



Technical Report 919

The Development of Content-Valid Performance Measures for 76C Course and Field Assessment

Stephen M. Cormier, J. Douglas Dressel,
and Angelo Mirabella
U.S. Army Research Institute

January 1991

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19. ABSTRACT (Continue on reverse if necessary and identify by block number) This report summarizes research on test development conducted as part of the Training Technology Transfer Program at Fort Lee. We developed a prototype, content-valid test battery for 76C (equipment records and parts specialist) prescribed load list (PLL) clerk personnel to evaluate the impact of new training methods and material for 76C MOS. The existing testing system in 76C MOS was found to be limited in several respects. For example, it did not ensure that actual job tasks were accurately sampled and represented on end-of-annex examinations. To overcome the limitations of the testing system, we compiled a model to produce a test battery for 76C MOS that includes a sample of multiple-choice items and work-sample exercises from the tasks in the PLL duty position. To test the battery, we administered it at three U.S. Army Forces Command (FORSCOM) sites. We also collected ancillary data (supervisor ratings and biographical information) to explore the usefulness of nontest data to evaluate soldier skills levels. We showed that the prototype battery is reliable but could be improved substantially by increasing the length of the multiple-choice portion. (Continued)			
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We also showed that the battery could be administered routinely without heavy resource demands and therefore could be used to assess the impact of new training methods. Neither ratings nor biographical information, e.g., job experience, correlated with test scores. The supervisor results highlight an organizational problem--76Cs are supervised by noncommissioned officers (NCOs) who may not be in a position to accurately evaluate 76C performance. Finally, the biographical data indicate that job experience is not necessarily a good indicator of skill.

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**The Development of Content-Valid Performance
Measures for 76C Course and Field Assessment**

Stephen M. Cormier, J. Douglas Dressel, and Angelo Mirabella
U.S. Army Research Institute

Automated Instructional Systems Technical Area
Robert J. Seidel, Chief

Training Research Laboratory
Jack H. Hiller, Director

U.S. Army Research Institute for the Behavioral and Social Sciences
5001 Eisenhower Avenue, Alexandria, Virginia 22333-5600

Office, Deputy Chief of Staff for Personnel
Department of the Army

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FOREWORD

The U.S. Army Research Institute for the Behavioral and Social Sciences (ARI), working in cooperation with the U.S. Army Training and Doctrine Command (TRADOC) and with TRADOC's schools, conducts research to develop ways to achieve more cost-effective training for the Army. In 1987 ARI joined with the Quartermaster School (QMS) at Fort Lee to form a partnership dedicated to identifying and solving Enlisted Supply Department (ESD) training problems. The partnership was defined by a Letter of Agreement (LOA) entitled "Establishment of a Joint Training Technology Transfer Activity (TTTA)."

This report is one result of that partnership. The work was carried out by members of the Automated Instructional Systems Technical Area (formerly the Logistics Training Technologies Technical Area) of ARI's Training Research Laboratory to supply ESD with a method for producing job-relevant performance measures.

This and other products of the TTTA were briefed to LTG Leon E. Salomon, Commandant, Logistic Center and Fort Lee, and BG Paul J. Vanderploog, Commandant, Quartermaster School, in the fall of 1989. It will be used to assess the impact of new training developments at QMS. It will also provide a model for test development at other TRADOC schools.



EDGAR M. JOHNSON
Technical Director

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The research summarized in this report would not have been possible without the outstanding support and cooperation of people at the Quartermaster School and the personnel at the data collection sites (Forts Bragg, Lewis, and Riley). We especially appreciate the efforts of Dr. Darl McDaniels, Director of Training Developments Quartermaster School, for his assistance and support through all phases of this effort. In addition, we thank SFC Franklin, SFC Long, and Mr. Jerome Pepper of the Enlisted Supply Department for their contributions in developing and/or reviewing test materials.

THE DEVELOPMENT OF CONTENT-VALID PERFORMANCE MEASURES FOR THE 76C
COURSE AND FIELD ASSESSMENT

EXECUTIVE SUMMARY

Requirement:

To develop a job-relevant test battery to assess 76C [prescribed load list (PLL) clerk duty position] skill level in the Advanced Individual Training (AIT) course and in units. The battery should provide a standard to measure changes in performance resulting from new training procedures at the U.S. Army Quartermaster School (QMS).

Procedure:

We constructed a prototype performance-oriented test battery, using standardized procedures for content-valid test development. In doing so, we also produced a model for development of other content-valid tests.

The prototype battery includes a sample of multiple-choice items from the tasks in the PLL duty position of 76C, and work-sample tests from this duty position. We administered the battery at Forts Stewart, Riley, and Lewis to 142 76C soldiers. We also collected supervisor ratings and biographical information to explore the usefulness of nontest data to evaluate soldier job proficiency.

We analyzed test-item data and internal test consistency to assess quality of the battery. We also correlated supervisor ratings and biographical information with test scores. Finally, we compiled test battery scores at the three U.S. Army Forces Command (FORSCOM) sites to get baseline information on current PLL skill levels.

Findings:

The prototype battery is reliable but could be improved substantially by increasing the length of the multiple-choice portion. The battery can be used to assess the impact of new training methods without heavy administrative demands.

Neither supervisor ratings nor biographical information, e.g., job experience, correlated with test scores. The supervisor results highlight an organizational problem, i.e., 76Cs are supervised by noncommissioned officers (NCOs) who may not be in a position to accurately evaluate 76C performance. The biographical data indicate that amount of job experience is not necessarily a good indicator of skill.

Test score averages indicated that the 76C skill level is moderate (71% for the multiple choice; 76% for the in-basket). But a subtest of task prioritization showed poor performance (38%). The first result should not cause concern since it mostly reflects manual form filling performance of manual PLL operations being overtaken by computer-aided procedures. The second result reflects a higher order, nonmechanical skill, and may need further examination. Task prioritization is the kind of skill being addressed in another Training Technology Transfer Activity (TTTA) project--the Transition Module for 76C MOS.

Utilization of Findings:

The test battery can be used to assess the impact of changes in training in the 76C AIT course that have been introduced as part of the TTTA program. The guidance provided in this report for constructing content-valid tests should also be useful to test developers at QMS and other U.S. Army Training and Doctrine Command (TRADOC) schools.

THE DEVELOPMENT OF CONTENT-VALID PERFORMANCE MEASURES FOR 76C
COURSE AND FIELD ASSESSMENT

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THE DEVELOPMENT OF CONTENT-VALID PERFORMANCE MEASURES
FOR THE 76C COURSE AND FIELD ASSESSMENT

INTRODUCTION

I. Project Background

As part of the on-going Training Technology Transfer Activity at the Quartermaster School (QMS), Fort Lee, new training methods and technologies are being applied to the 76C Advanced Individual Training (AIT) course and to on-the-job training in the 76C Military Occupational Speciality (MOS). In this situation, the accurate assessment of the impact of these course modifications on trainee performance in the school and on the job is essential. Thus, performance measures must be developed that can provide a valid index of trainee skills in order to measure the effects of such course changes.

The development of performance measures for the 76C AIT should be conducted with several objectives in mind. First, the performance measures must contain an accurate and representative sample of tasks performed on the job. Second, they should reliably measure the trainee's ability to perform those critical tasks. Third, an evaluation should be conducted on whether additional non-task-specific elements of the job are critical to successful performance and if so, how the performance measures will reliably assess trainee knowledge of these elements. Fourth, the performance measures need to be scoreable in a consistent, objective fashion. This is particularly the case if these tests are to be placed within a computer-managed instructional (CMI) system that would provide automatic scoring. Finally, scores should be able to predict on-the-job performance.

II. Supply System Performance and AIT

The development of high quality 76C performance tests is an important element in reducing what has become known as the transition problem. As Keese et al. (1980) among others have noted, the transition from 76C AIT to performing in the assigned unit has proven difficult for 76C trainees. There are several apparent reasons for this transition problem: 1) 76C AIT graduates often work by themselves in a motor pool and have few people close by who are more knowledgeable about supply procedures, 2) post-specific procedures for ordering parts and maintaining prescribed load lists (PLLs) create some divergences between what the 76C trainee has been taught in school and what he must actually do on the job, 3) there is a low system tolerance for even minor errors and omissions in parts orders.

Valid performance tests based on the findings of extensive front end analyses can help reduce the difficulty of transition by accurately assessing deficiencies in trainee knowledge and skills which are essential to successful job performance. In addition, they guide the development of appropriate instructional materials so that trainees can meet required standards of performance on the tests.

III. Objectives

A. Primary. This report will describe the test development methodology to be used in the construction of annex tests for the four major duty positions covered in the 9 week 76C AIT course and provide the test taxonomies which determine the structure of the exams. In addition, results from field tests assessing the utility of the PLL test battery created according to the taxonomy will be discussed.

B. Secondary. While performing field tests, the opportunity to achieve some worthwhile secondary objectives presents itself. A survey of the job histories of the participating 76C soldiers can provide useful information about the 76C population, particularly since the last such survey was conducted in 1986. The relation between a soldier's test performance and the supervisor's perceptions of the soldier's everyday job performance was also deemed to be worth investigating. Finally, the project provided a means to collect baseline performance on the proficiency of 76Cs to help evaluate the effectiveness of future training developments at QMS.

METHODOLOGY FOR 76C TEST BATTERY CONSTRUCTION

I. General Approach

A. Job Analysis. The initial step in developing a test battery is an analysis of the entry level job which trainees will be expected to perform. Keese et al. (1980) note that the 76C AIT graduate is expected to perform as a journeyman because his/her supervisor is not in the same MOS, e.g., a 76Y (Unit Supply Specialist) or 63B (Light Vehicle Mechanic) and not necessarily at a higher skill level. While this makes it more difficult for the trainee, it obviates the necessity for distinguishing between the tasks performed by 76C clerks with different levels of experience since they are largely responsible for all 76C tasks.

The Supply and Service (76) Career Management Field which includes the 76C MOS has been the focus of a number of recent job and task analyses (Hughes Aircraft, 1981; Duncan, 1984; TRADOC, 1984). Because of the existence of these reports, it was deemed unnecessary to conduct a separate job analysis for the current project. However, interviews were conducted with several PLL/TAMMS (Prescribed Load List/The Army Maintenance Management

System) clerks at Fort Lee and at Fort Carson as well as with instructors in the 76C AIT program at the QMS in order to clarify certain aspects of the task environment.

The most useful job analysis for the current purpose is the job analysis described in Duncan (1984) which was conducted by RCA Services and Educational Testing Service as part of the Basic Skills Education Project (BSEP). Critical tasks were analyzed in Skill Level 10 and 20 for the 94 highest density MOSs including 76C. The objective was to identify the prerequisite competencies or skills needed to successfully perform the critical tasks in each MOS. Task lists were developed on the basis of existing materials such as Soldiers Manuals and lists developed by proponent schools. In conjunction with Subject Matter Experts (SMEs), the job analysts identified a) the specific job or performance steps required to perform each task, b) the equipment required to perform each task, c) the knowledge and skills necessary to perform each task and the standards to which the completed task should conform.

The critical tasks for the 76C MOS determined by the BSEP study are listed in Appendix A. The component elements for each of the critical tasks are listed in Appendix B. The performance elements are paired with the code for the prerequisite competencies which were determined to be essential to successful element performance. The list of prerequisite competencies and the corresponding codes are listed in Appendix C.

B. Test Plan. Given the identification of the critical tasks and the skills required for their performance, the next step is the development of the test plan. The test plan can be considered as a template for the construction of alternative versions of a particular performance measure so that there is a high degree of consistency between the alternate versions. When the content of the performance test closely resembles and samples actual job tasks and duties (i.e. possesses content validity) the linkage between the items used in the tests and the tasks/duties of the job does not require the documentation that would be necessary if the items were more abstractly related to job performance (e.g., aptitude tests).

The test plan specifies the kind and number of items which will be used to measure trainees' knowledge of how to perform the identified critical tasks and the skills associated with their successful performance. In the present case, the BSEP study identified 44 critical tasks for the 76C MOS which cover the four main duty positions of the 76C MOS: PLL (manual and automated), TAMMS, Shop Stock (manual and automated) and shop clerk. Thus, the number of critical tasks to be covered in the individual AIT course annex devoted to each duty position is only a part of the total of 44 tasks. Due to the size of content material, the performance tests for each of these course annexes can contain a complete representation of the relevant critical tasks without being overly long.

The content of the end-of-annex tests must be based on the information taught in the annex. However, to be predictively useful, the test items must also reflect the critical performance requirements of the job environment. Basing the test content on the subject matter covered in the annex does not require comment. Taking into account the performance requirements of the job situation with respect to these tasks is a more difficult issue, however. It is not possible or necessarily desirable to exactly reproduce the job context in the training environment. Those aspects of the job which seem to present the greatest difficulties for the new AIT graduate deserve the most attention.

The results of the job analyses mentioned previously indicated that several aspects of the job environment cause particular problems. The lack of adequate supervisory technical expertise means that the 76C must be more proficient at finding information in Technical Manuals. The differences between school and post procedures make it more important for 76C, to have a better understanding of the nature of their job activities. Many of the differences are understandable or can be seen as minor if the nature of the activity is well understood. However, because current training emphasizes that record keeping and supply procedures are to be performed in one specific way, there is interference when AIT graduates have to perform the activity in a slightly different way on the job. In addition, the AIT graduates express concern about the differences because they believe that the procedures taught in school are the only correct way of performing these activities.

From these points, in addition to the basic subject matter of supply form completion, it would seem important to test trainee performance on job comprehension, ability to look up information, and the degree to which minor variations in procedures can be assimilated without undue disruption. These considerations in tandem with the job procedures themselves will guide the formulation of types of items which can best measure the knowledge, skills and abilities essential to successful 76C performance.

C. Item Construction. Once the test plan has been constructed and the item types and their relative weights specified, then item construction and validation can begin. SMEs generate items whose characteristics meet those specified in the test plan. The number of items generated is roughly 3 to 4 times greater than the total number needed to allow for constructions of alternative forms.

When enough items have been developed, they should be tried out on a pilot basis with personnel currently filling 76C duty positions and/or with trainees currently enrolled in AIT. Point biserial correlations or other appropriate statistical analyses should be performed on the overall test to define its difficulty level (the number of test takers correctly answering the item) and discriminative power (the number of students in the top 50%

passing the item compared to the number of students in the bottom 50% passing the item). The test should have items ranging in difficulty (e.g., 10% to 90% passing rates) which best differentiate high and low performing students at each level of difficulty.

Unlike aptitude tests, achievement tests, such as the end of annex test considered here, cannot contain items solely on the basis of their psychometric properties since there are particular competencies which must be exhibited by all AIT trainees. However, it is highly useful to have a substantial proportion of test items on which a range of performance can be expected; this can reveal the extent of individual differences between trainees' comprehension of the subject matter.

However, if the emphasis of the test is solely upon the proper classification of the student as either being a master or a non-master of the subject matter tested, then a criterion-referenced test is indicated. Here test items would be selected to maximally discriminate between masters and non-masters in the region of the cutoff (criterion) score. The accurate classification of test takers would thereby be enhanced (Hambleton and De Gruijter, 1983).

D. Validation. After the pilot testing of items has been completed and sets of items sufficient to form two alternate forms of the test specified in the test plan have been selected, the validation of the test should be conducted. The objective is to determine whether trainees who score well on the test will also perform well on the job in situations which are highly similar to the anticipated job.

There are a number of ways to establish the validity of a performance test depending on the relationship of the test items to the tasks performed on the job. In the current situation, since the job tasks are form-based they can be closely approximated by conventional types of paper and computer-based tests. This type of content validation is widely accepted as a proper psychometric procedure when the steps outlined above are followed carefully (Shrock et al., 1986).

E. Reliability Analysis. An essential part of the validation process is the assessment of a test's or scale's reliability, i.e., the degree to which the test or scale provides a stable index of an individual's knowledge, skills, or opinions. A common way of considering reliability is to view any particular test as composed of a random sample of items from a hypothetical domain of items. The purpose of an item sample is to estimate the measurement that would be obtained if all the items in the domain were given (a person's true score). The higher the correlation of a sample of items with the true score, the more reliable the sample of items on the test. This domain sampling model provides precise estimates of reliability when the items represent a single factor. If the test items used represent

several or many factors, the estimates become less precise because the correlations among items are more heterogeneous. Measurement theory is also sensitive to sampling error which makes larger sample sizes of soldiers desirable (e.g. 200-300). For the same reason, reliability estimates are more precise for longer tests. It should be noted though that estimates can become very precise even when the number of items is 20 or 30 (Nunnally, 1978). Thus in most measurement problems there is little error in the estimation of reliability that could be attributed to random error in the selection of items. Reliable tests also tend to have large variances of total scores relative to unreliable tests of the same length. The most straightforward way of assessing reliability is the test-retest method in which a person completes a test twice. The more reliable a test is, the more stable an individual's score would be from test to retest. Unfortunately, the test-retest method has practical difficulties in using it and in general is more suited to opinion scales than to tests.

Various statistical procedures have also been developed to estimate reliability based solely on the pattern of responses made by individuals to the test items. Large numbers of subjects (100-300) are typically needed to produce highly stable estimates by these methods though. One concept derived from these approaches is the importance of the correlations between item scores (pass rates) and test scores. Test items which have negative or zero correlation with overall test scores usually are poor items since people getting the item correct are getting lower overall test scores than people missing the item. Typically, this effect is produced by ambiguous, poorly worded, misleading, or even factually incorrect items. A reliable test at a minimum cannot have individual item scores negatively correlated with overall test scores.

Competency testing, as is found in many Army training situations, introduces an additional complication to construction of tests with high statistical reliability since certain skills must be tested regardless of how many soldiers get them right (or wrong). This requirement to test all identified critical tasks, usually results in less variation in test scores since some questions nearly everyone gets right. Unfortunately, the statistical estimation of reliability is hampered by reductions in test score ranges.

