ANALYST: Can you describe these actions as directions or orders? Please keep them as simple and clear as possible.

SME: OK. First monitor the traffic. Then take the hard copy and examine it to identify all uses of ECCM techniques. Third, mark any instances you consider to be improper; use a pair of double slashes; fourth annotate each such discrepancy by stating what you believe is wrong with the technique used. Last, give the annotated copy to the analyst for verification. That's the way I do it.

## STEP 3.4

### STEP DESCRIPTION

STEP 3.4 Ask the SME to check the steps to ensure the presence of all steps that are necessary and appropriate for this level of description. Make sure that the steps are listed in the optimal procedural order. Be careful to distinguish between parallel steps and sequentially prerequisite steps.

Note: Have the SME identify parallel steps first. Then identify the prerequisite order of the steps. It is helpful to draw, or ask the SME to draw, a flow diagram of the procedure to ensure that the order of the steps is both logical and optimal. Represent all procedural activities with flowcharts.

---

### VOCABULARY SUPPORT

Optimal procedural order - that sequence of steps which represents an approved, efficient way of performing the task. The "Army" way is usually the optimal order. Particular personal preferences or habits should not be described at this time.

Parallel steps - two or more steps which can be performed in any order since they all follow after, or lead into, a single other step.

Sequentially prerequisite steps - steps which must follow one another in a particular order such that one step must be performed before another step can be performed.

EXAMPLE: STEP 3.4

(Once the individual steps of the task have been identified, they must be ordered in an appropriate sequence.)

ANALYST: Your description of the steps is clear and direct. Is that the best sequence for them?

SME: Yes, it has to be done that way. The steps fit into each other. You can't mark the copy until you've typed it, and so on.

ANALYST: Fine; you've identified the best procedural order. I've drawn a diagram of what you've told me. Is it accurate and complete?



SME: Yes. It looks right. That's how it's done.

(Note that this task has no parallel steps. Instead, these steps are sequentially ordered.)

## STEP 10.1

### STEP DESCRIPTION

STEP 10.1 Examine a procedural step at its lowest level of description. Is there any knowledge (facts or concepts) that must be used to perform the task to criterion?

- a. If there is, go to STEP 10.4.
- b. If there is not, go to STEP 10.10.

---

### VOCABULARY SUPPORT

Knowledge analysis - a kind of analysis which involves identifying all facts and concepts that a soldier must know in order to perform the activity. Note that this lesson requires you to identify facts and concepts that support each step. In later lessons, you will also examine these facts and concepts to identify knowledge that a soldier must have in order to learn these facts and concepts.

Fact - a statement which applies only to a single object or event and which does not generalize. A fact states an identity of some kind.

Example: Sgt. Harris is a signal security specialist.

Not an example: Sergeants have supervisory duties.

The first statement is a fact because it describes one particular soldier; one other soldier is included in the statement. The second statement is not a fact because it describes many soldiers; every sergeant is included in the statement.

Examples: My technical manual is torn. This jeep has a flat tire. STEP 10.1 of ETAP is very simple to perform.

Not examples: Weapons must be cleaned and lubricated regularly. Task analysis procedures are used by the army.

Concept - a statement that applies to a group of objects,

events, or ideas. A concept has a) a name; b) a set of characteristics which define it; and c) at least two examples. Understanding a concept means using the defining characteristics to determine whether something belongs or does not belong to the group of objects or events or ideas.

Example 1: "Task" is a concept. One example of a task is "establish a COMSEC monitor site." A second example of a task is "qualify with an M16A1 rifle." A third example is "conduct inventories of property book items." To be classified as a task, an example must have the following defining characteristics: it must consist of 1) a set of mental or physical actions which, 2) when performed in an appropriate sequence, 3) results in a unique product or service.

Example 2: "Protective mask" is a concept. A protective mask is a covering for the face that screens out contaminants to prevent their being inhaled or exhaled.

One instance of a protective mask is the surgical mask worn by a particular doctor. Another instance is a gas mask worn by a soldier. A bandana worn by a child over her nose and mouth to protect her during a dust storm is also a protective mask. A stocking covering the face of a bank robber during a robbery is not a protective mask, since it is not used to screen out contaminants.

EXAMPLE: STEP 10.1

(Once the steps have been described and sequenced, each step must be examined to determine whether there is any knowledge a soldier must use in performing the step. Each step is examined individually.)

ANALYST: What we need to do now is examine each step to identify what a soldier must know before he can learn to perform the step. We're looking for any facts or concepts the soldier uses when performing the step. Look at step one; are there facts or concepts a soldier must know in order to monitor the traffic?

SME: Yes. There are several things a soldier has to know in order to do it right.

(Analyst decides that a knowledge analysis is needed on this step.)

## STEP 10.4

### STEP DESCRIPTION

STEP 10.4 Has the required knowledge already been acquired by soldiers who are at the minimum acceptance level?

Note: STEPS 10.2 and 10.3 are not relevant for procedural activities. These STEPS will be introduced later when other kinds of analysis procedures are presented.

-----

### VOCABULARY SUPPORT

Fact - a statement that does not generalize.

Concept - a group of objects, events, or ideas that share some defining characteristics. An example belongs to the concept if it has the characteristics which define the concept.

Standard conventions - the numerical and flowcharting systems used to describe the steps of a task, the pieces of underlying knowledge and their relationships. One system of alphanumeric conventions is presented in Lesson 8. Lessons 1-7 use a flowcharting system in the examples.

EXAMPLE: STEP 10.4

(Underlying facts and concepts are listed now and given identifiers according to the system of standard conventions.)

ANALYST: What must the soldier know in order to monitor traffic?

SME: He has to know what traffic is.

ANALYST: Give me a definition for traffic.

SME: Traffic is the actual messages broadcast over radiotelephone.

ANALYST: Good--we've identified one concept, traffic. Is there any other knowledge?

SME: He has to know the concept of monitoring.

ANALYST: How would you define that concept?

(The analyst records this definition and asks for additional knowledge to be identified and described. When all underlying knowledge for a step has been identified, the knowledge analysis for that step is complete.)

STEP 10.10

STEP DESCRIPTION

STEP 10.10 Are there any more steps which have not been submitted to knowledge analysis?

- a. If all steps and concepts are at entry level, go to STEP 11.1
- b. If there are more steps to be analyzed, go to STEP 10.1.

Note: For each step, return to STEP 10.1 to conduct a knowledge analysis of that step separately. When no more steps remain, go to STEP 11.1 to prepare the final report. --In this lesson, a simplified form of STEP 10.10 is presented. The complete version of this STEP will be presented in a later lesson.

EXAMPLE: STEP 10.10

(The analyst and SME have performed a knowledge analysis on the first step of the task. Now each remaining step must be similarly analyzed, one step at a time.)

ANALYST: Look at the second step, examining the hard copy to identify ECCM techniques. What must a soldier know in order to do this?

SME: He has to know what hard copy is and how it differs from taped copy, and what the ECCM needs to be able to identify examples of each technique when he hears it being used. I guess those are all concepts.

ANALYST: Are any facts needed?

SME: No, just those concepts.

ANALYST: Good. We need to define each concept separately.

(The analyst completes STEP 10.1 and 10.4 for this step.)

ANALYST: What about the third step, marking discrepancies. What must a soldier know to do that?

SME: He has to know what a discrepancy is. I guess that's a concept. He also has to know that double slashes are used to mark discrepancies in hard copy. That's a fact.

ANALYST: Good. Let's get some definitions down.

(The analyst continues analyzing each step separately.)

ANALYST: For step five, we identified three concepts and two facts. Are there any more steps to be analyzed?

SME: No. We've covered the entire procedure. We're done.

ANALYST: Fine. Now we can begin the final report.

(Analyst proceeds to STEP 11)

## STEP 11.2

### STEP DESCRIPTION

STEP 11.2 Check the results of the entire analysis with at least one other SME, or other sources of information to ensure that the results are complete and accurate.

- a. If the analysis is incomplete, return to STEP 3.1 to complete the necessary analysis.
- b. If the analysis is complete, go to STEP 11.3 to prepare a final description of the analysis.

---

### VOCABULARY SUPPORT

Sources of information - in addition to other SMEs, task information may be obtained from soldiers manuals, and technical manuals, existing training programs. To ensure the completeness and accuracy of the analysis, several information sources are used as checks on the analysis. The goal of this STEP is to make certain that the task description represents standard Army procedures rather than the habits and preferences of a particular SME or the demands of a particular situation.

EXAMPLE: STEP 11.2

(The analyst seeks confirmation of the accuracy and completeness of the analysis by contacting another SME.)

ANALYST: Sgt. Jackson, we've finished analyzing task 1405 in your MOS. I'd like you to examine the results for accuracy and completeness. First, have we identified all the necessary steps of the task?

SME: Yes. Everything's there.

ANALYST: Are the steps in the best order for performing the task?

SME: Yes, that's the Army way for doing it.

ANALYST: Fine. Now let's look at what a soldier must know in order to complete these steps. What about the first step; have we identified all the underlying knowledge needed to be able to monitor the traffic?

(The analyst reviews the entire analysis, one section at a time, with the second SME.)

SME: On this last step--I think there's another important concept. The soldier also has to know what we mean by verification. The Army has a special definition for that term.

ANALYST: Good. Give me the definition, please.

(The analyst and SME provide a definition for the additional concept.)

ANALYST: Is there anything else--anymore knowledge needed?

SME: No. this is very complete.

ANALYST: Thanks for your assistance.

(Once the completeness and accuracy of the analysis have been verified, the final report can be written. Analyst proceeds to STEP 11.3.)

## STEP 11.3

### STEP DESCRIPTION

STEP 11.3. Using the standard conventions (numerical and diagramatic), prepare an integrated description of the results of the entire analysis. Make sure it shows the following:

- all steps and concepts at the appropriate level of description;
- all procedural relationships among the steps; and
- all learning relationships.

---

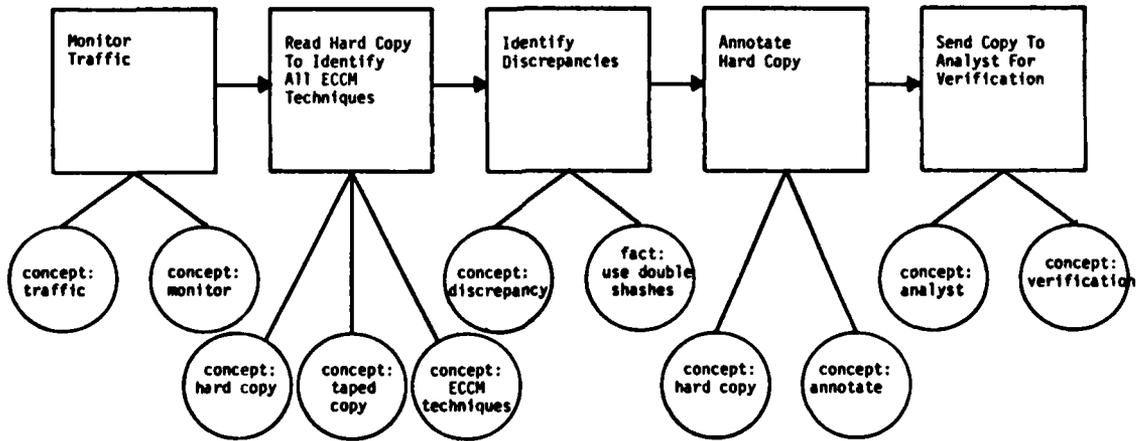
### VOCABULARY SUPPORT

Integrated description - a description which combines the results of the process analysis and the knowledge analysis to indicate both procedural relationships and learning relationships. The description must contain a complete detailing of all activities and prerequisite knowledge required for successful task performance.

Procedural relationships - relationships among the steps indicating logical order for performing them, including prerequisite relationships and parallel relationships. A flow diagram is a useful means for indicating procedural relationships.

Learning relationships - relationships between steps and their prerequisite knowledge. An alphanumeric system or a flowchart can be used for indicating what prerequisite knowledge for each step.

EXAMPLE: STEP 11.3



## STEP 12

### STEP DESCRIPTION

STEP 12 Have an experienced instructor review the results of STEP 12 and flag each step and concept that is taught in a training course. The remaining steps and concepts are prerequisite skills and knowledges which must be taught by BSEP.

-----

### VOCABULARY SUPPORT

Prerequisite skills and knowledges - those skills and knowledges which must be learned before others can be learned. Generally they are so basic that they are not normally taught during training but are assumed to be already mastered by soldiers. However, for soldiers at the lowest ability level, this assumption is usually false. Thus the Basic Skills Education Program (BSEP) must identify and teach these prerequisites before such soldiers can enter standard training programs.

EXAMPLE: STEP 12

(The analyst completes the procedure by consulting an experienced instructor.)

ANALYST: Sgt. Miller, we've just completed a task analysis of task No. 1405, Identify Improper ECCM Techniques Contained in Monitored Radiotelephone Traffic. You conduct the training for that MOS. Please review this integrated description of the results of the analysis to identify any skills or steps and any concepts listed here which are not currently trained. We need to identify those task components which require training in the Basic Skills Education Program.

EXPERIENCED INSTRUCTOR: Certainly. We include within present training all the steps you have listed. However, two concepts listed here are not taught in any of our SIGSEC courses: hard copy and annotation. The instructors probably assume that those concepts are familiar to trainees.

(The analyst decides that the concepts of hard copy and annotation require training in the BSEP program, and marks them accordingly.)

## SUMMARY

The most basic and simple form of ETAP consists of two kinds of analysis, process analysis and knowledge analysis. As you just learned, these two kinds of analysis can be used to analyze a procedural task; the sequence consists of the following STEPS:

- STEP 3.1 Given a procedural activity to be analyzed, have the SME identify and describe the individual actions which make up the task.
- STEP 3.4 Ask the SME to arrange the steps in the best order for performing the task. Ask him to indicate parallel steps and sequentially prerequisite steps.
- STEP 10.1 Examine each step to identify any concepts which must be learned before the step can be learned.
- STEP 10.4 List each concept along with an identifying numerical code.
- STEP 10.10 Check to make sure that every step has undergone knowledge analysis.
- STEP 11.2 Have another SME review the results of the analysis and/or check with other information sources to make certain the task is described completely and accurately.
- STEP 11.3 Combine the results of the process analysis and knowledge analysis into a single task description.
- STEP 12 Ask an experienced instructor to review the complete task description to identify all prerequisite skills and knowledge not taught in existing training programs.

## SUPPLEMENTARY EXAMPLE

In order to summarize conveniently all the steps presented in this lesson, an additional example is presented in the form of a set of products resulting from successful completion of each step.

The procedural task selected for analysis is task No. 1205, Complete a written conventional telephone monitor log. The process analysis resulted in the identification of seven steps to be performed. A flow diagram assisted in determining an optimal procedural order for the steps; no parallel steps were identified.



The knowledge analysis identified concepts which must be learned before each of the steps can be learned. These concepts were listed using the standard conventions. A review by another SME determined that the analysis was accurate, complete, and appropriate.

Combining the results of the process analysis and knowledge analysis produced an integrated description of the task. This description was reviewed by an experienced instructor who flagged with an asterisk prerequisite skills and knowledge that should be taught by BSEP (see Figure 3).

Step 1: Enter monitor log heading  
concepts: heading  
monitor log

Step 2: Determine that call is to be logged  
concepts: logging  
call

Step 3: Enter required identifying data  
concept: identifying data

Step 4: Summarize contents of conversation  
concept: summary  
fact: the summary must fit on two or three  
lines of the log page.

Step 5: Add operator remarks  
concept: operator remarks

Step 6: Enter value of conversation  
concept: approved values

Step 7: Affix appropriate classification markings.  
concept: classification markings

## PRACTICE

The most useful practice for these STEPS occurs in the real world, rather than within the pages of these materials. Ask someone to serve as your subject matter expert (SME) for a procedural task. Analyze that task by following the sequence of STEPS you just learned. Use the User's Manual as a guide, referring to the appropriate STEPS as necessary. When you have completed the analysis, check your results against the checklist below. Then identify any weaknesses or inconsistencies in your product and review the appropriate pages in this lesson, as needed.

### CHECKLIST FOR SIMPLIFIED PROCEDURE

1. Is the task identified by a number and title?
2. Are the component actions described as directions to perform, using action verbs?
3. Is the list of actions complete?
4. Are the steps arranged in a logical sequence?
5. Is the sequence optimal?
6. Are parallel steps and sequentially prerequisite steps indicated as such, either by a flow diagram or a coding system?
7. Do parallel steps have either a common prior step or a common following step?
8. Was the knowledge analysis performed on each step separately?
9. Were all steps analyzed for underlying concepts?
10. Is each concept identified by an alphanumeric code?
11. Does the code indicate which step each concept is a prerequisite for?
12. Has some other source of information confirmed the accuracy and completeness of the analysis? If not, have necessary changes been made and then reviewed?
13. Does the integrated description contain all steps and all concepts?
14. Does the coding system used indicate relationships between steps and prerequisite concepts?

## LESSON TWO: CONDUCTING A PROCESS ANALYSIS

### INTRODUCTION

In this lesson, you will learn how to do one of the two basic kinds of analysis described in Lesson One: Identification of the actions a soldier must do to complete the task. We will call this a Process Analysis because what is being determined is a path through or process of a task. Through the application of this analysis, you will be breaking down a task into a series of actions or activities. In lesson one you identified a general series of actions for a particular task. Now you will look to see if there are any other ways this series of actions might be completed, given a change in some condition. In other words, you will determine whether there are any decisions within the series of steps which branch in one of two directions depending on existing conditions. Then you will examine each separate activity to determine whether it too must be broken down. This is called Substep Analysis. Remember that process and substep analyses are only two components of a complete procedural analysis. You will be learning more about these other components in future lessons. At this point, we will concentrate on actions which comprise the task.

### OUTLINE OVERVIEW

To complete all activities for a Process Analysis of a procedural task, carry out the following.

- Determine if there are other ways to do the task identified in Lesson 1 for analysis by identifying all decisions to be made. (STEP 3.2)
- If there are other ways, list them using standard conventions. (STEP 3.3)
- Check the final process analysis to make sure that all steps are described in a sufficient amount of detail. (STEP 3.5)
- Identify any critical steps, or those steps for which the consequences of error are likely to be severe. (STEP 3.6)
- Examine a procedural step to determine whether a job aid is available for that step. (STEP 4.1)
- If there is a job aid, determine whether low-ability

entering soldiers can use the job aid without further training. (STEP 4.4)

--If no job aid is available for the step, decide whether a low-ability entering soldier can perform the step without further instruction. (STEP 4.2)

--If low-ability entering soldiers can perform the step or use the job aid without further instruction, indicate that no knowledge analysis is needed for the step or job aid. (STEP 4.5)

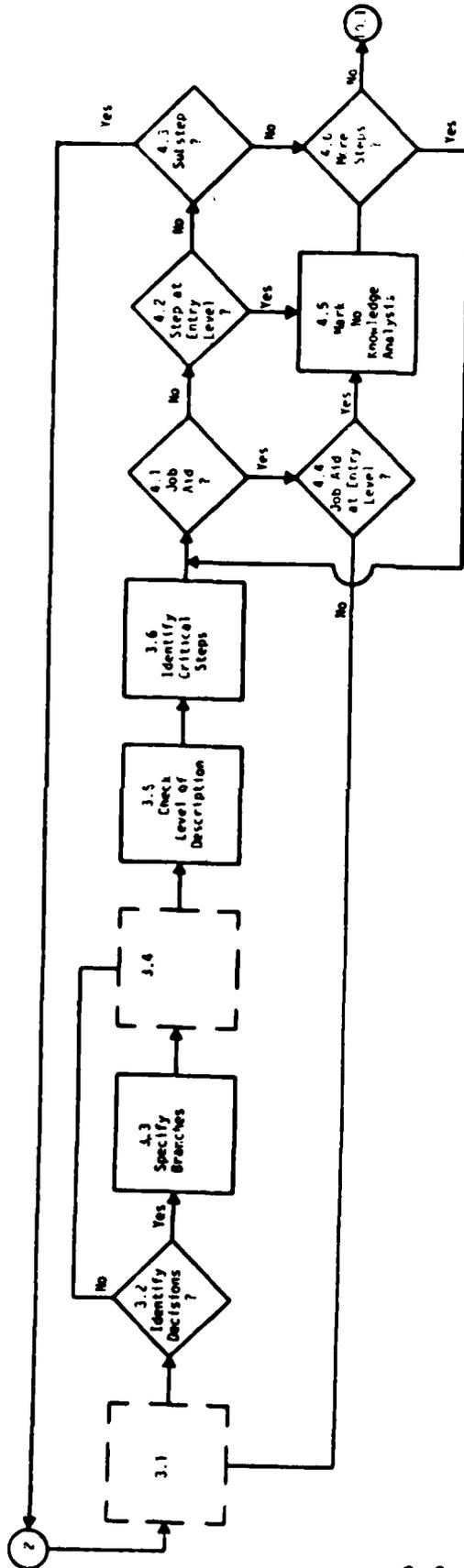
--If a soldier must be taught to perform the step, decide whether the step can be broken into substeps. (STEP 4.3)

--Identify the next step requiring substep analysis. (STEP 4.6)

#### COMMENTS

The process and substep analyses are completed as a part of the ETAP in order to lay out specified sequences of actions which are to be done by a soldier for a particular task. These actions will occur either in the form of "activities to do" or "decisions to be made." Once a process has been identified for doing a task, trainers will be more easily able to decide the best way to teach the skills of a particular task.

Reference



## STEP 3.2

### STEP DESCRIPTION

STEP 3.2 Ask the SME to review the steps to determine if there are other ways the activity should be done, depending on the conditions.

- a. If there are other ways, go to STEP 3.3.
- b. If there are not, go to STEP 3.6.

Note: You will recall that in Lesson One you were asked to determine the simplest path through a procedure. Now you are being asked to go back and look at points where a procedure can break into two or more possible paths. These points represent decision steps which indicate alternative routes by which a soldier may move through an activity.

You may have to probe several times to get the SME to talk about decision steps. Most procedural tasks are described as if there is one direct path involved in completing them. However, through asking the SME about points in the procedure which seem to involve a decision, you will probably find many decision steps.

---

### VOCABULARY SUPPORT

Other ways - these ways or alternative paths are determined by the presence of decision steps in the procedure.

Decision step - a point in a procedure at which the soldier must make a choice. This choice is usually one of two possibilities and is most often thought of as a "yes-no" decision. Standard conventions show decision steps as diamonds in a flow chart.

Path - a sequence of steps resulting from a decision.

EXAMPLE: STEP 3.2

(In Lesson One, you learned to identify the simplest path through the procedure; this path consisted of a set of execution steps arranged in an optimal order. Now this set of steps is examined again to identify points at which the soldier must decide what to do next. Each such point is a decision step and it must have at least two possible choices, which reflect different decisions. The Analyst helps the SME to identify these decision steps and the alternative paths that can result from each decision. The examples in this lesson continue with task #1405, identifying improper ECCM techniques.)

