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ABSTRACT

A new, more specific language for describing work activities, based upon the duty module (clusters of tasks that tend to go together occupationally and organizationally in meaningful ways) is being designed for the Army. The purpose is to improve communications between resource and requirement planners and program operators. The paper proposes two different kinds of modular evaluation devices: sets of tasks performed by individuals, and sets of tasks performed by organizational units. Most of the document examines and evaluates existing approaches to proficiency testing in the Armed Forces. Some duty modules are listed but the proposed designs have been neither analyzed nor evaluated. Recommendations are made for further development of the duty module concept. (NH)

A MODULAR APPROACH TO PROFICIENCY TESTING

by

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INTRODUCTION

A new, more specific language for describing work activities is being designed for the Army on an experimental basis. This language is designed for the purpose of improving communications between resource and requirement planners and program operators. Also, it will permit the integration of future data bases.

The need to evaluate the feasibility of personnel information systems based upon clusters of tasks smaller than a Military Occupational Specialty (MOS) was originally suggested by long-range planners at the Behavior and Systems Research Laboratory (BESRL), primarily by Mr. Cecil D. Johnson, who was Chief of the Statistical Research and Analysis Division, and Dr. J. E. Uhlaner, Technical Director. (BESRL has since changed its name and become part of the Army Research Institute [ARI] for the Behavioral and Social Sciences.)

The development of the duty module concept was a team effort originally conceived by ARI staff members, and developed and applied, under direction from ARI, by various staff members from the American Institutes for Research (AIR) and several consultants. Key ARI contributors include Mr. Cecil D. Johnson and Mrs. Bertha H. Cory, who acted as the Contracting Officer's Technical Representatives for the Army.[1]

Key AIR staff members, in addition to Dr. Stephenson, include Dr. Edwin A. Fleishman, Dr. Albert S. Glickman, Mr. Clifford P. Hahn, Dr. Ronald P. Carver, and Mr. Albert J. Farina. Key consultants at the time that the theoretical work was conducted included Dr. Robert B. Miller, Col. Warren P. Davis (USA, Ret.), and Mr. Harry I. Hadley. Col. Davis and Mr. Hadley later joined the AIR staff as project directors of the work currently in progress.

The new language is based upon a concept called the "duty module."[2,3] Duty modules are clusters of tasks that tend to go together occupationally

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[1] Contract No. DAHC-19-71-C-0004, "A Taxonomic Base for Future Information and Decision Systems," and Contract No. DAHC-19-73-C-0041, "A Comparison of Officer Job Content Modules with Activity Groupings Implicit in Course Design."

[2] Miller, R. B. A Taxonomic Base for Future Management Information and Decision Systems: Theoretical Background to the Design of Duty Modules; American Institutes for Research, Washington, D.C., Technical Report AIR-23500-7/71-TR-2, July 1971. (U.S. Army Behavior and Systems Research Laboratory, BESRL Technical Research Note, in preparation.)

[3] Stephenson, Robert W. (American Institutes for Research, Washington, D.C.) A Taxonomic Base for Future Management Information and Decision Systems: A Common Language for Resource and Requirement Planning; U.S. Army Behavior and Systems Research Laboratory, Arlington, Va., Technical Research Note 244 (AD-757-794), October 1972.

and organizationally in meaningful ways. They are initially identified and formulated based upon a detailed examination of task inventory or job analysis data. Then attention is given to ways in which these tentatively identified job content modules can be tested against various available criteria of operational utility. One relevant criterion is whether job content modules can be used as field assignment modules. Another possible application is in the area of requirement planning and unit effectiveness. A source of information here is data that can be gathered in conjunction with unit training and unit effectiveness exercises that are performed in the field. It is of interest to determine the utility of expressing unit capabilities in terms of duty module classifications of tasks performed.

The word "module" was chosen because job activity clusters, like equipment components of the same name, are meant to be largely self-contained, independent units of work. For purposes of occupational classification, a duty module is a cluster of tasks that apply without modification in a number of occupational classifications or specialties.

In addition to such "individual" duty modules, modular Army training test components for organizational units have also been designed that constitute the analog of duty modules for individuals. This presentation will describe two different kinds of modular evaluation devices--sets of tasks performed by individuals, and sets of tasks performed by organizational units.

INDIVIDUAL PROFICIENCY TESTS

Every individual proficiency test and every Army training test is already divided into special component sections with separate scores. Before going into detail about what our modular component scores are supposed to do and supposed to look like, it is necessary to say a few words about what these existing systems are like. We will begin with the evaluation of the proficiency of individual personnel in the Army.

ENLISTED PERSONNEL PERFORMANCE EVALUATION

This discussion should be prefaced by noting that evaluation of the performance of enlisted personnel is an important responsibility of every commissioned and senior noncommissioned officer in the Army. The rewards and punishments associated with such evaluations give commissioned and noncommissioned officers the necessary control over enlisted personnel to maintain and improve effectiveness. In addition to this important supervisory function, however, there are a number of formal proficiency evaluation procedures for enlisted personnel that are conducted by various headquarters. The most important of these, for purposes of this paper, is the U.S. Army Enlisted Evaluation Center, located at Fort Benjamin Harrison, Indianapolis, Indiana.

The Enlisted Evaluation Center is the major operating element of the formal enlisted evaluation system. It was established in 1958 as a Class 2 activity of the Army. Its primary purpose then was to help the Army manage the proficiency pay program, which had been established in response to the recommendations of the Cordiner Committee--the Defense Advisory Committee on Professional and Technical Compensation--in 1956 and 1957.

Monetary incentives were one of the Committee's proposals designed to improve personnel retention and job motivation among trained technical specialties and, at the same time, stimulate higher quality performance among all enlisted personnel. Proficiency pay, as a concept, emanated from this Committee recommendation. However, an underlying principle of this concept was that proficiency pay must be directly related to the demonstrated level of proficiency and must be contingent upon periodic checks to ensure maintenance of that proficiency. The Army enlisted evaluation system was developed to meet this requirement.