If the purpose of the test is solely to classify students as either master (having achieved the cutoff score) or non-master (not reaching the cutoff score) of the content area, then other measures of reliability should be used. These measures reflect the consistency of mastery classifications in test-retest situations. As previously noted, these measures of reliability can be increased by selecting highly discriminative test items in the region of the cutoff score. This item selection however can

be at the expense of uniformly testing the full content area of the test and subsequent diagnosis of student or instructional weaknesses.

II. Development of Prototype PLL Annex Test Battery

In order to provide a concrete example of this test development process for the Technology Training Transfer Activity at the QMS, a prototype test battery for the PLL Annex was developed and evaluated through the combined efforts of the U.S. Army Research Institute (ARI) and QMS. Using the findings of the job analyses of the 76C MOS (Duncan, 1984), a test plan was developed for the PLL duty position by SMEs from the QMS working with ARI researchers experienced in task analysis and test development.

The test plan specified the format and scoring procedures to be followed for this test and any alternatives versions of the PLL test battery. Included within this test plan is a method (or taxonomy) for classifying or defining the test items to be constructed. This taxonomy maps the major job functions (tasks) required in performing the job and the major knowledge and skill categories (operations) needed to perform these functions. By arranging the job functions as the columns and the operations as the rows, a matrix is created which defines the job space. The matrix for the PLL (manual) duty position is presented in Figure 1. The matrix can also be used after the test is completely developed. Following testing, item scores can be plotted into the appropriate matrix cell thereby indicating specific tasks or skill deficiencies. Matrices for all the 76C duty positions are presented in Appendix D.

In order to test PLL knowledge and skills fully in ways which have high correspondence to the tasks performed, three item types were selected as appropriate for inclusion in the PLL test battery: 1) multiple-choice, 2) rankings (of task priorities), and 3) fill-in (of forms). Multiple-choice items are useful for measuring comprehension of rules and regulations and technical knowledge. Rankings of task priorities measure the degree to which trainees know how to organize and sequence on-the-job activities. Fill-in of forms measures working knowledge of procedures for supply requests and inventory regulation. The resultant test plan for the PLL test battery is presented in Appendix E.

Initial item development was performed by QMS and ARI project personnel; then the items were pilot tested on PLL incumbents at Forts Lee, Carson, and Lewis. After the test items were reviewed and where necessary modified, a prototype test battery was then assembled which formed the basis for the present study.

	Request for issue NSN (1)	Turn-in (2)	RX (3)	PLL Main (4)	Supply Status (5)	RFI non- NSN (6)	Follow-ups (7)	General (8)
Form Functions (A)								
Definitions (B)								
Form Fill Out (C)								
Form Related (D)								
Postings (E)								
Systems Procedures (F)								

Figure 1. Matrix defining PLL test items.

MATERIALS AND PROCEDURE

I. Materials

The primary materials used in the present study were: a) a 34 item Multiple-Choice Test, b) an In-Basket Test containing 4 practical exercises. Each exercise required the ranking of task actions in a problem scenario in terms of priority. Two of these exercises also required the completion of the necessary PLL forms (6) and record postings (4) to perform the tasks. In addition, supplementary ways of assessing 76C performance were investigated using the Army Wide Rating Scales (Form 6A), and a PLL Job History Survey.

A. Multiple-Choice Test (PLL). The Multiple-Choice Test (PLL) was devised according to the Test Plan specifications. The test contained 34 items which tested knowledge of different functions and actions comprising the PLL duty position. These items had been culled from a larger initial group of items developed by SMEs at the QMS and researchers at ARI. The initial group of items was then pilot tested on a sample of 60 PLL clerks in order to identify items which were ambiguous, unclear or otherwise poor. Thirty seven items passed this initial screen but 3 of these items had to be dropped because of doctrinal changes in procedure for the referenced tasks.

Although a range of item difficulties was sought, items could not be excluded simply because they had very high pass rates if their omission would leave a gap in the taxonomic coverage of the test. U.S. Army Training and Doctrine Command (TRADOC) doctrine mandates that AIT tests will cover all of the critical tasks and knowledge that the soldier is expected to know at the journeyman level. Thus, the certification function takes precedence over differentiation of performance ability.

Each of the 34 items had a question stem less than 50 words long with 4 response alternatives, one of which was correct. Some of the items could reasonably be answered only by consulting the Supply Update, which was available to the soldiers throughout the test period.

B. In-Basket Test (PLL)

1. Overview. While the items of Multiple-Choice test sampled discrete aspects of job performances, the In-Basket Test was developed in order to provide an approximation of the whole task activities and duties that a PLL clerk might have to perform during a day "on the job" at a motor pool. Four problem scenarios were created, each of which described a series of overlapping events occurring in a brief span of time. These events (e.g. supply requests, picking up parts, inventory control) required responses or actions by the PLL clerk in the correct sequence. To test soldiers knowledge of task priority

and scheduling, each scenario was followed by a Prioritization question, which listed the different events described in the scenario. The test taker had to rank each event numerically in terms of the order in which it should be handled by the PLL clerk. The Prioritization items (P Items) had 4-5 events, which were assigned a numerical ranking starting with 1 for the first event, to be responded to by the PLL clerk. Of course, there was no necessary connection between the order of the events as they were described in the scenario and the correct order in which they should have been handled by the PLL clerk.

The first two problem scenarios required the test taker to complete all necessary forms and make all required postings as would be done on the job by the PLL clerk in performing the appropriate actions. The last two scenarios only required the test taker to complete the P item for that problem without having to complete any of the forms which would be used to perform these actions.

2. Form Fill-in. The Form Fill-In sections of Scenarios 1 and 2 consisted of a packet of blank or partially completed supply forms used in performing the standard functions of the PLL clerk duty position. Only relevant forms were included. The soldiers had to select the appropriate forms to complete the scenario actions from that packet. Then they had to fill-in the necessary information to correctly order parts, perform status requests, and post entries as dictated by the scenario events.

The Form Fill-In sections were devised according to the Test Plan for the PLL Annex. As the plan indicated, soldiers were asked to fill out those response blocks of the forms which were the minimum necessary and acceptable to meet Army supply system requirements for the desired action. A distinction was made between critical and noncritical response blocks, with criticality defined as the likelihood either that errors would not be detected or that such errors necessitated the return of the supply request to the PLL clerk for correction. Errors in response blocks defined as noncritical were capable of correction at points in the supply system above the PLL clerk without further clarification or input from him/her. Errors in critical response blocks received a deduction of two (2) points while errors in noncritical response blocks were assigned a one (1) point deduction. A maximum of 5 points could be deducted from any test taker's answers on an individual form, including a maximum of 2 critical errors (4 points).

In addition to supply or status requests and inventory checks, the Form Fill-In section also required the posting of information. All errors in posting received a one point deduction for each such error up to a maximum of 2 points for a single posting form (e.g., DA Form-3318, DA Form-2064). The correct posting of information that was incorrect on the original supply form was not counted as a posting error since points had already been deducted for the mistake on the original form.

C. DA Pamphlet 710-2-1 Supply Update. Soldiers taking either the Multiple-Choice Test or the In-Basket Test were allowed to consult DA Pam 710-2-1 (Supply Update) while answering test items. The Supply Update is published quarterly and provides the most current version of supply regulations as they apply to the PLL duty position (and other supply positions). Appendices to the Supply Update contain a variety of tables listing various supply codes and their definition. Because PLL clerks consult the Supply Update when performing their duties and since at least some of the information is not expected to be memorized, it was deemed reasonable and fair to allow the soldiers to have access to such information during testing.

D. Army-Wide Rating Scales (Form 6A) and Rating Guide

1. Rating Scales. The Army-Wide Rating Scales (Form 6A) are a collection of 13 rating scales to be used in evaluating peer or subordinate job performance and conduct. [Only 12 scales were used in the present research since Scale 13 (Promotion Potential) was irrelevant to the objectives.] The 12 scales are as follows: A. Technical Knowledge/Skill; B. Effort; C. Following Orders/Regulations; D. Integrity; E. Leadership; F. Maintaining Equipment; G. Military Appearance; H. Physical Fitness; I. Self-Development; J. Self-Control; K. Rater's Confidence in Ratings; L. Overall Effectiveness.

Most of these scales are self-explanatory, but K. Rater's Confidence in Ratings deserves some comment. In this scale, the persons doing the rating (peers or supervisors) are asked to indicate how confident they are in making the judgments of a given ratee on the dimensions of performance and conduct measured in the other scales. Presumably, the more opportunity to observe the ratee, the greater the confidence should be in the accuracy of the ratings.

The scales have 7 scale points with 3 behaviorally anchored descriptions of low, moderate and high levels of the dimension. The description of behaviors indicative of low levels applies to scale points 1 and 2; of mid levels to scale points 3, 4, and 5; and of high levels to scale points 6 and 7.

2. Rating Guide. The Rating Guide is a written explanation of sound rating practice which is delivered orally to raters immediately prior to their beginning the Army-Wide Scales. The explanation includes such topics as the interpretation of the behavioral descriptions of scale points, the greater importance of a person's typical performance as opposed to occasional highs and lows, halo errors, the avoidance of undue weight to the most recent events, and individual differences on different dimensions of performance. In addition, the Rating Guide provides a description of the correct way to use and fill out the rating scales particularly when the rater has two or more ratees to judge.

E. PLL Job History Survey. The PLL Job History Survey consists of 9 questions given to all test takers concerning their current status in the 76C MOS and previous related experience and training. The survey was intended to provide a rough picture of the job related characteristics of the current sample of 76Cs participating in the study. Inasmuch as the last limited survey occurred more than 4 years ago, the survey should provide a useful picture of the personnel currently staffing 76C duty positions and provide an indication of any changes over time in their job related training and experience. In addition, the survey permits the analysis of the effects of experience and training histories on soldiers test scores. None of the survey questions involved personal conduct on or off the job.

II. Experimental Procedure

A. Subjects. A sample of 142 male and female enlisted soldiers currently classified in the 76C MOS were given either the Multiple-Choice Test or the In-Basket Test. The soldiers were stationed at Fort Bragg, Fort Riley, or Fort Lewis, all of which were U.S. Army Forces Command (FORSCOM) sites with high densities of currently active 76Cs. All soldiers were required to have had at least 2 months of experience as PLL clerks sometime in the past 2 years (i.e., starting with March 1987). The testing at each site occurred over a period of 4 consecutive days. The testing across sites occurred between March 1989 and June 1989. In addition, a total of 66 76C supervisors provided ratings of their 76C subordinates using the Army-Wide Rating Scales (Form 6A). Only those supervisors who had one or more of their subordinates participating in this study were asked to provide ratings. With the small exception of five 76C sergeants, the supervisors were noncommissioned officers (NCOs) holding either the 63B MOS or 76Y MOS.

B. Rating Scales. The supervisors rated their subordinates using 11 (of 12) of the previously described rating scales originally developed to assess the effectiveness of first term soldiers participating in the Army Selection and Classification Project. The ratings looked at three aspects of the soldiers: performance, overall effectiveness, and NCO potential. However, in the current study, the NCO potential scale was not used.

To determine the correlation between test scores of non-supervisory 76C soldiers and supervisory perceptions of performance, supervisors were asked to rate the 76C soldiers on certain criteria. Depending on availability, first and second line supervisors were asked to rate all of their subordinates who were also participating in this study. Of the 96 supervisors that participated, 80% were first line supervisors and 20% were second line. A total of 116 soldiers were evaluated by either their first line or second line supervisor. Some supervisors were not available so test scores from the remaining subordinates could not be correlated with supervisory ratings.

The supervisors were asked to describe the length and level of their supervision of the participating subordinates. Specific supervision time ranged from less than one month to more than 12 months. The majority of soldiers had been supervised more than 4 months, 22% for 4-6 months, 29% for 7-12 months, and 23% more than 12 months. Only a small percentage had been supervised less than 4 months, 5% less than 1 month and 20% 1-3 months. There was no major discrepancy in supervision time when the information was broken down by sites. On the average 25% of the soldiers in each group had been supervised less than 4 months.

C. Experimental Design and Procedure

1. Overview. Soldiers were randomly assigned to either the Multiple-Choice Test group or the In-Basket Test Group. All soldiers completed the Job History Survey before taking their assigned test. All supervisors received rater training prior to completing the Army-Wide Rating Scales (Form 6A).

The procedure used to administer the performance testing and supervisory ratings was consistent across different sessions and test sites. Soldiers and supervisors were notified by their commanding officer (CO) in the week prior to test administration to report to a designated classroom on post and participate in a survey and experimental project sponsored by the QMS and Army Research Institute. Two sessions of 2 hours each were scheduled for each day of the week of testing allotted by FORSCOM for that site. Personnel were scheduled for a particular session based on their assigned unit. Thus, in any given session, soldiers were mostly from one or two companies. Supervisors were more irregularly distributed throughout the sessions for the week. Thus, supervisors did not necessarily attend the same session as their subordinates.

2. Location of Testing. The sessions took place in moderately large classrooms and meeting rooms which contained either several large tables seating 4 to 6 people each or a conventional classroom with rows of individual desks. The rooms were relatively free from noise and other disturbances. As personnel entered the room, the researchers asked supervisors to identify themselves. Supervisors were then directed to sit at a separate table or section of the room from the 76Cs.

At each place at the table or desk designated for the 76Cs, the following materials were set: a) Multiple-Choice Test or In-Basket Test, b) DA Pam 710-2-1, c) one pencil. At places for supervisors, one Army-Wide Rating Scale packet and a pencil were set.

3. Testing Instructions. The test session began with the chief on-site researcher introducing the data collection staff and explaining the purpose of the study. The voluntary nature of soldiers participation was emphasized at this time. It was further explained that performance scores were to be used only to

evaluate training procedures at QMS and would definitely not become part of their service record. All attending soldiers agreed to participate under these terms.

At this point, the researchers split up, with one assigned to the supervisors and the other to the 76Cs. The researcher with the supervisors delivered the rater training as specified in the Training Guide and then monitored the completion of the ratings, answering any procedural questions. The researcher with the 76Cs informed them that they would be completing either a multiple-choice test or an in-basket type test involving form fill-out on PLL procedures.

All soldiers were told that they had essentially all the time they wanted to complete the tests and could make use of the materials from the Supply Update. However, they were asked to refrain from discussing questions or sharing answers with other participants. In addition, they were asked to avoid revealing the test items to other personnel after they left the test session.

Soldiers were asked to first complete the Job History Survey before starting with the assigned test. Soldiers who had the Multiple-Choice Test were told to circle the correct response alternative to each question. Soldiers with the In-Basket Test were told to read the problem scenarios and prioritize the various actions that should be taken. Then, where indicated, they were to complete the forms and postings that would be required to actually perform the specified actions.

4. Time Allowed. All supervisors and soldiers completed their assignments within the two hour period allotted. The Multiple-Choice Test was completed in an average of 35 minutes while the In-Basket Test took an average of 65 minutes to complete. Supervisors performed the rating task in about 15 minutes plus approximately 10 minutes to go over the rater training materials. When a soldier had finished, their materials were collected and they were excused from the session. Supervisors and soldiers generally had few questions about their tasks and all the sessions at the 3 sites took place under generally equivalent circumstances.

5. Scoring.

a. Multiple-Choice Test. This test was scored in straightforward fashion, with each item worth one point and the total score being the sum of the number correct.

b. In-Basket Test. The In-Basket Test was necessarily more complex to score than the Multiple-Choice test. The In-Basket Test had two types of items: prioritizing (rank orderings) of 4 and 5 actions and fill-in of (form) blanks. The rank orderings were scored one point for each correct ranking with a total of 4 or 5 points available for each of the 4

prioritizing items. There were two form completion exercises with each item containing several forms to complete. Each form had 5-10 blanks to fill in, but not all the blanks are of equal importance or criticality in the successful completion of a supply request. For this reason, mistakes had differing degrees of severity, reflected in the scoring system used. Mistakes in 1 to 2 critical blocks on a single form resulted in a 2 point and 4 point deduction respectively from the points available for that item. Mistakes in 3 or more critical blocks on a single form resulted in the deduction of all ten points available for that form. Mistakes in noncritical blocks resulted in one point deductions from the item score up to a maximum of 2 such points deducted.

In addition to completing necessary supply forms, soldiers also had to post this information when appropriate. All errors in posting received a 1 point deduction for each error up to a maximum of 2 points for a single posting form (e.g., DA Form-3318, DA Form-2064). Logically speaking, postings could contain incorrect information either because the initial entries on the forms were incorrect and were transferred to the postings this way or because initial correct information was transferred incorrectly in posting. The second case is clearly a mistake in the act of posting. The first case, however, represents the (accurate) posting of incorrect information. Since points were deducted on the original forms for such errors, it was deemed inappropriate to double the penalty for such errors simply because they were posted elsewhere, as long as such postings were performed correctly. Therefore, no additional points were deducted for such postings.

RESULTS

I. Multiple-Choice Test (PLL)

A. Descriptive Statistics

1. Overall Test Scores. The Multiple-Choice Test (PLL) contained 34 items systematically covering the major functional tasks involved in performing the PLL position. Combined results across test sites showed that scores ranged from 20 to 31 with 24.5 (71%) being the average score (n=71, SD=2.7) The modal score was 25. (Each item had a value of 1 point.)

The tests comprising the Battery were completed by the soldiers with very few questions about the interpretation of questions or comments that the test content was inappropriate. The one topic that elicited some comments were the items on the Multiple-Choice Test which tested some aspect of the DA Form 3318. Many soldiers were currently using an automated PLL which takes on the record keeping function of the DA Form 3318s. Nevertheless, all soldiers agreed that they had received training on the DA Form 3318s in AIT or in the base schools and that it was still required for Skill Qualification Test (SQT).

The scores did display some differences as a function of site as measured by the Kruskal-Wallis one-way ANOVA test. Fort Riley, (n=23), and Fort Bragg (n=16) had similar averages, 25 (SD=2.1) and 25.5 (SD=3.5) respectively. The majority of the scores fell between 20 and 26, while 37% of the scores were 28 or above. Fort Lewis (n=32;SD=2.2) had a significantly lower average score of 23, (chi-square=13.7 df=70) that ranged from 20 to 30. Most of those scores were between 20 and 25 with only 6% at 28 or above (see Table 1).