ANALYST: Let's look at the set of steps the soldier must perform when identifying improper ECCM techniques in monitored radiotelephone traffic. Is the task always performed this way? Is each of these steps always performed?

SME: Yes, that's the sequence.

ANALYST: Do all communications contain improper ECCM techniques?

SME: Well, not all. But some do.

ANALYST: If a particular communication uses only correct techniques, what does the soldier do--does he mark the correct techniques?

SME: Well, no. He only marks the improper ones.

(The analyst is helping the SME to identify a decision step by asking questions about different situations or conditions that would cause the soldier to perform the task, or part of the task, differently.)

ANALYST: Are you saying that there are two ways to perform this task; if there are improper techniques, these are marked and annotated, but if no improper techniques are used, then no marking or annotating is needed. Is that right?

SME: Yes. Two choices are possible. The soldier has to decide whether improper ECCM techniques are being used.

ANALYST: You've identified a decision step with two alternative paths. That changes our original description of the steps.

(Analyst decides that there are two branches and proceeds to STEP 3.3.)

### STEP 3.3

#### STEP DESCRIPTION

STEP 3.3 List the different ways the activity is done. These different ways should be included as branches, complete with related decision steps.

Note: In the last step, you identified decision steps as the basis for branches or different ways the activity should be done. Now, using standard flowcharting conventions, list the ways so that all possible correct paths through a procedure are identified and recorded. This will help with development of effective training programs.

-----

#### VOCABULARY SUPPORT

Branch - an alternate path leading from a decision step

EXAMPLE: STEP 3.3

(The analyst has determined that there are two ways to complete the task of monitoring radiotelephone traffic. Now the analyst helps the SME to describe the decision step and the two branches. Drawing a flowchart helps the description process.)

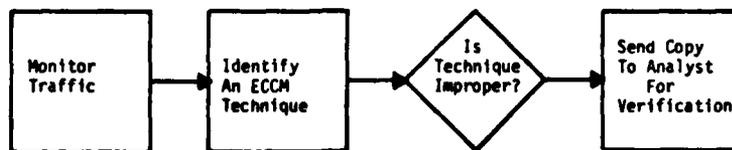
ANALYST: Let's take a look at the sequence of steps again. First, the soldier monitors the traffic. Second, he identifies all ECCM techniques used in the traffic. Each time he finds an ECCM technique, he must decide whether or not it has been used properly. Is that correct?

SME: Yes, he has to make a decision at that point.

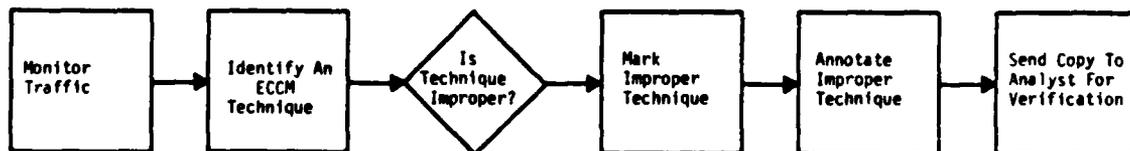
ANALYST: OK. We have a decision step. Now, let's look at the shorter path through the task. What happens if he doesn't find an improper technique in a communication?

SME: He just keeps reading the copy; he doesn't have to mark anything or annotate anything.

ANALYST: OK. Let's draw a flowchart of this shorter path.



Now, let's look at the other path. If he finds an improper technique, he marks and annotates it. So these two steps have to be included, making this path longer. Right? OK., let's draw a flowchart of the longer path.



Now what happens?

SME: He checks to see if there is another ECCM technique to be evaluated. If there is, he goes through the same decision process again. When there are no more ECCM techniques to be evaluated he sends the annotated copy off for verification.

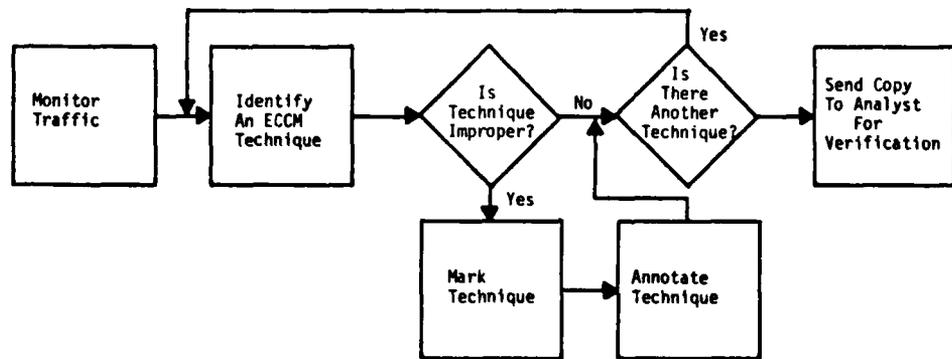
ANALYST: Great. That's another decision step, with two branches. The long branch takes the soldier back through

the procedure again; the short path goes directly to the last step. I'll draw a flowchart of this revised procedure. Tell me if it represents the decisions and branches accurately.

(See below)

SME: That's it. The branches cover all possible situations. I didn't realize the task was this complicated.

(Analyst decides that all the decision and branches are accurate and proceeds to STEP 3.5.)



STEP 3.5

STEP DESCRIPTION

STEP 3.5 Check to make sure that all steps are stated at approximately the same level of description.

EXAMPLE: STEP 3.5

(The analyst check to see that all steps (actions) in the procedure are stated at about the same level of description.)

ANALYST: (to the SME) In looking at the set of steps we have found to make up this task, do you think each one is about as complex as any of the others?

SME: Yes, I believe so.

(The analyst now moves on to the identification of any critical steps in the procedure.)

STEP 3.6

STEP DESCRIPTION

STEP 3.6 Ask the SME to identify any critical steps in the procedure and to include a step somewhere in the procedure for rechecking any critical step.

Note: It is important to check and recheck all critical steps to ensure such steps will be performed correctly in the field.

-----

VOCABULARY SUPPORT

Critical steps - these steps include those activities for which the consequences of an error are particularly severe.

EXAMPLE: STEP 3.6

(The analyst helps the SME to identify critical steps and to build check on their performance into the procedure.)

ANALYST: Now, in looking at the process we have just mapped out--that of identifying improper ECCM techniques--are there any steps which you feel are critical. By critical, I mean are there any steps which, if not done correctly, would seriously hamper the performance of the task?

SME: Well yes, if a soldier makes a mistake in determining improper techniques that could cause a lot of problems.

ANALYST: So, we could flag the first decision step as a critical step. Are there any others?

SME: No, not here.

ANALYST: OK. We have one critical step in this activity. What would be the consequences of making an error on this step. Is it serious?

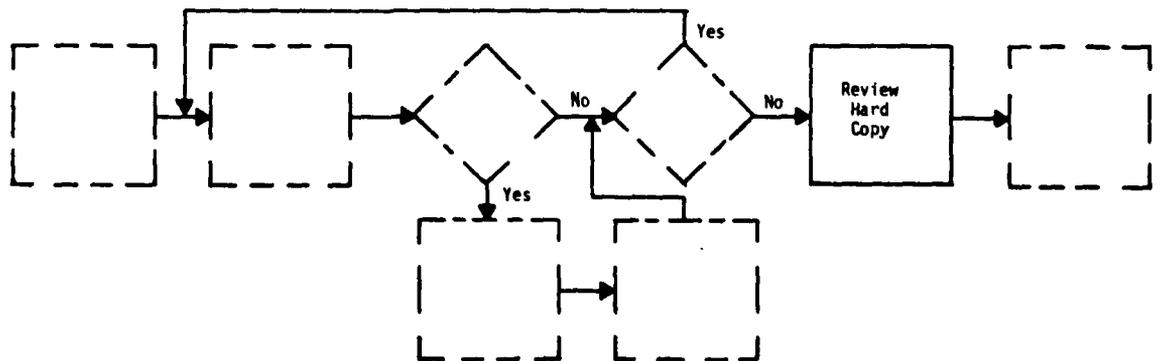
SME: Improper techniques are serious security risks. The enemy can get valuable information from them. If the soldier misses an improper technique, the chances are that he loses a chance to plug up a security leak. That's serious.

ANALYST: How can we include a check on this critical step?

SME: Well, we can require the soldier to review the annotated copy before sending it in.

ANALYST: Good. Let's add that step. It goes in before the last step in the flowchart.

(Analyst decides that all critical steps have been identified and proceeds to STEP 4.1.)



STEP 4.1

STEP DESCRIPTION

STEP 4.1 Choose one of the steps identified in STEP 3. Does a job aid exist for the action identified in the step?

- a. If yes, go to STEP 4.4 to analyze the job aid.
- b. If no, go to STEP 4.2.

Note: If the soldier can use a job aid to guide performance, then he does not have as much information to learn or memorize. However, if no job aid is available, then the step must be broken into substeps.

-----

VOCABULARY SUPPORT

Job aid - any source of information which a soldier can consult rather than learn the information. Job aids include manuals, directives, maps, charts, graphs, tables, and human agents such as superiors and fellow soldiers. The availability of a job aid makes the soldier's work easier since he need not learn or memorize the information in the aid but merely know what aid to use and how to use it in order to obtain the information.

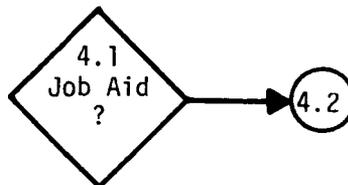
EXAMPLE: STEP 4.1

(Any step may be selected first for substep analysis. In order to provide complete examples for all five possible paths through STEP 4, this example begins with an analysis of the first step in the task, monitoring traffic. The analysis of this step takes the analyst through the longest path in STEP 4. A diagram of that path will be constructed during the examples for the next three STEPS. Only those STEPS are presented which lie in this longest path. The other activities in STEP 4 will be presented and exemplified later in this lesson.)

ANALYST: Is there a job aid the soldier can use to help him monitor traffic? Or does he have to be taught to do this?

SME: There's nothing. He has to know how, or be taught.

(The first part of this longest path can be diagrammed thus:



STEP 4.2

STEP DESCRIPTION

STEP 4.2 Can a soldier at entry level perform the action involved in the step without further training?

- a. If yes, go to STEP 4.5.
- b. If no, go to STEP 4.3 to begin breaking the action into elements.

EXAMPLE: STEP 4.2

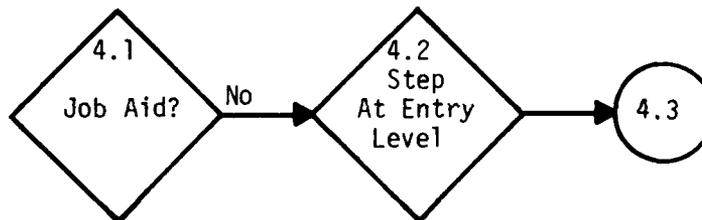
(If no job aid exists to help a soldier perform the step, then the step requires further analysis.)

ANALYST: You said that there's no job aid to help a soldier monitor traffic. Could an entering soldier perform this step without any training, or would he have to be taught?

SME: It's a very complex activity. He'd have to be taught.

ANALYST: OK. We have to analyze the step further.

(If the step requires training, it must be further analyzed. The next part of this longest path through STEP 4 can be diagramed thus:



### STEP 4.3

#### STEP DESCRIPTION

STEP 4.3 Can the action identified be broken down into substeps?

- a. If the step is already specific enough, go to STEP 4.6.
- b. If the step is too general, go to STEP 3 to do a process analysis of the substep.

Note: In making this decision, assume that all necessary knowledge underlying the steps has been learned by the soldier. You are asked here to look at the clarity of the statements which define what the soldier must do in order to complete the task to criterion. Remember that a step is too general if it does not describe sufficiently precise and detailed actions for an entering soldier to be able to perform that step.

EXAMPLE: STEP 4.3

(Having determined that the step requires training, the analyst must now decide whether the activity for that step can be broken into a set of substeps. If it can, the analyst must help the SME to determine what these substeps are and what their optimal order is. To do this, the analyst cycles back to STEP 3 and analyzes that activity involved in monitoring traffic. The longest path through STEP 4 includes this recycling; it can be diagrammed thus:



Note that STEP 2 has not yet been taught in these lessons because we are assuming that each step is procedural and that the answer to the question in that STEP is always yes.)

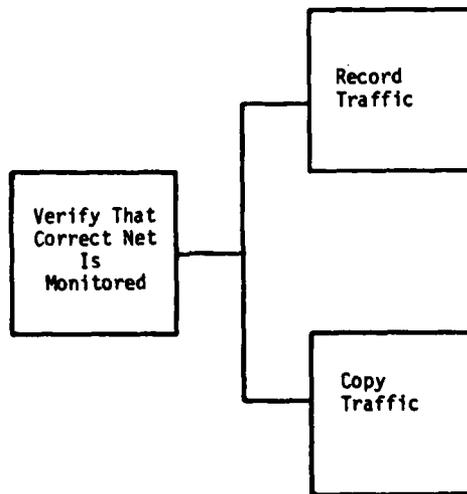
ANALYST: You said the activity required in monitoring traffic can be broken into a series of substeps. Please list those actions for me.

SME: Sure, first you verify that the correct net is monitored; then you record and copy the traffic.

ANALYST: Are recording and copying two separate steps?

SME: Yes, but they are done at the same time.

ANALYST: Good, then the flowchart of this step looks like this:



SME: Yes, that's right.

ANALYST: OK, are there any places where a decision is made?  
(STEP 3.2)

SME: No

(Analyst goes to STEP 3.5 as there are no decision steps.)

ANALYST: Are all the steps stated at about the same amount of detail?

SME: Yes, they are.

ANALYST: Are any of these steps critical?

SME: No, not at this point.

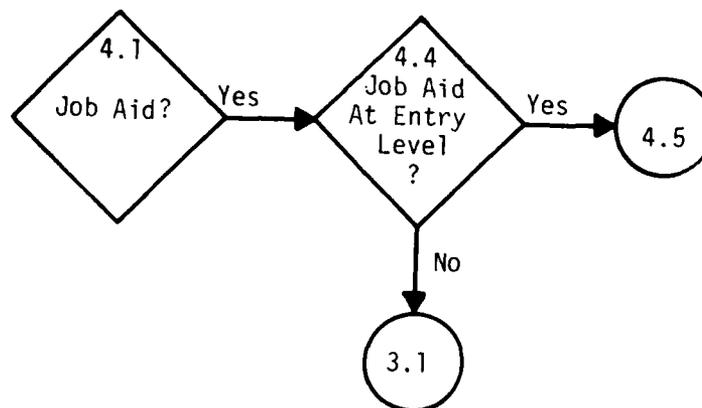
(The analyst now selects one of the three substeps on which to perform a substep analysis (STEP 4). Each of the three substeps must be submitted to substep analysis; one will be used as an example here, to demonstrate another path through STEP 4. A flowchart of that path will be build during this example and the ones that follow.)

ANALYST: We've identified as one substep the activity of recording the traffic. Is there a job aid the soldier can use to help him record traffic.

SME: Well, there's a technical manual that tells him what to do.

ANALYST: Good, now we need to look at that job aid.

(This path through the procedure involves identifying and analyzing a job aid. A flowchart of these STEPS looks like this:



#### STEP 4.4

##### STEP DESCRIPTION

STEP 4.4 Can a soldier at entry level use the job aid without further instruction?

- a. If yes, go to STEP 4.5.
- b. If no, go to STEP 3 to analyze the substeps necessary to be able to use the job aid.

Using the job aid may require skills which the entering soldier lacks. If this is the case, those skills must be described as a set of steps and analyzed down to an appropriate level of description. Therefore, the analyst must return to STEP 3 to conduct a process analysis of the steps for using the job aid.

EXAMPLE: STEP 4.4

(If a job aid exists to help a soldier perform an activity, that job aid must be analyzed. The job aid for recording traffic is analyzed now.)

ANALYST: Would an entering soldier with limited skills and knowledge know how to use a technical manual? Or must the Army teach him?

SME: He'd have to be taught.

ANALYST: OK. Is there a procedure for using the job aid? Please describe it.

(The analyst guides the SME through a process analysis of the procedure for using the technical manual, using STEPS 3.1 to 3.6. Each step of the procedure for using this job aid must also be submitted to substep analysis (STEPS 4.1 to 4.6).)

STEP 4.5

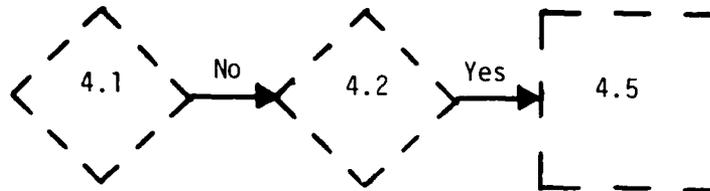
STEP DESCRIPTION

STEP 4.5 Mark the step or job aid to indicate that no knowledge analysis is required.

Note: If a step is stated in such a way that an entering soldier could perform it without further training, then knowledge analysis leading to identification of knowledge which must be taught need not be done. This also holds true for a job aid which is at entry level that aids in the performance of the step.

EXAMPLE: STEP 4.5

(The analyst helps the SME to examine one of the substeps in the procedure for using the job aid. This example reveals one of the shorter paths through STEP 4: an activity for which no training is necessary. This path can be diagramed thus:



ANALYST: Let's take a look at the activities involved in using a technical manual. The first step is to select the right manual. Is there a job aid for this step?

SME: No, you don't need one. If the soldier can read, he can look at the titles of manuals and pick out the right manual.

ANALYST: You're saying that an entering soldier can perform this step without training?

SME: Sure. He only has to be able to read.

ANALYST: OK, let's mark that step "no knowledge analysis." That means that we've finished analyzing this particular substep.

(The analyst continues with STEP 4.6.)

STEP 4.6

STEP DESCRIPTION

STEP 4.6 Are there any more steps which have not been submitted to substep analysis? Have all substeps identified as a result of substep analysis been submitted to further substep analysis until all of the substeps are at the level appropriate to the soldier entering at the lowest ability entering level?

- a. If there are steps which have not been submitted to substep analysis, go to STEP 4.1 to analyze the next step or substep.
- b. If all of the steps and substeps have been analyzed to the level appropriate for the entering soldier, go to STEP 10.

This step helps you to check on your progress in working through the process analysis. It asks you to examine what you've done thus far to determine what remains to be analyzed. If all steps and substeps have been analyzed down to the appropriate level, you are ready to begin the knowledge analysis.

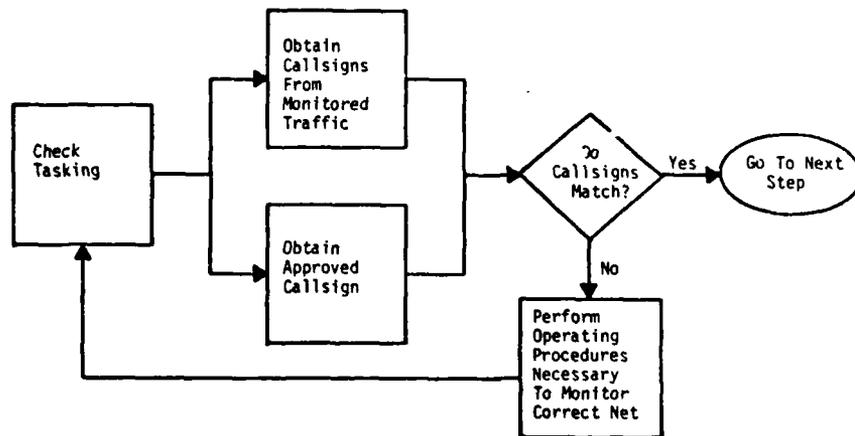
EXAMPLE: STEP 4.6

(The analyst checks on the progress of the analysis by reviewing the completed portion with the SME.)

ANALYST: Let's see, we've analyzed Step 1 of the task of monitoring radiotelephone traffic. We've identified three major substeps of monitoring traffic: verifying that the correct net is being monitored; recording traffic; and copying traffic. We've also determined that there is a job aid, a technical manual, to help a soldier record the traffic and we've analyzed the procedure for using the technical manual. Now what else do we have to do?

SME: We need to look at the activity involved in verifying that the correct net is being monitored. That's fairly complicated; a lot of steps are involved.

(The analyst and SME conduct a substep analysis of this activity. They determine that no job aid exists to help the soldier (STEP 4.1). They also realize that entering soldiers will be unable to perform the activity without further training (STEP 4.2). Therefore, they break down the activity into a sequence of substeps (STEPS 3.1 to 3.6) and draw a flowchart of the activities involved in verifying the correct net:



(The SME indicates that the activity involved in checking the tasking has no job aid (STEP 4.1) and requires training (STEP 4.2), but it can't be broken down into substeps (STEP 4.3). Therefore, it must undergo knowledge analysis (STEP 1.1). A similar analysis is made of each substep involved in verifying the correct net. When all of these substeps have been analyzed and a complete set of flowcharts prepared, the analyst and SME are ready to begin the knowledge analysis of each substep and each job aid.)

## SUMMARY

What you have just learned is a part of a procedural analysis which deals with the actions the soldier must perform to complete a particular task. You have conducted a process analysis to identify the major steps in the task and a substep analysis to break each step into a sequence of substeps or to identify and analyze a job aid for a step. The complete set of STEPS includes the following:

- STEP 1 (Ask the SME to describe the set of steps required for performing the task: taught in Lesson One.)
- STEP 3.2 Ask the SME if there are other ways that an activity could be done. This involves the identification of decision steps. If the answer is yes, you move on to the next step.
- STEP 3.3 List the different ways an activity should be done using standard flowcharting conventions.
- STEP 3.4 (Have the SME arrange the steps in their optimal order, identifying execution and decision steps, parallel steps, and sequentially prerequisite steps in a flowchart: taught in Lesson One.)
- STEP 3.5 Check the final process analysis (and substep analysis) to make sure that all steps are stated at approximately the same level of description (or amount of detail).
- STEP 3.6 Ask the SME to identify any critical steps in the procedure and include a step somewhere in the procedure for checking these critical steps.
- STEP 4.1 Examine a step to determine whether a job aid is available for that step.
- STEP 4.2 If no job aid exists, determine whether a low-ability entering soldier could perform the step without further training.
- STEP 4.3 If the step requires training, determine whether it can be broken into substeps. If it can, break it down and conduct a substep analysis separately on each substep.

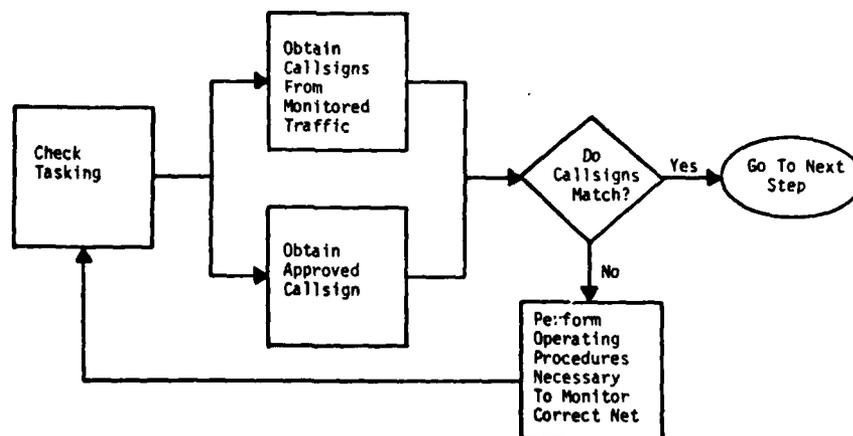
EXAMPLE: STEP 4.6

(The analyst checks on the progress of the analysis by reviewing the completed portion with the SME.)