ARMY ENLISTED EVALUATION SYSTEM

The enlisted evaluation system consists of two major components: (a) evaluation of the enlisted man's knowledge of the various duties that are required at his skill level in his MOS, as indicated by MOS evaluation tests and performance tests; and (b) evaluation of performance in the currently assigned duty position, as indicated by supervisory ratings on the enlisted evaluation report (see Figure 1). A rating system is applied to the scores obtained on these instruments, and it is used to compute a composite score for taking individual personnel actions. This MOS evaluation score indicates the individual's relative standing among those evaluated in the same MOS and skill level and in the same pay grade. It is used to verify MOS qualification, to assist in determining promotion eligibility, to award proficiency pay, to guide remedial training, and in a variety of other personnel actions.

PROFICIENCY TESTING "AREA SCORES"

The characteristics of the MOS proficiency testing program will not be detailed herein, but one particular aspect of the MOS proficiency test program directly relevant to this paper will be considered--the MOS "major area" scores. Each MOS evaluation test is organized into four to ten major areas; that is, four to ten subscores. The six major areas for an Infantry senior sergeant, for example, are weapons, tactics, field activities, unit defense, administration, and personnel accounting. Study references from Army regulations, pamphlets, field and technical manuals, and other manuals are coded to each of the major areas in an accompanying test aid so that each soldier can locate the printed materials upon which the test is based. He may study these reference materials to improve his knowledge and performance.

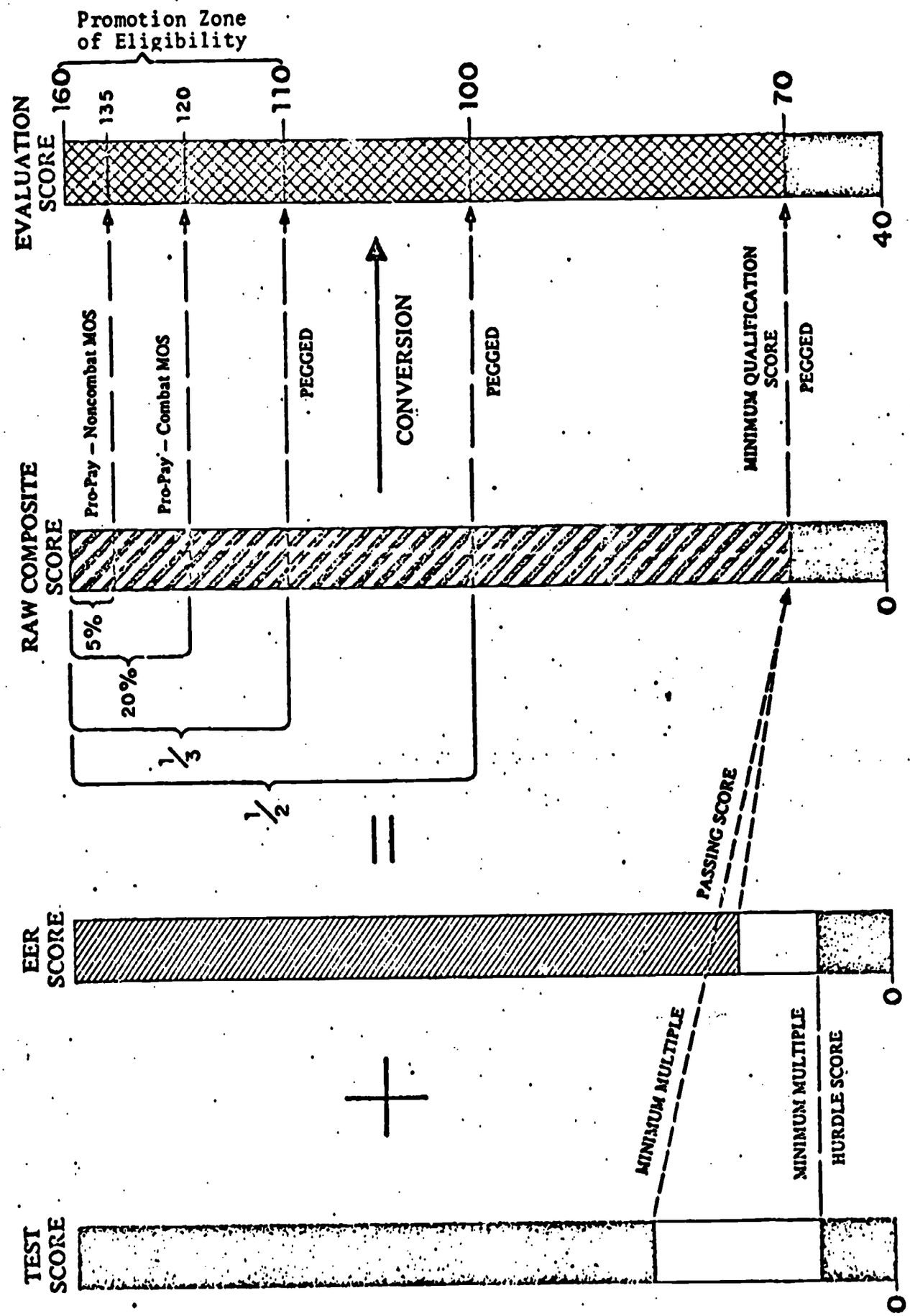

Figure 1. MOS Evaluation Score.[a]

[a] From U.S. Army Enlisted Evaluation Center, Briefing Supplement; Indiana, USAEEC, 1971.

The major areas are weighted according to the relative importance of the functions in the missions of all units that are authorized duty positions in the MOS skill level, and not on the basis of the time required to teach the subject matter in formal classroom courses nor on the basis of the number of personnel assigned or authorized for specific duty positions. The number of questions allocated to an area out of the total number of items in an MOS proficiency test indicates the weight assigned to that area. Subscores for these major areas are useful not only to the soldiers tested, who can use the information to improve their performance, but also to various headquarters, to centralized management programs, and to commanders for managing assignments and training programs.