2. Automated PLL Scores. The Multiple-Choice Test contained items which dealt with automated as well as manual PLL procedures. Because some sites were using PLL automated procedures exclusively, rather than a mixture of manual and automated procedures, it was decided to additionally analyze test scores on the PLL automated items alone (Autoscores). The purpose was to see if any significant differences could be found between the overall test scores (Testscores) and the scores on the Automated only items (all the items except Items 14, 15, 17, 18, 20, 29, and 30). A chi-square test revealed no significant differences between the Testscores and the Autoscores expressed as proportions.

3. Reliability. The reliability (shown in Table 2) of the test was measured by the Cronbach alpha procedure. The reliability coefficient for the entire test was .44 (n=71). The removal of one item (#17) increased the reliability coefficient to .48. The relatively low reliability could be due to a number of factors. The test length may have been too short although coverage of all the major tasks was ensured by the taxonomy used to guide test construction. In addition, because this test could be used as part of a certification process, a number of items have to be included even though the pass rates are very high. This could produce restriction of range effects for the test scores which reduce the observed reliability.

B. Item Analyses

1. Pass Rates. The test items displayed a considerable range of pass rates. Five of the items had 100% pass rates while six other items had pass rates between 90% and 97%. Conversely, three items had pass rates below 25%. The remaining items were fairly evenly distributed between these extremes.

2. Item-Test Correlations. An analysis was made of the correlation between soldier's test scores and pass-fail scores on the individual items as a way of screening for confusing, ambiguous or otherwise poor items. A negative or zero correlation between the two indicates that the better performers are doing the same or worse on that item than the poorer performers, not a desirable characteristic. The items with 100% pass rates are of course not analyzable with this procedure.

Table 1

Mean Performance Scores for Test Battery Components by Post

<u>Post</u>	<u>Multiple-Choice Number/(% Correct)</u>	<u>In-Basket Errors/ (% Correct)</u>	<u>Prioritizing Number/(% Correct)</u>	<u>Supervisor Ratings</u>
Riley	25.6/ 75%	36.7/ 80%	7.1/ 37%	4.9
Bragg	25.5/ 75%	59.5/ 67%	8.1/ 42%	5.1
Lewis	23.3/ 68%	41.3/ 77%	5.1/ 26%	4.9

Table 2

Reliability of Test Battery Components

<u>Test Component</u>	<u>Reliability</u>
Multiple-Choice	0.48*
In-Basket Forms	0.65
Prioritizing	0.72

*Item 17 deleted

Note. The values represent Cronbach's coefficient alpha of internal consistency.

Only one item (#17) had a slight negative correlation with test scores ($r=-.01$). Two other items displayed positive correlations but close to zero. As noted above, Item 17 was the only item whose removal significantly increased overall test reliability.

II. In-Basket Test (PLL)

A. Descriptive Statistics. Because of the complex scoring structure on the form fill-in items, results are reported in terms of the total error points assessed on each of the forms rather than overall test scores. The prioritizing rank order scores however are recorded as points correct.

1. Prioritizing Scores (P Scores). A total of 66 76Cs completed the prioritizing items across the three sites. The overall scores ranged from 16 (out of a maximum of 19) points to 0 correct. The mean score was 6.1 or 38% correct rankings with a SD of 3.5. It should be noted that since the items called for a rank order, one mistake would result in two or more incorrect ranks. Thus, the absolute scores overestimate the number of errors committed by the soldiers although this doesn't affect their relative position. The majority of scores (51.9%) were clustered between 3 and 9 points correct with a bimodal distribution at 4 and 7 points. A Kruskal-Wallis one way ANOVA revealed a significant effect of site on P Scores ($\chi^2=9.65$, $p<.05$ corrected for tie ranks). Fort Lewis had the lowest mean P Score ($m=5.1$, $n=37$) with Fort Riley next ($m=7.5$, $n=22$) and Fort Bragg highest at $m=8.1$ ($n=7$). Table 1 shows these P scores by site.

2. Form Fill-in Error Scores (E Scores). A total of 74 76Cs completed the form fill-in items across the three sites. Eight of these soldiers failed to complete the prioritizing items, accounting for the difference in N between E Scores and P Scores. As noted, the E Score represents points deducted for mistakes in form fill-in (out of 180 maximum). The E Scores ranged from a best score of -18 to the lowest score of -81. The mean E Score was -42.8 (76% correct) with a SD of 20.8. Scores were evenly distributed in this range with only a slight hump between -38 and -41. A Kruskal-Wallis one way ANOVA did not reveal a significant effect of site on E Scores. Table 1 shows these E scores by site.

3. Reliability. The reliability of the In-Basket Test was assessed by Cronbach alpha. The overall reliability coefficient was 0.65 for the 10 E Score (Forms and Posts) items (see Table 2). The exclusion of Form 4 raised the reliability coefficient slightly to 0.67. Since the In-Basket Test was a power test rather than a speed test there is some question as to the interpretation of missing values. As a check on this, reliability was analyzed with all missing values on Form and Post items reclassified as errors. The reliability coefficient was not greatly different in this case however (0.59). The

reliability coefficient of the P Score (Situation Prioritizing) items was 0.72 with missing values excluded. No item significantly decreased the overall reliability.

B. Item Analyses

1. Error Rates. Because of the nature of the items in form fill-in, errors were a more meaningful analysis than pass rates. An item in this part of the In-Basket Test represented a separate form that needed to be completed to fulfill the supply action required by the problem situation. The two problem scenarios which specified form fill-in required a total of six action forms and five posting forms (Forms 1 to 6 and Posts 1 to 5).

Unlike the Multiple-Choice Test, the incidence of incomplete or non-completed items was moderate to high although soldiers essentially had unlimited time to complete the In-Basket Test. Two contributing factors to this effect were the greater amount of time necessary to complete the In-Basket Test compared with the Multiple-Choice Test (60 minutes vs 30 minutes) and the inherent uncertainty in selecting and completing forms to problem scenarios which do not specify the response alternatives. Missing value rates ranged from 1.4% (Form 6) to 91.9% (Form 4) with the average at 32%, if Form 4 is included (clearly a poor item) or 14.7%, if Form 4 is excluded. The Post items averaged about 23% missing values.

For completed Forms, error rates were lowest for Forms 1 and 6, in which over 85% of the soldiers had an error score of -2 or better. Error rates were roughly twice as high with Forms 2, 3, and 5 since only about 40% of soldiers had error scores of -2 or better with these items. The large number of nonresponses to Form 4 allowed only 6 cases to analyze; however, those who did complete it had low error rates. This suggests that the Form itself was not likely the reason for the nonresponses, but rather it was probably the phrasing and interpretation of the problem scenario which led soldiers to think the Form was not required.

Error rates on completed Posts 1 to 5 varied considerably as well. Posts 4 had the lowest error rates with 80% scoring -2 or better while Posts 1 had the highest error rates with more than 80% scoring worse than -2. Posts 2, 3 and 5 were roughly comparable with 80% scoring -4 or better.

2. Inter-item Correlations. An analysis was made between soldiers's overall E scores and the E Scores on individual items as a way of screening for poor, confusing, or ambiguous items. A negative or zero correlation indicates an inverse or no relation between overall E Scores and the E Scores on an individual item which is undesirable. Only Form 4 had a negative or zero item-total correlation (-0.03) while the other items mostly had correlations in the .30s and .40s.

A similar analysis was performed between soldiers overall P scores and the scores on individual items. All items had a positive item-total correlation with the majority of the correlations falling between $r=.25$ and $r=.40$.

III. Job History Survey

A. Descriptive Statistics. The Job History Survey was completed by all 145 non-supervisory 76C soldiers participating in the study (see Appendix F). The three participating sites contributed different proportions of soldiers to the overall sample. Fort Lewis had the most representation with 49% followed by Fort Riley with 32%, and then Fort Bragg which had 19%. The majority of the soldiers were Specialist Four (E-4) (54%). The next most frequent rank was Private First Class (E-3) with 26%. The remainder were either Privates (E-2) or Sergeants (E-5). The most frequent current duty position of the soldiers was PLL clerk (63%), followed by TAMMS clerk 25% and shop clerk 12%. Half of the soldiers had spent between one to two years in their current duty position; while 34% had spent less than one year in their position and 16% had spent three or more years.

Since there are several duty positions in the 76C MOS it is common for soldiers to rotate assignments between these duty positions. For this reason it is possible for a 76C currently performing in the TAMMS or shop clerk positions to have had previous PLL experience. Therefore, soldiers were asked to indicate their duty position prior to their current one, if any. Nearly half of the soldiers had been PLL clerks in their previous position, while 30% had been in TAMMS, and 21% had been shop clerks. However, all of the soldiers had at least two months of PLL experience sometime in the past two years.

Soldiers were also asked about the nature of their job training. The overwhelming majority (98%) of the soldiers were graduates of the AIT course given at the QMS, Fort Lee. The remaining soldiers had been reassigned from other MOS into the 76C MOS. At some time after graduating from the AIT course, 13% of the soldiers had been given refresher training. Sixty-eight percent of the soldiers had attended a course on PLL skills given at some duty location. These courses usually last one to two weeks and provide both review of PLL procedures and familiarization with the post-specific variations constituting local practice. Students have to pass a final test to graduate from these courses.

Soldiers were also asked to rate their level of job knowledge as well as the use of reference materials to assist them in performing their tasks. Fifty-five percent rated themselves as having moderate levels of job skill, while 43% considered themselves as having high levels of job knowledge. Only 3% considered themselves as having low job knowledge. Most soldiers reported using reference materials occasionally in the course of their job, with lesser percentages reporting either frequent use or low levels of use, 27% and 19%, respectively.

The data were broken down by site to see if there were any location variations in biographical data. There were very few differences detected in the response between the various sites and none of these seemed significant for the interpretation of the performance results. For example, at Fort Bragg and Fort Lewis half of the soldiers' prior duty position was as a TAMMS clerk while at Fort Riley two-thirds were previously PLL clerks.

B. Test Score Cross-Correlations

1. Multiple-Choice Test Scores by Job History Survey Variables. The overall scores on the Multiple-Choice Test were correlated with soldiers' responses to the Job History Survey items concerning their MOS related experiences. Most of the job experience variables showed low or no correlation with test scores either for all sites together or by individual sites. The variables showing nonsignificant correlations were: rank, prior duty position held, length of time spent in the current duty position, whether they had received "shadow school" training on post, or the degree to which they used reference materials on the job. The soldiers' current duty position showed a marginally significant correlation with Testscores (the complete 34 item test) ($r=.16$, $p<.08$) and a significant correlation with Autoscores ($r=.20$, $p<.05$). As would be expected, soldiers currently in the PLL duty position had (slightly) higher scores than soldiers currently in the related 76C duty positions of TAMMS Clerk and Shop Clerk. On the other hand, a surprising negative correlation was found for soldiers who had been given refresher training at QMS ($r= -.19$, $p<.05$), although such training may be specified in part based on performance difficulties. Interestingly, the strongest correlation was found between self-reports of degree of job knowledge and both Testscores and Autoscores ($r=.24$, $p<.05$)

2. In-Basket Test Scores by Job History Survey Variables. The correlations between soldiers' responses on the Job History Survey and their In-Basket Test Scores showed a similar pattern to that obtained with the Multiple-Choice Test Group as we would expect since assignment was random. A significant correlation was found between duty position and P Scores ($r=.38$, $n=66$, $p<.05$) as with the Multiple-Choice Test group; however, the correlation between duty position and E Scores was not significant. On the other hand, reported self knowledge was significantly correlated with E Scores ($r=.23$, $n=74$, $p<.05$) but not with P Scores. Other correlations were only marginally greater than zero.

IV. Supervisor Ratings of Performance

For the purposes of the present research, ratings on Scale A (the technical skill scale) and the overall soldier effectiveness rating are most relevant. Additional information about supervisor responses to the other scales can be found in Appendix G.

A. Descriptive Statistics. Supervisors rated the overwhelming majority (97%) of the soldiers technically capable (Scale A). Only 35% of 76Cs were rated competent to perform all job assignments and tasks without technical assistance, however. Scores were distributed nearly symmetrically around the modal value of 5 (moderate skill).

In terms of overall effectiveness (Scale L), supervisors rated 7% of the soldiers as ineffective and unable to meet expectations or standards of performance while the majority (64%) were rated adequate in this area. The remaining 29% were rated to perform excellently and exceed standards of performance.

In an effort to further examine the supervisory rating information, the data were broken down by the specific posts that participated. Although a few differences were found between ratings of subordinates at different sites, these differences were neither extreme nor fell into a systematic pattern.

The reliability of the scale items was assessed through the use of the Cronbach alpha test. The overall alpha score was .8950 (n=116) and all the individual items displayed a high degree of correspondence with the overall scale. This indicates either a lack of discrimination by the rating supervisors in distinguishing between the 12 rating categories or the presence of a group of soldiers each of whom has a uniform achievement across a very broad array of categories each of which is important for effective soldiering.

Table 3

Correlation of Test Scores with Supervisor Rating of Technical Skill

<u>Test Component</u>	<u>Correlation</u>
Multiple-Choice	0.12
In-Basket Forms (Errors)	-0.04
Prioritizing	0.08

B. Test Scores and Supervisory Ratings

1. Overview. The 76C MOS has an unusual structure of first-line supervision as was previously described above. Since neither the nominal 76Y supervisor or the motor pool sergeant (63B) has technical training in the 76C subject matter, the accuracy of supervisory performance ratings is of particular

interest. Of course, in a typical test development situation, supervisor ratings are often used as criteria to validate the tests. Under the present circumstances, it was unclear what effect would be produced by the lack of any systematic technical training given to the 76Y or 63B supervisor on 76C tasks. Thus, the present effort was forced to put particular reliance on the content validity of the test materials pending some assessment of the utility of supervisory ratings in this situation.

As was noted, supervisor ratings of 76C subordinates were collected on a number of performance dimensions. Then, correlations between these ratings and the 76C test scores were measured. It should be noted that not all of the soldiers who took the Multiple-Choice test had supervisors participating in this research. Generally, supervisor ratings were obtained for only about 50% of the soldiers.

2. Multiple-Choice Test by Supervisor Ratings. For the group of soldiers taking the Multiple-Choice Test, a non-significant correlation ($r=0.12$, $n=38$) was obtained between Testscores and supervisory ratings of technical skill (Scale A only). Interestingly, the correlation between Testscores and the performance ratings summed across all 12 rating scales was -0.11 . In fact, the correlation between Testscores and supervisor ratings had its maximum when only Scale A ratings were used and progressively decreased as additional scales (dealing with factors other than technical skill) were added (see Table 3).

A similar pattern of results was obtained between Autoscores and the supervisor ratings. A breakdown by site also showed no significant deviations from these results at individual posts.

3. In-Basket Test Scores and Supervisor Ratings. As with the Multiple-Choice Test, it was important to determine the degree of correlation of supervisory ratings with the corresponding In-Basket Test scores. For the overall group of soldiers taking the In-Basket Test, a correlation of -0.04 ($n=41$) was obtained between E Score totals and supervisory ratings on Scale A (Technical Knowledge/Skill) and a correlation of 0.08 ($n=36$) was found between P Score Totals and Scale A ratings. As with the Multiple-Choice Test, correlations of P Scores with the sum of all 12 rating scales were lower (-0.05) than with Rating Scale A only. The E Score correlation with the sum of all rating scales was -0.01 was virtually the same however as the correlation with Rating Scale A. Site differences could not be assessed reliably due to the small Ns at Forts Bragg and Riley (see Table 3).

DISCUSSION

I. Test Battery Methodology and Quality

The present study has sought to lay out a systematic plan for performance evaluation of 76C AIT and field performance, document the development of a test battery created according to its precepts and provide an initial empirical demonstration of its utility. The 76C MOS, because of the task structure and the typical field conditions for performance, presents certain difficulties in assessing performance in training or on the job. Nevertheless, by following procedures like those outlined in the Methodology for 76C Test Construction, assessment accuracy can be increased.

The key points of the Methodology are: 1) the development of a test plan in which a matrix maps the critical functions and task operations of the job, 2) the creation of items which systematically represent each of the test plan categories (matrix cells), 3) the pilot testing of items to ensure their discriminative capacity, and 4) the use of consistent scoring parameters.

In keeping with the TTTA concepts, ARI created a demonstration Test Battery for the PLL Annex of the 76C AIT course at Fort Lee following the Methodology described in this report. The two main elements of the Test Battery are the Multiple-Choice Test and the In-Basket Test. The pilot study which was conducted provided a field test of the acceptability of the tests to the 76C journeymen population (face validity) as well as data on the psychometric properties of the test items and item types used in the Battery.

The statistical analysis of the Multiple-Choice Test showed that the test items displayed appropriate psychometric properties in pass-fail rates, range of difficulty, and item-test score correlations given the constraints of the certification process mandated by TRADOC and QMS. As noted, these constraints mainly involve the required coverage of certain topics irrespective of their difficulty. Thus, a higher proportion of items than ordinary have pass rates in excess of 90%. This circumstance may necessitate a longer multiple-choice test than that used in this study, preferentially adding optional items of moderate and high difficulty.

Internal consistency (reliability) estimates for the Multiple-Choice Test were in the moderate range (.48 adjusted). There are several possible reasons for this finding. First as noted, the current version of the test is probably too short at 35 items given the topic requirements of TRADOC and QMS. Longer tests generally have higher reliability estimates than shorter tests. If the number of test items was doubled, then, according to the Spearman-Brown formula, the internal consistency would be increased to .65.