ANALYST: Let's see, we've analyzed Step 1 of the task of monitoring radiotelephone traffic. We've identified three major substeps of monitoring traffic: verifying that the correct net is being monitored; recording traffic; and copying traffic. We've also determined that there is a job aid, a technical manual, to help a soldier record the traffic and we've analyzed the procedure for using the technical manual. Now what else do we have to do?

SME: We need to look at the activity involved in verifying that the correct net is being monitored. That's fairly complicated; a lot of steps are involved.

(The analyst and SME conduct a substep analysis of this activity. They determine that no job aid exists to help the soldier (STEP 4.1). They also realize that entering soldiers will be unable to perform the activity without further training (STEP 4.2). Therefore, they break down the activity into a sequence of substeps (STEPS 3.1 to 3.6) and draw a flowchart of the activities involved in verifying the correct net:



(The SME indicates that the activity involved in checking the tasking has no job aid (STEP 4.1) and requires training (STEP 4.2), but it can't be broken down into substeps (STEP 4.3). Therefore, it must undergo knowledge analysis (STEP 10). A similar analysis is made of each substep involved in verifying the correct net. When all of these substeps have been analyzed and a complete set of flowcharts prepared, the analyst and SME are ready to begin the knowledge analysis of each substep and each job aid.)

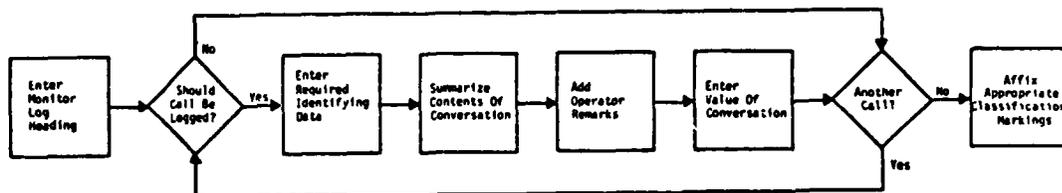
STEP 4.4 If a job aid exists for a step or substep, determine whether a low-ability entering soldier could use the job aid without training. If he cannot, conduct a process analysis on the procedure for using the job aid.

STEP 4.5 If either a job aid or a step does not require training indicate that no knowledge analysis is needed for that job aid or step.

STEP 4.6 Identify the next step that must be submitted to substep analysis and repeat STEPS 4.1 to 4.6 as necessary.

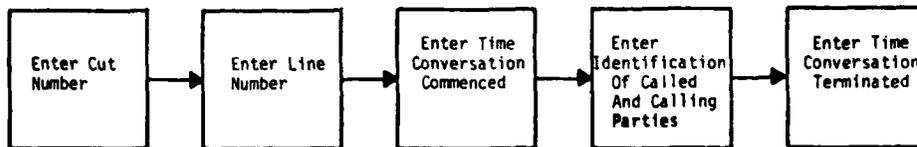
## SUPPLEMENTARY EXAMPLE

For SIGSEC task #1205, completing a written conventional telephone monitor log, seven major steps were identified; first the analyst helped the SME to identify decision steps and branches. Then a flow diagram of the entire procedure was prepared for this level of description:



Then each step underwent substep analysis. The first step, entering the monitor log heading. First, the SME indicated that a job aid, the log form, was available to guide performance of the step. The SME decided that an entering soldier would be able to follow the form without further instruction.

Next, another step was selected, entering required identifying data for a telephone call. Since no job aid was available and since entering soldiers could not be expected to perform this step without training, the step was broken into a sequence of substeps:



Each other major step was similarly analyzed.

## PRACTICE

This practice will be more effective if you can continue to use the same SME and the same task you used for practicing Lesson One. Conduct the substep analysis. Refer to the User's Manual as necessary; do not consult these training materials while you are analyzing the substeps. When the analysis is complete, review it against the following checklist. Then return to the appropriate pages of the training materials as necessary.

### CHECKLIST FOR SUBSTEPS ANALYSIS

#### PROCEDURAL ANALYSIS

1. Did you identify all decision points at which choices must be made about how to perform the activity?
2. Did you identify and list at least two branches for each decision step? Does each branch follow an appropriate path through the task?
3. Have all critical steps been identified? Has a check on the outcome of each critical step been included?
4. Have all job aids been identified.
5. If no job aid is available, has the step been broken down into more detailed substeps?
6. If instruction is needed for using a job aid, has the procedure for using the job aid been described?
7. For each step, has one of the following occurred:
  - the step (or job aid) has been determined to need no training; or
  - the step has been broken into substeps; or
  - the job aid for the step has been analyzed.
8. Are all steps at a particular level of description described with the same amount of detail and specificity?
9. Have all steps and job aids which do not need knowledge analysis been marked?

## LESSON THREE: CONDUCTING A KNOWLEDGE ANALYSIS

### INTRODUCTION

In this lesson, you will learn more about the second type of analysis. Knowledge analysis is the identification of the knowledge a soldier must have in order to learn or do a given task. The knowledge identified now serves to support a soldier in completing the activities of the task. In Lesson 1, you began a knowledge analysis by looking at each activity to identify its underlying facts and concepts. Now you expand your skills by learning to analyze all prerequisite knowledge (facts and concepts), and to determine whether that knowledge requires teaching.

### OUTLINE OVERVIEW

To perform a knowledge analysis, you will do the following:

- Examine a procedural step to see if there is any knowledge which a soldier must use to perform the step to criterion. (STEP 10.1)
- List the knowledge, identifying it as either a fact or a concept, providing a label and/or definition for it, and giving it an appropriate identifier. (STEP 10.4)
- Decide whether the knowledge has already been learned or is typically known by a soldier at the minimum acceptance level. If so, there is no need for further analysis of that knowledge. If not, the analysis continues. (STEP 10.5)
- Examine prerequisite knowledge for a step to decide whether a job aid provides that knowledge. (STEP 10.6)
- Determine whether a soldier is able to use that job aid without further training. (STEP 10.7)
- If the soldier must be trained to use the job aid, determine what type of knowledge (procedure, facts or concepts) must be taught. (STEP 10.8)
- Identify any procedure for using the job aid and

indicate that a process analysis must be performed on that procedure. (STEP 10.9)

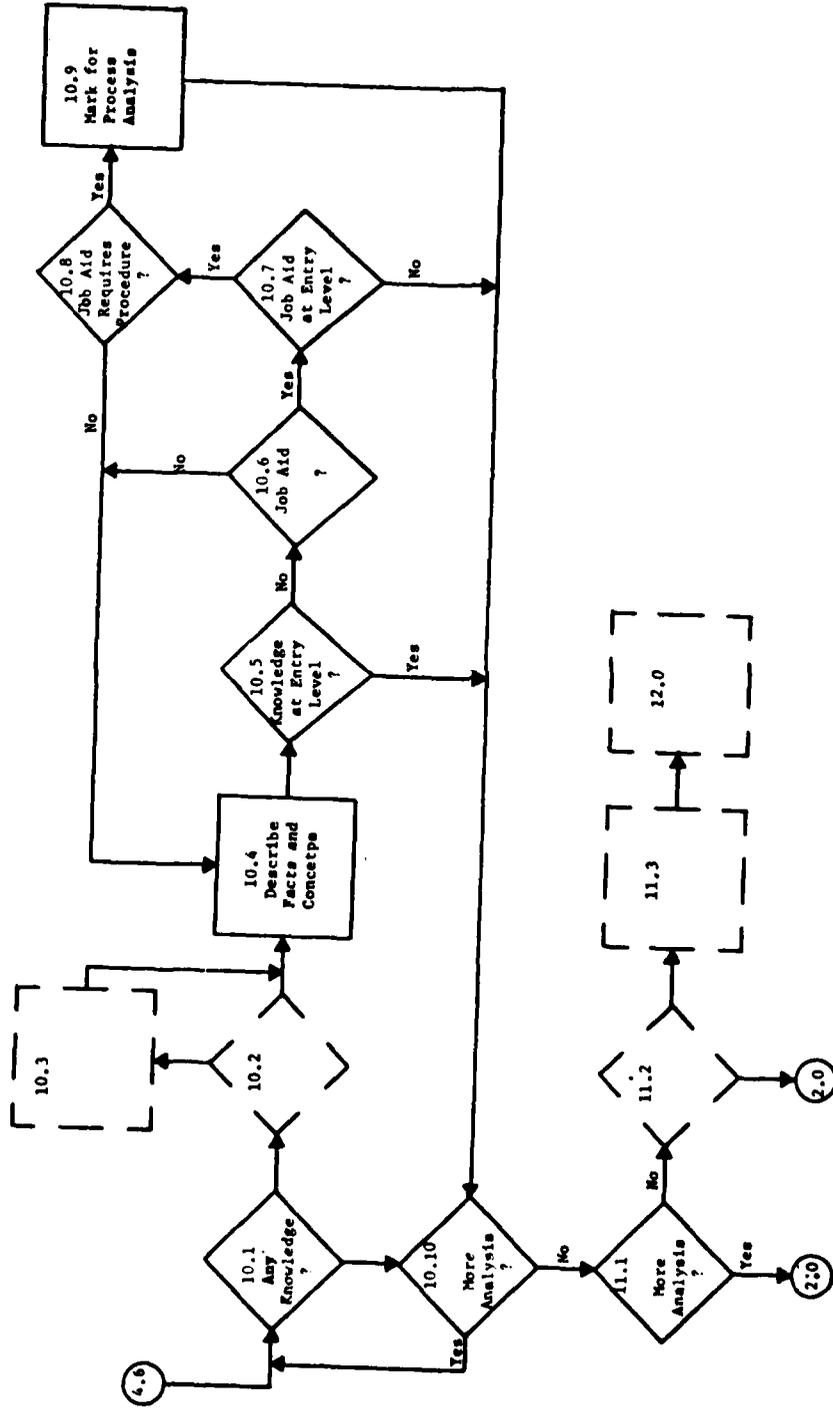
--Identify any steps and concepts that have not been analyzed into underlying knowledge and repeat the knowledge analysis process for each such step and concept. (STEP 10.10)

--Review the analysis to identify any steps or job aids that were marked for process analysis. If there are any, conduct these analyses now. (STEP 11.1)

#### COMMENTS

The identification of necessary underlying knowledge is an important part of a complete task analysis. In order to train soldiers effectively and efficiently, training programs must begin with the level of knowledge and skills possessed by the entering soldier and lead him/her to successful task performance. Thus, to design useful training, the Army must know what all prerequisite skills and knowledge are for a given task and whether soldiers entering with minimal skills and knowledge can be expected to possess these prerequisites. This two-pronged analysis helps training development personnel decide what must be taught.

REFERENCE



NOTE: STEPS 10.2 and 10.3 are not relevant to analysis of procedural tasks, therefore, they are not taught in this lesson.

STEPS 10.1, 10.4

STEP DESCRIPTION

STEP 10.1 Examine a procedural step at its lowest level of description. Is there any knowledge (facts or concepts) that must be used to perform the step to criterion?

a. If there is, go to STEP 10.4.

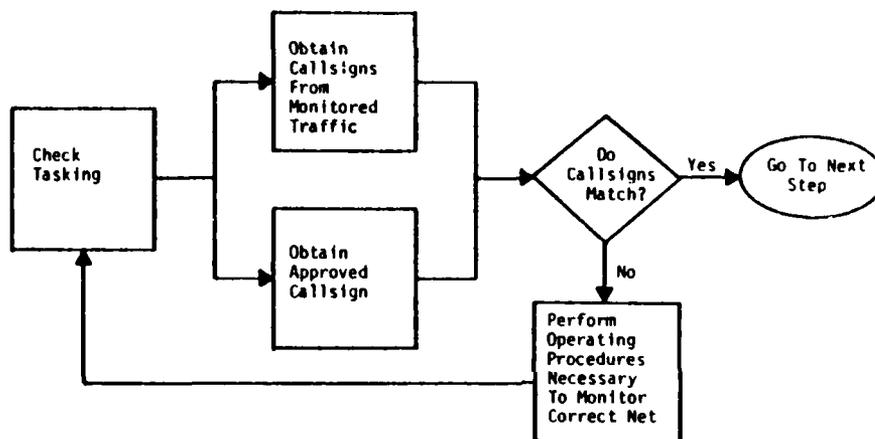
b. If there is not, go to STEP 10.10.

STEP 10.4 Identify and describe with a label and/or a definition each concept or fact which is prerequisite to the performance of the activity identified for the step or substep. Determine whether the knowledge is a fact or concept and label it using the standard conventions.

Note: In Lesson One, you learned to identify the prerequisite concepts and facts for each step of a procedural activity using STEPS 10.1 and 10.4. These STEPS are repeated here for review and for continuity. Remember that STEPS 10.2 and 10.3 are not utilized in the knowledge analysis of a procedural activity and are therefore not included in this lesson. An example of the application of STEPS 10.1 and 10.4 follows.

EXAMPLE: STEPS 10.1, 10.4

(Once all steps and substeps of the task have been identified, a knowledge analysis must be conducted on each step separately. The examples for this lesson use the substeps involved in monitoring traffic, the first major step in performing the task. A flowchart of these substeps is included for reference.)



ANALYST: We'll look at each substep separately during this part of our analysis. Let's start with this one--obtaining approved callsigns. What must a soldier know in order to do this?

SME: He has to know what a callsign is. And he has to know how to get the approved callsigns for the net.

ANALYST: Knowing what a callsign is--that's a concept. And knowing how to get approved callsigns--that's a procedure. Anything else?

SME: No, that's it for this step.

(Once underlying knowledge has been identified, the analyst must go to STEP 10.5 to begin analyzing that knowledge.)

STEP 10.5

STEP DESCRIPTION

STEP 10.5 Has the required knowledge already been acquired by lowest ability entering soldiers?

- a. If the knowledge has already been acquired, go to STEP 10.10.
- b. If the knowledge has not already been acquired, go to STEP 10.4.

Note: Knowledge which has typically been acquired by lowest ability entering soldiers does not need to be taught. Such knowledge requires no further analysis.

EXAMPLE: STEP 10.5

(The analyst helps the SME determine whether the knowledge just identified must be taught in a training program. Any knowledge that has already been acquired by a lowest ability entering soldiers need not be included in a training program.)

ANALYST: Let's talk about the knowledge we've just identified. Would a soldier entering the Army with the lowest acceptable ability know what a callsign is? Would that soldier know how to locate approved callsigns for the net?

SME: No way, we'd have to teach those things. They're specialized knowledge that no recruit would know.

STEP 10.6

STEP DESCRIPTION

STEP 10.6 Is there a job aid which provides the knowledge required for the step or substep?

- a. If there is no job aid, go to STEP 10.4 to conduct a knowledge analysis of the steps.
- b. If there is a job aid, go to STEP 10.7.

Notes: This step helps the analyst decide what the soldier must learn. If a job aid is available, the soldier must learn to use it. If no job aid is available, the soldier must learn the prerequisite knowledge for the step.

-----

VOCABULARY SUPPORT

Job aid - any source, such as a manual, a soldier can consult instead of learning some knowledge.

EXAMPLE: STEP 10.6

(Since entering soldiers cannot be expected to know what tasking is or where to find tasking information, the analyst must help the SME decide how that knowledge can be provided for the soldiers. One path through the knowledge analysis involves the identification of a job aid that the soldier can use instead of learning the knowledge. That path, which consists of STEPS 10.2, 10.7, 10.8, 10.9, and 10.10 will be followed in this and the next several examples. The step undergoing knowledge analysis is identifying approved callsigns.)

ANALYST: You said that the soldier must know what a callsign is and how to obtain approved callsigns for the net. You also said that the entering soldier would not have either piece of knowledge. Now, is there a job aid which the soldier can consult in order to find the approved callsigns?

SME: He can use the CEOI. He doesn't have to memorize lists of approved callsigns.

ANALYST: OK, let's look at this job aid.

(Since a job aid exists, the analyst goes to STEP 10.7 to analyze the job aid.)

STEP 10.7

STEP DESCRIPTION

STEP 10.7 Does a low-ability entering soldier need additional knowledge in order to use the job aid?

- a. If yes, go to STEP 10.8.
- b. If no, go to STEP 10.10.

Notes: Decide whether it is likely that soldiers entering the Army with minimal skills and knowledge would know how to use the job aid. The aid may only require limited reading skills, or arithmetic knowledge, or other similarly basic capabilities in order for the soldier to be able to use it. In this case, no training in using the job aid is required. Thus the analysis of this piece of knowledge is complete. However, if the job aid requires more specialized or advanced knowledge for its use, then that knowledge must be analyzed.taught.

EXAMPLE: STEP 10.7

(The analyst and SME have determined tha a job aid, the CEOI, can be used to obtain approved call signs. Now that job aid is analyzed.)

ANALYST: Would an entering soldier know how to use the CEOI?

SME: No way. The CEOI is a very specialized tool. Only certain personnel learn how to use it. It has to be taught.

ANALYST: OK. We'll have to analyze that job aid.

STEP 10.8

STEP DESCRIPTION

STEP 10.8 Does the job aid require the soldier to learn a procedure for its use? Does the job aid require the soldier to know some other knowledge (facts or concepts)?

- a. If a procedure is required, go to STEP 10.9.
- b. If concepts or facts are required, go to STEP 10.4 to analyze the prerequisite facts or concepts.

Note: A job aid must be analyzed exactly as a step or any prerequisite knowledge is analyzed. Facts such as types of job aids, their locations and availability are stated and labelled appropriately. Concepts are stated, defined, and labelled appropriately. Procedures for using the job aid, including prerequisite skills such as ability to read or to match sets of numbers, are also described and further analyzed as appropriate.

EXAMPLE: STEP 10.8

(The analyst helps the SME to identify prerequisite skills and knowledge for the CEOI, the first job aid identified.)

ANALYST: What does the soldier have to know to be able to use the CEOI?

SME: He must know what a CEOI is and what information it contains. Also, he has to know what call signs are. And he has to know how to use the CEOI.

ANALYST: Let's see; you've identified two concepts and a procedure. Let's look at the first concept. What is a definition for CEOI?

(The analyst helps the SME to define each concept. Then each concept is listed, along with its definition, and given an identifying number; the CEOI is given the identifying number 1405.1.1.3.lj to signify that it is a job aid. Then each piece of prerequisite knowledge is numbered accordingly: 1405.1.1.3.lj.lc CEOI; and 1405.1.1.3.lj.2c call signs.)

ANALYST: Is this definition enough? Or must the soldier learn some other knowledge before he can understand the definition?

(The analyst is conducting further knowledge analysis on the concept underlying the use of the job aid. Each concept must be analyzed further until all concepts are described in enough detail to be useful to soldiers at the minimum acceptance level. Thus the concept of call signs is similarly analyzed.)

## STEP 10.9

### STEP DESCRIPTION

STEP 10.9 Mark the job aid to indicate that process analysis (STEP 3) is required. Then go to STEP 10.10.

Note: It makes the most sense to avoid interrupting the analysis of underlying concepts and facts with the analysis of a procedure. Therefore, simply indicate that the job aid must undergo process analysis. You will cycle back to perform that analysis during STEP 11.

EXAMPLE: STEP 10.9

(The SME has indicated that there is a procedure for using the CEOI. Now the analyst must remind himself to analyze the procedure during a later part of the task analysis.)

ANALYST: OK, we have a procedure for using a job aid that entering soldiers can't be expected to know. I'll make a note that process analysis is needed and continue with the analysis of facts and concepts. We'll do the process analysis later.

(The analyst completes the knowledge analysis of this substep and continues to STEP 10.10.)

STEP 10.10

STEP DESCRIPTION

STEP 10.10 Are there any more steps which have not been submitted to knowledge analysis? Have all of the concepts which were identified as a result of the knowledge analysis been submitted to further analysis until the component concepts are all those which can be assumed to be acquired by the entering soldier?

- a. If all steps and knowledge are entry level, go to STEP 11.1.
- b. If there are more steps to be analyzed, go to STEP 10.1.

Note: This checking step helps the analyst to pull back from his/her work to examine the whole activity being analyzed. All concepts identified for a particular step or substep should be reviewed to ensure that their component concepts are listed. All steps and substeps should be similarly reviewed for prerequisite facts and concepts (and component concepts). The analysis should proceed through one substep at a time.

EXAMPLE: STEP 10.10

(The analyst assists the SME to review the progress of the knowledge analysis to identify any concepts or steps requiring further knowledge analysis. Any step not yet analyzed is submitted to knowledge analysis now, by returning to STEP 10.1 for that step or substep.)

ANALYST: Have we identified all the knowledge a soldier needs to identify approved callsigns?

SME: Yes, we've covered that step.

ANALYST: OK, let's look at another step. What must a soldier know in order to obtain callsigns from the traffic?

SME: Well, he has to know what a callsign is, what traffic is, and what monitoring is.

ANALYST: Would an entering soldier be likely to know these things?

(The analysis of this substep proceeds exactly as the analysis in previous examples in this lesson. Each substep is analyzed separately for its prerequisite knowledge. If no job aid exists, the knowledge must be broken down into its component concepts. If a job aid does exist, it must be analyzed.)

STEP 11.1

STEP DESCRIPTION

STEP 11.1 Review the analysis. Are there any steps or job aids which were marked for process analysis which have not yet been analyzed?

- a. If so, return to STEP 2 to complete the necessary analysis.
- b. If no, go to STEP 11.2.

EXAMPLE: STEP 11.1

(The analyst and SME must now conduct a process analysis on the procedure for using the CEOI.)

ANALYST: You said that the soldier must learn how to use the CEOI. What are the steps involved in this procedure?

SME: First, you turn to the index to find the item number of the unit you're monitoring. Second, you go to the page indicated for that unit. Third, using the correct time period, find the 3-digit callsign for the unit. Fourth, go to the index again to find the item number for suffixes. Fifth, go to that page. Sixth, find the appropriate 2-digit suffix. Seventh, combine the 3-digit and the 2-digit numbers into the complete callsign. That's it.

ANALYST: Is that the only way to use the CEOI?

SME: Yes, the only way. You do those things in that order.

(The analyst takes the SME through process and substep analyses until all steps are stated at the appropriate level of description. Knowledge analyses are also conducted on each step of this procedure at its lowest level of description.)