DIFFERENT APPROACHES TO DUTY AREAS

Unfortunately, there is no consistent theoretical basis or consistent approach to the definition of these area scores by test developers, training personnel, or requirement planners (see Table 1). Some of the areas for which the Enlisted Evaluation Center has developed scores can be classified as duty areas. These area scores roughly correspond to subject matter areas within an MOS. They are used to provide information as regards an enlisted man's strengths and weaknesses in selected subject areas, and they are associated with specific subject matter references.

Table 1. Different Approaches to Duty Areas

Approach	Duty Areas
MOS proficiency tests	Selected by test developers
Army training schools	Identified by systems engineering of training
Requirement planners	Associated with additional skill identifiers

If subject matter references happen to be organized in terms of duty areas, it is easier to find the appropriate references that need to be studied; however, it is not essential. A sample list of major areas in an MOS is given:

1 Weapons
2 Tactics
3 Field Activities
4 Unit Defense
5 Administration
6 Personnel Accounting

The study guides list the regulations and technical manuals for the various areas, and no great amount of effort is needed to find the references

that correspond to the area in which a low score was received in the proficiency evaluation test (see Table 2).

Table 2. Sample Study Guide

References	Major Area
Army Regulations	
65-75	5
210-10	6
DA Pamphlets	
600-8	6
672-2	3
Field Manuals	
5-15	4
7-10	2

It should be made clear that we are heartily in favor of using area scores for proficiency tests. This was an important development in the design of MOS proficiency tests. Such feedback systems are an integral part of any sophisticated testing program. What, then, would be questioned in the design of these area scores as they are used by the proficiency testing system? The point raised is not so much how the proficiency testing subsystem works, but the manner in which these area scores interface with other personnel subsystems in the Army.

The Army training schools, for example, identify major duty areas at great expense and with great difficulty, as part of their systems engineering of training process (see Figure 2). Systems engineering of training is a long, drawn-out procedure, involving detailed job analyses and the application of systems engineering principles and approaches in order to break a job into components and then select components for training. The job is also organized into "areas" when a Program of Instruction (POI) is prepared. There is no consistent relationship between these POI area scores designed by the training people and the area scores as used by the proficiency training people.

Requirement planners are also interested in a different kind of duty area. For example, the Army has additional skill identifiers (ASI) that are authorized for functional skills, which are not consistently required of all the job incumbents in an MOS. An example of such an additional skill identifier is the ability to maintain a specific type of system (e.g., maintenance on the Hawk Guided Missile Simulator, or the ability to work with specially trained scout dogs). These different approaches to duty areas are not necessarily incompatible with each other, but they are all different. When you have three different parts of the same organization--and the Army is one organization--using three completely different

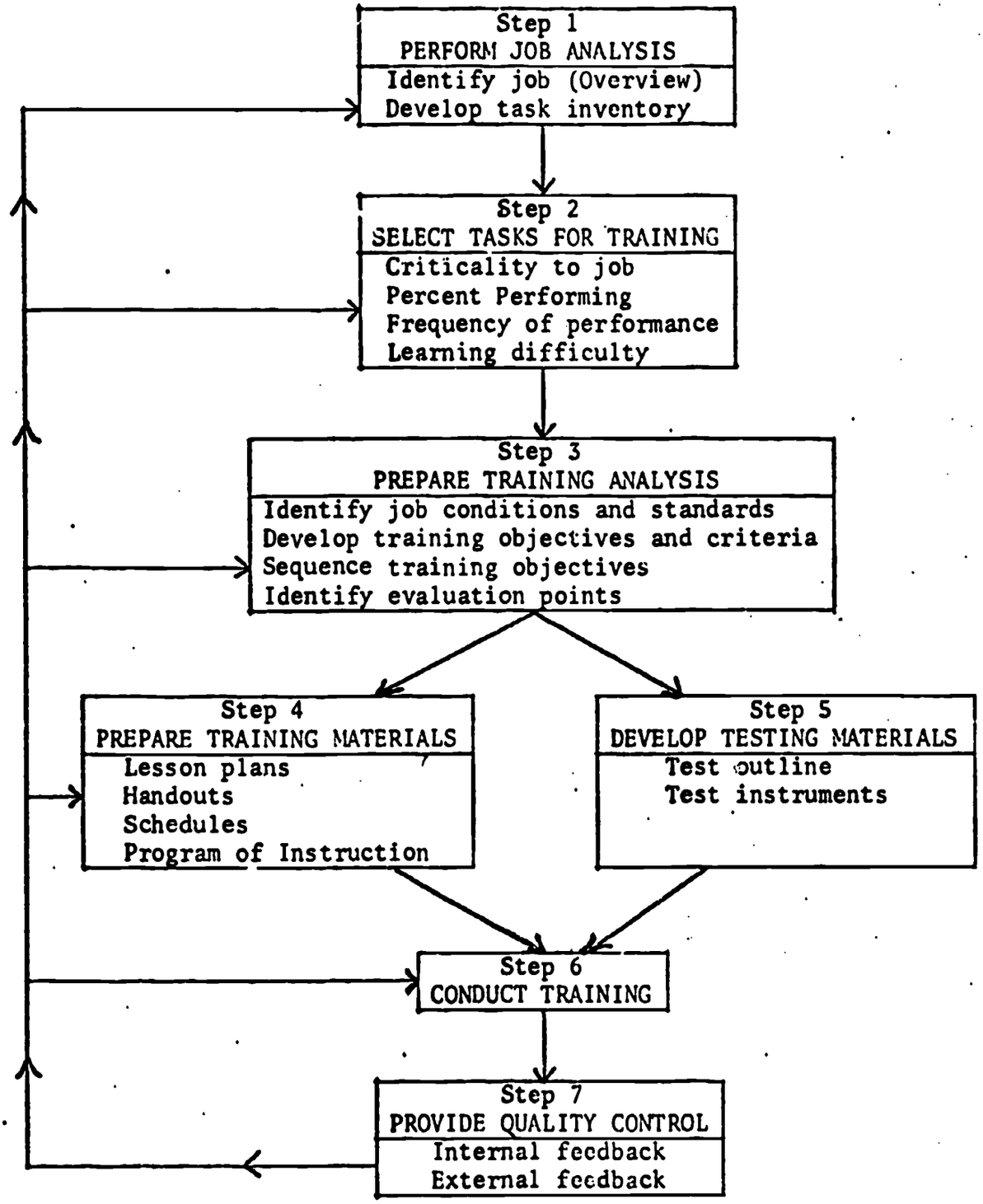

Figure 2. Simplified Flow Process of Systems Engineering of Training.[a]

[a]From Southeastern Signal School Briefing Supplement. Systems engineering of training at USASESS. Undated.

language systems to describe the same kind of work, it is likely that there will be some unnecessary duplication of effort. This could be avoided if a common language could be designed for all three parts of the organization (e.g., the Army) to use.