Second, since the item statistics themselves were adequate with few exceptions, this low measure of internal consistency suggests that the test is measuring several skills or knowledges which are not highly interrelated at least as far as the subject population is concerned. Domain heterogeneity has a direct effect on the internal consistency measure since it reduces the likelihood that a person who knows some given topic covered by the test will also know other test topics. An extreme example of domain heterogeneity might be a test which contained questions on food preparation and electronics. By using a matrix taxonomy to construct test items, knowledge of seven tasks is sampled. It is very plausible that soldiers were not equally proficient in each of these tasks.

In the present case, some level of soldier heterogeneity is likely to be present since divergences in 76Cs training and experience occurs after AIT, during rotational assignments. For example, assignment to a combined PLL motor pool unit leads to a daily work routine quite different from a PLL clerk in a medical unit. Certain activities are equally probable in both situations but other tasks will be much more likely in one or the other position. Two other factors create additional complications: frequent rotational assignments of 76Cs which may or may not involve positions with similar daily routines and post-specific training experiences and supply procedures which diverge in some respects from the materials presented in AIT.

An analysis conducted on the Multiple-Choice Test results to determine whether the inclusion of items concerning DA Form 3318 actions differentially affected PLL clerks who were currently working in automated PLL units showed no significant differences on overall test scores as a function of their inclusion or omission from the test. Indeed, item analyses showed that performance on the DA Form 3318 items was comparable to the pattern seen on the other items for the group as a whole. However, the post AIT training and job experiences of this group are quite varied so the heterogeneity may reside at the level of the individual 76C rather than at a group level.

If these differences in post AIT experience are affecting the levels of internal consistency, lengthening the test may not boost the reliability coefficient as much as would normally be expected. This is because additional items would probably maintain or increase the existing level of perceived or actual domain heterogeneity.

As a final note on the matter of reliability, what has been presented thus far concerns reliability in a norm-referenced framework. A more meaningful measure of test reliability for the military, which uses criterion-referenced tests, is a measure of how consistently the test can measure a soldier meeting a preset criterion rather a specific score. A measure of this sort of reliability has been suggested by Linderman and Merenda (1979) in

which computations are made upon the number of students reaching the criterion on either the first, second, both or neither administrations of the test.

Finally, it should be noted that multiple-choice tests in general for this MOS will place a greater emphasis on reading comprehension skills. A significant portion of the knowledge base is present in Army supply documents and technical manuals which require a high school reading level on the part of personnel. Although it would have been useful to examine test score-ability correlations, privacy considerations make it difficult to conduct analyses of 76C journeyman test performance as a function of personal information such as Armed Services Vocational Aptitude Battery (ASVAB) scores etc.

The statistical analysis of the In-Basket Test results showed that all but one of the 10 fill-in-the-form (E Score) items displayed acceptable psychometric properties in pass-fail rates, range of difficulty, and item-test score correlations. Because of the extended number of responses required in this item type, there was much less problem with ceiling effects for item performance.

The internal consistency (reliability) estimates for the In-Basket Test E Score items were substantially greater than for the Multiple-Choice Test (.67 adjusted), although both cover essentially the same task functions. The E items score provide a greater degree of correspondence with the corresponding on-the-job task actions than the multiple-choice item type, which may account for in part for the higher internal consistency estimate.

This correspondence has its good and bad aspects with respect to assessing 76C job knowledges and skills. On the positive side, soldiers are more comfortable with this item type, whereas on the negative side it is harder to score reliably and permits more rote responding. Perhaps more importantly, student errors on these items do not permit the identification of the precise areas of student weakness. Because of the extended nature of the items, most errors have multiple potential causes. Therefore, the overall test score is probably far more meaningful than the interpretation of errors for any given item.

In addition to the Fill-in item type, the In-Basket Test had four rank order (P Score) items which required soldiers to assign a numerical priority to each of a series of job actions that were to be performed in a given situation. This item type was used in order to measure the task organizing skills of 76Cs, which as noted in the Introduction, has been one area of criticism of 76C field performance. One potential drawback in using this item type is that such skills have not been a large part of the AIT curriculum, although presumably 76C journeymen should have acquired such skills during their time on-the-job.

Soldiers performance on this item type was low in terms of pass-fail rates on the individual items (38%) although, as noted, the absolute scores for this item type will tend to overestimate the actual level of errors. Consequently, the criterion score for passing a test should be lower for this item type. The pattern of errors on these items indicated that soldiers in many cases were fundamentally unsure of the relative priority of certain job actions rather than simply transposing an action up or down one step from the appropriate rank order. Nevertheless, the estimates of internal consistency (.72) were higher for these items than for the other two item types employed in the Test Battery .

Given the lack of specific training in AIT on the content for this item type, the initial item statistics collected here provide encouragement that this item type may provide useful information about job organizing skills. Training materials developed as part of other Fort Lee TTTA efforts offer explicit instruction and testing on these kind of skills for the first time. It is essential that 76Cs performance on these item types be measured again when such training becomes part of their AIT experience.

II. Job History Survey

In addition to the two tests, the 76C soldiers completed a short Job History survey form which provides a rough picture of the kind of work and training experiences that journeymen PLL clerks are likely to have received during the period 1986-1989. In contrast to previous surveys (e.g., Hughes Aircraft 1982), it now seems that a high percentage of personnel in PLL duty positions have gone through AIT rather than being reassigned from other MOSSs. Additional training or retraining is still common in post schools, although one site (Fort Bragg) has discontinued their formal on-site PLL course. Whether the increase in AIT experience among current PLL clerks has or will reduce the need for such courses remains an unanswered question at this time.

The Job History survey presented an opportunity to see if particular job or training experiences might have some correlation with test performance. This analysis of the survey responses with test scores in fact revealed little apparent connection between any of the experience and training variables and scores on either the Multiple-Choice or In-Basket Tests. The one substantial positive correlation was between self-reports of degree of job knowledge and test scores. In other words, soldiers had a fair idea of how much they knew and didn't know about PLL procedures.

The absence of correlation obtained between these measures is not unique to this study; other investigations have revealed a similar non-association between job performance measures and job experiences (Schurman et al., 1980). One possible explanation is

that the recent task experience is the most important factor in performance. All of the soldiers had been or currently were in the PLL duty position within the two preceding years. At least as far as the present sample is concerned, the vast majority of active PLL clerks have been through AIT at QMS which provides some level of uniformity to the training experiences of these personnel.

III. Supervisory Ratings and Test Scores

Supervisors of the soldiers were also asked to provide performance ratings of their own subordinates. Only one of the 12 scales dealt directly with supervisor perceptions of their subordinate's technical skill, although the other scales did cover other aspects of soldier effectiveness.

Supervisor ratings of their subordinate's technical skill showed very low correlations with the test scores of these personnel. However, it should be noted that the combined ratings from all 12 scales had a significantly lower (and negative) correlation with test scores than did Scale A alone. In fact, the correlation steadily decreased as additional scales were added to Scale A ratings. This pattern of results suggests that supervisors were distinguishing the different scales in terms of their ratings and that they were probably considering more skill related behaviors while answering Scale A than for the other scales. However, it also indicates that these supervisors do not seem to have a clear awareness of the technical skills of their subordinates.

It might be argued that supervisors do have an accurate idea of their subordinates' technical skills and the Test Battery is not providing an accurate index of their skills. Several points argue against this possibility. First, the materials and topics being tested in both the Multiple-Choice Test and the In-Basket Test come straight from the AIT course materials as well as the major Army supply documents and regulations. Second, the In-Basket Test provides a close approximation of the actual tasks performed by the PLL clerks. Third, soldiers raised no complaints about the items being hard to understand or outside their experience and training. The one small exception to this were the multiple-choice items which dealt with DA Form 3318 since this is used only where automated PLL procedures are absent. Nevertheless, even in this case, all soldiers agreed that they had received training in the manual PLL procedures and that they had to know it for their SQT.

It should be noted that a confounding does exist since supervisors rated only their own subordinates. Thus it is not possible to control for response differences between raters. Nevertheless, an examination of the ratings did not indicate high levels of response bias.

One unusual systemic feature of the 76C MOS is the relationship of supervisor to subordinate. Since the 76C series ends at the rank of Sergeant, promotions past this point are to the 76Y (Unit Supply Specialist) MOS. Thus, in most cases, the nominal supervisor of a 76C is a 76Y who is not co-located with his subordinate 76Cs. More than two-thirds of the 76Y NCOs have always been assigned to that MOS and have no specific experience as a PLL clerk or even a 76C. Because of this anomaly, in many cases the actual rating supervisor is a 63B Motor Pool Sergeant who has received no 76 series training either a 76Y or 76C. On the other hand, the 63B is at least co-located with the 76C PLL clerk and interacts with him/her on a daily basis. One additional complication occurs in combined PLL motor pools which have a common PLL section for a number of different companies. In these situations, since there is a group of PLL clerks working together, a division of tasks may exist, some clerks may "cover" for others, etc. All these factors make the supervisor's task of assessing individual technical skill more difficult. Thus, unlike most work settings, the 76C supervisor, whether 76Y or 63B, may not be the best judge of their subordinates' technical skill.

In summary, a systematic methodology for assessment of 76C AIT and journeyman performance has been presented along with a first stage implementation of the plan in the form of an integrated Test Battery. Both the Multiple-Choice Test and the In-Basket Test displayed acceptable item statistics although the Multiple-Choice Test should probably be expanded to 50-60 items provide a consistent method for measuring 76C AIT performance changes over time as a function of new training procedures instituted in the course. It also provides a yardstick for school based efforts to improve the accuracy of evaluations of student performance and knowledge acquisition.

CONCLUSIONS

A systematic methodology for assessing 76C AIT and journeyman performance is now available along with a prototype test battery.

A general model for developing content-valid, i.e. job relevant tests is also available and is applicable to any MOS.

The components of the prototype (multiple-choice and in-basket tests) are reliable but the multiple-choice test can be improved by expanding it from 35 to 50 items. A criterion-referenced measure of test reliability is recommended

A revised test battery will provide a consistent method for measuring 76 AIT performance changes over time as a function of new training procedures instituted in the course.

The manual PLL performance of 76Cs in units is adequate given the increasing use of computer aiding. However, the higher order skill of prioritizing tasks is not currently mastered by these personnel.

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Appendix A
76C Critical Tasks

APPENDIX A

BSEP Critical Tasks for 76C MOS

1. 76C 101-539-1101 Maintain a Prescribed Load List (Manual)
2. 76C 101-539-1102 Prepare and Maintain Non-stock List Records
3. 76C 101-539-1103 Process a Request for a Prescribed Load List Repair Part (Manual)
4. 76C 101-539-1104 Process a Request for a Prescribed Load List Repair Part (Automated)
5. 76C 101-539-1105 Process a Request for Non-stockage List Repair Part (Manual)
6. 76C 101-539-1106 Process a Request for Non-stockage List Repair Part (Automated)
7. 76C 101-539-1107 Process a Request for Non-national Stock Number Repair Part (Manual)
8. 76C 101-539-1108 Process a Request for Non-national Stock Number Repair Part (Automated)
9. 76C 101-539-1109 Process a Request for a Repair Part Designated as a Direct Exchange (Manual)
10. 76C 101-539-1110 Process a Request for a Repair Part Designated as a Quick Supply Store

11. 76C 101-539-1111 Receive Repair Parts (Manual)
12. 76C-101-539-1112 Receive Repair Parts (Automated)
13. 76C-101-539-1113 Turn-in Repair Parts (Manual)
14. 76C-101-539-1114 Turn-Repair Parts (Automated)
15. 76C-101-539-1115 Conduct Review and Inventory of Prescribed Load List (PLL) Records (Manual)
16. 76C-101-539-1116 Process Prescribed Load List (PLL) Change Listings Automated)
17. 76C-101-539-1118 Process Supply and shipment Status List of Cards
18. 76C-101-539-1119 Initiate Follow-up or Document Modification Action
19. 76C-101-539-1120 Initiate Cancellation Action
20. 76C-101-539-1121 Perform Reconciliation of Due-in
21. 76C-101-539-1301 Prepare and Maintain an Equipment Log MOS: 17K
54E
22. 76C-101-539-1302 Prepare and Maintain a Preventive Maintenance Schedule and Record
23. 76C-101-539-1303 Prepare and Maintain an Equipment Uncorrected Fault Record
24. 76C-101-539-1304 Request Repair or Modification of Equipment
MOS: 31M
25. 76C-101-539-1305 Prepare and Maintain an Equipment Component Register
26. 76C-101-539-1306 Prepare an Equipment Control Record MOS: 54E
27. 76C-101-539-1307 Dispatch and Record Return of Equipment MOS: 76C

28. 76C-101-539-1308 Prepare and Maintain The Material Condition Status Report
29. 76C-101-539-1309 Prepare and Maintain the Oil Analysis Oil
30. 76C-101-539-1401 Process Complete or Rejected Request for Maintenance
31. 76C-101-539-1402 Process Maintenance Work Request Envelope and Update Maintenance Workload Status
32. 76C-101-539-1403 Process Complete or Rejected Request for Maintenance
33. 76C-101-539-1404 Process an Intra-Shop Work Request
34. 76C-101-539-1405 Process a work Request in Shop Supply
35. 76C-101-539-1406 Maintain a Shop Stock List
36. 76C-101-539-1407 Maintain a Bench Stock
37. 76C-101-539-1408 Prepare and Maintain a Parts Request/Status Register for a Request (Manual)
38. 76C-101-539-1409 Prepare and Maintain a Parts Request/Status Register for Status (Automated)
39. 76C-101-539-1410 Conduct Review of Shop Stock Records (Manual)

Appendix B
Component Elements of 76C Critical Tasks

(Available upon Request from the Author)

Appendix C
Prerequisite Competencies for 76C Critical Tasks

APPENDIX C

TABLE 1: Prerequisite Baseline Skills

1 NUMBERING AND COUNTING

- 1A MATCH NUMERALS WITH WORD NAMES AND MODELS
- 1B WRITE NUMERALS ONE THROUGH N IN SEQUENTIAL ORDER FROM ANY STARTING POINT
- 1C STATE WHAT NUMERAL COMES AFTER, BEFORE, OR BETWEEN ANY TWO GIVEN NUMBERS
- 1D SELECT THE NUMERAL WHICH IS GREATER/LESSER FROM A SET OF NUMERALS
- 1E IDENTIFY AN OBJECT WITH A SPECIFIED ORDINAL POSITION
- 1F WRITE OR STATE THE PLACE VALUE OF A PARTICULAR DIGIT, WHOLE OR DECIMAL NO.
- 1G ROUND OFF A NUMBER TO A SPECIFIED PLACE, WHOLE OR DECIMAL
- 1H COUNT BY ONES, TWOS, FIVES, TENS, ETC., BACKWARD OR FORWARD (SKIP COUNTING)
- 1I MATCH NUMBERS WITH POINTS OR INTERVALS ON A NUMBER LINE (POS OR NEG VALUES)

2 LINEAR, WEIGHT, AND VOLUME MEASURES

- 2A NAME THE MARKINGS ON A LINEAR SCALE
- 2B DIFFERENTIATE UNITS OF MEASURE & EQUIVALENTS IN THE ENGLISH & METRIC SYSTEM
- 2C USE A RULER, YARDSTICK, METER STICK OR SCALE TO MEASURE LENGTH OR DISTANCE
- 2D IDENTIFY MEASURE OF OUNCE, POUND, OR GRAM
- 2E IDENTIFY MEASURES OF PINTS, QUARTS, GALLONS, LITERS
- 2F USE A SCALE WHICH IS NOT NUMERICALLY CALIBRATED
- 2G ESTIMATE MEASURES OF VARYING LENGTHS, DIMENSIONS OR WEIGHTS

3 DEGREE MEASURES

- 3A IDENTIFY DEGREE OR MIL AS A UNIT IN DETERMINING DIRECTION, DISTANCE OR TEMP
- 3B ESTIMATE THE MEASURE OF A GIVEN ANGLE NOT GREATER THAN 180 DEGREES
- 3C INTERPRET BEARINGS, AZIMUTH ETC., IN WHICH ANGLES RANGE 0-360 DEG/0-6400 MILS
- 4 TIME-TELLING MEASURES
 - 4A USE A 24-HOUR OR DIGITAL CLOCK TO TELL TIME
 - 4B NAME INTERVALS AND TELL TIME IN HOURS, MINUTES, AND SECONDS
 - 4C ESTIMATE TIME IN SECONDS, MINUTES, AND PARTS OF AN HOUR
 - 4D IDENTIFY CALENDAR UNITS AND ARRANGE THEM IN JULIAN STYLE
 - 4E CONVERT TIME INTO HOURS AND TENTHS OF HOURS
 - 4F COMPUTE TIME - USE GREENWICH MEAN TIME (GMT) TO ESTABLISH ZONES & DISTANCES
- 5 GAUGE MEASURES
 - 5A IDENTIFY THE UNIT OF MEASUREMENT FOUND ON AN INSTRUMENT
 - 5B INTERPRET THE NUMBER, WORD, SYMBOL FROM A DISPLAY READ-OUT
 - 5C RECOGNIZE A "READING" FROM A GAUGE WITH COLOR DIVISIONS
 - 5D RECOGNIZE POSITIVE (+) AND NEGATIVE (-) DEMARCATION ON A SCALE
 - 5E SELECT BAND(S) FROM A MULTI-SCALE GAUGE
 - 5F MATCH A GAUGE READING TO A SPECIFICATION USING NUMBERED, LABELED INTERVALS
 - 5G INTERPRET GAUGE READINGS FROM AN UNNUMBERED/UNMARKED INTERVAL
 - 5H INTERPRET A GAUGE READING WHICH IS FLUCTUATING OR MOMENTARILY SUSTAINED
 - 5I MATCH SPECS OF REQUIRED MEASURES BY MANIPULATION, ALIGNMENT OR MAINTENANCE