## SUMMARY

A complete knowledge analysis includes several activities: identification of prerequisite knowledge for each step; identification of job aids and any knowledge required for using them; and further analyses of all concepts. In this lesson, you learned to perform the following:

- STEP 10.1 Examine each step to identify any underlying knowledge.
- STEP 10.4 List each piece of knowledge as either a concept or a fact.
- STEP 10.5 Determine whether each piece of knowledge is at or below the minimum acceptance level. If not, reanalyze that knowledge into its component parts.
- STEP 10.4 See if there are any more steps to be analyzed. If not, the knowledge analysis is complete.
- STEP 10.6 Examine each piece of knowledge to determine whether a soldier must learn that knowledge or whether a job aid can supply that knowledge.
- STEP 10.7 Determine whether or not entry-level soldiers are likely to know how to use the job aid.
- STEP 10.8 Analyze each job aid whose use must be taught. Determine what types of knowledge are required for using the job aid. Identify, with a label and/or definition, each fact or concept and use the standard conventions to label each accordingly.
- STEP 10.9 Flag any procedure required or using the job aid and indicate that process analysis must be performed on that procedure.
- STEP 10.10 Identify any step or supporting concept which has not yet been submitted to knowledge analysis. Conduct these analyses now. Then go to STEP 11.1.
- STEP 11.1 Review the analysis. Identify any steps or job aids requiring process analysis. Conduct these analyses now.

SUPPLEMENTARY EXAMPLE: PROCEDURAL ANALYSIS

Procedural task No. 1205, Complete a written conventional telephone log, was submitted to knowledge analysis. After process and substep analyses were conducted, the steps and substeps were listed and described in flow charts.

For the first step, entering the monitor log heading, the job aid was analyzed. The SME determined that, in order to use the job aid, the soldier would have to learn the following:

Concepts: tape number  
position number  
unit being monitored  
operator identification codes

Facts: the location of the tape identifying number  
the identifying number of the monitoring position  
the soldier's assigned operator code

No job aids provided this knowledge, which all must be taught since entering soldiers could not be expected to have this knowledge.

Similar analyses were conducted on other steps.

## PRACTICE

It is difficult to practice the STEPS addressed in this lesson in isolation. A more efficient and useful approach is to continue with the knowledge analysis you performed during Lesson Two practice. Ask the SME you previously worked with to help you now. Finish the analysis of that task by adding the steps of the knowledge analysis (STEP 10). Use the User's Manual as you work, referring to the appropriate STEPS as necessary. When you have completed the analysis, check your results against the checklist below. Then identify any inconsistencies or weaknesses in your product and review the appropriate lessons, as needed.

### CHECKLIST FOR KNOWLEDGE ANALYSIS

1. Has each step been examined for underlying knowledge?
2. Has each piece of knowledge been identified as either a concept or a fact?
3. Has each concept been checked to see if it is at entry level, and, if not, has that concept been reanalyzed for its component concepts?
4. Have the standard conventions been used in labeling the pieces of knowledge?
5. Have all job aids for prerequisite knowledge and for steps been identified?
6. Have you identified those aids which soldiers must be taught to use?
7. Have you analyzed each job aid to identify its prerequisite knowledge?
8. Has each prerequisite fact been appropriately labelled?
9. Has each prerequisite concept been appropriately labelled and further analyzed as necessary?
10. Has each procedure for using the job aid been appropriately analyzed and described?
11. Have all steps undergone knowledge analysis?

## LESSON FOUR: CONDUCTING A FACTOR-TRANSFER ANALYSIS

### INTRODUCTION

In this lesson, you will learn how to decide which type of analysis to use, depending on your given task for analysis, and how to conduct a Factor-Transfer Analysis.

Learning how to decide on the type of analysis to use is a matter of distinguishing between tasks which always require following a single set of procedures and tasks which can be performed only after considering certain conditions and applying some underlying rules. You will remember that the process analysis was completed for tasks which could easily be broken into about 7 to 10 steps. The distinction you must now learn is between those tasks which have less than 7 to 10 procedures and those which have more, and which vary according to the situation. For you as the analyst working with SME, getting this distinction correct is very important since this decision will direct you to the appropriate procedure of ETAP.

The Factor-Transfer Analysis section of ETAP is very useful for analyzing tasks which are difficult to proceduralize. The performance of the tasks depends upon important situational factors which the soldiers must consider. You will learn these factors and their associated rules in this lesson in addition to the rules for combining those factors.

### OUTLINE OVERVIEW

The STEPS to be dealt with in this lesson illustrate the procedures used to:

Determine type of analysis for a specific task. (STEP 2)

Conduct an analysis of factors by listing all of the conditions and constraints that must be considered in order to perform the activity well. (STEP 6.1)

List the decision rules for each factor that help the soldier determine how to consider that factor. (STEP 6.2)

Describe the common rules for organizing all factors

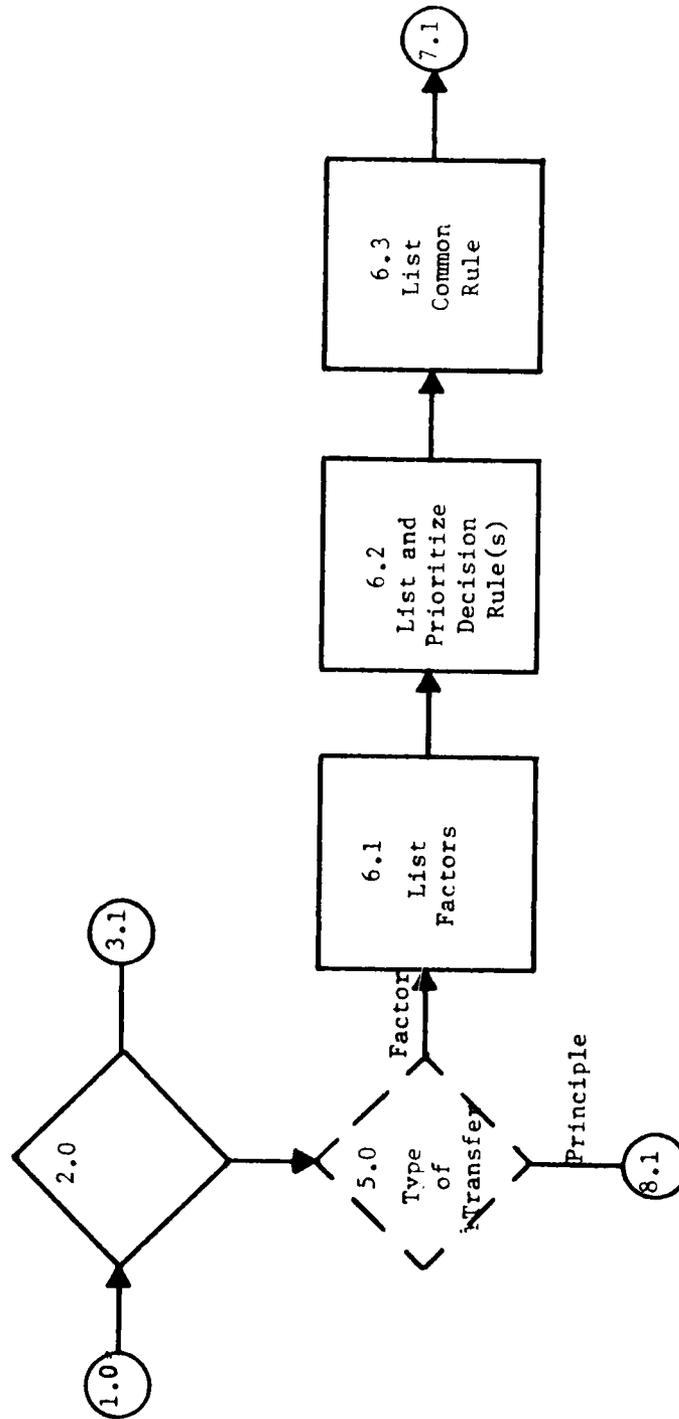
and for resolving conflicts among factors. (STEP 6.3).

## COMMENTS

Some activities require a soldier to learn more than about 7-10 procedures (or branches) in order to perform that activity. These activities cannot be broken down into steps easily. For these kinds of activities, it is more efficient for the soldier to learn the underlying knowledge required to be able to perform the activity than to learn all the necessary procedures (and branches) themselves. For specific tasks for which knowing the underlying factors to be considered is enough, Factor-Transfer Analysis should be used, because these tasks cannot be easily analyzed using Process Analysis.

Factor-Transfer Analysis provides the method to identify all conditions (factors) which must be considered in performing the task, and to identify the rule which states how each condition should be considered in making the decision. The decision rules which indicate how to consider each factor are either a principle or a procedure.

REFERENCE



## STEP 2

### STEP DESCRIPTION

STEP 2 Ask the SME whether or not the task activity lends itself to being broken down into steps.

- a. If the activity does lend itself to being broken down into steps, then go to STEP 3 to analyze it as a procedural activity.
- b. If it does not lend itself to being broken down, then go to STEP 5.

Note: This step ensures that the Analyst decides on which type of analysis to use depending on SME's comments and answers about the type of task. In order to make the appropriate decision, have the SME think of a typical situation where the task under analysis is performed and have him or her list the steps that must be followed to perform the task in that particular situation. You learned how to do this in Lesson One. If the task can easily be broken down into steps, then you must go to STEP 3 to analyze it as a procedural activity. If the task cannot be broken down into steps easily, you must then go to STEP 5. (For the purpose of this lesson, it is assumed that only one type of transfer task--factor transfer--exists. In lesson six, you will learn about another type.)

---

### VOCABULARY SUPPORT

Step(s) - a mental or physical action performed as part of a duty, task, or task element.

Procedural Activity - an activity that can conveniently be broken down and analyzed into a series of discrete steps. A procedural activity can be efficiently learned by learning a single sequence of steps (actions or decisions).

EXAMPLE: STEP 2

(The analyst and SME are working in the MOS 05G Signal Security Specialist, and analyzing the task "Establish a COMSEC Monitor Site." They are at a point at which they have analyzed the task into its procedural steps.

- 1) Examine the COMSEC support plan and the results of premission liason for impact on establishment of COMSEC monitor site.
- 2) Determine locations for position(s)/facilities.
- 3) Determine location for power source.
- 4) Determine location for RE-292 antenna, if required.
- 5) Direct placement of equipment.
- 6) Direct placement of internal defense positions, if required.

Now the analyst wants to decide which type of analysis to use to further analyze the task.)

(For instructional purposes, in this example, we assume that all the steps required to perform the task "Establish a COMSEC Monitor Site" except Step 3 can be broken down into discrete steps and analyzed down to the desired level using the Process-Substep Analysis. Step 3 is the Factor-Transfer step to be analyzed for our purposes.)

ANALYST: Each of the steps which taken as a whole make up the whole task is described in fairly general terms. Could a soldier at the minimum acceptance level be able to perform the steps by reading our description?

SME: Step 3, determining location for the power source is simple enough to be executed as it is, only the soldier should consider the necessary conditions to reach a decision to do the step. But the other steps should be broken down into smaller steps.

ANALYST: So Step 3 of this task does not lend itself to being broken down into steps. It is more useful to think of different conditions or factors which affect performance of the task. Is that right?

SME: Correct.

(Here the analyst decides that the activity requires a Factor-Transfer Analysis. The analyst now is directed to STEP 5 to decide which type of transfer analysis the step requires. Discussion with the SME reveals that factor-transfer analysis is appropriate for this step. Instruction on STEP 5 will be presented in Lesson Six.)

STEP: 6.1

STEP DESCRIPTION

STEP 6.1 Help the SME to identify and list all of the factors that may need to be considered in order to perform the activity well.

Note: This step ensures that the analyst, working with SME identifies all the important conditions to be considered for deciding how to perform the task. The conditions reflect the variations in situations in which the particular task must be performed. In order to do this STEP, have the SME think of various typical performances of the task and examine these performances to extract all the essential conditions as examples. Make a list of these conditions and let the SME review the list carefully to make certain that all the essential conditions are included.

-----

VOCABULARY SUPPORT

Factor - a concept which characterizes a condition or constraint that must be considered in deciding how to perform an activity.

EXAMPLE: 6.1

(Analyst and SME continue to analyze the task of "Establishing a COMSEC Monitor Site" in order to identify the important factors to be considered in performing the activity.)

ANALYST: I'm interested in analyzing Step 3 of this task; determining the location for the power source. How would you identify all the conditions which must be taken into account here? In other words, what are the things that you should consider in deciding where to put the power source?

SME: First, you must think of what kinds of power sources you got. Is it the commercial type or are you bringing your own generator? If you're bringing your own generator, you have to think about;

- how much fuel you have,
- how and where you're going to store it
- how accessible both the generator and the fuel are
- what are the limitations of the equipment you're using, like how much cable you have to work with, how much space the equipment is going to take up
- what the terrain is like and how the terrain restricts where you can put things
- the type of unit you're monitoring
- security and concealment requirements
- noise discipline, for example keep generator away from sleeping areas, if you can.

ANALYST: OK. You've given me all these examples. In all these examples, are there some common concerns or conditions that should be considered everytime the power source location is to be determined.

(Here, the analyst is trying to extract all the important factors to be considered in making a necessary decision about how to perform the activity, together with all the different values each factor might take).

SME: Well, like I told you, something you consider first is how much fuel you have and how and where you're going to store it.

ANALYST: OK. It seems you're saying fuel requirements are one important consideration. So can we then say "fuel storage requirements" is one of the important factors to be considered?

SME: Yes.

(The analyst repeats this process for all the examples SME describes. Analyst summarizes everything in general terms for the SME's approval, always guiding the SME to the

appropriate level of description).

ANALYST: So, is it accurate to conclude that all the important factors for this step of the task are the following?:

- type of power source
- equipment limitations
- accessability
- fuel storage requirements
- noise discipline
- enemy/friendly fire
- concealment requirements
- terrain restrictions
- tactical vs. garrisonoffensive vs. defensive

SME: Yes, it's accurate.

(The analyst includes the explanation or definition of each factor and makes sure that all the factors are identified correctly.)

## STEP 6.2

### STEP DESCRIPTION

STEP 6.2 Help the SME to identify and list and prioritize the decision rule (either a principle or a procedure) for each factor.

Note: This step ensures that the analyst identifies all the necessary information about how to use each condition (factor) in making the appropriate decision for performing the task. In order to collect this information, the analyst must ask the SME specific questions about each condition and the specific governing rules related to each one. Analyst must have SME state each rule either in the form of a principle, (i.e., an "If. . . . then statement), or a procedural statement, (i.e., "Do this, then do this . . ."). Each factor can have one, or more than one, decision rule governing it. If a factor has more than one decision rule, the rules should be prioritized. Priority indicates degree of importance in consideration.

-----

### VOCABULARY SUPPORT

Decision rule - a rule (principle or procedure) based on the relevant characteristics of factors which assists or guides someone in making a decision. A decision rule as a principle is stated as signifying a change relationship. A decision rule as a procedure is stated as a set of procedural steps to be followed decision about the factor being considered.

Principle - a statement of relationship between a cause and an effect, usually expressed as an "If . . . , then . . . ." statement. An example of a principle is the following: If the generator is placed too close to the sleeping area, then the noise from the generator will interfere with sleeping.

EXAMPLE 6.2

(The analyst and SME continue to analyze the same task in order to identify the decision rule for the factor "equipment limitations" and to prioritize them.)

ANALYST: How do you use the limitations of the equipment to decide on the locations of the power source?

SME: Well, if you're tapping in on a commercial source, you can only use as much cable as you've got. If you're using a generator, there is a bunch of stuff you have to consider:

- 1) the generator has to be level; and
- 2) it has to be close enough to the fuel storage to obtain fuel easily;
- 3) you should consider the cable length that connects the generator to the equipment.
- 4) locate the generator for the least amount of noise in the living areas where the tents are, but this can be ignored if necessary, if problems arise.

The list is in order of importance.

(Analyst identifies them as factor decision rules in the form of principles).

For the factor "equipment limitations" the Analyst identifies four decision rules:

The generator has to be level.

The generator has to be close enough to fuel storage to obtain fuel easily.

Cable length should be considered.

Locate the generator for the least amount of noise.

ANALYST: Among these four decision rules, which is the most important one to consider?

SME: Distance between generator and fuel storage.

ANALYST: How would you put the other three in an order of importance?

SME: The second one should be making the generator level; then cable length, and the last one concerns noise.

(The analyst prioritizes the decision rules with the help of the SME in the following way:

- 1) Distance between the generator and the fuel storage.
- 2) Generator has to be level
- 3) Least amount of cable must be used
- 4) Noise discipline)

## STEP 6.3

### STEP DESCRIPTION

STEP 6.3 Have the SME think through several performances of the step to try to identify any common rules (procedures or principles) for deciding which factors should be considered when, and which factors should take priority if two or more are in conflict.

Note: This STEP ensures that the analyst can gather all the necessary information about how to put factors into a useful order for an appropriate decision required by the task. In order to do this, the analyst must have the SME think through several performances of the step (of the analyzed task) and ask the SME if there exist any governing rules which are common to more than one factor.

-----

### VOCABULARY SUPPORT

Common rule - a rule (procedure or principle) based on the relevant characteristics of more than one factor which assists or guides someone in making a decision. A common rule signifies the order in which factors should be considered.

EXAMPLE: STEP 6.3

(The analyst and SME have identified all important factors to be considered in performing the third step of task 2101, determining the location of the power source. Now the analyst asks the SME to think through several performances of the activity to identify the set of rules for ordering and prioritizing the factors.)

ANALYST: Think through the examples you've just described. How do you organize what you think about? Which factors must be considered first?

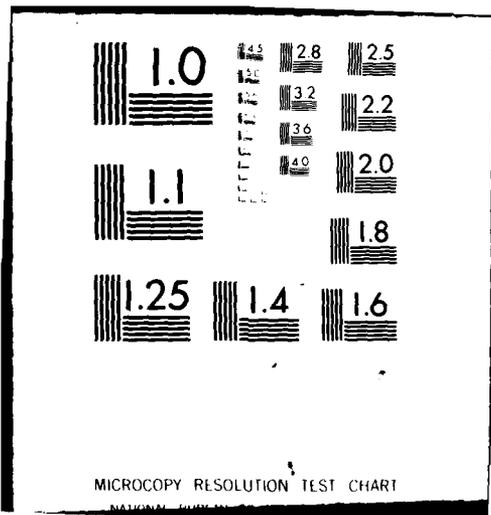
SME: First comes type of power source because that restricts all the other decisions. Next I'd consider equipment limitations, especially cable length limits. Then, if we're using a generator, I'd look at fuel storage requirements and terrain restrictions. Next is concealment. The last thing I think about is noise discipline.

ANALYST: What about priorities? What has to come first in case decisions about different factors come into conflict? What is absolutely essential?

SME: Equipment limitations for a given type of power source. That's the most important thing. Next comes accessibility, fuel storage, terrain and concealment. At the bottom of the heap, I deal with noise discipline, since it can be ignored if necessary.

(The analyst takes the SME through the complete set of factors, of which only a limited set have been mentioned here. The SME is helped to identify the normal or approved sequence for considering each factor and the priority structure which must be utilized. The process is conducted separately for each factor-transfer activity; a separate common rule is described for each.)





MICROCOPY RESOLUTION TEST CHART

NATIONAL BUREAU OF STANDARDS-1963-A

## SUMMARY

In this lesson, you learned to distinguish between procedural activities and factor-transfer activities and to select the appropriate type of analysis for each kind of activity. You also learned to conduct a factor-transfer analysis. You learned the following STEPS:

- STEP 2 Decide whether the activity to be analyzed can be easily broken down into a set of steps. If it cannot, plan to conduct a factor-transfer analysis of the activity.
- STEP 6.1 Identify all factors (conditions and constraints) that the soldier must consider in deciding how to perform the activity.
- STEP 6.2 For each factor, identify and list the decision rules that help the soldier decide how to consider the factor. Arrange each set of decision rules in an order of priority.
- STEP 6.3 Identify the common rules for organizing the entire set of factors into the order for considering them and for determining which factor takes priority whenever two or more factors are in conflict.

## PRACTICE EXERCISE

Although the STEPS of the ETAP presented in this lesson may look quite simple, you will find that they can only be mastered through appropriate practice. Practice on STEPS related to Factor-Transfer Analysis can provide you with very useful insights in doing your analyses. Experience with a real SME will help you learn how to effectively extract the important factors, the decision rules for each and rules for combining them.

For practice, choose someone to be your SME for any task which is based on using some factors. Use STEPS 2, 6.1, 6.2, and 6.3 to apply what you have learned in this lesson.

At the end of the analysis, check the results using the following checklist to see if you covered these important points:

### CHECKLIST FOR FACTOR-TRANSFER ANALYSIS

1. Make certain that the task has been appropriately selected as a Factor-Transfer task.
2. Make certain that all the important factors are taken into account.
3. Make certain that related decision rules are stated appropriately and are inclusive of everything necessary.
4. Make certain that the correct "common rule" (rule to combine the factors) is identified.

## LESSON FIVE: CONDUCTING SUBFACTOR AND KNOWLEDGE ANALYSIS

### INTRODUCTION

This lesson consists of two main parts and a final check step. First you will learn how to conduct subfactor analysis. This is a method to further analyze factors. Further analyzing the factors involves deciding whether they need to be broken down into simpler factors. Second, this lesson will introduce a method for analyzing the underlying (prerequisite) knowledge for performing factor-transfer tasks. This method is very similar to the comparable knowledge analysis section for procedural tasks.

The final STEP in the lesson is one for checking the completeness of analysis.