THE DUTY MODULE

A duty module is a group of occupationally interrelated tasks smaller than an occupational specialty. It is modular in the sense that it can be used as a plug-in unit to a variety of different occupational specialties. Table 3 defines the module group, number, and title. Table 4 shows an MOS duty module matrix for Army military occupational specialties. As one can see, a relatively small number of duty modules can account for seven different MOS. Notice that each of these military occupational specialties has demonstrable similarity with other MOS.

Table 3. Module Group, Number, and Title

A ADMINISTRATION

- A-1 Performs general administration at unit level
- A-2 Performs unit supervision and control of personnel
- A-3 Establishes and operates a unit mail room
- A-4 Types, files, and performs general clerical operations

B TRAINING

- B-1 Conducts or participates in unit and individual training

C COMMUNICATIONS

- C-1 Operates unit tactical communications equipment (excluding use of Morse code)
- C-2 Installs and maintains unit tactical wire communication systems

D TRANSPORTATION

- D-1 Operates unit combat support vehicles

(continued)

Table 3 (continued)

E TACTICAL OPERATIONS

- E-1 Prepares and employs maps, charts, and instruments in land navigation
- E-2 Engages enemy with tank and Armor vehicle mounted assault weapons
- E-3 Drives tanks and associated Armor combat vehicles
- E-4 Emplaces, reports, and neutralizes tactical obstacles
- E-5 Performs in mounted, dismounted, airborne or long-range patrols
- E-6 Engages enemy with mortars
- E-7 Participates in ground tactical operations as member of a maneuver unit
- E-9 Engages enemy in close combat with individual weapons and machine guns
- E-10 Engages enemy with recoilless rifles and direct fire missiles
- E-11 Functions under CBR warfare conditions

F STAFF MANAGEMENT

- F-1 Performs tactical operations support duties
- F-2 Performs tactical intelligence support duties

G MAINTENANCE

- G-1 Performs user maintenance on individual and unit equipment and weapons (excluding motor vehicles)
- G-2 Performs organizational maintenance on track and wheel vehicle mechanical systems
- G-3 Performs organizational maintenance on track and wheel vehicle electrical systems
- G-4 Performs maintenance administration

H FOOD SERVICE

- H-1 Establishes and operates a field mess
- H-2 Prepares and serves meals
- H-3 Operates a mess facility

I SUPPLY

- I-1 Establishes and operates a unit supply point

J PERSONNEL

- J-1 Initiates, posts, files, and retrieves information from personnel records
- J-2 Manages individual enlisted personnel and carries out manpower and personnel management programs
- J-3 Processes personal affairs actions for individuals

Table 4. MOS — Duty Module Matrix

Duty Modules[a]	Military Occupational Specialties						
	11B	11C	11D	11E	11F	11G	11H
A-1			x				
A-2	x	x	x	x		x	x
A-3	x		x	x			
B-1	x	x	x	x	x		x
C-1	x	x	x	x	x		x
D-1	x	x	x	x			
E-1	x	x	x	x	x	x	x
E-2				x			
E-3			x	x			
E-4	x		x	x			x
E-5	x	x	x	x		x	x
E-6		x					
E-7	x	x	x	x	x	x	x
E-9	x					x	
E-10							x
F-1			x	x	x		
F-2			x		x		

[a]See Table 3 for definitions of duty modules.

It is also possible to use duty modules to express personnel requirements. The list of work activities in Table 5 has not been formally approved, but it illustrates the type of approach that can be used. Given a data processing group, there is a need to supervise, to plan the analysis of the reporting, to keypunch, and so on. The number of full-time duty positions needed in the organization is ten. You can also specify the requirements in terms of the number of people qualified to perform each work activity. If you have a computer activity with a lot of night shift work, you are going to need at least three people who can supervise.

Table 5. Work Activity Requirements

Work Activity	Minimum Number of People Needed with This Skill	Number (or Proportion) of Full-Time Duty Positions
Supervision	5	1.00
Planning of analysis and reporting	3	.25
Receipt and verification of input data	3	1.00
COBOL programming	2	2.00
Keypunching	8	1.50
Computer operation, including peripherals	5	3.00
Interpretation of output	2	1.00
Preparation of reports	2	.25
Total Number of Work Activity Requirements	30	
Minimum Number of People Required		10.00

You may want one or two people for backup, in case of illness or vacations. Even though there may only be three duty positions involving supervision, you may want five people to be qualified as shift supervisors. Similarly, in planning the analysis and the reporting, you may want three qualified persons, but it is only a quarter-time job. In other words, defining work activities in terms of duty modules can provide a more efficient use of personnel with all functions covered, using a minimum number of personnel.

TESTS OF EFFECTIVENESS OF DUTY MODULES

Resource and requirement planning experts must first agree upon the qualification requirements. Secondly, compatibility with work practices in the field is involved. For this, we can rely upon actual survey data regarding the way in which tasks are assigned in the field. A third test is to evaluate the usefulness of the module in planning and evaluating the requirements for and performance of organizational units.

TEST 1

A first test is to ask experts to design job content modules. Typical job content modules are:

(1) Operates unit tactical communications equipment, excluding Morse code.

(2) Installs and maintains unit tactical wire communication system.