6 SPATIAL

6A IDENTIFY DIRECTIONS THAT TOOLS, HARDWARE, OR COMPONENTS MAY BE MOVED

6B MANIPULATE OBJECTS TO ALIGN, MATCH, MATE, BE PARALLEL, PERPENDICULAR, ANGLED

6C INTERPRET SPATIAL RELATIONSHIPS OF FIGURES AND OBJECTS FROM 2-D REP

6D RELATE GEOMETRIC SYMBOLS AND GRAPHIC REPRESENTATIONS TO ACTUAL SYSTEMS, ETC

7 LINES

7A IDENTIFY AND NAME POINTS, LINES, RAYS, AND SEGMENTS

7B IDENTIFY INTERSECTING LINES, PARALLEL LINES, AND LINE SEGMENTS

7C DEFINE AND IDENTIFY PERPENDICULAR LINES

7D IDENTIFY CONGRUENT SEGMENTS

8 PLANES

8A IDENTIFY AND NAME PLANE GEOMETRIC FIGURES

8B LIST THE CHARACTERISTICS OF GEOMETRIC FIGURES

8C CLASSIFY FIGURES ACCORDING TO THE NUMBER OR MEASURE OF THEIR SIDES OR ANGLES

8D IDENTIFY FIGURES WHICH POSSESS SIMILARITIES

8E IDENTIFY FIGURES WHICH MAY BE PARALLEL, PERPENDICULAR OR CONGRUENT

9 ANGLES AND TRIANGLES

9A IDENTIFY, NAME AND SYMBOLIZE THE DIFFERENT KINDS OF ANGLES AND TRIANGLES

9B IDENTIFY VERTICAL, ADJACENT, COMPLEMENTARY OR SUPPLEMENTARY ANGLES

9C CLASSIFY TRIANGLES ACCORDING TO THEIR SIDES OR ANGLE-SIZE

9D IDENTIFY ALTITUDES AND MEDIANS OF TRIANGLES OR THE BISECTOR OF AN ANGLE

9E NAME AN ANGLE BY USING LETTERS, A NUMBER, OR A SINGLE LETTER

10 SOLIDS

10A RECOGNIZE AND MATCH THE NAMES OF SOLIDS WITH THEIR CORRESPONDING FIGURES

11 TERMINOLOGY

11A IDENTIFY TECHNICAL WORDS ASSOCIATED WITH GEOMETRIC FIGURES

11B INTERPRET MEANING OF TERMS DERIVED FROM SPATIAL ORIENTATION

12 ADDITION AND SUBTRACTION

12A ADD OR SUBTRACT WHOLE NUMBERS, WITHOUT CARRYING OR BORROWING

12B ADD OR SUBTRACT WHOLE NUMBERS, CARRYING AND BORROWING

12C ADD & SUBTRACT, BORROWING & CARRYING WITH MIXED NUMBERS (WHOLE AND DECIMAL)

12D ADD OR SUBTRACT POSITIVE & NEGATIVE NUMBERS USING A NUMBER LINE FOR SOLUTION

12E ADD OR SUBTRACT TO FIND CORRECT TIME (24 HR. CLOCK) USING HOURS OR MINUTES

12F ADD OR SUBTRACT VARIOUS INCREMENTS ON GAUGES, DIALS, OTHER MEAS. INSTRUMENTS

12G ADD OR SUBTRACT TIME, LINEAR, DRY, LIQUID OR DEGREE MEASURES REQ. REGROUPING

12H ESTIMATE A SUM OR DIFFERENCE

13 MULTIPLICATION AND DIVISION

13A MULTIPLY AND DIVIDE WHOLE NUMBERS

13B MULTIPLY AND DIVIDE MIXED NUMBERS (WHOLE AND DECIMALS)

13C DIVIDE A NUMBER WITH DECIMALS IN BOTH DIVISOR AND DIVIDEND

13D MULT & DIV INTEGERS, BOTH POSITIVE & NEGATIVE & ASSIGN
PROPER SIGN TO RESULT

13E ESTIMATE A PRODUCT OR QUOTIENT

14 FRACTIONS/DECIMALS

14A SUBDIVIDE WHOLE OBJECTS OR A SET OF OBJECTS INTO $1/2$ 'S,
 $1/3$ 'S, $1/4$ 'S, $1/8$ 'S

14B REDUCE FRACTIONS TO LOWEST TERMS

14C CONVERT FRACT. (PROPER & IMPROPER) TO DEC. EQUIV & VICE
VERSA USING TABLE

14D COMPUTE EQUIVALENT VALUE OF FRACT., DEC., PERCENTS, & MIXED
NOS. TO LOWEST TERMS

14E ADD AND SUBTRACT FRACTIONS, WITH SAME OR DIFFERENT
DENOMINATIONS

14F MULTIPLY AND DIVIDE FRACTIONS WITH AND WITHOUT WHOLE NUMBERS

14G ESTIMATE A FRACTIONAL SUM, PRODUCT, OR QUOTIENT

15 GEOMETRY

15A DRAW GEOMETRIC FIGURES, PLANE AND SOLID

15B MATCH GEOMETRIC FIGURES WITH WORD NAMES, EQUIVALENT MEASURES

15C LABEL GEOMETRIC FIGURES USING MATHEMATICAL AND CHARACTERISTIC
DESIGNATORS

15D USE A PROTRACTOR TO MEASURE ANGLES, MAKE GEOMETRICAL
CONSTRUCTIONS

15E CONSTRUCT PERPENDICULAR ON A LINE SEGMENT, BISECTOR OF AN
ANGLE

15F COMPUTE THE PERIMETER AND AREA OF ANY FIGURE

15G COMPUTE THE CIRCUMFERENCE AND AREA OF A CIRCLE

15H COMPUTE THE AREA AND VOLUME OF ANY SOLID FIGURE

- 15I USE FORMULAS IN SOLVING PROBLEMS INVOLVING GEOMETRIC FIGURES
- 15J SOLVE PROBLEMS & INTERPRET SPATIAL RELATIONS OF FIGURES, ETC FROM 2-D REP
- 16 COMBINATION OF PROCESSES
 - 16A IDENTIFY MEDIAN AND MODE
 - 16B COMPUTE AVERAGES
 - 16C SOLVE PROBLEMS COMBINING ALL PROCESSES USING WHOLE, MIXED NOS. AND FRACTIONS
 - 16D SOLVE PROBLEMS, COMBINING ALL PROCESSES, INVOLVING UNITS OF MEASUREMENT
 - 16E INTERPRET INFO FROM CHARTS, NUMBER LINES, SCALES & GRAPHS TO SOLVE ARITH PROB
 - 16F SOLVE CONVERSION PROBLEMS OF LINEAR, LIQUID, WEIGHT AND TEMPERATURE MEASURES
 - 16G SOLVE PROBLEMS INVOLVING RATIO AND PROPORTION
 - 16H SOLVE WORD PROBLEMS WHERE ANY MATHEMATICAL PROCESS MAY OCCUR
- 17 GRAPHING IN THE COORDINATE PLANE
 - 17A IDENTIFY COORDINATES OF A POINT IN ANY GRID SYSTEM
 - 17B IDENTIFY POINTS ON A LINE GRAPH
 - 17C MATCH A GRAPH WITH ITS EQUATION
- 18 ALGEBRA
 - 18A SOLVE SIMPLE ALGEBRAIC EQUATIONS WITH ONE UNKNOWN
 - 18B RECOGNIZE AND DERIVE EQUIVALENT ALGEBRAIC EXPRESSIONS
 - 18C EVALUATE POWERS AND ESTIMATE ROOTS
- 19 TRIGONOMETRY
 - 19A USE TABLES OF TRIGONOMETRIC FUNCTIONS
 - 19B USE TABLES OF LOGARITHMS TO SOLVE PROBLEMS

19C SOLVE GEOMETRIC PROBLEMS USING TRIGONOMETRIC FUNCTIONS

19D USE TRIGONOMETRIC RATIOS TO SOLVE PROBLEMS

25 PROCEDURAL DIRECTIONS

25A IDENTIFY FACTUAL DETAILS OR SPECIFICATIONS FOUND WITHIN A STATEMENT

25B SELECT PARTS OF TEXT AND VISUAL MATERIALS TO COMPLETE A TASK ACTIVITY

25C FOLLOW HIGHLY-DETAILED DIRECTIONS TO ACCOMPLISH SEQUENCE OF TASK ACTIVITIES

25D DETERMINE THE ESSENTIAL MESSAGE OF A PARAGRAPH OR SECTION OF WRITTEN MAT'L

25E INFER FROM A WRITTEN SOURCE, WHERE INFO IS NOT EXPLICIT, TO MAKE A DECISION

25F SYNTHESIZE INFO FROM WRITTEN SOURCES CONTRIBUTING TO COMPLETION OF TASK

26 VOCABULARY

26A RECOGNIZE COMMON WORDS AND THEIR MEANINGS

26B RECOGNIZE TASK-RELATED WORDS WITH TECHNICAL MEANINGS

26C IDENTIFY THE CORRECT MEANING OF A WORD FROM THE CONTEXT OF A SENTENCE

26D RECOGNIZE THE MEANING OF COMMON CONTRACTIONS, ABBREVIATIONS AND ACRONYMS

26E DETERMINE MEANING OF FIG, IDIOM, TECH TERMS USING CONTEXT CLUES, REFERENCES

27 REFERENCE SKILLS

27A LOCATE TM, FM, OR ANY RELATED SOURCE DOCUMENT BY CODE NUMBER AND TITLE

27B ALPHABETIZE WORDS OR TOPICS TO LOCATE INFORMATION

27C USE TABLE OF CONTENTS, INDEX, HEADINGS, APPENDIX & GLOSSARY

TO LOCATE INFO

- 27D LOCATE PAGE, TITLE, PARA, FIG, OR CHARTS TO ANSWER QUESTION/
SOLVE PROBLEM**
- 27E DETERMINE, AFTER SCANNING OR SKIM-READING, WHETHER THE
INFO IS RELEVANT**
- 27F XREF W/IN & ACROSS SOURCE DOCUMENTS, SELECT INFO NEEDED TO
PERFORM ROUTINE**
- 27G ORGANIZE INFO FROM MULTIPLE SOURCES INTO A SEQUENCED SERIES
OF EVENTS**

28 TABLES/CHARTS

- 28A OBTAIN A FACT OR SPECIFICATION FROM A 2-COLUMN TABLE OR
CHART TO FIND INFO**
- 28B OBTAIN A FACT OR SPEC FROM AN INTERSECTION OF A ROW BY
COLUMN TABLE OR CHART**
- 28C USE COMPLEX TABLE/CHART REQUIRING XREF W/IN CHART OR IN
COMBW/OUTSIDE TEXT**
- 28D APPLY INFO FROM TABLES & CHARTS TO LOCATE MALFUNCTIONS/
SELECT ACTION COURSE**

29 ILLUSTRATIONS

- 29A IDENTIFY DETAILS, LABELS, NUMBERS, AND PARTS FROM AN
ILLUSTRATION OR PICTURE**
- 29B IDENTIFY PARTS OR DETAILS ACCORDING TO A KEY OR LEGEND**
- 29C INTERPRET A CROSS-SECTIONAL DRAWING OF AN OBJECT FOR
ASSEMBLY OR DISASSEMBLY**
- 29D INTERPRET 3-D PROJ OR EXPLODED VIEW FOR ASSEMBLY OR POSITION
IN SYS/SUBSYS**
- 29E FOLLOW ILLUSTRATIONS OR PHOTOGRAPHS, ARRANGED IN A
SEQUENTIAL ORDER, AS GUIDE**
- 29F INTEGRATE INFORMATION FROM VARIOUS SOURCES TO SELECT A
COURSE OF ACTION**

30 FLOW CHARTS

30A USE A SIMPLE LINEAR PATH OR ORGNIZATIONAL CHART TO LIST EVENTS IN SEQUENCE

30B USE A LINEAR PATH OF A FLOW CHART TO PROVIDE VISUAL AND TEXTUAL DIRECTIONS

30C TRANSLATE THE SIGNIFICANCE OF THE SYMBOLS INTO PHYSICAL ACTIVITIES

31 SCHEMATICS

31A ISOLATE EACH MAJOR SECTION OR ENTITY PRESENTED IN A SCHEMATIC DIAGRAM

31B IDENTIFY THE COMPONENTS WITHIN EACH ENTITY

31C TRACE CONNECTIONS IN AN INTEGRATED CIRCUIT FROM ORIGIN TO ANOTHER POINT

31D ISOLATE A PROBLEM COMPONENT IN A SCHEMATIC & TRACE IT TO CAUSING COMPONENTS

31E INTERPRET SYMBOLS TO INDICATE DIRECTION OF FLOW, TEST POINTS, COMPONENTS, ETC

32 FORMS

32A LOCATE THE BLOCK ON A FORM TO ENTER THE APPROPRIATE INFORMATION

32B TRANSFER A NO., DATE, ETC. FROM EQUIP. OR WRITTEN SOURCE TO SECTION OF FORM

32C WRITE NAME OF ORG., PERSONNEL, DISPOSITION, NOMENCLATURE ETC IN FORM SECTION

32D WRITE A DESCRIPTIVE ACCOUNT OF AN ACTIVITY OR TRANSACTION PERFORMED

32E USE A COMPLETED FORM TO LOCATE OR COMPARE INFORMATION

33 NOTE-TAKING

33A DISTINGUISH BETWEEN ESSENTIAL AND NON-ESSENTIAL DETAILS WHILE NOTE-TAKING

33B RECORD DETAILS W/O MISINTERPRETING INTENT OF WRITTEN

MATERIAL OR INTERVIEW

33C REWRITE ALL RECORDED DETAILS IN SENTENCE FORM

33D ORGANIZE ALL SENTENCES INTO PARAGRAPHS

34 OUTLINING (TOPIC OR SENTENCE)

34A DISTINGUISH BETWEEN MAJOR AND SUBORDINATE TOPICS

34B GENERATE TITLES FOR EACH MAJOR TOPIC SELECTED

34C USE PHRASES/SENTENCES TO PROVIDE SUBORDINATE DETAILS FOR EACH MAJOR TOPIC

34D ALTERNATE, INDENT NUMBERS AND LETTERS TO ESTABLISH A HIERARCHY

35 REPORT WRITING

35A STATE THE INTENT OR OBJECTIVE(S) OF THE REPORT

35B DESCRIBE THE PARAMETERS OF THE EVENT OR SITUATION

35C DISTINGUISH BETWEEN RELEVANT AND IRRELEVANT DETAILS

35D SEQUENCE EVENTS IN THE ORDER THEY HAVE OCCURRED

35E STATE GENERAL IMPRESSIONS OF EVENTS DESCRIBED

35F SELECT EXAMPLES THAT WILL CLARIFY MAJOR ISSUES PRESENTED IN THE REPORT

35G EXAMINE OPPOSING POINTS OF VIEW IN THE REPORT

35H SUMMARIZE THE MAJOR POINTS DEVELOPED IN THE REPORT

35I JUSTIFY AN ACTION TAKEN AND GIVE REASONS FOR REJECTING ALTERNATIVES

36 EDITING

36A SPELL FREQUENTLY USED WORDS CORRECTLY

36B SPELL TASK-RELATED WORDS CORRECTLY

36C IDENTIFY WORDS THAT NEED TO BE CAPITALIZED

36D CORRECT ALL MISSPELLED WORDS WITH OR WITHOUT THE USE OF A REFERENCE SOURCE

36E APPLY ALL RULES FOR END MARKS, COMMAS, AND APOSTROPHES

36F APPLY COMMON RULES OF GRAMMAR

36G REWRITE PARAS: STATE MAIN IDEA IN FIRST SENTENCE, RESTRUCTURE FOR COHERENCE

36H APPRAISE AN ENTIRE WRITTEN COMMUNICATION & MAKE ADJ. TO IMPROVE CLARITY

37 TYPE

37A INDIVIDUAL - A PERSON WORKING ON A TASK AND COMMUNICATING WITH ANOTHER

37B INSTRUCTION- COMMUNICATION BETWEEN INSTR. & INDIVID. OR GROUP TO PASS FACTS

37C TUTOR-INTERACTION BETWEEN TWO PERSONS - ONE INSTRUCTING, ONE DOING THE TASK

37D PEER GROUP(LESS THAN 10)- ACTIVITY WHERE ONE PERSON ASSUMES LEADERSHIP ROLE

37E INTERVIEW - COMMUNICATING W/ANOTHER TO USE THE INFORMATION IN A TASK

37F BRIEFING - COMMUNICATING FINAL INSTRUCTIONS OR GIVING AN ACCOUNT IN SUMMARY

37G COUNSEL - COMMUNICATING TO EXCHANGE IDEAS OR OPINIONS TO RECOMMEND, ADVISE

37H COMMAND - COMMUNICATE AN ORDER OR ACTION TO BE TAKEN

38 CHARACTERISTICS

38A ENUNCIATE CLEARLY, USING THE PROPER RATE OF SPEECH

38B USE TECHNICAL VOCABULARY SUITABLE TO THE TASK AND LEVEL OF THE PERSON

38C DETERMINE THE APPROPRIATE AMOUNT OF INFORMATION TO COMMUNICATE

38D INTERPRET FIGURATIVE OR IDIOMATIC LANGUAGE BY REFERENCE TO USE IN CONTEXT

38E FOLLOW HIGHLY DETAILED, STEP-BY-STEP DIRECTIONS

38F SOLICIT FEEDBACK TO CONFIRM THE ACCURATE RECEPTION OF THE COMMUNICATION

38G RECOGNIZE WHEN A LOW-KEY, INFORMAL DIALOGUE IS SUITABLE

38H RECOGNIZE WHEN DIRECT VERBAL COMMANDS ARE NECESSARY

38I RECOGNIZE WHEN A SERIES OF VERBAL INTERACTIONS IS REQUIRED TO COORDINATE

38J RECOGNIZE WHEN SITUATION WILL REQUIRE A STRUCTURED METHOD OF PRESENTATION

39 BARRIERS

39A RECOGNIZE NEED FOR CLEAR CONCISE DIRECTIONS: AVOID WORD-MEANING DIFFERENCES

39B RECOGNIZE PERSONALITY FACTORS & INTER-PERSONAL RELATIONSHIPS THAT MAY EXIST

39C RECOGNIZE FEEDBACK AIDS EFFECTIVE COMMUNICATION & INCREASES TASK COMPETENCE

40 PRECAUTIONS

40A USE COMMON KNOWLEDGE TO AVOID HAZARDS TO PREVENT INJURY TO SELF OR EQUIP.