### OUTLINE OVERVIEW

The following STEPS from the ETAP illustrate the procedures used to:

- Identify any job aids that a soldier can use to consider each factor. (STEP 7.1)
- Determine whether all entering soldiers can use the factors without further instruction. (STEP 7.2)
- If there is no job aid for a factor and if the factor requires instruction, determine whether that factor can be subdivided into a set of component factors. (STEP 7.3)
- If there is a job aid, determine whether all entering soldiers can use that job aid without further instruction. (STEP 7.4)
- If the job aid requires no instruction, mark it to indicate that no knowledge analysis is required on that job aid. (STEP 7.5)
- If a job aid requires that a procedure for using it be taught, mark that job aid to indicate that process analysis must be conducted on the job aid. (STEP 7.6)
- Identify another factor that requires subfactor

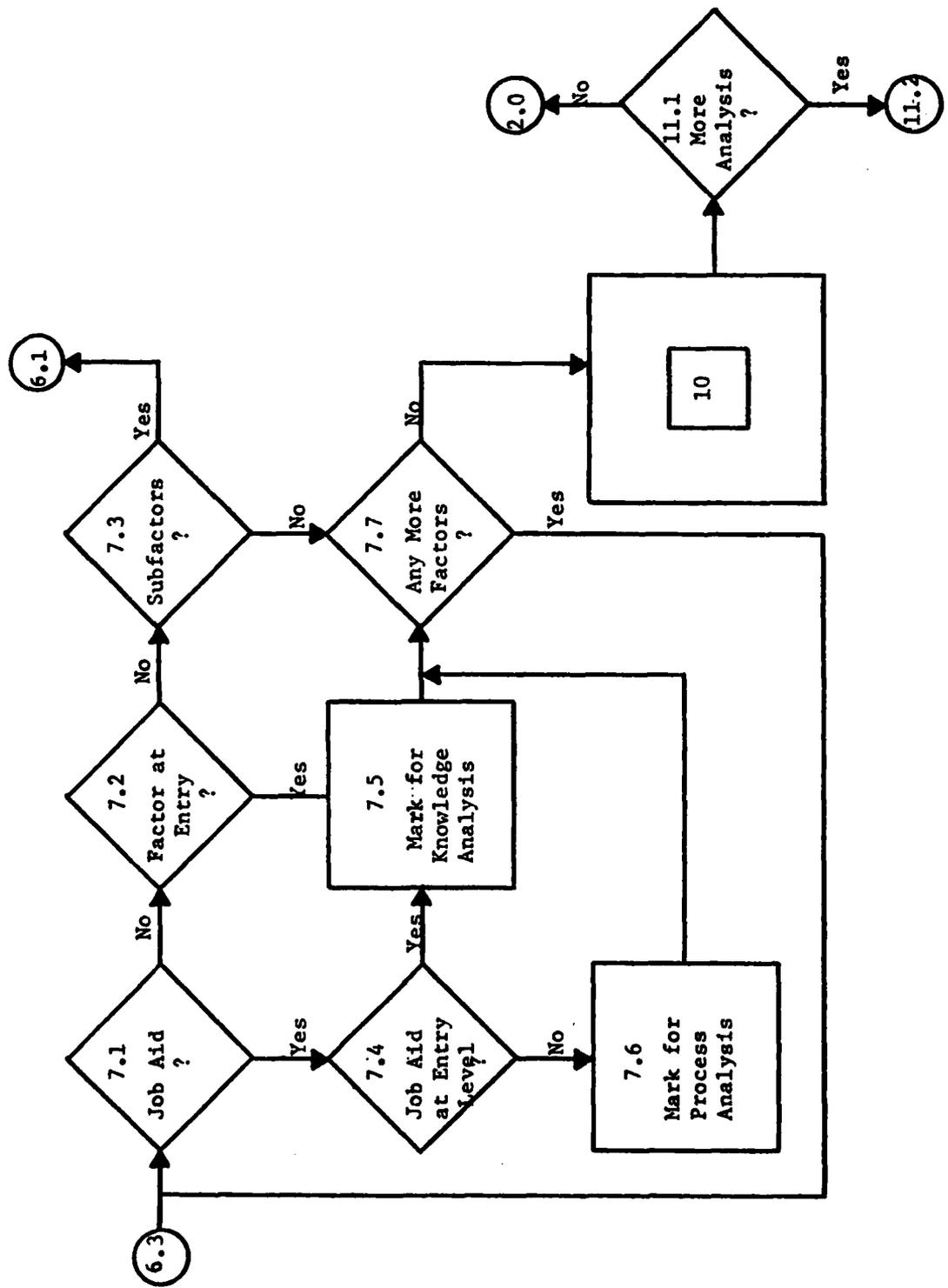
analysis and repeat STEP 7 for that factor. (STEP 7.7)

--Conduct a knowledge analysis of each factor, decision rule, and job aid. (STEP 10)

#### COMMENTS

The major STEP to be learned in this lesson (STEP 7) identifies any factors which themselves need to be broken down into factors. At this level, any factor which is found to be at too general a level of description for a low-ability entering soldier is broken down into more specific factors. These are easier to understand and to consider for the low-ability entering level soldiers. These more specific factors combine to form the more general factor.

Also it is very important to identify and analyze all the underlying knowledge in considering each factor (any facts, concepts, principles or procedures) after the important conditions (factors) and the related decision rules are identified. This is done by using the method prescribed by the knowledge analysis section of ETAP. This underlying knowledge is the basic learning prerequisite content for the specific task analyzed.



## STEP 7.1

### STEP DESCRIPTION

STEP 7.1 Choose one or a set of factors identified in STEP 6. Does a job aid exist for the consideration of the factor or factors?

- a. If yes, go to STEP 7.4.
- b. If no, go to STEP 7.2.

Note: As you learned in earlier lessons, a job aid provides information that a soldier would otherwise have to learn. A job aid for a factor may define and describe the factor, present decision rules and outcomes of acceptable decisions, and/or detail common rules for combining factors to perform the activity. Any job aid for the factors are identified now.

---

### VOCABULARY SUPPORT

Job aid - any source of information, such as a manual, which a soldier can consult rather than learn the information.

**EXAMPLE: STEP 7.1**

(The analyst and SME continue to analyze the same step as in STEP 6: determining the location for the power source. This is step 3 of the SIGSEC MOS task, "Establish a COMSEC monitor site.")

**ANALYST:** Let's look at the "fuel storage requirements" factor. Is there a job aid that a soldier can use in considering this factor?

**SME:** None. The soldier has to know the factor. There isn't anything that he can use.

(The analyst goes to STEP 7.2.)

STEP 7.2

STEP DESCRIPTION

STEP 7.2 Can a soldier at the lowest ability entering level use the factor(s) without further training?

- a. If yes, go to STEP 7.5.
- b. If no, go to STEP 7.3

Note: If all entering soldiers already know how to use a factor, then instruction on the factor is not necessary. The soldier only needs to be directed to use the factor in making a decision about performing the activity. However, if the factor requires instruction, then further subfactor analysis is necessary.

EXAMPLE: STEP 7.2

(The analyst and SME continue to analyze the same activity as in STEP 7.1.)

ANALYST: Can a soldier entering the Army with minimal skills and knowledge be expected to know how to use the factor "fuel storage requirements" to reach a good decision?

SME: Probably not. There are several things he'd have to be taught.

(Analyst goes to STEP 7.3.)

### STEP 7.3

#### STEP DESCRIPTION

STEP 7.3 Can the factor be subdivided into several other factors?

- a. If yes, go to STEP 6.
- b. If no, go to STEP 7.7.

Note: This step ensures that the factors are stated at an appropriate level of specificity. Factors which are too general to be understood or too general to be useful to the soldier must be further analyzed into more specific and simple factors. To further analyze the factor, return to STEP 6 to break the factor into its component subfactors, to identify decision rules for each subfactor, and to identify, if appropriate, a common rule for combining the subfactors.

EXAMPLE: STEP 7.3

(The analyst and SME continue to analyze the same task as above. The analyst wants to decide whether there are any factors which themselves need to be broken down into more specific factors. Again for our instructional purposes, one factor, "fuel storage requirements," is selected as an example. But the analyst should do necessary analyses for all the factors.)

ANALYST: Can this factor be broken down into contributing concerns?

SME: Yes, it can. More specific things you should consider are these:

- whether the fuel is to be stored
- distance between storage and generator (determined by regulation)
- type of position (defensive or offensive)
- amount of fuel to be stored
- manner of restocking the fuel

(The analyst goes to STEP 6 to analyze subfactors.)

## STEP 7.4

### STEP DESCRIPTION

STEP 7.4 Can a low ability soldier use the job aid without further instruction?

- a. If yes, go to STEP 7.5.
- b. If no, go to STEP 7.6.

Note: As you learned in earlier lessons, instruction in the use of a job aid may also be necessary. If the soldier already knows how to use the job aid, then it need not be analyzed any further. However, an unfamiliar job aid must be analyzed to identify factors and subfactors that must be learned before the soldier can learn to use the job aid. Once all factors for using the job aid have been analyzed down to the minimum acceptance level, you are ready to begin the knowledge analysis for all relevant factors.

EXAMPLE: STEP 7.4

(The SME has indicated that one of the subfactors of the "fuel storage requirements" factor has a job aid. There are written regulations available which tell the soldier the minimum distance permitted between the generator and the stored fuel.)

ANALYST: Is there a job aid that will help the soldier to consider this factor? Or must he learn all the decision rules and common rules for the factor?

SME: Well regulations are pretty specific about what the storage requirements are for fuel. The decisions and acceptable choices are pretty well laid out. The soldier can just consult the appropriate directives.

ANALYST: Good; we've identified a job aid the soldier can use. Can a low ability entering soldier use this job aid without further instruction?

SME: Yes, it is simple enough.

(Analyst goes to STEP 7.5.)

STEP 7.5

STEP DESCRIPTION

STEP 7.5 Mark factor or job aid to indicate no knowledge analysis is required. Go to STEP 7.7.

EXAMPLE: STEP 7.5

(For this STEP the analyst makes job aid to indicate no knowledge analysis is required. The soldier does not need to learn anything to be able to use the job aid. The analyst then goes to STEP 7.7.)

STEP 7.6

STEP DESCRIPTION

STEP 7.6 Mark job aid to indicate process analysis (STEP 3) is required. Go to STEP 7.7.

**EXAMPLE: STEP 7.6**

(Continuing their analysis of subfactors, the analyst and SME examine the subfactor "tactical versus garrison." The SME indicates that a job aid is available, in the form of an Army regulations manual, to help the soldier learn to understand and use this subfactor (STEP 7.1). However, entering soldiers would probably not know how to use this highly specialized kind of manual (STEP 7.4).)

**ANALYST:** You said that there is a procedure for using this manual. That procedure will have to be analyzed so that it can be taught. I'll mark the job aid to remind us to perform that process analysis later.

**SME:** Why can't we do it now?

**ANALYST:** We'd have to switch back to a different kind of analysis. That would break our chain of thought. It's more efficient for us to continue analyzing factors than to interrupt these factor analyses with process analysis. We'll pick up process analysis requirements later.

(The analyst continues with STEP 7.7.)

STEP 7.7

STEP DESCRIPTION

STEP 7.7 Are there other factors which must be submitted to further subfactor analysis?

- a. If yes, go to STEP 7.1.
- b. If no, go to STEP 10.

EXAMPLE: STEP 7.7

(The analyst and SME continue to analyze the same task as above.)

ANALYST: Are there any other factors that must be broken down into subfactors? Or have we completed examining and analyzing all the factors?

SME: No, I think we did them all.

(Analyst goes to STEP 10.)

## STEP 10

### STEP DESCRIPTION

STEP 10 Involves conducting a knowledge analysis of all factors, subfactors, and job aids. You learned to conduct a knowledge analysis for a procedural analysis in Lesson Three. The knowledge analysis for a factor-transfer activity is highly similar to that. Brief descriptions of individual STEPS of the knowledge analysis for a factor-transfer activity are presented on the following pages, together with an example of each STEP. The STEPS are also described here as an overview.

Examine the factors, subfactors, and decision rules identified in STEPS 6 and 7 except those marked as not requiring knowledge analysis. Is there any knowledge a soldier must have before he can use a factor appropriately (STEP 10.1)?

Determine whether the required knowledge is a procedure, a principle, a fact, or a concept. If it is a procedure or principle, go to STEP 10.3. If it is a fact or concept, go to STEP 10.4 (STEP 10.2).

Mark the required procedure to indicate that process analysis (STEP 3) is needed. Mark the required principle to indicate that principle-transfer analysis (STEP 8) is needed (STEP 10.3).

Identify and describe each fact and concept that underlies a factor or decision rule (STEP 10.4).

Determine whether the required knowledge has already been acquired by the lowest ability entering soldier. If it has no further analysis of that knowledge is necessary (STEP 10.5).

Determine whether a job aid exists to provide the knowledge. If there is no job aid, analyze the knowledge by returning to STEP 10.3 (STEP 10.6).

If there is a job aid available, decide whether all entering soldiers can already use the job aid (STEP 10.7).

Determine the kind of knowledge a soldier must learn in order to use the job aid. If facts or concepts are required, go to STEP 10.4 to identify them (STEP 10.8).

If the soldier must learn a procedure in order to use the job aid, indicate that process analysis (STEP 3) is required on that job aid (STEP 10.9).

Identify any other factors and concepts which require knowledge analysis and repeat STEP 10 for each (STEP 10.10).

STEP 10.1

STEP DESCRIPTION

STEP 10.1 Examine each factor from STEP 6 and 7 except those marked that no knowledge analysis is necessary. Is there any knowledge (facts, concepts, procedures or principles) that must be used to consider this factor?

- a. If there is, go to STEP 10.2.
- b. If there is not, go to STEP 10.10.

EXAMPLE: STEP 10.1

(The analyst and SME are working in MOSO5G Signal Security Specialist, and analyzing the task "Establishing a COMSEC Monitor Site." Analyst picks a factor identified in STEP 6 and wants to analyze it for its supporting knowledges.)

ANALYST: Let's look at a factor: "fuel storage requirements." Is there any thing that a soldier has to know to consider this factor and reach a decision?

SME: Yes, there are some things. The soldier has to understand some concepts like fuel storage, what are some conditions like wether fuel is going to be stacked or not and some others. These are important.

(Analyst goes to STEP 10.2.)

STEP 10.2

STEP DESCRIPTION

STEP 10.2 Is a procedure or principle required in order to consider the factor?

- a. If yes, (either a procedure or principle) go to STEP 10.3.
- b. If no, go to STEP 10.4.

EXAMPLE: STEP 10.2

(The analyst and SME have determined that some knowledge must be learned before the soldier is ready to consider a factor effectively. The factor they are analyzing is "fuel storage requirements." Now they must determine what kinds of knowledge are involved so that each different kind may be analyzed appropriately.)

ANALYST: Think about fuel storage requirements. What must a soldier know before he can effectively consider the factor? Are there any procedures or principles?

SME: He has to know what fuel storage is--what that idea means. He also has to know about different kinds of fuel and how to stack each kind. He has to know some basic principles about combustion and the like.

ANALYST: OK, let's take these one at a time. You said a soldier must know what fuel storage is and what the different kinds of fuel are. These are concepts. We'll need to perform a knowledge analysis on each concept. Also, there is knowing how to stack each kind of fuel, or just some general rules?

SME: There is a procedure for stacking each different kind. He just learns the procedures; they're pretty straightforward.

ANALYST: Also in learning to consider fuel storage requirements, a soldier must learn about principles of combustion. Is this right?

SME: Yes.

(The analyst concludes that there are procedures and principles to be learned.)

STEP 10.3

STEP DESCRIPTION

STEP 10.3 If procedures are required to consider the factor, mark to indicate that process analysis (STEP 3) is required.

If principles are required to consider the factor, mark to indicate that a principle-transfer analysis (STEP 8) is required.

Then go to STEP 10.4.

EXAMPLE: STEP 10.3

(In examining the factor "fuel storage requirements" the SME has identified underlying knowledge in the form of procedures and principles.)

ANALYST: You said that a soldier must learn procedures for stacking different kinds of fuel. I'll make a note to remind us that we have to analyze these procedures later.

SME: What about the principles the soldier must know?

ANALYST: We'll do the same thing--make a note to remind us that we must analyze these principles after we finish examining all the factors.

STEP 10.4

STEP DESCRIPTION

STEP 10.4 Identify and describe with a label and/or a definition each concept or fact which is a prerequisite to the consideration of the factor. Determine whether the knowledge is a concept or a fact.

EXAMPLE: STEP 10.4

(The analyst and SME are working on the same task as in STEP 10.1. Analyst needs to identify the kind of supporting knowledge. This example will present this STEP's function for only one supporting idea as an example. But the analysis should repeat the same process for all supporting knowledge.)

ANALYST: Let's examine the first piece of knowledge, "fuel storage." We can give it the label of concept #1. What is the definition of the concept?

(The analyst writes the definition after the label. Then the next peice of knowledge is examined. The process of identifying and defining concepts is identifal to that which was presented in Lesson 3. Then the analyst goes to STEP 10.5.)

STEP 10.5

STEP DESCRIPTION

STEP 10.5 Has the required knowledge already been acquired by the lowest-ability entering soldier.

- a. If yes, go to STEP 10.10.
- b. If no, go to STEP 10.6.

EXAMPLE: STEP 10.5

(Analyst and SME are working on the same task as STEP 10.3.)

ANALYST: Does an entering soldier with very low skills and abilities know what fuel storage is?

SME: No, they have to learn it.

(The analyst helps the SME to analyze further all concepts likely to be unfamiliar to entering soldiers. Each concept underlying a factor is similarly analyzed, then the analyst goes to STEP 10.6.)

STEP 10.6

STEP DESCRIPTION

STEP 10.6 Is there a job aid which provides the knowledge required for the consideration of the factor?

- a. If not, go to STEP 10.4.
- b. If there is a job aid, go to STEP 10.7.

EXAMPLE: STEP 10.6

(The analyst and SME are analyzing the same task as above. The factor they are analyzing is "fuel storage requirements." One subfactor (a factor which is more specific than the "fuel storage requirements") is the "distance between storage and generator." The analyst addresses the question for this subfactor.)

ANALYST: Is there a job aid which helps the soldier to consider this factor and decide accordingly?

SME: Yes, that distance is determined by a regulation. The soldier looks at the regulation manual and knows what the distance should be.

(The analyst goes to STEP 10.7.)

STEP 10.7

STEP DESCRIPTION

STEP 10.7 Does a low ability entering soldier need additional knowledge in order to use the job aid?

- a. If yes, go to STEP 10.8.
- b. If no, go to STEP 10.10.

EXAMPLE: STEP 10.7

(The analyst and SME are analyzing the same task as above. They continue from the point at which they identified a job aid, for the subfactor "distance between storage and generator" for the factor "fuel storage requirements.")

ANALYST: Is there anything which should be taught to use the entering soldier in order to use this job aid, the regulation manual? Or does any soldier who is at this level know how to use it?

SME: Well they think they know. But actually they should be instructed how to read and interpret the regulations about the distance between storage and generator.

(Here the analyst decides to analyze the job aid to identify and list its underlying knowledge. The analyst then proceeds to STEP 10.8.)

STEP 10.8

STEP DESCRIPTION

STEP 10.8 Does the job aid require the soldier to learn a procedure for its use? Does the job aid require the soldier to acquire facts or concepts for its use?

- a. If a procedure is required go to STEP 10.9.
- b. If no, go to STEP 10.4.

EXAMPLE: STEP 10.8

(As a result of the information in STEP 10.6, the analyst wants to make sure which type of underlying knowledge needs to be taught.)

ANALYST: Does the job aid require the soldier to learn a procedure for its use or are there some facts or concepts to be learned?

SME: Both. First, how to use the regulations should be taught. But knowing some concepts like fuel storage and generator is also important.

(Here, the analyst decides to analyze the job aid to describe both the procedure for its use (using STEP 3) and the underlying concepts (using STEP 10.)

STEP 10.9

STEP DESCRIPTION

STEP 10.9 Mark the job aid to indicate that process analysis (STEP 3) is required--go to STEP 10.10.

EXAMPLE: STEP 10.9

(The analyst makes the job aid to indicate that a process analysis (STEP 3) is required to analyze the underlying procedure to be learned to use the job aid. Then the analyst goes to STEP 10.10.)

STEP 10.10

STEP DESCRIPTION

STEP 10.10 Are there any more factors which have not been submitted to knowledge analysis? Are there any of the concepts which were identified as a result of STEP 10.3 which are not at a level at which mastery can be expected for the entering soldier?

- a. If yes, go to 10.1.
- b. If no, go to 11.1.

EXAMPLE: STEP 10.10

(Analyst and SME are working on the same task as STEP 10.4.)

ANALYST: Are there any other factors which need further analysis?

SME: No, the others are simple enough for a soldier at the minimum acceptance level to consider.

(The analyst goes to STEP 11.1.)

## STEP 11.1

### STEP DESCRIPTION

STEP 11.1 Review your analysis. Are there any steps, factors, principles, or job aids which were marked for process analysis, factor-transfer analysis, principle-transfer analysis, or knowledge analysis but which have not yet been analyzed?

- a. If so, return to STEP 2 to complete these analyses.
- b. If no, go to STEP 11.2.

Note: It is at this point that you pick up all analyses that were marked but not yet performed. If process analysis is needed, go to STEP 3. If factor-transfer analysis is needed, go to STEP 6. If principle-transfer analysis is needed, go to STEP 8. And if knowledge analysis is needed, go to STEP 10. When all analyses have been completed, go to STEP 11.2.

EXAMPLE: STEP 11.1

(The analyst and SME review their analysis and discover that they have identified needs for additional analyses.)

ANALYST: I notice that we have a job aid requiring process analysis. You said that soldiers must learn to use a regulations manual. Would you describe the steps involved?

(The analyst returns to STEP 3 to conduct this process analysis. When it is completed, the analyst also conducts any other remaining analyses. Then the analyst continues to STEP 11.2 to begin preparing the final report.)

## SUMMARY

In forming complete subfactor and knowledge analysis, you learned to include the following STEPS:

- STEP 7.1 Examine each factor to determine if a job aid exists to be used in considering the factor.
- STEP 7.2 Examine each factor to determine if it can be used by a low ability entering soldier.
- STEP 7.3 Examine each factor to determine whether it can be subdivided into several other factors.
- STEP 7.4 Determine whether each of these requires training.
- STEP 7.7 Determine if subfactor analysis is complete.
- STEP 10.1 Examine the factors, subfactors, and decision rules identified in STEPS 6 and 7. (Except those marked as not requiring knowledge analysis.) Is there any knowledge a soldier must have before he can use a factor appropriately (STEP 10.1)?
- STEP 10.2 Determine whether the required knowledge is a procedure, a principle, a fact, or a concept. If it is a procedure or principle, go to STEP 10.3. If it is a fact or concept, go to STEP 10.4 (STEP 10.2).
- STEP 10.3 Mark the required procedure to indicate that process analysis (STEP 3) is needed. Mark the required principle to indicate that principle-transfer analysis (STEP 8) is needed (STEP 10.3).
- STEP 10.4 Identify and describe each fact and concept that underlies a factor or decision rule (STEP 10.4).
- STEP 10.5 Determine whether the required knowledge has already been acquired by the lowest ability entering soldier. If it has no further analysis of that knowledge is necessary (STEP 10.5).

- STEP 10.6 Determine whether a job aid exists to provide the knowledge. If there is no job aid, analyze the knowledge by returning to STEP 10.3 (STEP 10.6).
- STEP 10.7 If there is a job aid available, decide whether all entering soldiers can already use the job aid (STEP 10.7).
- STEP 10.8 Determine the kind of knowledge a soldier must learn in order to use the job aid. If facts or concepts are required, go to STEP 10.4 to identify them (STEP 10.8).
- STEP 10.9 If the soldier must learn a procedure in order to use the job aid, indicate that process analysis (STEP 3) is required on that job aid (STEP 10.9).
- STEP 10.10 Identify any other factors and concepts which require knowledge analysis and repeat STEP 10 for each (STEP 10.10).
- STEP 11.1 Determine if all factor-transfer analysis is complete and accurate. Make certain that each factor and all prerequisite knowledge are analyzed as necessary.

## PRACTICE

It is very important to gain experities in conducting factor-transfer analysis by practicing the steps involved. If possible, continue with the task or activity you selected for practice in Lesson 4. Ask te SME to work with you to perform the complete factor-transfer analysis. Then, if there is time, select a second activity and analyze it. Refer to the appropriate sections of the User's Manual, as necessary, as you conduct the analysis. When you have finished, make certain that you covered the following:

## CHECKLIST

### FURTHER SUBFACTOR ANALYSIS AND KNOWLEDGE ANALYSIS

1. Can each factor be subdivided into a set of more specific factors?
2. Have all factors which must be taught been identified?
3. Have all job aids for factors been identified?
4. Has the prerequisite knowledge for each job aid requiring training been listed?
5. Has the prerequisite knowledge for those factors without job aids been listed?
6. Have al analyses been completed?