In this case, the people who are asked to operate unit tactical communications equipment are usually different from those who install and maintain it. Neither of these work activities, however, is a full-time position for anyone. These are modular things that can be assigned to different people.

TEST 2

A second test of duty modules is compatibility with assignment practices in the field. Some data have already been analyzed (see Figure 3). Data were used that were already in existence, and that had been collected with task inventories that were administered by the Army Office of Personnel Operations. The data base is called the Military Occupations Data Bank, or MODB. The original task statements in MODB are organized in terms of functional areas of performance (see the administration and training columns on the right side of Figure 3). The rows correspond to task clusters that were identified in an empirical clustering of tasks.

Number of Tasks in Cluster	Duty Modules: Admin. A 1	2	3	4	Trng. B 1	2	Co- 1	Admin. A	Training B	Co--- C
6	50	33						100		
9	44		33			22		77	22	
9	33			55				100		
4		50						100		
6						50			100	
13		45				15		85	15	
10					60	20		10	90	

Figure 3. Test 2, Compatibility with Assignment Practices in the Field (in Percent).

The Comprehensive Occupational Data Analysis Programs (CODAP) system, developed by the Air Force, was used. This system was developed by Ray Christal, Joe Ward, Bill Lecznar, and others at the Air Force Personnel Laboratory. People were not clustered together on the basis of their similarity in terms of task performance, which is the way this program is usually used for clustering purposes. Instead, tasks were clustered together on the basis of the probability that the tasks would be assigned to the same people. On the left side of Figure 3, clustering is compared with some duty modules that were analyzed in terms of this particular CODAP run (see Table 3 for definitions of duty modules). The computer run suggested that there were seven task clusters in this particular group of tasks. The percentages shown in the duty module columns on the left side of Figure 3 indicate the percent of tasks in each of the empirically identified clusters that fall into duty module categories A-1 through B-2. The percentages shown on the right-hand side of the figure indicate the percent of tasks in the empirically identified clusters that fall into each of the administrative areas used to group tasks in the Military Occupations Data Bank.

It is important to note that the design of the duty modules is not complete, nor is the preparation of the task statements. These task statements will be revised to reflect the computer output. In due course, the definition of our duty modules will correspond with the assignment practices that actually exist in the field for any given specialty. Thus, the clusters will correspond more closely with the duty modules.

It does not necessarily follow that there will be complete agreement with the computer runs. For example, it is possible that the first three empirical task clusters would be considered as really one cluster rather than three. Before that conclusion can be made, many other occupational specialties, in addition to the one that these data are based upon, will have to be reviewed. Essentially, duty modules are derived from many different occupational specialties rather than just one, which is the case with this particular computer run. The decision as to whether these first three clusters are one cluster or two or three clusters must be based upon data in other occupational specialties as well.

TEST 3

A third test of duty modules is the relationship to unit performance in the field. Task checklist items have been devised based upon our duty modules. Each duty module consists of a collection of task statements. We were thus able to study Army Training Tests (ATTs) and convert task statements into checklist items. This provides the means by which information can be collected about the performance of individuals during unit training tests. Separate scores are obtained for separate practice maneuvers. Separate scores can be obtained for movement, defense, and attack, as noted in Figure 4. Each exercise will have a scenario, the possibility of casualties, and so forth. Duty modules will be looked at during the appropriate phase of the Army Training Tests. They would not be tested during every single phase.

Module	Task Checklist Item	Unit Test Phase: Movement	Defense	Attack
C-1	Establish and operate field communications relay station		x	
G-1	Make entries in equipment log books	x	x	

Figure 4. Step 3, Relationship to Unit Performance.

SUMMARY

These individual duty modules are designed to be derived from a variety of specialties rather than just one. They are economical in the sense that many different task inventories can be designed with a small set of duty modules. They utilize task inventory data already collected on assignment and work assignment practices in the field. They are designed to improve communications between resource planners and requirement planners. They meet an apparent need for consistency at a level of generality between the MOS and the task, at an optimum level of detail, and they permit more precise matching of personnel to job requirements.

PERFORMANCE STANDARDS AND SKILL LEVELS

It is not possible to talk about testing in terms of duty modules without first talking about testing standards. Performance standards in the Army are prepared systematically as part of the systems engineering of training process for the design of Army school courses. At one point in systems engineering, task and skill analysis sheets are prepared. These result in evaluation plans. It is a standard practice to indicate specific performance standards for training purposes for each terminal or facilitating objective on these evaluation plans (see Figure 5).

The evaluation plans only cover those areas of interest to the school, however. They usually do not cover all the tasks in an MOS, especially for the more advanced tasks, which the personnel are supposed to learn on the job. The Enlisted Evaluation Center, therefore, has to supplement this school-oriented information with other sources. Usually, they use the judgments of knowledgeable NCOs who have experience in the particular MOS, and who formulate proposals regarding what tasks are appropriately included in an MOS proficiency test.

1. Criteria for the Training Objective developed for the task:

Action	Troubleshoot AN/TRC-24. (A-22-1)
Condition	In addition to Standard Training Conditions, the student is given an AN/TRC-24 with one major component containing a DS part defect as well as OS-8, ME-30/U, TM 11-5820-287-12, TM 11-5820-287-34, and AN/TRC-24 Block Diagram.
Standard	The student is qualified if, when given two defective AN/TRC-24s with a 2-hour time limit on each, he can isolate one of the defective parts.

Figure 5. Evaluation Planning Information Sheet.

The proficiency testing system in the Army, as it is presently organized, provides separate tests for each skill level within each MOS. Occasionally, one test may be used in two or three skill levels with different score requirements, but the principle is the same. One reason for providing separate tests for different skill levels is that an MOS is a broad collection of duty areas that cover many different duty positions. Providing separate tests for each skill level makes it possible to provide items that are more appropriate for the positions being filled by those who take the tests.