40B APPLY PREVENTIVE MEASURES PRIOR TO TASK: MINIMIZE SAFETY OR SECURITY PROBLEMS

40C SELECT AN APPROPRIATE COURSE OF ACTION IN THE EVENT OF AN EMERGENCY

41 RECOGNITION

41A IDENTIFY SIMILARITIES AND DIFFERENCES BETWEEN AND AMONG OBJECTS

41B USE BODY LANGUAGE (MOTIONS, GESTURES, POSTURES) TO COMMUNICATE OR SIGNAL

- 41C DETERMINE THE PRESENCE OF A DEFECT OR EXTENT OF DAMAGE
- 41D MATCH OBJECTS BY SIZE, SHAPE, COLOR, AND SIGNIFICANT MARKING
- 41E CLASSIFY OBJECTS BY SIZE, SHAPE, COLOR AND SIGNIFICANT MARKINGS
- 41F DETERMINE DIRECTION, DURATION, AND INTENSITY OF SOUNDS, SIGHT SIGHTINGS, AND SMELLS
- 41G INFER FROM SIGHTS, SOUNDS, TOUCH, SMELLS, OR TASTES TO DETERMINE COURSE OF ACTION
- 41H INTERPRET CODES AND SYMBOLS
- 45 MOTOR SKILL
 - 45A MULTI-LIMB COORDINATION: COORDINATE GROSS MOVEMENTS REQUIRING USE OF LARGE SKELETAL MUSCLES FOR STRENGTH
 - 45B MANUAL DEXTERITY: MAKE SKILLFUL, CONTROLLED ARM/HAND MOVEMENTS IN MANIPULATING LARGE OBJECTS UNDER SPEED CONDITIONS
 - 45C CONTROL PRECISION: HIGHLY CONTROLLED, PRECISE MUSCULAR ADJUSTMENTS, OPERATING CONTROLS BY HAND, ARM OR FOOT MOVEMENTS
 - 45D RESPONSE ORIENTATION: SELECT APPROPRIATE RESPONSE, EACH PATTERN OF SIGNALS REQUIRES A DIFFERENT CHOICE OF CONTROLS AND DIRECTION AND MOVEMENT-SPEED AND ACCURACY
 - 45E REACTION TIME: SPEED WITH WHICH AN INDIVIDUAL IS ABLE TO RESPOND TO AN AUDITORY OR VISUAL STIMULUS
 - 45F RATE CONTROL: MAKE CONTINUOUS ANTIICIPATORY MOTOR ADJUSTMENTS RELATIVE TO CHANGES IN SPEED OF A MOVING TARGET
 - 45G FINGER DEXTERITY: SKILLFUL, CONTROLLED MANIPULATIONS OF SMALL OBJECTS, PRIMARILY FINGER MOVEMENTS OF SMALL
 - 45H ARM-HAND STEADNESS: MAKE PRECISE ARM-HAND POSITIONING MOVEMENTS WHERE STRENGTH AND SPEED ARE MINIMIZED
 - 45I WRIST-FINGER SPEED: MAKE RAPID, PRECISE TURNING,

TAPPING, TRIPPING, ALIGNING MOTIONS IN RESPONSE TO
AUDITORY OR VISUAL STIMULI

46 OPERATIONS

- 46A OPERATE EQUIPMENT OR BE A CREW MEMBER ENGAGED IN
MANUALLY LIFTING OR MOVING OBJECTS
- 46B USE HAND TOOLS CONSIDERED TO BE COMMON; DETERMINE SIZES AND
AND SELECTION; PLIERS, SCREWDRIVERS, HAND DRILLS---SIMPLE
MECHANICAL OPERATIONS, MAINLY REMOVE AND REPLACE
- 46C INSTALL, RELOCATE AND REMOVE
- 46D ADJUST, REPAIR, MAINTAIN MECHANICAL, ELECTRICAL,
HYDRAULIC SYSTEMS OR SUBSYSTEMS; DISSEMBLE AND ASSEMBLE
USING HAND TOOLS
- 46E TESTING EQUIPMENT USED IN THE PRODUCTION, TRANSMISSION
DISTRIBUTION, AND UTILIZATION OF ENERGY SOURCES
- 46F CURRING, BENDING, TRIMMING, WELDING, RIVETING ETC.
TO FORCE, SHAP OR FABRICATE METALS
- 46G OPERATOR CHECKS AND SERVICES IN RESPONSE TO A VARIETY
OF EXTERNAL SIGHTS AND SOUNDS
- 46H POSSESS THE PHYSICAL ABILITY TO PERFORM IN COMBAT
OR POLICE ACTIONS
- 46I CLERICAL DUTIES, MAINTAINING RECORDS, OPERATING
OFFICE MACHINES, PROCESSING DATA USING ELECTRONIC
MACHINES
- 46J PERFORM ACTS REQUIRING SKILL AND CARE OF INJURED OR
INFIRMED PERSONS

47 EQUIPMENT USE

48 OTHER

Appendix D
Test Plan Matrices

ITEM TAXONOMY FOR MULTIPLE CHOICE ITEMS

PLL MANUAL

	Request for Issue NSN (1)	Turn-in (2)	RX (3)	PII Main (4)	Supply Status (5)	RFI non- NSN (6)	Follow-ups (7)	General (8)
Form Functions (A)								
Definitions (B)								
Form Fill Out (C)								
Form Related (D)								
Postings (E)								
Systems Procedures (F)								

PLL AUTOMATED

	RF/NSN	RFI/MPN	QSS	RX	Modifiers, Etc.	Status Reconciliation	Turn-ins	PLL Procedures
Form Functions								
Definitions								
Form Fill Out								
Form Related								
Postings								
System Procedures								

TAMMS

	DISPATCH	RFM	MCSR	ECR	OIL ANALYSIS	PMS+R	GENERAL
Form Functions							
Definitions							
Form Fill Out							
Form Related							
Postings							
System Procedures							

SHOP STOCK CLERK MANUAL

	RF/NSN	RF/MPN	RX	MODIFIERS, ETC.	STATUS	TURN-INS	SLL MAINT.
Form Functions							
Definitions							
Form Fill Out							
Form Related							
Postings							
System Procedures							

SHOP STOCK CLERK AUTOMATED

	RFI/NSN	RFI/MPN	MODIFIERS, ETC.	STATUS	TURN-INS	SLL PROCEDURES	GENERAL
Form Functions							
Definitions							
Form Fill Out							
Form Related							
Postings							
System Procedure							

SHOP CLERK

	RFM	MWR	Completed RFM	Process Corrections to the Maint. Transaction Error List
Form Functions				
Definitions				
Form Fill Out				
Form Related				
Postings				
System Procedure				

Appendix E
76C (PLL) Test Plan

Test Plan for 76C AIT Duty Position Annexes

This test plan specifies the kind and number of items to be used in developing performance tests for the four duty position annexes taught in the 76C AIT course: PLL (manual and automated), TAMMS, shop stock (manual and automated), and shop clerk. Alternate forms of the end of the annex test should be constructed within the framework of the plan. Each of the tests must cover the critical tasks for that annex.

The test plans are designed as part of a CMI system in which scores are computed and analyzed by the hardware/software system in operation. For on-line tests, trainees will answer test items on the terminal screen and their test scores will be computed directly (cf. prototype CMI system [Interamerica, 1986]). For off-line tests, the answers to tests are typed individually into the CMI system using appropriate test and student identification, which then computes the score.

Each test item is assigned a taxonomic code based on the type of information or knowledge needed to answer it correctly (see Appendix D for the diagrams of the taxonomic plans for each of the four duty positions in the 76C MOS). The software program tallies the correct and incorrect responses for each student and provides figures on the proportion choosing each item alternative in multiple choice questions. In addition, the items missed on each taxonomic category cell are summed and provided as output tables. From these tables, instructors can quickly determine the particular functional areas which have not been mastered by the trainee. Summations should also be provided by row and column of the taxonomic matrix. For example, if a trainee misses a PLL item with code 6C (Request for issue, non-NSN repair part - form fill out) and two items with code 4C (PLL maintenance - form fill out) there would be one error in column 4, one error in column 6, and 3 errors in row C. Thus, the trainee would be exhibiting particular problems with form fill out operations.

PLL Annex (Manual)

The end of annex test for the PLL (Manual) is composed of 7 form fill out items and 35 multiple-choice items. The form fill out items will be worth a total of 65 points. Thirty-five multiple-choice items will be worth 1 point each for 35 points total. Thus the test as a whole will be worth 100 points.

Form Fill Out Items

The form fill out items will contain versions of the main forms used in the course of the PLL clerk's duties. The set of forms to be used are: the DA Form 2765-1, DD Form 1348-6, DA Form 2402, DA Form 3318, DA Form 2063-R, and DA Form 2064. The six items should constitute a representative set of the functional activities that the PLL clerk must perform in a typical day. The following critical tasks will be covered in these items as of

February 1986 (cf. Appendix A): a) process a request for a prescribed load list (PLL) repair part, 2) process a request for nonstockage list repair part, 3) process a request for non-national stock number repair part, 4) process request for repair part designated as RX (repairable exchange), 5) turn-in repair parts, 6) conduct review and inventory of PLL records, 7) process supply and shipment status list or cards, 8) initiate follow up or document modification action. Optionally, the following tasks may be covered in addition: 1) prepare and maintain nonstockage list records, 2) maintain a PLL, 3) initiate cancellation action, and 4) perform reconciliation of due-in.

The purpose of the form fill out items is the measurement of the trainees ability to correctly fill out the major forms currently being used in the course of the work performed by the PLL (manual) clerk. The test taker will be provided with a set of information which would be generally available to him in the job environment in order to fill out the forms correctly, including relevant technical manuals, DA pamphlets and supply unit codes. Specifically, these materials will be provided in advance to the test taker: 1) technical manuals (excerpts) containing the NSN, figure number, item number for non-stock supply parts named, 2) parts on a repairable exchange (RX) list, 3) DA Pam 710-2-1 including appendices, 4) a unit PLL containing NSN, item description unit of issue, and quantity for stock parts, and 5) general unit information (e.g., DIC, FAD, DODAAC, SSA, location, CO).

Each of the seven form fill out items should be independent of the responses to the other items although they may deal with the same class of parts. The items should function as an integrated series of activities comprising "a day in the life" of a PLL clerk.

Item Format

Item A. This item tests the ability to complete a request for issue for PLL parts and nonstockage parts possessing an NSN and the requisite posting of the transactions to the supply records. The following information is provided to the test taker in addition to the general information:

- a) the name of 5 parts to be issued or ordered there at least one and not more than 2 parts will be non stockage NSN parts,
- b) 5 unfilled DA Form 2765-1. Preprinted versions may be used for those parts which are on the PLL,
- c) narrative information sufficient to derive a UND and the end item,
- d) one filled in DA Form 2064,
- e) one DA Form 3318 with at least one previous demand and request for each of the PLL parts,
- f) one unfilled DA Form 3318 for each of the non-stocked parts.

A scenario which provides the basis for ordering the parts will be provided which will be representative of a typical job situation. The test taker will be asked to fill out the following information on the preprinted DA Form 2765: a) quantity requested with unit of issue, b) Julian date/serial number, c) EIC, d) PD, e) NMCS or ANMCS, f) item information (NSN, name). With respect to the manual DA Form 2765s, the test taker will fill out the information listed above plus a) the DIC, b), DODAAC, and c) demand code.

In the second part, after all the DA Form 2765s have been filled in, the test taker will post the supply actions to the document register (DA Form 2064). The test-taker will enter: a) the Julian date, b) serial number, c) the last three digits of the SSA DODAAC, d) the NSN, e) item name, f) PD, g) quantity requested, and h) Julian follow up due date.

In the third part, the test taker will take the appropriate action to post the requests to the Record of Demands DA Form 3318. For PLL items, the respective DA Form 3318 will have the title insert filled in; in addition, at least one demand and one request will be listed. For the non PLL items the respective DA Form 3318s will have no information in the title insert. However, the test taker will supply the: a) NSN, b) document number, c) quantity requested, d) quantity due in, e) end item, :) item description.

Item Scoring (A): This item is worth a total of 5 points. One or more errors in the following parts of the DA Form 2765 will be penalized by the full 5 points: a) quantity requested, b) EIC, c) PD, d) item information, e) unit issue. The full five points are deducted since these errors could lead to inaccurate ordering of the items and are indicative of the test taker's technical knowledge for PLL manual procedures. Multiple errors are not additionally penalized. One or more errors in the following parts of the DA Form 2765 are penalized a total of one point: a) Julian date and serial number, b) DIC, c) DODAAC, and d) demand code.

One or more errors in the DA Form 2064 are penalized a total of one point. One or more errors in the DA Form 3318s are penalized a total of one point.

Example: A test taker makes an error on the Julian date in the DA Form 2765, two errors on the DA Form 2064, and two errors on the DA Form 3318s. A total of 3 points are deducted; one point for missing the Julian date, one point for the one (or more) errors on the DA Form 2064, and one point for the one (or more) errors on the DA Form 3318.

Item B. This item tests the capacity to complete a turn-in of parts. The following information is provided to the test taker in addition to the general information:

- a) the names of the parts to be turned in,
- b) two unfilled DA Form 2765-1s.

A scenario which provides the basis for turning in the parts will be provided which will be representative of a typical job situation. The test taker will be asked to fill out the following information on the DA Form 2765-1: a) quantity being turned in, b) NSN (if applicable), c) item description, d) condition, e) DODAAC, f) Julian date and serial number, g) unit making turn in, and h) date turn-in completed.

Item Scoring. This item is worth a total of 5 points. One or more errors in the following parts of the DA Form 2765-1s will be penalized by deducting 5 points: a) condition, b) NSN (if applicable) one or more errors in the following parts of the DA Form 2765-1 will be penalized by deducting one point, a) quantity, b) item, c) DODAAC, d) Julian date and serial number, e) unit making turn in, and f) date turn in completed.

Item C. This item tests the capacity to order non-NSN parts. The following information is provided to the test taker in addition to the general information:

- a) the names of 2 non-NSN parts to be ordered,
- b) the name of 1 NSN part which does not need to be ordered,
- c) narrative information sufficient to derive a UND
- d) two unfilled DD Form 1348-6s for the non-NSN parts to be ordered,
- e) an excerpt from the MCR to determine if the parts do have NSNs.

A scenario which provides the basis for ordering the parts will be provided which will be representative of a typical job situation. The test taker will be asked to determine which of the parts do not have an NSN and then order those parts. The following information will be filled out on the DD Form 1348-6: a) part number, b) FSCM, c) item description, d) quantity, e) unit of issue, f) PD, 8) Julian date and serial number, h) DODAAC.

Item Scoring. This item is worth a total of 5 points. One or more errors in the following parts of the DD Form 1348-6s will be penalized by deducting 5 points: a) part number, b) FSCM, c) unit issue, d) PD, and e) quantity requested. One or more errors in the following parts of the DD Form 1348-6 will be penalized by deducting one point: a) Julian date/serial number, b) DODAAC, and c) item description.

Item D. This item tests the capacity to execute a RX request. The following information is provided to the test taker in addition to the general information:

- a) the name of the RX parts to be ordered,
- b) narrative information sufficient to derive a UND and determine the PD code,
- c) two unfilled RX slips (DA Form 2765-1),
- d) two DA Form 3318s with at least one previous demand and request.

A scenario which provides the basis for exchanging RX parts will be provided which will be represented of a typical job situation. The test taker will be asked to fill out the following information on the RX slip (DA Form 2765-1): a) NSN, b) PD, c) deficiency, d) DODAAC, e) serial #, f) NMCS, g) noun, h) end item, and i) model.

Item Scoring. This item is worth a total of 5 points. One or more errors in the following parts of the DA Form 2765 will be penalized by the full 5 points, a) NSN, b) PD, c) serial #, d) noun, e) end item, and i) model. One or more errors in filling out the DA Form 3318s will be penalized one point.

Item E. This item tests the capacity to review demands and make the required changes to the unit's PLL. The following information is provided to the test taker in addition to the general information:

- a) four filled out DA Form 3318s for two PLL and two non-PLL items which require review,
- b) PLL stockage level task,
- c) one filled out DA Form 2063-R (consolidated),
- d) one blank DA Form 2063-R.

A scenario which provides the basis for a review of demands and consequent changes to the PLL will be provided to the test taker. The test taker will have to perform the following potential actions: a) determine whether a review is needed for the item, b) determine any changes in authorized stock level, c) determine any changes to PLL, d) make appropriate changes on DA Form 3318s in the event of stock level increases or decreases (e.g. post additional requests, cancel excess due-in. The test taker will fill out a revised DA Form 2063-R (consolidated) performing the following actions: a) arranging items in NIIN sequence, b) providing item description, c) unit of issue, d) authorized quantity, and e) remarks (e.g. added changes or deleted). In the second part the test taker will make appropriate notations on the DA Form 3318s such as a) adjust due in levels, b) change authorized stockage levels, and c) post additional requests.

Item Scoring. This item is worth a total of 5 points. One or more errors in the following parts of the DA Form 2063-R will be penalized the full 5 points: a) incorrect listing of items, b) incorrect stockage levels One or more errors in the following parts of the 2063-R will be penalized by one point: a) incorrect NIIN sequence, b) unit of issue, and c) remarks.

One or more errors in the following parts of the DA Form 3318 will be penalized by 2 points: a) adjusting due in levels and b) posting additional request. One or more errors in the following parts of the DA Form 3318 will be penalized by one point: a) changes in authorized stockage code.

Item F. This item tests the ability to post status and receive repair parts. The following information is provided to the test taker in addition to the general information:

- a) 3 receipts, two of which are copies of preprinted DA Form 2765s from the original request and one of which is a filled in DA Form 1348-1,
- b) 2 supply status cards on preprinted DA Form 2765s,
- c) one DA Form 2064,
- d) 3 DA Form 3318s one for each part (receipt),
- e) Appendix C: (Status Rejection codes).