## OVERVIEW: PRINCIPLE TRANSFER ANALYSIS

(LESSON SIX AND SEVEN)

### OVERVIEW

Principle-transfer analysis is a method to use to find out what a soldier must know in order to perform a transfer task. Principle-transfer tasks are activities which are based primarily on principles which the soldier must use in a wide variety of situations. The activity may have a set of procedural steps at the most general level of description, or it may have a few fundamental principles. In either case at the next level of description, there are many procedures to choose from (more than 7-10 procedures) depending on the specific situation. There may also be so many factors that a soldier can't learn them all. Because of the presence of so many procedures and factors, the soldier must use principles as the basis for his or her performance of the activity.

Using principle-transfer analysis you will be able to identify the principles a soldier uses, and procedures which he or she develops to employ these principles. Once the procedures and their related principles are identified you will be able to do a knowledge analysis. The procedure for a knowledge analysis of principles is almost the same as the procedure used in identifying knowledge for process tasks and factor-transfer tasks. The difference is that the knowledge analysis for principle-transfer tasks does not involve breaking the principle into subprinciples--while the knowledge analysis for process and factor-transfer tasks does call for this step in some cases.

When you have completed your principle-transfer task analysis you will have: (1) the common procedures a soldier performs when using the principles; (2) the categories of principles and important individual principles which relate to each procedure; (3) a list of any job aids which help the soldier; and (4) a list of knowledge which the soldier must know in order to perform the activity.

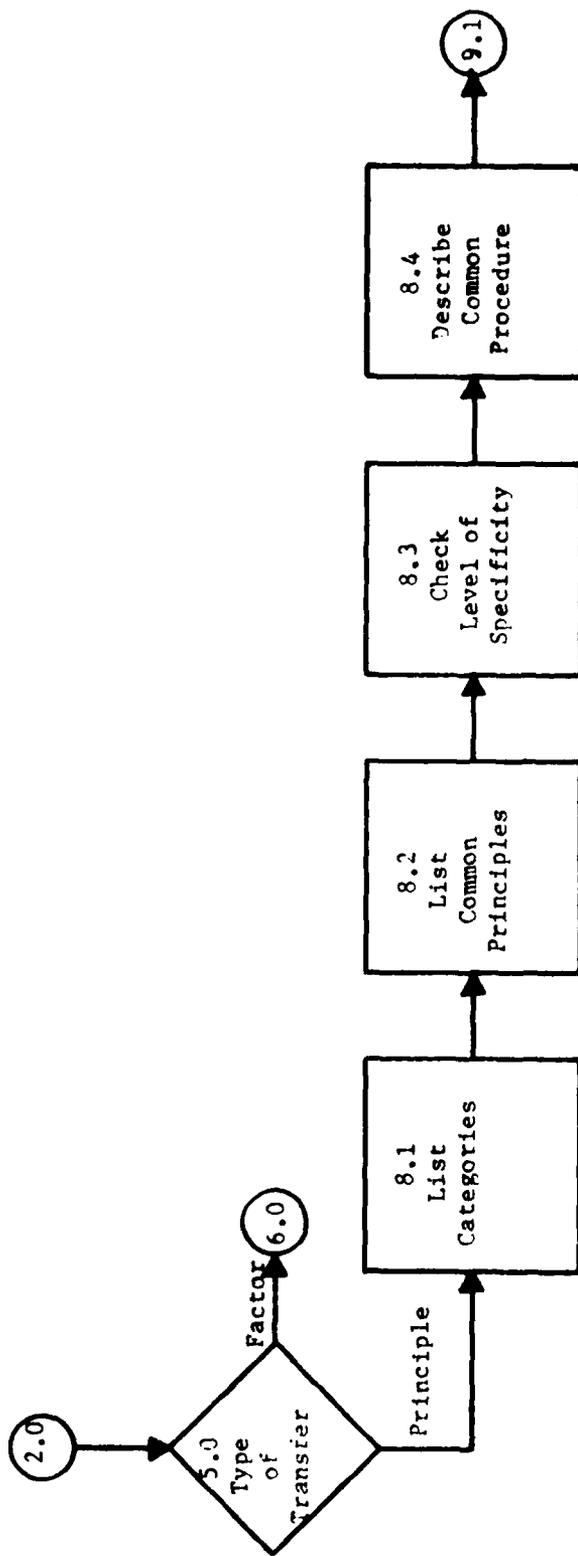
## COMMENTS

It is important to use the Principle-Transfer Analysis for activities which are based on important principles for two reasons. First, these tasks can not be accurately analyzed using process analysis, since they consist of more than 7-10 procedures for performing the activity in various situations. And second, these tasks can not be analyzed using factor-transfer analysis because the activities contain too many factors which vary from one situation to another, and a soldier can never learn all of them.

Principle-Transfer Analysis provides a method for identifying the categories of principles and some important individual principles which a soldier must know in order to perform the activity in a wide variety of situations. The analysis procedure also identifies how the principles from a category are used to develop a common procedure that can be used in many situations.

Principle-Transfer Analysis is also necessary to identify the knowledge which a soldier must have in order to perform the activity, and which forms the basis for identifying the learning prerequisites of the activity.

REFERENCE



## STEP 5

### STEP DESCRIPTION

STEP 5 Ask the SME whether or not it is sufficient for a soldier to know factors that should be considered in performing the activity, or whether it is more important for a soldier to know principles that can be used to decide how to perform the activity.

- a. If it is sufficient for a soldier to know factors that should be considered in performing the activity, then go to STEP 6 to analyze it as a factor-transfer activity.
- b. If it is more important for a soldier to know principles, then go to STEP 8 to analyze it as a principle-transfer activity.

Note: In this step you will determine whether the activity should be analyzed using factor-transfer analysis or principle-transfer analysis.

---

### VOCABULARY SUPPORT

Factor - a concept which characterizes a condition or constraint that must be considered in deciding how to perform an activity.

Principle - statement of a change relationship between two or more concepts describing how changes in one concept are related to changes in the other concept. For example the following statement is a principle because it shows the change relationship between how much money and time are used and how practical a solution to a problem is: the more time and money a solution requires, the less practical it is. The next statement is also a principle because it describes a change relationship between the concept warm air and the concept of moisture: The warmer the air, the more moisture it holds. The following statement is not a principle because it describes one concept and does not show a change relationship between two concepts: "Traffic" is radio/telephone communication.

EXAMPLE: STEP 8.1

(Analyst and SME continue to analyze Task 007 in order to identify the categories of principles associated with each procedural step.)

ANALYST: We've decided that the task is based upon principles, and now we need to begin the principle-transfer analysis by figuring out what groups or categories of principles are necessary for the soldier to know. Since we have a general procedure to work from, we can begin by thinking about each step from the procedure and try to identify the category of principles that seem to belong to that step.

SME: I'm not sure I understand you.

ANALYST: Well, if we take the general procedure that we identified earlier, and think about each step in it, we'll begin to see that some general categories of principles exist for each step. For instance, the first step of the procedure is to gather information to define the problem. Now what type of principles does the soldier need to know in order to do this?

SME: OK, he needs to know how to gather pertinent information, and to understand why it must be done. He has to know what sources of information to consult and how this should be done.

ANALYST: So one category of principles deals with gathering information. What's another category? Think about the second step in the procedure; identify applicable subject areas in appropriate technical manuals.

SME: Well, the soldier has to understand how to use technical manuals, and he has to know how to identify appropriate subject areas in the manual.

ANALYST: Then one category is that of principles dealing with using technical manuals and another is identifying appropriate subject areas?

SME: Yes, and for the third procedural step -- identifying important characteristics of appropriate theoretical solutions -- I'd say the soldier has to know how to find applicable solutions and then pick out the advantages and disadvantages of various solutions. He also has to decide how practical a solution is.

ANALYST: In other words, he has to rate the theoretical solutions in terms of important characteristics such as how advantageous or disadvantageous a solution is, and how practical it is?

SME: Yes, so there is another category of principles that deal with rating solutions.

ANALYST: The fourth procedural step is choose the solution which is most advantageous and most practical.

SME: Here the soldier not only has to make the best choice but also has to provide a rationale statement. So he

needs principles that deal with making judgments and supporting arguments.

ANALYST: Are there any other categories you can think of that don't relate to the general procedure?

SME: No, that's it.

ANALYST: So, to summarize, we've got these categories of principles: information gathering; using technical manuals; identifying subject areas; finding appropriate solutions; rating theoretical solutions; and making judgments. Now let's relate these to the four steps of the general procedure. Step 1: gather information to define the problem. So the information gathering category of principles belongs to this step.

SME: Ok, if we take STEP 2 -- identify applicable subject areas in the appropriate technical manuals -- then there are two categories which apply to it. The principles concerning using the manuals, and those of finding subject areas.

ANALYST: Now look at STEP 3: Identify important characteristics of appropriate theoretical solutions.

SME: Well, this one has two categories also--that of interpreting applicable solutions and that of rating solutions.

ANALYST: Right, now what about step 4?

SME: There's really only one category here--making judgments.

ANALYST: Ok, now let's move on to identify principles for each category.

(Analyst and SME move to STEP 8.2 in order to identify the important principles for each category.)

## STEP 8.2

### STEP DESCRIPTION

STEP 8.2 Help the SME to identify and state--at the level appropriate level for the activity--the most important/common principles in the category.

Note: In this step you will think about the principles from the category which seems to be the most useful or most important for the soldier to use in performing the activity. Identifying these principles now will provide you with the basis for conducting the knowledge analysis later.

-----

### VOCABULARY SUPPORT

Level appropriate for activity - principles are neither too general nor too specific to be useful, but are stated at the level of detail which best describes a successful performance of the activity.

EXAMPLE: STEP 8.2

(Analyst and SME continue analyzing task 007 in order to identify the principles most important to, or most commonly used in, each category at one level of specificity.)

ANALYST: Now we're going to take each category of principles and see if we can figure out the important principles that a soldier uses from each one. Think about the principles which are most commonly used, or which seem to be the most important for a soldier to know in order to perform the activity. Since the order of analysis doesn't matter, let's begin with Step 3, category 2, that of rating solutions.

SME: You want to know what principles a soldier must know in order to rate solutions?

ANALYST: Yes, that's right.

SME: Well, in rating solutions, the soldier is looking at theoretical solutions which generally apply to his problem, and which are sanctioned by Army doctrine.

ANALYST: These solutions aren't specific at all? None of them give definite remedies?

SME: These are theoretical solutions--the soldier has to interpret them from general statements of Army doctrine to fit the specific problem he has.

ANALYST: What do you mean by interpret?

SME: I mean that the soldier has to decide how the solution can be specifically applied to his problem situation. He has to make this interpretation in order to rate the solution.

ANALYST: What does the soldier need to know in order to make this interpretation?

SME: He must know that if keywords from his problem appear in the solution then he can apply the solution to his problem. He can rate its characteristics.

ANALYST: Ok, so this principle is important for category 1. Now move on to what a soldier must know in order to rate solutions.

SME: Well, he must know that the better a solution solves a problem, the more advantageous it is. And that the less a solution solves a problem, the more disadvantageous it

is.

ANALYST: And what about practicality?

SME: He has to know that the more practical a solution is, the less time or money it will use and the less stress it will cause.

ANALYST: And the less practical a solution is, the more time, or money it will use, and the more stress it will cause?

SME: Right, and he also has to know that there is no necessary relationship between the most advantageous solution and the most practical one.

ANALYST: Let's review what we've found. You have identified five individual principles from Step 3, category 2: (1) the more advantageous a solution is, the better it will solve the problem; (2) the more disadvantageous a solution is, the less it will solve the problem; (3) the more practical a solution is, the less time or money it will use, and the less stress it will create; (4) the less practical a solution is, the more time or money it will use, and the more stress it will create; and (5) the most advantageous solution is not necessarily the most practical solution.

SME: Right.

ANALYST: Can you think of any other principles at this level of specificity? That aren't more general or more detailed?

SME: No, I think those five cover it.

(Analyst decides that the most important common principles have been identified for category #2 on rating solutions.)

STEP 8.3

STEP DESCRIPTION

STEP 8.3 State all principles of one category at the appropriate level of specificity, for performing the activity. State the principles more generally or more specifically as necessary.

Note: In this step you will make certain that all the individual principles are analyzed to a level of detail appropriate for a soldier to perform the activity. In either case, you analyze the principles until they are either more general or more specific, depending upon the appropriate level.

-----

VOCABULARY SUPPORT

Level appropriate for activity - principles are neither too general nor too specific to be useful, but are stated at the level of detail which best describes a successful performance of the activity.

EXAMPLE: STEP 8.3

(Analyst and SME continue to analyze Task 007 in order to make sure that all the principles identified in STEP 8.2 are at an appropriate level of detail for performing the task for Step 1.)

ANALYST: Now I'd like to take a few minutes to review all the principles we identified from the four categories of principles. Think about each principle in terms of how generally or specifically it's stated. Is it too general for a soldier to use in performing the task? Or is it too detailed to be useful?

SME: Can you give me an example of this?

ANALYST: Well, one of the principles you mentioned in step 1, category 1--that of information gathering--seems too general to me. The principle is: the more firsthand information gathered from the problem situation, then the more accurate the problem definition will be. Couldn't this be broken down further to a level more useful for a soldier performing the activity?

SME: I guess it could. Let's see, if the soldier performs a physical inspection in the problem situation, then the more accurate his problem definition will be.

ANALYST: Isn't there another principle there too? Maybe performing interviews with as many involved persons as necessary will result in a more accurate problem definition.

SME: Ok, I guess those two principles really do hit at what the other one said on a more general level.

ANALYST: Yes, and these are on the level appropriate for a soldier to use to perform the activity.

SME: Now here's one--step 2, category 1 on identifying the appropriate subject areas--that seems too specific. The principle is that the more paragraphs in a theoretical solution, the more likely it is to contain some appropriate information for the problem.

ANALYST: Yes, that certainly could be incorporated under the principle that the more information contained in a subject area, the more likely the area is to contain appropriate theoretical solutions.

(Analyst and SME examine the other principles identified for the category and decide that they are all on an appropriate level of detail for performing the activity. They then move to STEP 4.)

## STEP 8.4

### STEP DESCRIPTION

STEP 8.4 Describe the common procedure for generating appropriate procedures for a wide variety of specific situations.

To do this, it is often helpful to ask SME to generate several procedures for performing the activity in specific situations, and to "think out loud" while he does it--that is, to describe the mental process that he goes through to generate each procedure.

Note: This step will provide you with the description of how appropriate actions are developed for specific situations. Using the principles from one category upon which the activity is based, you will examine two or more examples of an activity, and determine what the common method of using the principles is, and how this common method is applied to a variety of specific situations.

---

### VOCABULARY SUPPORT

Common procedure - a set of steps based on one category of principles which is used to generate appropriate procedures for performing a transfer task in specific situations.

EXAMPLE: STEP 8.4

(Analyst and SME continue to analyze Task 007 in order to identify the common or most usual procedure a soldier uses in order to develop actions appropriate for a situation. The analyst wants the SME to describe at least two different examples of the task being used in widely varying contexts. They are using principles from step 3 of the general procedure for the task, category 2 on rating theoretical solutions.)

ANALYST: I'd like you to give me a couple of examples of someone using the principles identified for rating the theoretical solutions.

SME: Well, let's say the problem has been identified as that of a typewriter which is not adequately shielded, and consequently its signal is received on car radios in the vicinity. The soldier goes to the appropriate manual, and he finds three areas that deal with problems related to his problem. And then he identifies two solutions concerning unauthorized transmission of radio signals.

ANALYST: So he has identified the subject areas relative to his problem and decided which were applicable and which weren't.

SME: Right, and now he has to identify the important characteristics of the two solutions which are applicable. He might begin by listing the advantages and disadvantages associated with each solution. In this case one solution suggests constructing an adequate shielding structure. The advantage of this is that the problem would be completely solved; there would be no chance for the signal to be received in cars. There are no disadvantages to this solution.

ANALYST: What about practicality? Should the soldier consider this now?

SME: Yes, and in practical terms this solution isn't so good. The building which houses the typewriter is not structurally suited to increase the shielding necessary for adequate protection, but it could be done for a lot of money. It would inconvenience or stress a lot of people working in the building to have a construction project going on and it would take a lot of time.

ANALYST: How does the other solution work?

SME: The other solution is to relocate the typewriter where adequate shielding already exists. This solution has a disadvantage because this would remove the typewriter from the building where it's most convenient.

ANALYST: So it's not practical either?

SME: No, it causes stress on a lot of the people to relocate, and uses up time and money for the move.

ANALYST: So constructing shielding for the existing location is advantageous, has no disadvantages, but would

cost a lot of money and stress and so rates low on practicality

SME: Yes, while relocating would solve the problem but create others. And it would cause stress for both the people who had to move and those in command buildings. Plus cost money and time for the move.

ANALYST: Ok, we won't carry this into step 4 on making judgments because we want to stick to step 3 on rating solutions. So now let's take a completely different example. Can you describe another situation which would use the same set of principles?

SME: Sure--the same principles for rating theoretical solutions apply to a situation in monitoring radio traffic.

ANALYST: What is "traffic?"

SME: It's communication heard by the monitor and recorded on tapes. All traffic is recorded on tapes but the monitor only records something of significance. Now if he hears traffic which doesn't fit approved content or procedures he will note it in the log. His supervisor then has to decide what it is. And that's the problem that has to be defined.

ANALYST: Ok, then what?

SME: Let's say the problem is defined as traffic which is disapproved content. The soldier finds two different theoretical solutions which apply to the problem.

ANALYST: What are they?

SME: These solutions tell him how the traffic can be reported. One recommends reporting disapproved content through capabilities of the unit, using the general information category. The advantage of this is that the soldier can write a very accurate and thorough description of the content. The disadvantage is that it can take a long time for the report to get to the attention of the commanding officer and it may even get displaced.

ANALYST: Is the solution practical?

SME: Yes, it's highly practical--no money spent or stress put upon anyone and not too much time lost to write the report.

ANALYST: What is the other solution that is applicable?

SME: The other solution is to report it through logistics to the commander, which has the advantage of getting to the commanding officer's attention fairly rapidly, but which has the disadvantage of requiring a brief report. This always allows the possibility of misinterpretation by the commanding officer.

ANALYST: And this is a practical solution?

SME: Yes, it uses little time, no money and generates no stress.

ANALYST: Now let's take a look at these two examples again. First you describe the problem of an electric typewriter which did not have adequate shielding. Then you described the problem of a radio monitor noting

disapproved content on radio traffic. You described the possible theoretical solutions for each one, listing the advantages, disadvantages and the practicality of each solution. Now what did the soldier do in both cases in order to rate the solutions? What common procedure did the two soldiers follow, even though the content and context of the situations were very different?

SME: Well, first both soldiers identified theoretical solutions which applied to their problems. One found solutions concerning shielding, and the other found solutions dealing with how to report disapproved content.

ANALYST: Ok, and then what?

SME: Then both soldiers identified the important characteristics of each solution, in terms of advantages, disadvantages and practicality.

ANALYST: One soldier found that constructing adequate shielding for the typewriter's present location was advantageous--it would completely solve the problem. But it was not entirely practical. This soldier also found that moving the typewriter to a shielded location was not possible, and also not entirely practical even if possible.

SME: Right, and the second soldier found that he could report the disapproved content in a thorough manner which would take a lot of time and possibly get misplaced, or that he could report it in a brief report which would reach the Commanding Officer's attention rapidly but might be misinterpreted.

ANALYST: So the common procedure that both soldiers used in trying to rate theoretical solutions was:

- 1) Identify applicable solutions
- 2) Determine advantages and disadvantages of the solutions
- 3) Determine how practical the solutions are

SME: Yes, that's what both soldiers were doing.

(Analyst decides that this above set of steps is the common procedure for step 3, category 2, and decides to go on to STEP 9.1.)

## SUMMARY

In this lesson you learned five steps from the ETAP that must be followed in order to do a principle-transfer analysis. You learned to perform the following:

- STEP 5 Determine if it is more important for a soldier to know principles, in order to perform the activity, which indicates that the activity should be analyzed using principle-transfer analysis methods.
- STEP 8.1 Identify the categories of principles which must be known in order for a successful performance of the activity.
- STEP 8.2 Identify the most important or most common principles from a category.
- STEP 8.3 State all principles from a category at the level appropriate for the performance of the activity.
- STEP 8.4 Describe a general method for developing procedures from the important principles of a category which are appropriate for specific situations.

## PRACTICE

It is important to do the practice exercise in order to gain experience in the procedures of principle-transfer analysis, and in order to check yourself on your knowledge of the methodology. Choose someone to be your SME for any task which you think is likely to be based on principles. Use STEPS 5, 8.1, 8.2, 8.3, 8.4 to perform your analysis. After the analysis is completed, review it using the following checklist to see if you covered these important points:

### CHECKLIST FOR PRINCIPLE-TRANSFER ANALYSIS

1. Does the task have more than 7-10 procedures or branches, either at every level or at all levels below the most general level of description? (In other words, the task may have a set of steps at the most general level, but is based on important principles at more specific levels.)
2. Are there too many important factors for a soldier to consider and learn in order to perform the activity in a variety of situations?
3. What are the categories of principles that a performer must know and that are derived from either a general procedure or a few fundamental principles?
4. What are the important or most common principles from each category that a performer must know in order to do the activity in specific situations?
5. What is the common procedure for each category of principles that the performer must use in order to do the activity?

LESSON SEVEN: CONDUCTING A KNOWLEDGE ANALYSIS  
FOR PRINCIPLE-TRANSFER ACTIVITIES

INTRODUCTION

It's important to use the knowledge analysis procedure in order to identify the facts, concepts, and procedures a soldier must know before he or she performs the task. The procedure used for the knowledge analysis of principle-transfer activities is similar to the procedure used for the knowledge analysis of procedural and factor activities. It differs only in the absence of further analysis of principles.