This skill level approach, which is not incompatible with the duty module concept that we have described, is appropriately used in connection with duty modules, and, further, it illustrates how useful duty modules can be to those who design tests. Table 6 lists the tasks for a duty module of patrolling, either mounted or dismounted. One's skill level is dependent upon whether one supervises a task, does the task and also supervises it, simply does the task, or whether one just assists in in doing it. The three skill levels in the 11B MOS (Light Weapons Infantryman) are indicated. The skill levels are numbered 1, 2, and 4. There are only three skill levels in this particular MOS, so there is no skill level numbered 3. Table 6 indicates that people who are at skill level 4 are more likely to supervise. People who are at skill level 2 do not supervise, and are much more likely to assist somebody. People who are at skill level 1 carry out the orders and requirements of their superiors. This kind of information about skill level profiles could be extremely useful to Army organizations in designing proficiency tests.

Table 6. Duty Module E-5: Patrols, Either Mounted or Dismounted

Tasks	Performance Expectations for Skill Levels 1, 2 and 4 of 11B MOS[a]			
	Super-vise	Do and Supervise	Do	Assist
(1) Plan patrol operations			4	2
(2) Assemble, inspect, issue patrol order, and lead patrol			4	2
(3) Operate listening or observation post	4		1	
(4) Serve in combat patrols		4	2, 1	
(5) Serve in reconnaissance patrols		4	2, 1	
(6) Serve in ambush patrols		4	2, 1	
(7) Mark route or serve as guide for unit[b]			2, 1	
(8) Participate in air search operations or air delivered patrol		4	2, 1	
(9) Estimate charge, emplace and fire demolitions		4	2, 1	

[a]There are only three skill levels in the 11B MOS: 1, 2 and 4.

[b]Task No. 7 (when performed by an 11B MOS) is normally supervised by someone in another MOS.

COST ADVANTAGES OF A MODULAR APPROACH

Previously mentioned were the ways in which the Army military occupational specialties were modular. Refer to Table 4 and note that with this matrix one can account for many different tasks with a relatively small number of duty modules. Moreover, this matrix is just the corner of a much bigger matrix. In our present work with enlisted duty modules, we have developed 31 duty modules that can account completely for 16 different MOS.

To appreciate the possible savings is to translate this information on duty modules and MOS into test items. Say that these 16 MOS would require 100 items apiece to account for them if they were developed independently by various test-developing agencies. That would make 1,600 test items, if you used an independent approach to test development. We estimate that it takes only 10 items apiece to describe a duty module. In other words, it is possible that 310 items can do essentially the same job as 1,600 test items. To be able to prepare 310 items rather than 1,600 items reflects a considerable savings. It is contingent upon defining modules that cut across, and have the same meaning in, different occupational specialties. In giving these figures, we have not discussed skill levels; but different tests for different skill levels would be required in both systems. Thus, multiply the number of items in our example by three or four to get the number of test items that would actually be needed by the people who design these tests and work with them.

MODULAR ARMY TRAINING TESTS (ATTS)

At the present time, the Army has several hundred Army Training Tests (ATTs) for use in evaluating the performance of organizational units. Each of these tests has a scenario and provisions for referees who are trained to follow people and take notes as regards their performance in the unit test. The question to be posed here is this: Would it be desirable for Army Training Tests for organizational units to be organized in the same modular fashion that we have proposed for individual proficiency tests?

PURPOSE OF ORGANIZATIONAL UNITS

Before further discussion of the feasibility of modular ATTs, the accuracy and consistency with which the intended purposes of organizational units have been specified must be considered. The Army has several different terms for describing the intended purposes of organizational units: a primary mission, some functions, and a capability.

A primary mission is defined as the principal purpose that an organization is designed to accomplish. The functions are the appropriate or assigned duties, responsibilities, missions, or tasks of an individual office or organization. A capability is the ability to execute a specified course of action. Further details will not be discussed except to state that after studying the various mission, functional, and capability statements in Army documents, it was concluded that the capability statement was the one that should be used as the basis for structuring organizational unit testing modules.

THE CAPABILITY STATEMENT

A possible capability statement for a theoretical unit is shown in Table 7. It is clearly possible to analyze a capability in terms of specific component functions and operational criteria, as shown in the table.

Table 7. Theoretical Capability of a Unit

1. Title:

   Transport supplies and resupply itself.

2. Essential Component Functions:

   a. Load, move, and unload unit loads of rations, POL, ammo, and repair parts.
   b. Repair minor vehicular failures enroute.
   c. If unable to make minor vehicular repairs, tow inoperable vehicles.
   d. Move unit loads on the road or cross-country.
   e. Pick up and issue supplies.

3. Minimum Operational Criteria:

   a. Sufficient vehicles on hand in condition to move unit load.
   b. Sufficient vehicles on hand in condition to pick up and deliver supplies.
   c. Trained drivers.
   d. Authorized maps and compasses on hand.
   e. Supply platoon trained as a team.
   f. Trained supply personnel.
   g. Trained vehicular and radio mechanics.
   h. Satisfactory status of equipment maintenance.
   i. Satisfactory completion of ATT and FTX.

4. Standards (To be developed):

   Includes minimum personnel, skills, operable equipment, and training necessary to be considered C-1, C-2, or C-3 as defined in AR 220-1. Standards below C-3 are C-4.

The capability of the unit is to transport supplies and to resupply itself. What is involved in this capability are the functions of loading, repairing vehicles, picking up initial supplies, and so forth. The minimum operational criteria are also indicated. A Department of the Army

study of output measurement conducted in 1968[4] shows the same conclusion that we express--that capabilities are a good way to structure and organize ATTs.

CRITERIA FOR MODULAR ATT EVALUATION DEVICES

We have formulated a number of criteria for an improved system of evaluating performance in Army Training Tests. Details are beyond the scope of this presentation, but the criteria and related recommendations are given.