A scenario which provides the basis for receiving parts (receipts) and supply status cards will be provided which will be representative of a typical situation. The test taker will be asked to fill out the following information on the DA Form 2064 after matching the document number, NSN, quantities and nomenclature of the receipt with the line item: a) post the quantities received from the receipt document, b) erase or change the quantity due-in, and c) enter date received.

If the item is a stockage item, post the following information to the appropriate DA Form 3318 a) change the quantity due-in, b) if ordered for a vehicle change the quantity due in and c) if the item is for stockage, adjust balance on hand.

If it is a partial quantity receipt test taker must post the actual quantity received to the DA Form 2064, b) new quantity due-in, and c) date available with appropriate status code. Then, if appropriate, he should post to the DA Form 3318 the new quantity due-in.

In the second part the test taker should post supply status information to the DA Form 2065 (i.e. cancellation of PLL items) and where appropriate to the DA Form 3318. The information posted will be the a) supply status, b) estimated delivery date, c) cancellation (if any) in remarks section. The cancellation will be posted to the DA Form 3318 as well by changing the quantity requested and due-in.

Item Scoring. This item is worth a total of five points. One or more errors in the following parts of the DA Form 2064 will be penalized 2 points: a) changes in quantity due-in, b) supply statutes (EDD). One or more errors in the following parts of the DA Form 2064 will be penalized one point: a) quantities received and b) date received. One or more errors in the following parts of the DA Form 3318 will be penalized 2 points: a) change quantity due-in if ordered for vehicle, b) changes in the balance on hand, and c) cancellation postings. One or more errors in the following parts of the DA Form 3318 will be penalized on point: quantities received.

Item G. This item tests the knowledge of conducting and posting follow-ups and one of the following activities: modifications or cancellations. The following will be provided the test taker in addition to the general information:

- a) one filled out DA Form 2064,
- b) two blank DA Form 2765s (for follow-ups),
- c) two status card DA Form 2765s (for cancellations),
- d) two blank DA Form 2765s (for document modifier requests),
- e) reconciliation list (for reconciliations and follow-ups).

Scenarios which provide the basis for two of the four activities listed above will be provided to the test taker which will be representative of a typical job situation.

For follow ups the test taker will be asked to determine from the DA Form 2064 (or reconciliation list) which items (no more than 2) require follow ups. For those items which require follow ups the test taker will fill in the following information on the DA Form 2765s: a) DODAAC, b) Julian date and serial number, c) NSN, d) item description, e) priority, f) quantity ordered from original request, g) NMCS/ANMCS identifier, h) document identifier code, i) recurring or nonrecurring, j) unit of issue, and k) EIC. The information will be obtained from the DA Form 2064 and the appropriate DA Form 3318.

In the second stage, the test taker will post the follow-ups to the DA Form 2064 by erasing the date the follow-up is due and status in column L and entering AF1 and the date of the transaction in column N.

For cancellation, the test taker will be asked to cancel one or two requests using the status cards (DA Form 2765) provided. The test taker will fill in the a) DIC, b) quantity to be cancelled, and c) routing identifier.

In the second stage, the cancellations are posted to the DA Form 2064 by entering the code AC1 and the Julian date in column N.

For document modifier requests the test taker will be asked to change the priority and/or the require delivery of one or two requests using the status cards (DA Form 2765) provided. The test taker will fill in the a) DIC, b) routing identifier code, c) priority), d) NMCS/ANMCS if required and e) the required delivery date.

In the second stage, the modification will be posted to the DA Form 2064. The test taker will erase the entry in column L and enter the DIC and Julian date in column N. If appropriate, the priority (required delivery) should be crossed out and the new one entered next to it. If necessary, changes to the document number must be made as well.

Item Scoring. This item is worth a total of 5 points. For follow-ups, one or more errors in the DA Form 2765 will be penalized 2 points. One or more errors in the DA Form 2064 will be penalized one point. For cancellations and document modifier requests one or more errors in the DA Form 2765 status cards will be penalized one point. One or more errors in the DA Form 2064 will be penalized one point.

Multiple-Choice Items

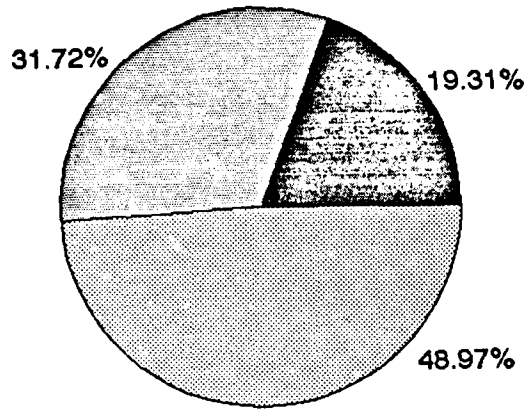
The end of annex PLL test will contain multiple-choice items in addition to the fill-in the form items. The 36 items will cover 8 topic areas: (1) requests for issue NSN, (2) turn-ins, (3) RX and QSS, (4) PLL maintenance, (5) supply status and receipts, (6) requests for issue (non-NSN), (7) follow-ups, modifications, cancellations, reconciliations, and (8) general information. Thirty of the items will be drawn from the first seven categories with each category being represented by no less than 2 and no more than 8 items. Each of these 30 items will be worth 2 points. The general information category will contain 5 items. Each of these items will be worth one point.

The items with two points will cover KSAs concerning the functional activities of the PLL clerk. These items will be constructed with a stem and four alternatives: A, B, C, D. The items will deal with 5 types of queries: 1) form functions, 2) definitions, 3) form fill out, 4) form related information, and 5) postings. Form functions involve the uses to which particular forms are put and the role they play in the activities of the PLL clerk. Definitions involve the meaning of key terms used in the different functional activities. Form fill out involves the way in which the different forms need to be filled out in order to fulfill their purpose and the kind of information which needs to be entered. Form related information involves additional knowledge (e.g. PDs, Julian dates) needed to complete the required forms. Posting involves the information from one form which needs to be transferred and recorded on another form for record keeping purposes.

The items worth one point will cover the general nature and function of the PLL duty position as it relates to other 76C duty positions and the supply system in general. These items will be constructed with a stem and four alternatives: A, B, C, D.

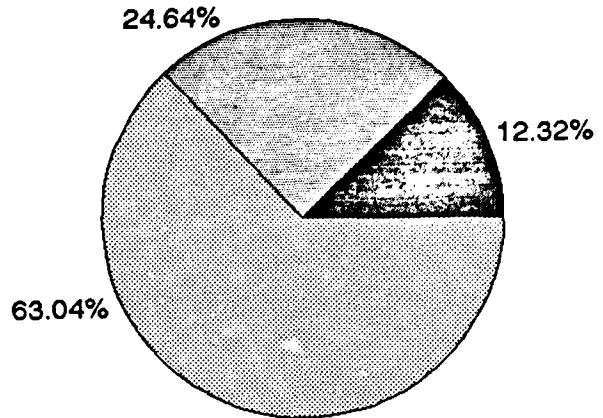
Appendix F
Job History Frequency Counts

PERSONNEL BY SITE



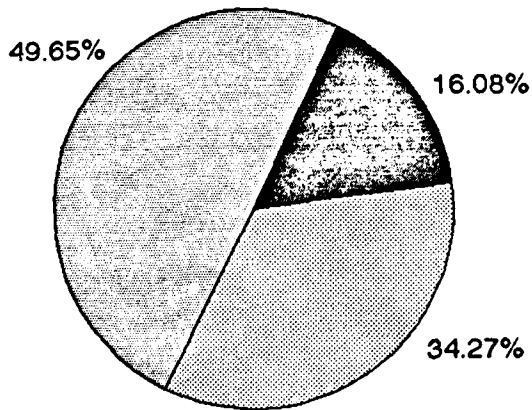
- Ft. Bragg
- Ft. Riley
- Ft. Lewis

CURRENT DUTY POSITION



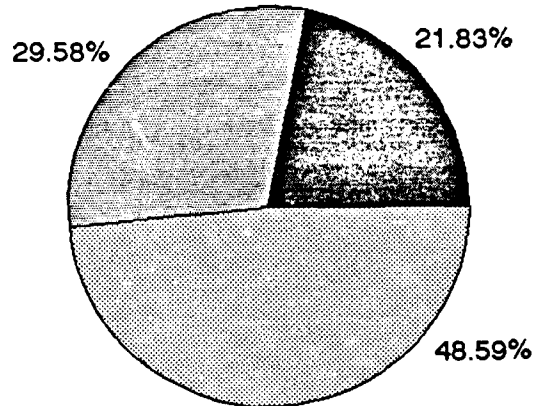
- SHOP Clerk
- TAMMS Clerk
- PLL Clerk

TIME IN CURRENT POSITION



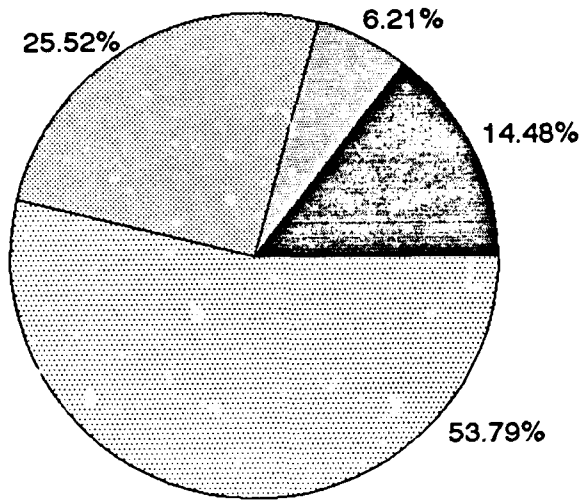
- 3 or more years
- 1-2 years
- Less than 1 year





PRIOR DUTY POSITION



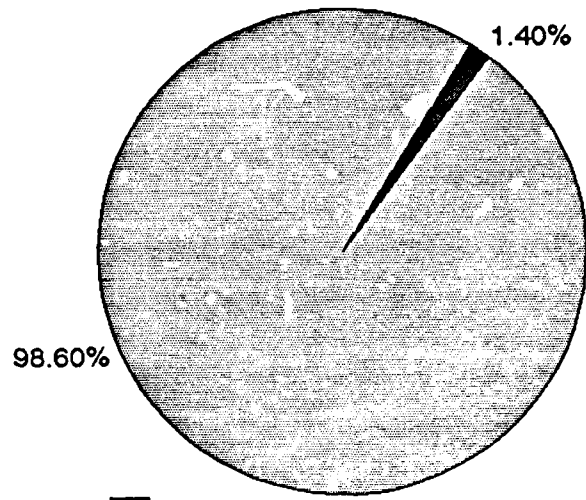
- SHOP Clerk
- TAMMS Clerk
- PLL Clerk

76C RANK



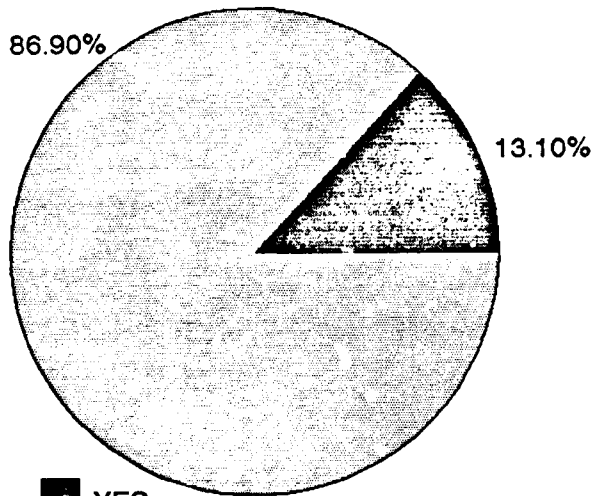
-  E5
-  E2
-  E3
-  E4



AIT TRAINING



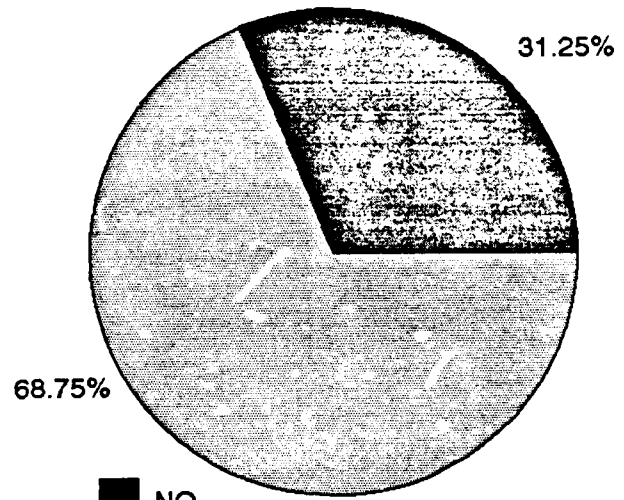
-  No AIT
-  AIT

REFRESHER TRAINING



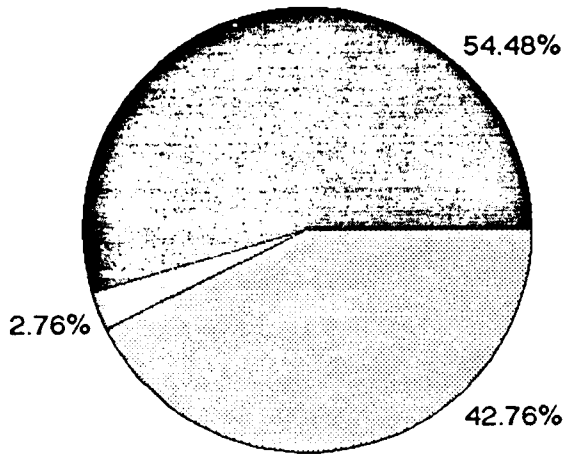
-  YES
-  NO




SHADOW SCHOOL



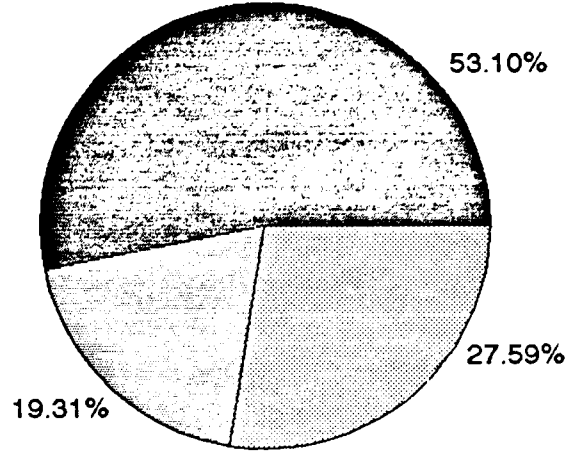
-  NO
-  YES




PERCEIVED JOB KNOWLEDGE



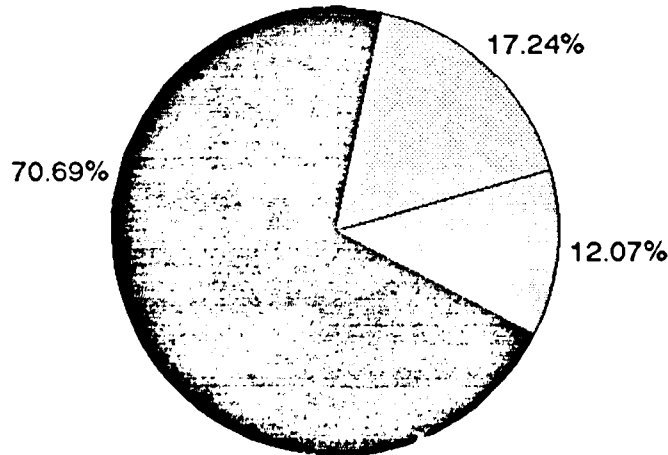
-  MODERATE
-  LOW
-  HIGH




USE of REFERENCE MATERIALS



-  SELDOM
-  OCCASIONALLY
-  FREQUENT

SUPERVISOR RATINGS
by SITE



-  Ft. Lewis
-  Ft. Bragg
-  Ft. Riley

Appendix G
Supervisor Ratings Frequency Counts

In this appendix, the results for the individual scales of the supervisor rating form are presented in the accompanying graphs.

The findings for Scale A have already been discussed. Supervisors rated 57% of the soldiers as putting in extra effort (Scale B) when completing important or time-critical assignments in order to overcome obstacles. While 17% did not put in any extra effort or even gave up in such situations, almost 26% went above and beyond what was asked of them and often volunteered to work extra hours according to supervisors. With Scale C, the supervisors believed that more than half (52%) of the soldiers almost always follow Army rules and regulations. An additional 33% of the soldiers carefully followed the rules, while 15% often failed to follow rules or at times showed signs of disrespect.

On Scale D, 48% of the soldiers were rated as responsible and truthful in dealing with mistakes and/or personal matters. In addition, 38% take extra steps to ensure that others aren't blamed for their mistakes and are honest even when it is not in their best interest. However, 14% were seen as avoiding responsibility and assignments or not displaying sufficient integrity.

In the area of leadership and ability to guide others (Scale E), the supervisor saw 55% of the soldiers fully capable in the context of 76C requirements. Another 20% of the group were seen as able to take charge effectively whenever necessary (e.g., NCO absence).

While in the Army, soldiers are assigned equipment. The supervisors rated 66% of the 76Cs as keeping equipment in good condition by performing routine checks and preventive maintenance while 19% kept their equipment in 'ready for inspection' condition (Scale F). Only 15% of the soldiers kept equipment in poor condition and rarely performed checks.

While nearly one-half (47%) of the soldiers were seen as being neatly dressed and maintaining military standards of personal cleanliness and grooming, an additional 43% exceeded even this standard (Scale G). The remaining 10% were rated as sloppily dressed and unable to meet military standards.