OUTLINE OVERVIEW

Knowledge analysis for principle transfer activities includes identifying any related job aids and knowledge necessary for their use. It also provides a method for identifying the knowledge a soldier must have learned in order to use the principles important for each category. In this lesson you will learn to:

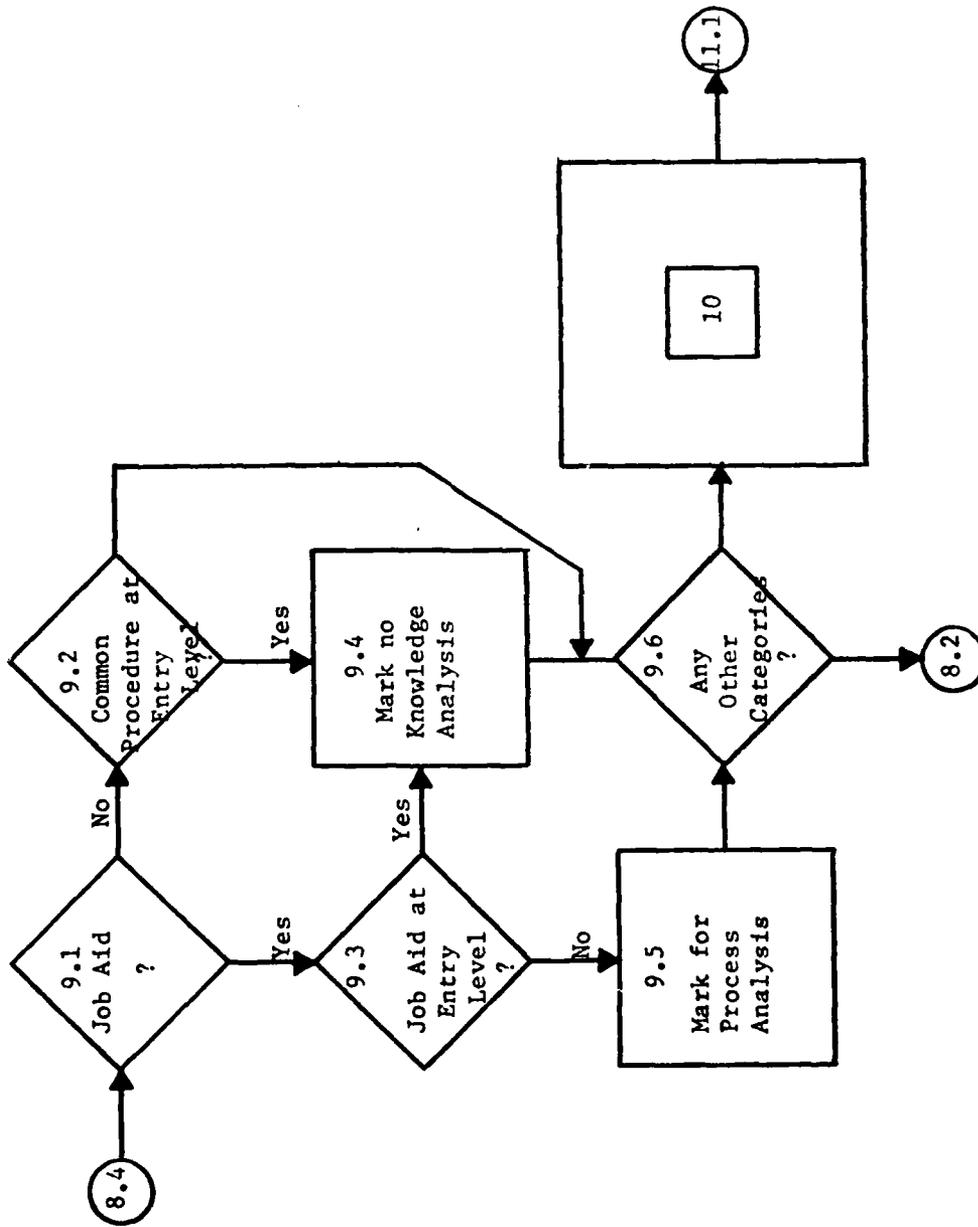
- Identify any related job aids for each category of principles. (STEP 9.1)
- Determine if a soldier at the lowest ability entry level can use the common procedure for each category. (STEP 9.2)
- Identify those categories of principles which do not require a knowledge analysis. (STEP 9.3)
- Determine if the soldier at the lowest ability entry level can use the job aid without further training. (STEP 9.4)
- Determine if in order to use a job aid a process analysis is required. (STEP 9.5)
- Determine if more categories of principles need to be analyzed. (cstep 9.6)
- Determine if there are any types of knowledge that must be known to use each principle of the

activity. (STEP 10.1)

- Determine what kinds of knowledge must be known in order to use each principle. (STEP 10.2, 10.3, and 10.4)
- Determine if the required knowledge has already been acquired by lowest ability entering soldier. (STEP 10.5)
- Determine if there is a job aid to provide the knowledge required for application of the principle. (STEP 10.6)
- Determine if the job aid can be used by the lowest ability entering soldier without further instruction. (STEP 10.7)
- Determine what kind of knowledge is required for the job aid (STEP 10.8)
- Mark the job aid for process analysis if a procedure is required for using the job aid. (STEP 10.10)

#### COMMENTS

Knowledge analysis provides the basis for identifying the knowledge prerequisites for performing a principle-transfer activity. Effective training depends upon the knowledge which must be known in order to perform the task. This knowledge consists of both what a soldier must learn and retain in his or her memory, and what s/he obtains from a job aid of some sort. Thus, the knowledge analysis must include job aids, and also provide the method for analyzing any knowledge prerequisite to the job aids.



STEP 9.1

STEP DESCRIPTION

STEP 9.1 Choose one category. Does a job aid exist to help the soldier apply the common procedure?

a. If yes, go to STEP 9.3.

b. If no, go to STEP 9.2.

-----  
VOCABULARY SUPPORT

Job aid - any source of information which a soldier can consult rather than learn (or remember) the information in order to perform an activity.

EXAMPLE: STEP 9.1

(Analyst and SME continue to analyze the common procedure from category 2 of STEP 2 of Task 007 in order to identify any job aids which help the soldier apply the procedure. The category is principles to identify applicable subject areas in technical manuals.)

ANALYST: Now, is there any kind of aid--a manual, a pamphlet, or something that will help a soldier apply this category?

SME: Well, there is a section in the regulations manual that deals with keywords. It lists alphabetically keywords which are often found in problem definitions, and which are also found in theoretical solutions found in the manual. They give the soldier an idea of where to look.

ANALYST: OK, that's an aid to help the soldier use the common procedure. He has to have a good idea of what some common keywords are, and that list would provide him with that knowledge. Are there any other aids that you can think of for this principle?

SME: No, there's nothing else that would help the soldier.

(The analyst decides that the list of keywords is the only job aid available to the soldier, and goes to STEP 9.3.)

STEP 9.2

STEP DESCRIPTION

STEP 9.2 Can a soldier at the lowest ability entering level use the common procedure for that category without further training?

- a. If yes, go to STEP 9.4.
- b. If no, go to STEP 9.6.

Note: In this step you will determine if a soldier at the lowest ability entering level can follow the common procedure identified in STEP 8.4 in order to use the category of principles related to that common procedure. If he or she can, then you do not need to perform a knowledge analysis. If the soldier cannot use the common procedure then a knowledge analysis will be necessary later.

EXAMPLE: STEP 9.2

(Analyst and SME have been analyzing STEP 4, category 1 from Task 007. They completed STEPS 8.2, 8.3 and 8.4. They have identified the important principles at a level appropriate for performing the task, and have described the common procedure for using these principles. They then went to STEP 9, where they determined that there was no job aid available. Now they are going to decide if a soldier at the lowest ability entering level can use this common procedure (STEP 9.2).)

ANALYST: We've determined there is no job aid for the common procedure used to make judgments on what theoretical solution to choose.

SME: Right.

ANALYST: Now do you think a soldier at the lowest ability entering level could use this procedure? Remember, the procedure is: (1) Order the solutions in terms of most to least advantageous; (2) Take the two most advantageous and order them in terms of most practical to least practical; (3) Rate problem on degree of threat; (4) Pick solution most advantageous if degree of threat is high; (5) Pick solution most practical if degree of threat is low.

SME: A soldier at the lowest ability entering level is not going to understand how to follow that procedure. There are a lot of terms he or she won't be familiar with, for one thing.

ANALYST: So, we'll have to do a knowledge analysis later on for this common procedure. Right now let's see if there are more categories to analyze.

(Analyst and SME proceed to STEP 9.6.)

### STEP 9.3

#### STEP DESCRIPTION

STEP 9.3 Can a soldier at the lowest ability entering level use the job aid without further training?

- a. If yes, go to STEP 9.4.
- b. If no, go to STEP 9.5.

Note: In this step you will decide if the job aid for applying the principle can be used by a soldier at the minimum acceptance level. If the soldier can use the job aid without further training then a knowledge analysis is unnecessary. If the soldier can't use the job aid without further training then a knowledge analysis will be necessary.

EXAMPLE: STEP 9.3

(Analyst and SME continue to analyze Task 007 in order to determine if a soldier at the lowest ability entering level can use the keyword list in the manual without having further instruction.)

ANALYST: Do you think the list of keywords in the manual can be used by a soldier at the lowest ability entering level? Or do you think the soldier would need more instruction of some sort?

SME: I think he could use the list. He'd have to know how to read, of course, but the list is in very basic English. I don't think the soldier would need any special instructions on using the list.

(Analyst decides that a soldier at the minimum acceptance level can use the job aid without further instruction. He then proceeds to STEP 9.4.)

STEP 9.4

STEP DESCRIPTION

STEP 9.4 Mark no knowledge analysis is necessary. Then go to STEP 9.6.

EXAMPLE: STEP 9.4

(Analyst and SME proceed to STEP 9.4 to mark the job aid that knowledge analysis is unnecessary.)

ANALYST: OK, if the soldier at the lowest ability entering level could use the keyword list, then a knowledge analysis is unnecessary.

SME: That's right, the soldier will know how to use it.

ANALYST: So I'll mark that knowledge analysis is unnecessary, and we'll go on.

(Analyst and SME proceed to STEP 6.)

## STEP 9.5

### STEP DESCRIPTION

STEP 9.5 Mark job aid or common procedure to indicate that process analysis (STEP 3) is required. Then go to STEP 9.6.

Note: In this step you will note the job aids which a soldier at the minimum acceptance level could not use without further training. Since a job aid usually requires knowledge of a procedure for using it, you will eventually use STEP 3 to do a process analysis on how to use the job aid. But for now you simply mark that such analysis is required and go on to see if more categories need to be analyzed (STEP 9.6).

EXAMPLE: STEP 9.5

(Analyst and SME have been working on STEP 1, category 1 of Task 0071. They have identified the important principles (STEP 8.2), made certain they were at a level appropriate for performing the task (STEP 8.3) and described a common procedure for using these principles (STEP 8.4). They then identified a job aid that a soldier would use in order to gather information (STEP 9.1) and determined that a soldier at the minimum acceptance level could not use the job aid without further instruction (STEP 9.3). Now they are marking that the job aid requires further analysis (STEP 9.5).)

ANALYST: This pamphlet on possible problem sources could definitely not be used by a soldier at the lowest ability entering level?

SME: That's correct. He'd have to be taught how to use the cross-referencing.

ANALYST: So I'll mark it for process analysis. Later on we'll have to identify the procedure a soldier would use for the cross-referencing. But for now we'll move on.

(Analyst and SME proceed to STEP 9.6 to decide if more categories need to be analyzed.)

STEP 9.6

STEP DESCRIPTION

STEP 9.6 Are there other categories of principles which have not yet been analyzed?

- a. If yes, go to STEP 8.2.
- b. If no, go to STEP 10.1.

EXAMPLE: STEP 9.6

ANALYST: Now that we've decided that the job aid helps the soldier identify applicable subject areas in the technical manual and that this list of keywords doesn't need knowledge analyses, we need to think about whether there are categories of principles which haven't been analyzed yet.

SME: Yes, we need to look at the category of principles for STEP 1, concerning information gathering.

ANALYST: Right, let's look at that now.

(Analyst and SME return to STEP 8.2 in order to analyze another category.)

## STEP 10

### STEP DESCRIPTIONS

STEP 10.1 Examine each principle in each categories from STEP 8 and 9. Is there any knowledge (facts, concepts, procedures or principles) that must be used to apply this principle?

- a. If there is, go to STEP 10.2.
- b. If there is not, go to STEP 10.10.

STEP 10.2 Are there factors which must be considered or procedures which must be executed in order to apply this principle?

- a. If yes, go to STEP 10.3.
- b. If no, go to STEP 10.4.

STEP 10.3 If factors must be considered, mark to indicate that a factor-transfer analysis is required. Go to STEP 10.4.

If a procedure must be executed, mark to indicate that a process analysis is required. Go to STEP 10.4

STEP 10.4 Identify and describe with a label and/or a generaltiy each fact, concept, or principle under analysis. Determine whether the knowlege is a fact, concept or principle and identify with the standard conventions.

STEP 10.5 Has the required knowledge already been acquired by soldiers who are at the lowest ability entry level?

- a. If yes, go to STEP 10.10.
- b. If no go to STEP 10.6.

STEP 10.6 Is there a job aid which provides the knowledge required for application of the principles?

- a. If not, go to STEP 10.3.
- b. If there is a job aid go to STEP 10.7.

STEP 10.7 Does a soldier at the lowest ability entry level need additional knowledge in order to use the job aid?

- a. If yes, go to STEP 10.8.
- b. If no, go to STEP 10.10.

STEP 10.8 Does the job aid require the soldier to learn a procedure for its use? Does the job aid require the soldier to acquire facts, concepts or other principles for its use?

- a. If a procedure is required go to STEP 10.9.
- b. If not, go to STEP 10.4.

STEP 10.9 Mark the job aid to indicate that process analysis (STEP 3) is required, go to STEP 10.10.

STEP 10.10 Are there any other principles which have not been submitted to knowledge analysis? Are there any of the concepts which were identified as a result of STEP 10.3 which a soldier at the lowest ability entering level would not know?

- a. If all principles and concepts are at the entry level go to STEP 11.
- b. If there are more principles or concepts to analyze, then go to STEP 10.1.

Notes: This knowledge analysis is basically the same procedure that was covered in Lesson One and Five. Therefore, the specific substeps of STEP 10 will not be taught, but will be illustrated in the following example.

EXAMPLE: STEPS 10.1 through 10.10

(The analyst and SME are examining a principle from Task 007 which relates to the common procedure from step 3, category 2 of Task 007. The principle is, the more practical a solution is the less time or money it will use, and the less stress it will create. They are beginning the knowledge analysis using STEP 10.1 through STEP 10.10.)

ANALYST: Look at the principle about practicality; the more practical a theoretical solution is, the less time or money it will use, and the less stress it will create. Are there any factors, concepts, or procedures that a soldier must know in order to use this principle?

SME: Yes, there are concepts. The soldier has to know what time, money and stress are.

ANALYST: Ok, and what about the concept of theoretical solution?

SME: Sure, the soldier has to understand what that means.

ANALYST: Are there any factors which the soldier has to consider in using this principle?

SME: No, I can't think of any.

ANALYST: What about procedures?

SME: No there aren't any procedures. The concepts I mentioned are the only things a soldier has to know.

ANALYST: Ok, we have four concepts the soldier must know: time, money, stress, and theoretical solution. Do you think a soldier at the lowest ability entry level would already know these concepts?

SME: No, not in the Army sense. For instance, he wouldn't know that causing stress doesn't mean making someone nervous, in the Army sense. He would have to learn that it means causing inconvenience or hardship to such an extent that the normal amount or quality of the work is lowered.

ANALYST: And this would also be true for the concepts of theoretical solution, time and money?

SME: Yes, he wouldn't know theoretical solution at all, and he wouldn't understand time and money in the Army sense.

ANALYST: Ok, is there a job aid which would provide this knowledge?

SME: Yes, there is. There's a glossary at the end of the technical manual on theoretical solutions. These concepts are defined there.

ANALYST: Could a soldier at the lowest ability entering level use the glossary? Or would he need more information?

SME: Well, I think the soldier would need more information. I don't think he would know how to use the technical manual in order to find the glossary.

ANALYST: What would the soldier need to learn in order to find the glossary? A procedure for using the manual?

SME: Yes, he'd have to know how to find the glossary for each major section of the manual.

ANALYST: So it's a complicated manual to use?

SME: Yes, it is.

ANALYST: So the soldier would need to learn a procedure?

SME: Yes.

ANALYST: Ok, I'll mark that the technical manual should be process analyzed for a procedure to use it. Now let's see if there are any other principles which need to be analyzed.

(The analyst and SME continue knowledge analysis until all appropriate principles and job aids have been examined.)

## SUMMARY

A complete knowledge analysis for principle-transfer activities includes several activities: (1) the identification of the knowledge prerequisite for using each principle; (2) the identification of job aids and any knowledge required for using them; and (3) the analysis of all facts, concepts or procedures prerequisite to the knowledge for using the principles or the job aids. In this lesson you learned to:

- STEP 9.1 Identify any job aids for each category of principles.
- STEP 9.2 Determine if a soldier at the lowest ability entry level can use the common procedure for each category.
- STEP 9.3 Identify those categories of principles which do not require a knowledge analysis.
- STEP 9.4 Determine if a soldier at the lowest ability entry level can use a job aid without further training.
- STEP 9.5 Determine whether a process analysis is necessary in order to identify how to use the job aid.
- STEP 9.6 Determine if more categories of principles need to be analyzed.
- STEPS 10.1 through 10.10 Perform a knowledge analysis on principles and job aids which are appropriately marked.

## PRACTICE

This practice will be most effective if you can continue to use the same SME and the same task you used in the practice exercise for Lesson 6. Use STEPS 9.1 through 9.6 and STEPS 10.1 through 10.10 to perform the knowledge analysis. When the analysis is complete, review it against the following check list in order to make certain that these important points were covered.

### CHECKLIST FOR KNOWLEDGE ANALYSIS OF PRINCIPLE-TRANSFER ACTIVITIES

1. Did you identify the appropriate job aids, if any, for each category of principles?
2. Did you identify the common procedures which can not be used by soldiers at the lowest ability entry level?
3. Did you identify any categories of principles which did not require a knowledge analysis?
4. Did you identify any job aids which a soldier at the lowest ability entry level could not use?
5. Did you determine if any job aids required a process analysis?
6. Did you check to see if all categories of principles had been analyzed?
7. Did you identify any principles which required prerequisite knowledge?
8. Did you identify any factors or procedures that must be known for each principle?
9. Did you identify each fact, concept, or principle which is prerequisite knowledge for each principle?
10. Did you determine if the knowledge had been acquired by soldiers at the lowest ability entry level?
11. Did you identify any job aids for application of the principle?
12. Did you determine if these job aids would be used by a soldier at the lowest ability entry level?

13. Did you determine whether a procedure or facts or concepts are required for using the job aid?
14. Did you check to make sure that all principles appropriately marked have been analyzed?

LESSON EIGHT: STANDARD CONVENTIONS

CONTENTS

Verbal Explanation	8-1
Practice Items and Answers	8-9
System Requirements	8-16

### Verbal Explanation

The conventional hierarchical notation (military numbering system) is a method by which tasks can be referenced to based on their dependency to other tasks involved in the particular project. Numeric symbols, recognizing task dependency, are used to designate each individual task. The top task is assigned the notation 1. (or 2. or 3., etc.) From this point, a hierarchy is built based on the relationship of each task to its prerequisites and on the relationship of the prerequisites to each other.

A procedural notation (network notation) is very similar to the conventional hierarchical notation in that a reference system is built based on the tasks' relationships to each other. However the procedural notation must be able to handle convergent networks and even loops, which is not possible with the conventional hierarchical notation. Thus a task within a group or network of tasks which is dependent on a branch can be referenced. The procedural notation must also designate those instances where two or more tasks should all follow a given task or when there is a choice regarding the proceeding tasks (i.e. "and" versus "or"). The procedural notation must distinguish decision elements from other elements as well as indicate the boundary between bottom level MOS tasks and prerequisite basic skills and knowledge.

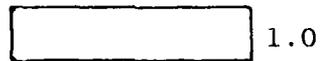
determining how many MOS's each prepares for and how many tasks each takes. The COTR may request that specific clusterings of tasks/MOS's explored and reported on, in addition to those the contractor explores on his own.

- It is apparent that a given task/knowledge may occur as a first or second level prerequisite to some simple MOS task, while for a relatively complex task in another MOS the same task/knowledge may be a sixth or seventh level prerequisite. Therefore, all analysis elements must be cross-referenced so that both the hierarchical/procedural position in the MOS prerequisite structure is maintained, and so that some unambiguous ("absolute") identification exists for each element independent of which MOS it occurred in or where it is encountered in that structure. It is recommended that the four level taxonomic structure of Job Dimension, Functional area, capability statement, and competency must be used for the "absolute" identification of each element while the hierarchical/procedural notation in the attached example be used to describe the MOS prerequisite structures. Obviously, the task comparison/redundancy matrix should use the absolute identification number.

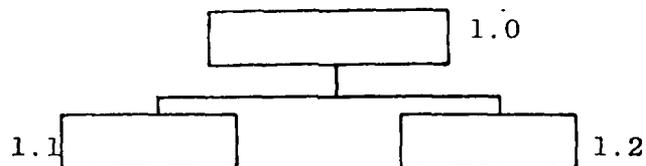
In addition, the procedural notation must be able to indicate where principles, facts, and concepts are involved.

Example: creating hierarchical notation

Top task

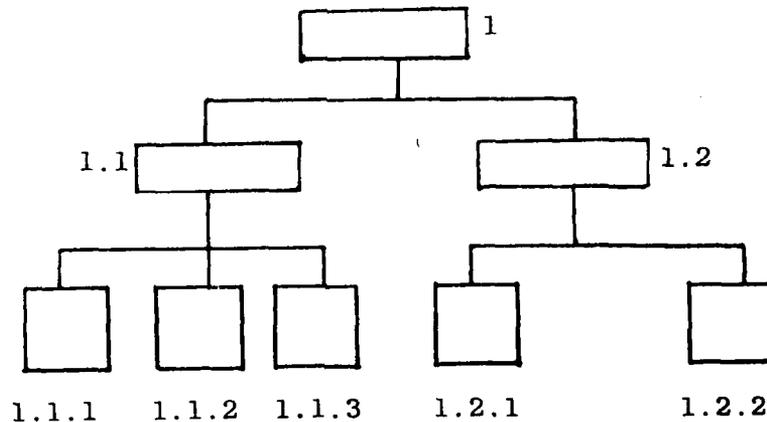


Two tasks prerequisite to Task 1.0 - Notation 1.1, 1.2

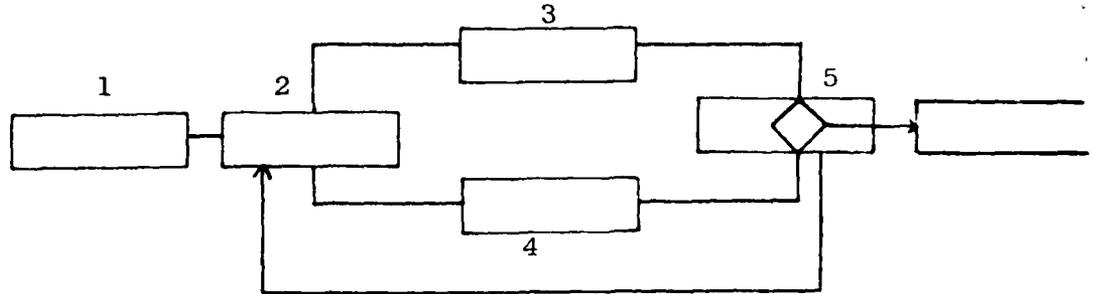


Three tasks prerequisite to Task 1.1 - Notation: 1.1.1, 1.1.2, 1.1.3

Two tasks prerequisite to Task 1.2 - Notation: 1.2.1, 1.2.2



A procedure (network) of 6 tasks prerequisite to (or defining in more detail) task 1.2.2. Draw boxes for all steps in the procedure; use diamonds for decision boxes. Arbitrarily number tasks as follows:



Notation for box 1: 1.2.2\*1 → 2  
 box 2: 1.2.2\*2 → 3,4  
 box 3: 1.2.2\*3 → 5  
 box 4: 1.2.2\*4 → 5  
 box 5: 1.2.2\*-5 → 2/6 (C)  
 box 6: 1.2.2\*6

At some point in the MOS task structure you cross the boundary between bottom level MOS tasks and prerequisite knowledges, etc. This boundary can be denoted by replacing the terminal period (.) with an asterisk. Therefore, in this example

1.2.2\*N → N

you know that task 1.2.2 is a bottom level task in the MOS training, and fields to the right of the asterisk (\*) define prerequisite basic skills and knowledges.