- A series of clear, quantitative statements specifying the capabilities of a unit.
- A taxonomy of unit capability statements. If possible, these statements should be modular.
- Criteria of unit effectiveness based upon and relatable to the taxonomy of unit capabilities, and consistent with and relatable to criteria for the performance of individuals in the unit.
- Both kinds of criteria (individual and unit) based upon performance standards rather than relative standing in test performance.
- Varied performance standards depending upon situational conditions, such as terrain, percent casualties, and resource inputs.
- Aggregation of standards for organizational components and generation of an overall index for the unit as a whole.
- The emphasis in criteria statements upon end results rather than methods used to achieve the results.
- Output measures allowing for the possibility in evaluations of corrective measures that may have been taken by command personnel, and that would permit the unit to meet standards in spite of some departure from expected procedures.
- Scoring that provides specific information about the leadership of a unit.

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[4] Department of the Army. Improvement of Output Measurement, Report of a Special Study by the Army Staff Coordinated by the Comptroller of the Army, January 1968.

- Scoring that provides comprehensive evaluations of the unit when tested as an entire unit.

- Quantitative weights assigned for satisfactory performance and deducted for inadequate performance that reflect the probable seriousness of the actions.

- A method for relating output measures to input measures logically.

SUMMARY

A series of clear, quantitative statements are needed to specify the capabilities of a unit. There is also a need for a taxonomy of unit capability statements. A taxonomy is a theoretically-based language that implicitly classifies or categorizes a capability statement at the same time that it describes it.

Capabilities should also be modular in nature; that is, the capability statement for an Infantry battalion should be the same, if possible, as a highly similar, closely related capability statement for an Armored Cavalry squadron. If you can design the capability statements thusly, and organize the testing accordingly, it is possible to design one modular unit training test component that would be useful for Infantry battalions and for Armored Cavalry squadrons. Examples of possible modules are night ground attack, retrograde movement, and stationary defense. Since many different capabilities of different kinds of battalions are common, having similar tests provide many economic features.

CURRENT WORK ON MODULAR ATTS

Having proposed the design of modular Army Training Tests, we proceeded to design some. Some field survey work was conducted in conjunction with Army Training Tests at Fort Lewis, Washington, in August 1973, to pre-test the first versions of these modular evaluation devices. These devices and data have not been analyzed or evaluated as yet, thus our comments are based upon what was learned during the design stages.

PERSONNEL CAPABILITIES

In designing these evaluation devices, two things quickly became apparent: (a) devices could not be designed for units based upon enlisted duty modules alone; and (b) there was a need for officer duty modules. The Army also needed information about officer jobs and had contracted for job analyses of about 200 officer jobs. These job analyses were used as the basis for designing initial duty modules for officer

jobs. Table 8 defines officer duty modules by area and module number. Table 9 accounts for all the major duties of an officer's job with just a few duty modules. Each of the positions shown is completely accounted for by the officer duty modules listed. (The letter refers to the "areas" from which the module was taken in Table 8, and the number identifies a specific module within that area.)

Table 8. Officer Duty Modules by Area

Area	Title	Number of Modules
A	Command Management, General Management and Administration	9
B	Personnel	4
C	Intelligence	5
D	Operations and Plans (Staff)	4
E	Organization, Training	3
F	Logistics (Staff and Consumer Units)	9
G	Communications and Electronics	2
H	Civil-Military Affairs	3
I	Comptrollership, Budget and Fiscal	2
J	Army Aviation	5
K	Research, Development, Test and Evaluation	2
L	Operations Research and Systems Analysis	1
M	ADP Management and Programming	1
N	Education, Instruction	2
O	Information Activities	1
U	Tactical Direction of Combat Units	5
W	Miscellaneous	9
X	Individual Functions and Special Qualifiers	4
FF	Logistical Services	9
HH	Supply and Maintenance Support Operations	9

Table 9. Application of Duty Modules to Officer Positions

Position	Duty Modules
Cdr., Infantry Rifle Co. CPT	A-1, A-3, A-4, A-6, A-8, E-1, F-1, X-1, X-2
Cdr., Reception Station Co. LT	A-1, A-3, A-5, F-1
Asst. Army Attache LTC	A-1, A-4, C-4

EQUIPMENT CAPABILITIES

In addition to information on the personnel capabilities of a unit, there was a need for detailed information about the capabilities of equipment. The need to think about equipment capabilities became apparent when preparing a unit capability table, which described different types of capability for each component in a platoon (Table 10).

Table 10. Equipment Capability Table for Armored Cavalry Platoon (TOE 17-107H)

Item of Equipment	Basis of Issue	Capability	Reference
1. Antenna (AT-784/PRC)	2-Scout Section 1-Rifle Squad	Determine the direction to a specific radio transmitting in the frequency range 30.0 to 75.95 MHz.	ST-24-18-1
2. Armored Reconnaissance Airborne Assault Vehicle (M 551)	3-Light Armor Section	Negotiate almost any terrain at speeds from 4 miles per hour in water to 43 mph on roads, including 7-foot spans, 33-inch vertical obstacles and 60% grades.	ST-17-1-1; ST-17-15-1; FM-17-36

It was not possible to describe the fire-power capabilities of a squad that was equipped with a certain type of machine gun, for example, without knowing what type of machine gun it was. One machine gun might be capable of a sustained firing of 40 rounds per minute, while another might fire 100 rounds per minute. The range of the first machine gun might be 6,000 meters, while the range of the second, faster machine gun might be 3,000 meters. Clearly, any quantitative statement of the capabilities of that squad, and hence the capabilities of the whole platoon, is greatly affected by which of the two machine guns is being used. Similar constraints upon unit capability statements are imposed by the kind of transportation that is available. One vehicle, for example, is capable of a road speed of 40 miles per hour, a water speed of 3 miles per hour, and has a range of 300 miles, a cargo space of 23 cubic feet, and can carry a cargo payload of 3,000 pounds, including the driver. When carrying troops, this vehicle is limited to the vehicle driver, the commander, and eleven passengers. This type of information has obvious implications as regards the capabilities of a unit.

PRELIMINARY WORK ON EVALUATION DEVICES FOR ATTS

As stated earlier, one of the requirements for the individual enlisted modules is that they be meaningful in terms of unit evaluation procedures as well as individual evaluation procedures. Consequently, we designed Army Training Tests that were not solely modular in the sense that they could be useful in evaluating different kinds of Army units. They were also composed of scoring evaluation procedures for individuals, based upon performance in duty module terms.