In this example the notation N.N.N\*1→2 means that in the procedure defined by those elements N.N.N. -----, step 1 is followed by step 2 (→ means "go to").

N.N.N\*2→3,4 means step 2 is followed by steps 3 and 4 (, means and). This would indicate that in this procedure both steps 3 and 4 must follow 2 (and precede 5) but that steps 3 and 4 may be done in either order (3,4 or 4,3). Decision boxes such as box 5 in our example have this attribute noted by use of a negative (-) number (some other special character may be used).

N.N.N\*-5→N/N (C)

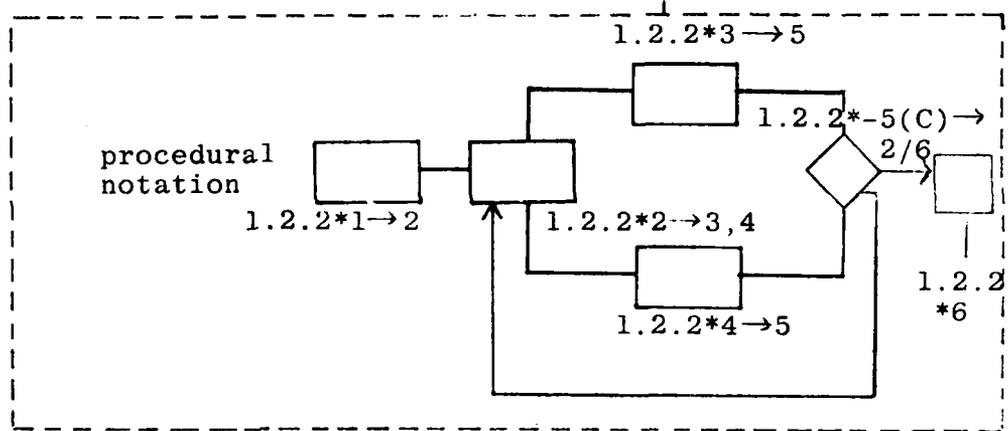
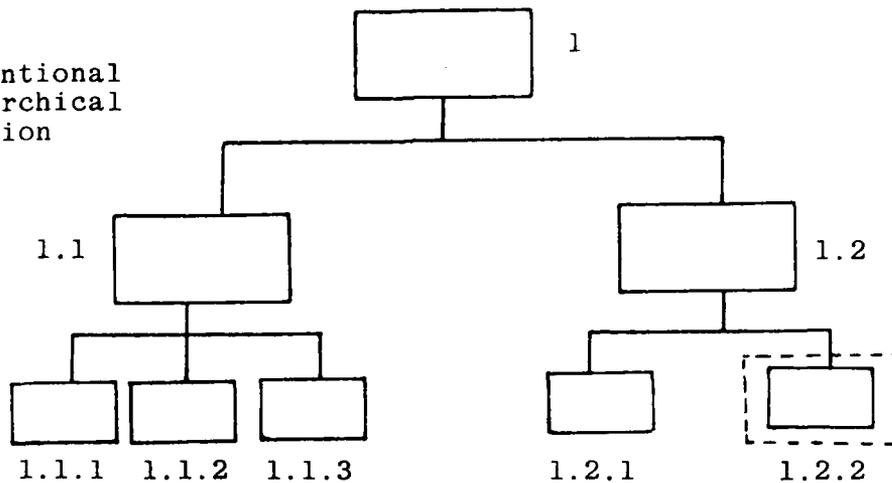
The parenthetical C (C) in this example notes that the content defined by this box is a concept. A parenthetical P (P) is used to indicate content classified as principle.

An F (F) indicates a fact element. Box 5 notation further indicates that box 5 goes to either box 2 or box 6 (/ means "or").

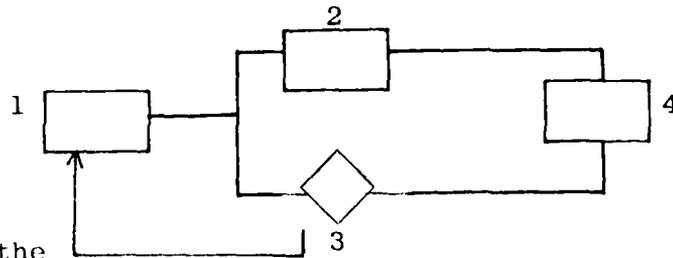
N.N.N\*-5→2/6 (C)

Investigation of the diagram will reveal that there is a loop within this procedure based on the decision made in step 5.

conventional  
hierarchical  
notation



Breaking things down further, here is a network of 4 tasks defining step 3 in more detail. (Normally, this instruction would be prerequisite to the instruction for 1.2.2\*3→5. Tasks are numbered arbitrarily left to right. The network can be accurately defined regardless of order of the numbering 1-4.



Then the notation is: 1.2.2\*3.1 → 2,3

1.2.2\*3.2 → 4

1.2.2\*3.-3(c) → 1/4

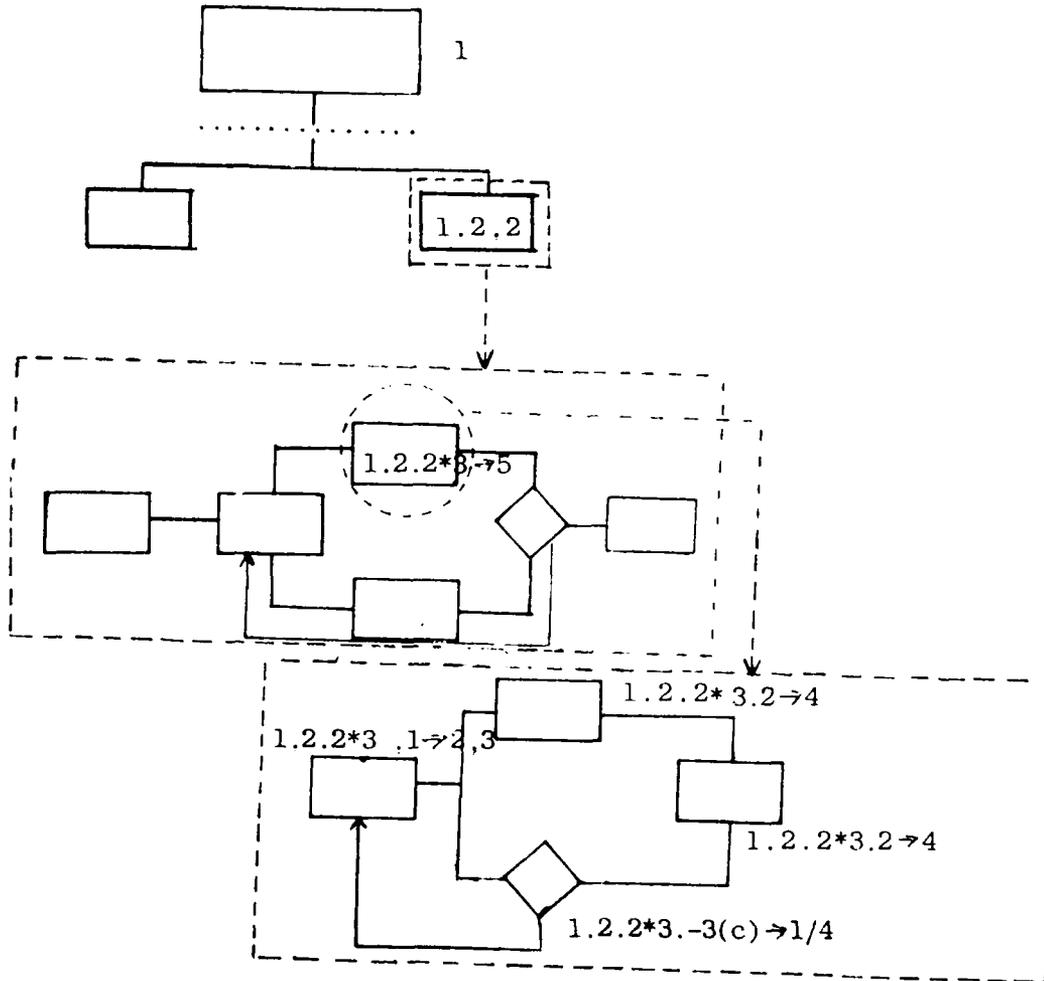
1.2.2\*3.4

Notice that the qualifying information about step 3 is dropped in the notation for substeps of step 3.

1.2.2\*3.1 → 2,3

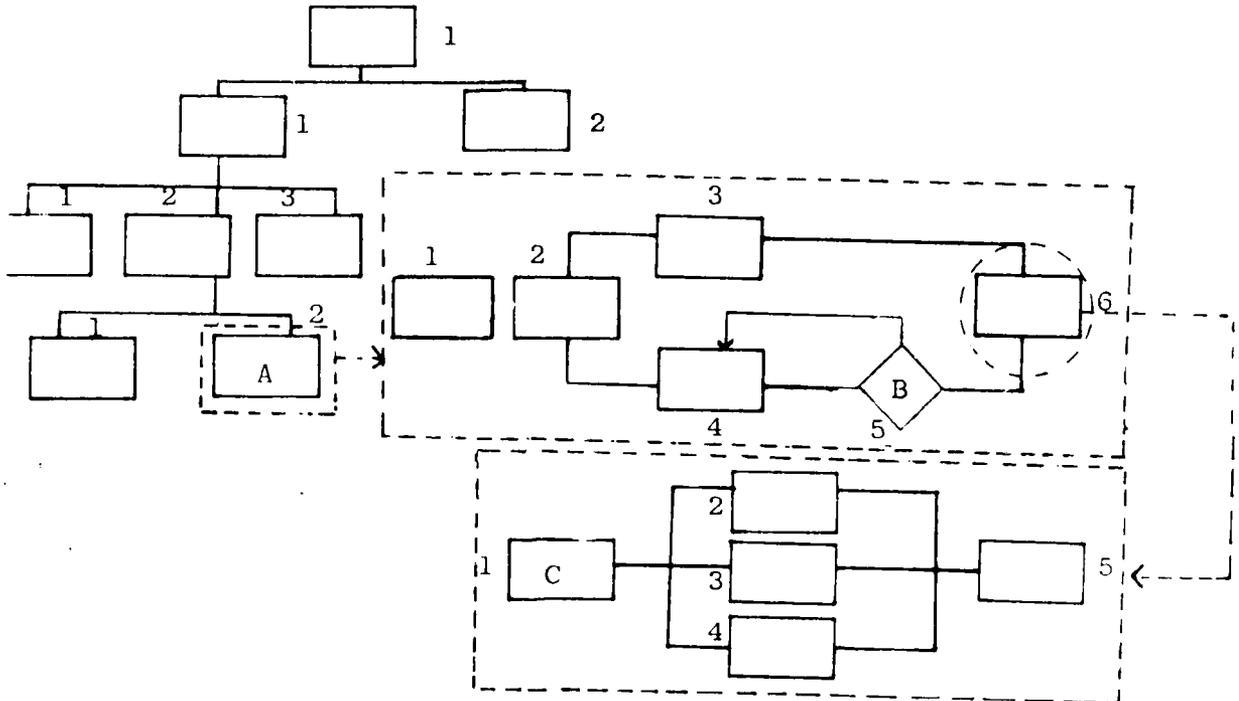
NOT 1.2.2\*3 → 5.1 → 2,3

Here is a diagram of the complete analysis up to this point.



Practice items

I. determine the appropriate notations for the boxes marked A, B, C



Answers to Practice I

- A. 1.1.2.2
- B.  $1.1.2.2 * -5 \rightarrow 4/6$
- C.  $1.1.2.2 * 6 - 1 \rightarrow 2, 3, 4$

AD-A098 389

ARMY TRAINING DEVELOPMENTS INST FORT MONROE VA  
EXTENDED TASK ANALYSIS PROCEDURE (ETAP): TRAINING MATERIALS. OR--ETC(U)  
JUL 80 M D MERRILL, C REIGELUTH, R K BRANSON

F/G 5/9

UNCLASSIFIED

NL

3 of 3

5-81



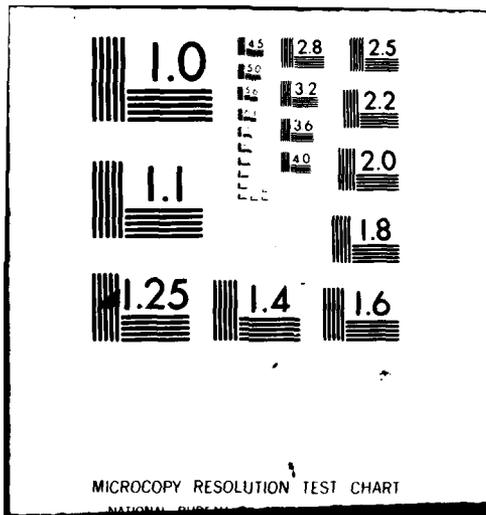
END

DATE

FORMED

5-81

DTIC



MICROCOPY RESOLUTION TEST CHART

NATIONAL BUREAU OF STANDARDS-1963-A

II. Given the following list of elements, build as much of the hierarchical structure as they define.

1.2.2\*2(P)

1.2

1.2.1

1.2.2\*-1→2/3

1.2.2\*3.1→2

1.2.2\*3

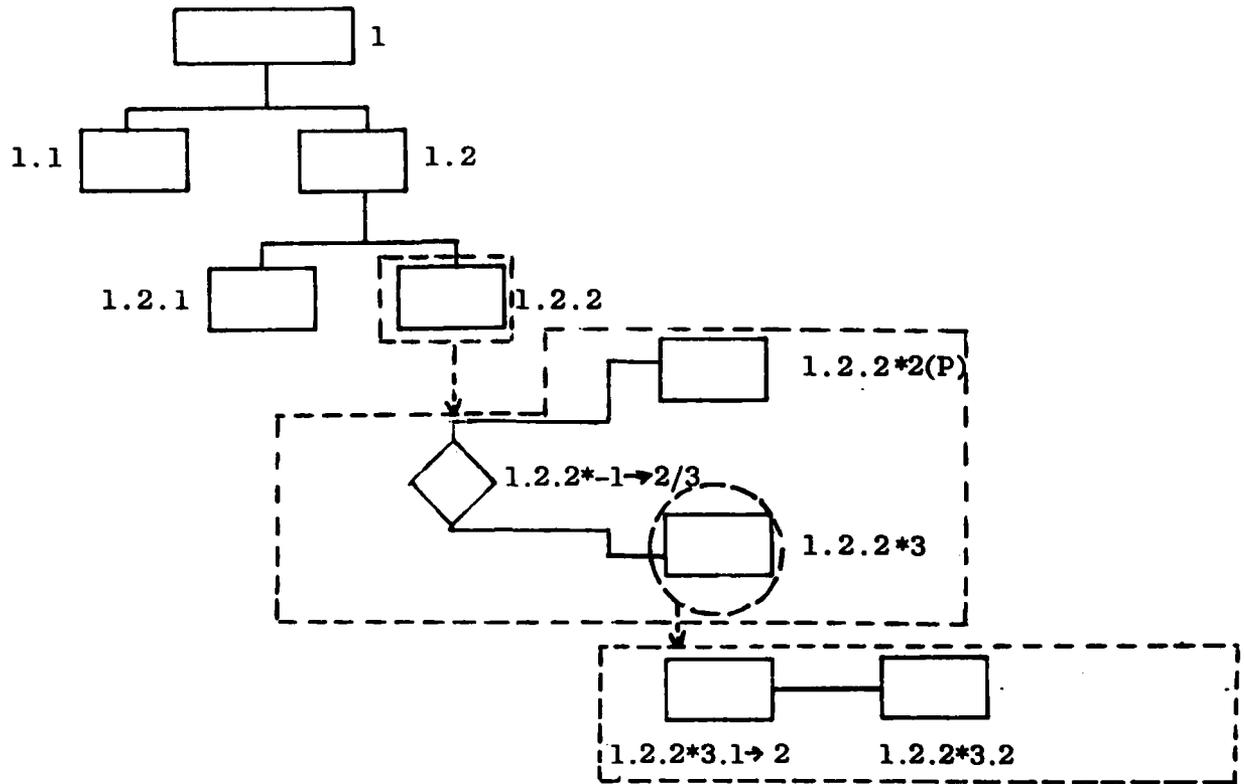
1

1.1

1.2.2\*3.2

1.2.2

Answer to Practice II



III. Given the following list of elements, build as much of the hierarchical structure as they define or imply.

3.0

3.1

3.2

3.3

3.4

3.2.1

3.2.2

3.2.2\*1→2

3.2.2\*2→3,4,5

3.2.2\*3→6

3.2.2\*4→6

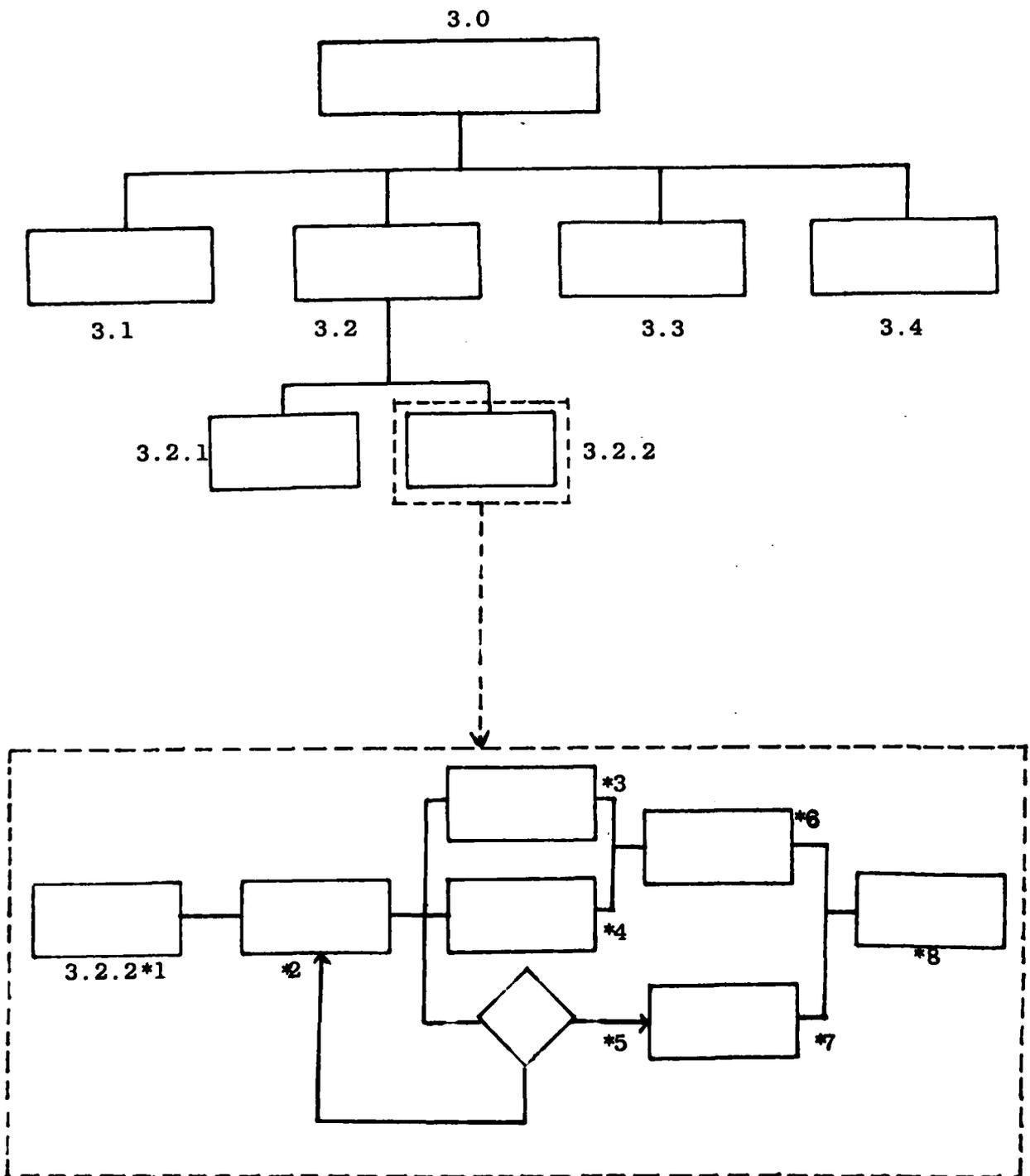
3.2.2\*-5→2/7

3.2.2\*6→8(P)

3.2.2\*7→8

3.2.2\*8

Answer to Practice III



## System Requirements

- All task elements data to be provided to government on OCR-B readable forms. Format will be provided as GFM. With COTR approval, properly formatted magnetic media may be substituted. (However, if you do the first, the second is no problem in any event.)
  
- Database representation must preserve both hierarchical and procedural relationships between elements (see example).
  
- Data collection must be made on basis of a well defined taxonomy of tasks/skills. Taxonomical elements must be well defined and documented in such a manner that the analysts in the field can accurately, efficiently, and reliably classify tasks uncovered by the analysis, according to the taxonomy. That is, the tasks must be correctly classified, in a short time, with good agreement between independent observers/analysts.
  
- The taxonomy should be easily and quickly expandable. That is, when a task is found which the existing taxonomic elements cannot accurately describe, it

must be easy and straightforward to add new elements to the taxonomy along with their description and definition. The updated taxonomy, definitions, and explanatory examples of new elements must be provided to all analysts in the field within 2 to 3 days of being added to taxonomy.

- The system must be able to identify redundancy/ commonality of prerequisite tasks/knowledges/competencies across MOS's (this is the heart of the effort).

Reports must include (as a minimum).

	MOS's/Skills							total
tasks/ knowledges/ competencies	x	x	x					3
			x			x		2
	x							1
							x	1
	x		x		x		x	4
		x		x		x		3
			x					1
total	3	1	4	2	1	2	2	15

- Contractor system must be able to manipulate the data base to determine the most cost effective configuration of new courses and existing MOS course enhancements. To do this, the contractor must be able to explore different configurations quickly and economically.

**DAT  
ILM**