APPROACH TO THE PROBLEM

The first approach was to develop examples of criterion behavior for a particular duty module, but it did not seem to be workable because too much territory was covered with one global rating.

A new approach was developed. Since each duty module is defined by approximately ten task statements, we decided to design our evaluation devices in terms of checklist items based upon these task statements (Figure 6). The method of grouping the items was retained so that the devices were still organized in terms of duty modules. The overall performance of the unit could not be scored exclusively in terms of individual performance, however. Some unit performance indices were developed. An example of overall unit performance rating procedures is shown in Figure 7.

		ATT Phases					
Module Number	Checklist Item	Movement to and Occupation of Forward Assembly Area	Reconnaissance	Covering Force	Route and Area Security	Flank Guard and Economy of Force	Overall Rating
A-2	1. Replacements properly received and assigned 2. Losses and casualties properly processed 3. Leadership of platoon and squad NCOs 4. Duties of subordinates properly allocated						

Figure 6. An Approach to Unit Evaluation Devices Based upon Task Statements.

Activity Rated: Rifle Platoon	Score	Comments
Phase 1--Daylight Attack		
Proper actions and preparations in assembly area?		
Proper organization, formation, and dispersal?		
Platoon's use of cover and concealment?		
Firing on objective--good volume, well directed? (Scored only for live firing)		

Figure 7. Evaluation in Terms of Unit Performance As a Whole.

RECOMMENDED APPROACHES AND PLANS

APPROACH

Our modular approach is summarized in the following description. Tests have usually been designed by taking a particular criterion situation and designing a test for that one situation irrespective of how it is structured for that particular case at that particular point in time. If, for example, a proficiency knowledge test is being designed for somebody who repairs automobiles, you determine exactly which tasks people in that MOS are supposed to perform, then you design the individual proficiency tests to measure knowledge of those specific tasks.

The same is true of unit training tests. You look at the capability statements, study the terrain in which the test is to be conducted, and then you design some tests for that particular type of unit in that particular situation. If you are dealing with an Infantry unit, you design an Infantry test; if you are dealing with an Armored Cavalry unit, you design an Armored Cavalry test. There is relatively little overlap or systematic utilization of materials prepared by other people for different kinds of units.

What we are proposing for individual testing is that personnel experts in the various services spend a lot more time dealing with a variety of occupational specialties rather than focusing upon one specialty at a time. If possible, they should change the way in which occupational specialties are defined, and define different occupational specialties in terms of a common set of duty modules.

What we are proposing for organizational units is that evaluation devices be designed so that different kinds of organizational units can be evaluated with the same kind of modular evaluation devices. The modular approach, in both cases, facilitates feedback regarding performance and makes the feedback to the individual or unit being tested much more meaningful. Both strong points and weak points are much better defined.

It is possible to argue that feedback about test performance should not be too specific. The Air Force, for example, does not provide information about area scores in its Skill and Knowledge Tests (SKTs), which are its equivalent of the Army's proficiency test. The reason given is that people would study for the test rather than study for the job (i.e., the Air Force would seem to be worried about the unintended consequences of providing information in terms of proficiency testing area scores). Available data suggest that area scores have been successful in the Army, however, and the unintended consequences simply have not occurred.

It is our opinion that, regardless of whether you provide feedback in terms of the modular scores that we have described, or whether you provide feedback in terms of areas defined by a committee of NCOs or unit commanders, area scores are useful feedback and should be used.

Our proposal that the Army develop modular unit tests becomes somewhat complicated because the Army has already embarked upon a large-scale program to overhaul all of its unit training tests. The Army recently designed a systems engineering of unit training programs that is patterned after its systems engineering of training procedures for individual training. Several organizations are currently working on the redesign of unit training programs in terms of the Army's systems engineering of unit training programs. Thus, a number of new evaluation devices will definitely be designed. We have discussed our approaches to modular unit training tests with those who are responsible for this type of work, and we hope that they will consider a modular approach to ATTs as an alternative when the tests are revised.

USES OF DUTY MODULES

We have stressed the economy of duty modules in terms of test preparation costs and the importance of consistency in language. Other possible advantages are given.

(1) Duty modules can improve occupational research, its description, and utilization.

(2) They have the potential to reduce training time and lower training costs.

(3) They can provide a better use of individuals in assignment substitutions.

(4) They can simplify automated assignment and control procedures.

(5) They can improve proficiency evaluation.

(6) They can improve career guidance and planning.

(7) They can improve utilization of personnel at a local level.

(8) They can improve unit training evaluations.

PRESENT IMPLEMENTATION OF PROCEDURES

It will take many years before the kind of modular system that we propose can be established. If everyone agreed that it should be done tomorrow, it would still take several years before such a system could become operational. Nevertheless, we think that the advantages of a modular approach to test construction are so great that people should start thinking about it now. The problem arises because test developers

cannot proceed by themselves. The whole occupational structure needs to be revised so that occupational specialties would be defined in terms of duty modules.

Nevertheless, there are several procedures that could be started now. For example, change the way in which test design work groups are established. Instead of assigning test development to a group of experts in the same specialty, create a work group comprising representatives from several specialties, and ask that group to design a single test component that would be useful to them all. A similar approach (i.e., assigning groups of experts from different types of units) can be used with those who design unit evaluation devices. These preliminary steps, taken now, would have many immediate advantages, and would greatly facilitate a conversion to modular testing in the future.

FUTURE PLANS

Our current work on the design of modular personnel systems is moving in the direction of skills inventories, improved assignment systems, and the design of career-progression patterns. Special interest is in career-progression patterns that have some kind of optimum discrepancy between present duty module qualifications and the duty module qualifications needed for the next assignment.

Several other modular personnel systems are also in the planning stage, because the flexibility provided by a modular system makes many things possible that were previously out of the question. This widening of possibilities becomes exciting, and the work is fun--we look forward to its many challenges.