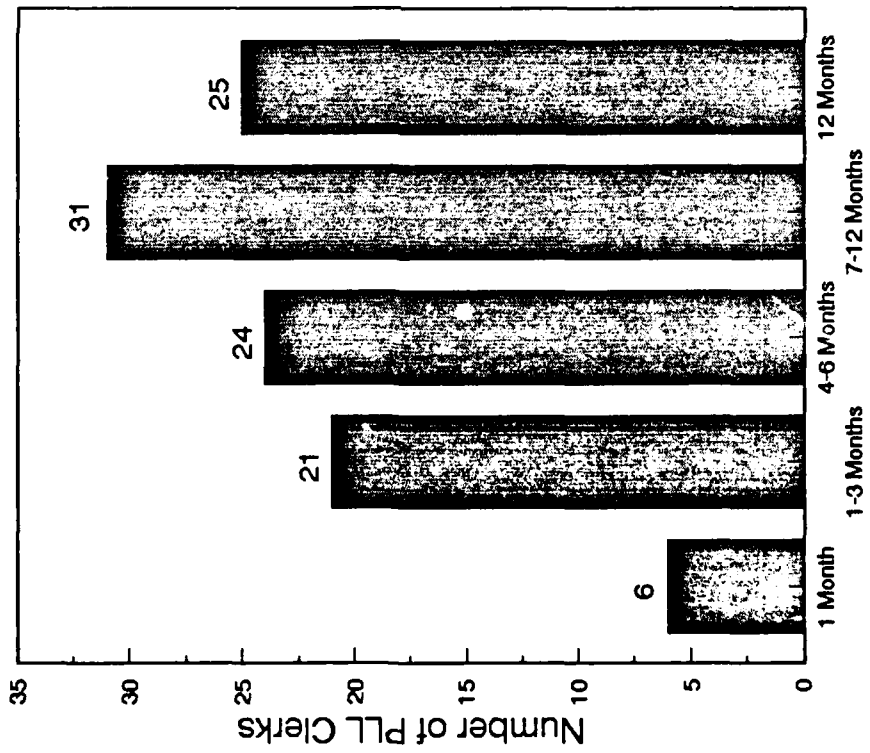
The majority of the soldiers (55%) were rated in good physical condition (Scale H), with an additional 34% in excellent condition exceeding Army standards. Only 10% of the soldiers rated were seen as being in poor condition.

The supervisor in Scale I rated how effective soldiers were in developing their own job and soldiering skills. About 83% of the soldiers practiced, studied manuals, or participated in courses and training to improve his/her skills to varying degrees. The remaining 17% did not attempt to improve their job skills.

The supervisors did not feel that many soldiers had a problem with self control. They perceived that only 9% would lose their temper easily. The other 91% kept their temper in most situations. About one-half of this latter group always kept a cool head and avoided aggressive acts.

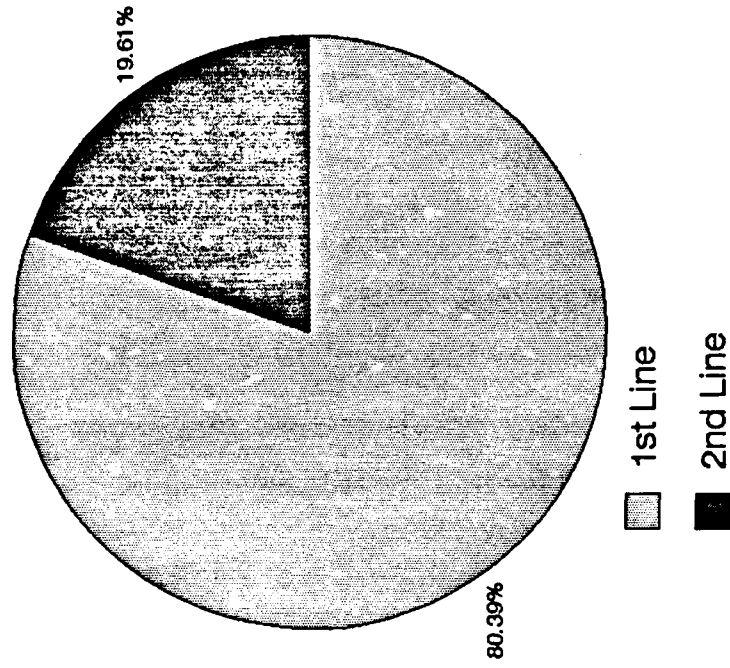
Supervisors were then asked to rate the degree of confidence in their own ratings of their subordinates. Two-thirds of the supervisors were highly confident that their ratings of subordinate effectiveness were accurate. However, the remainder indicated some reservations about the accuracy of their perceptions of subordinate performance.

TIME SUPERVISED

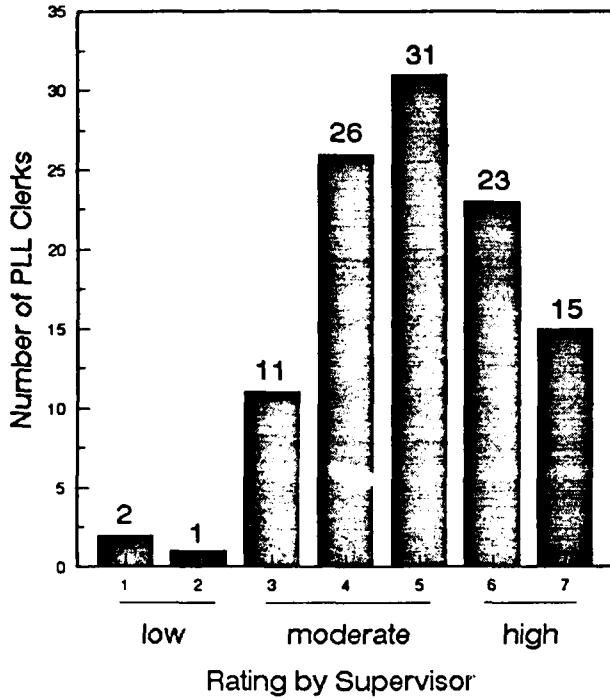


Time Supervised by Rater

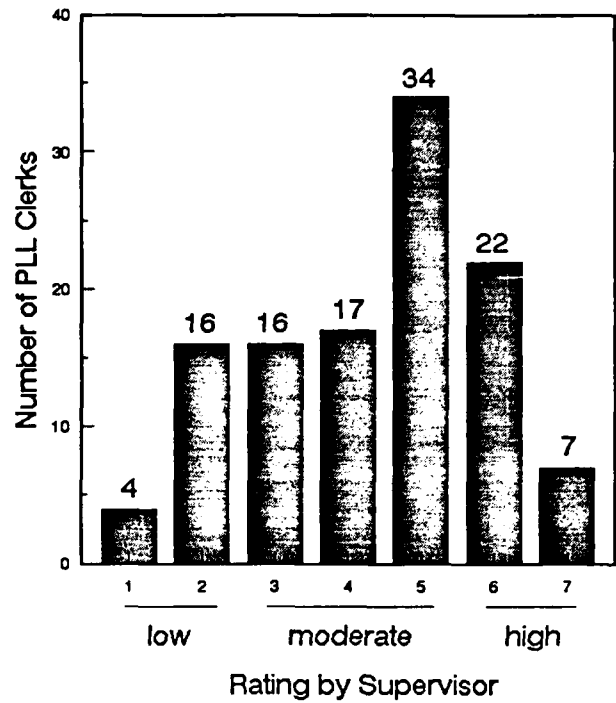
SUPERVISOR LEVEL



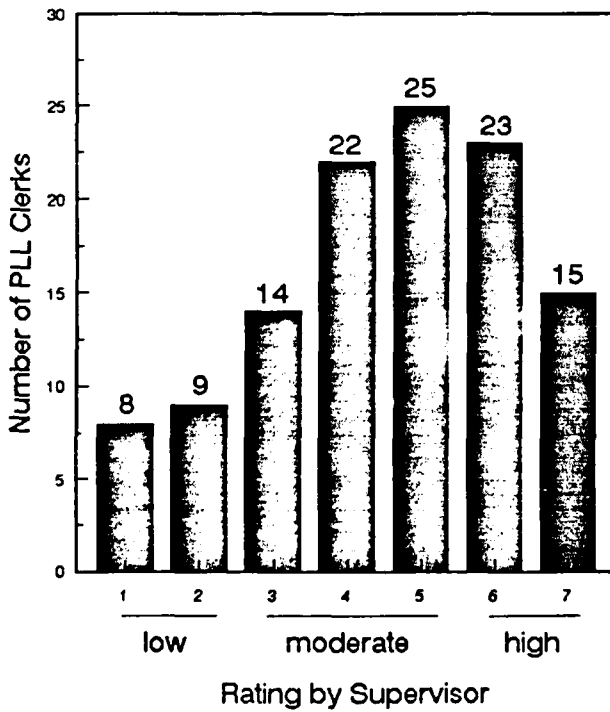
Scale A: TECHNICAL SKILL



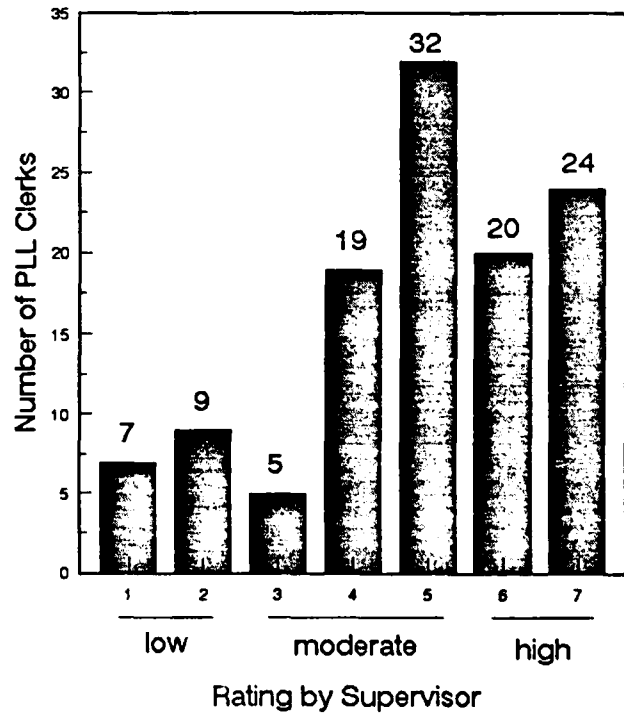
Scale B: EFFORT



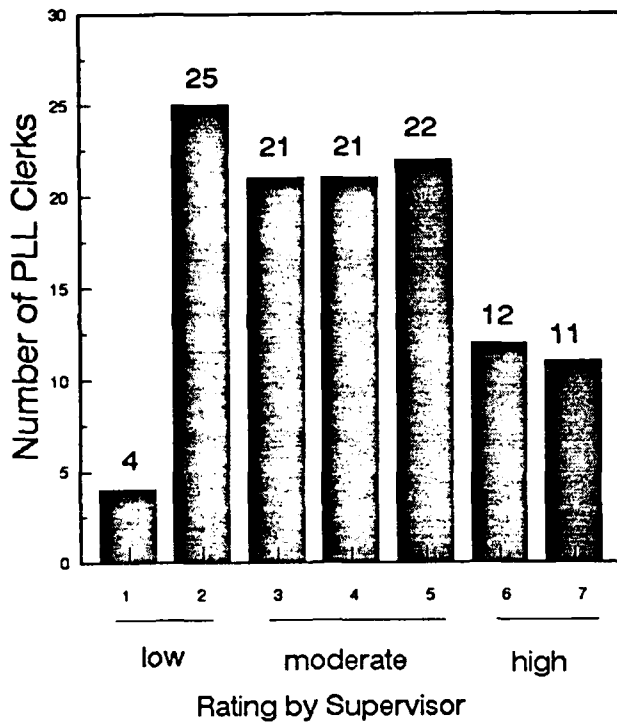
Scale C: TAKING ORDERS



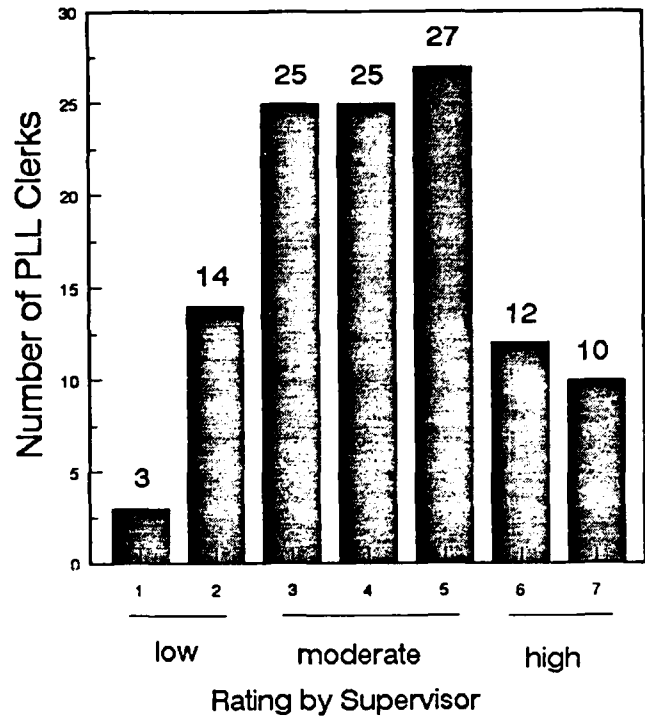
Scale D: INTEGRITY



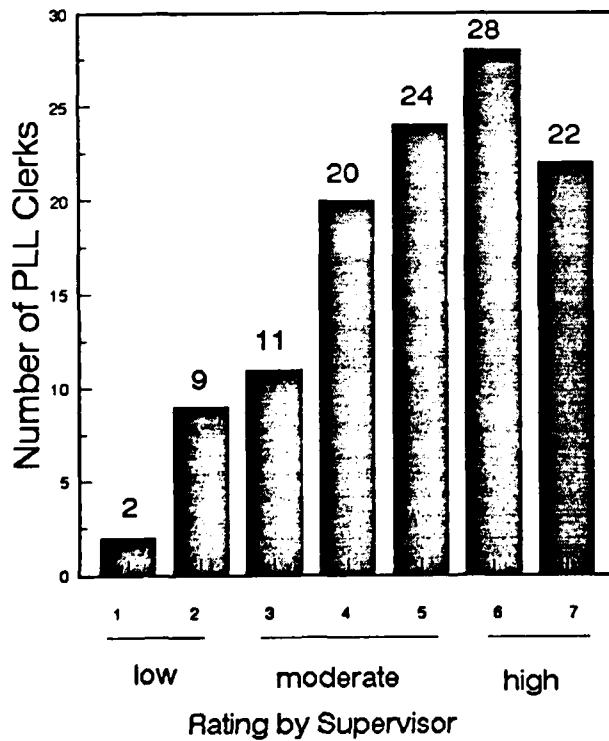
Scale E: LEADERSHIP



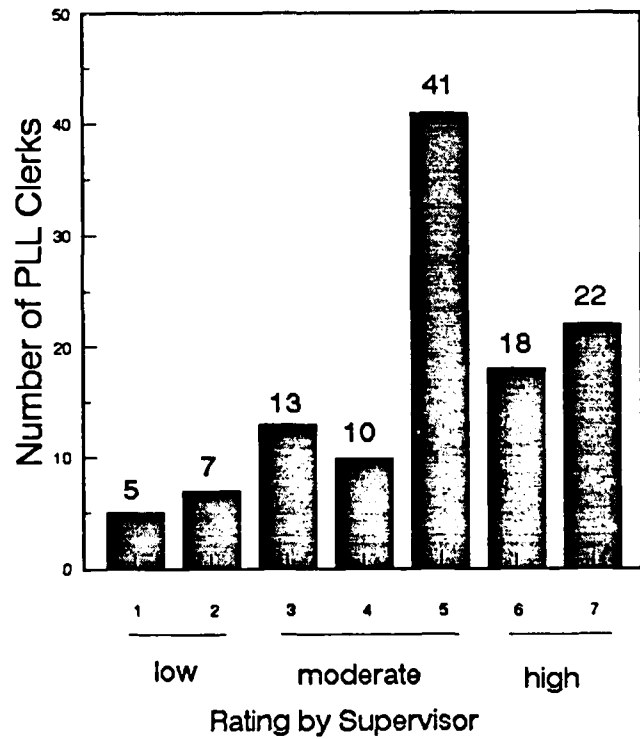
Scale F: MAINT. EQUIP.



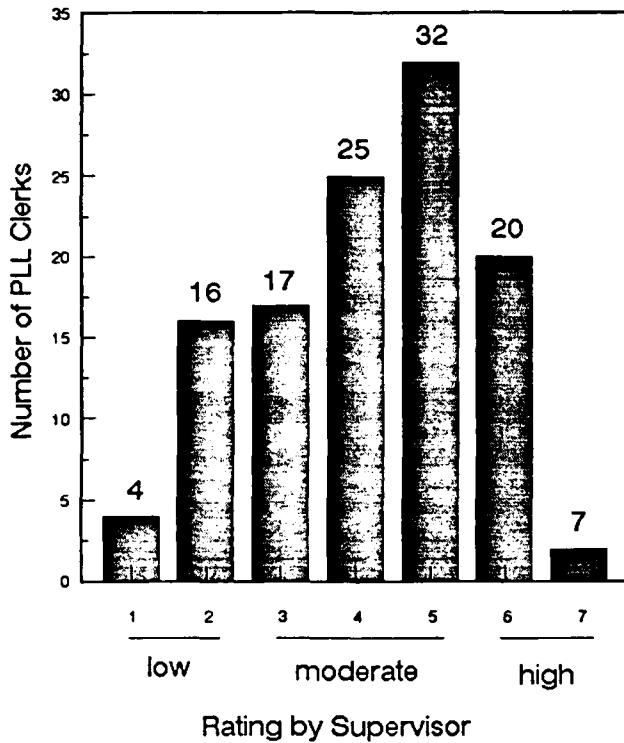
Scale G: MIL. APPEARANCE



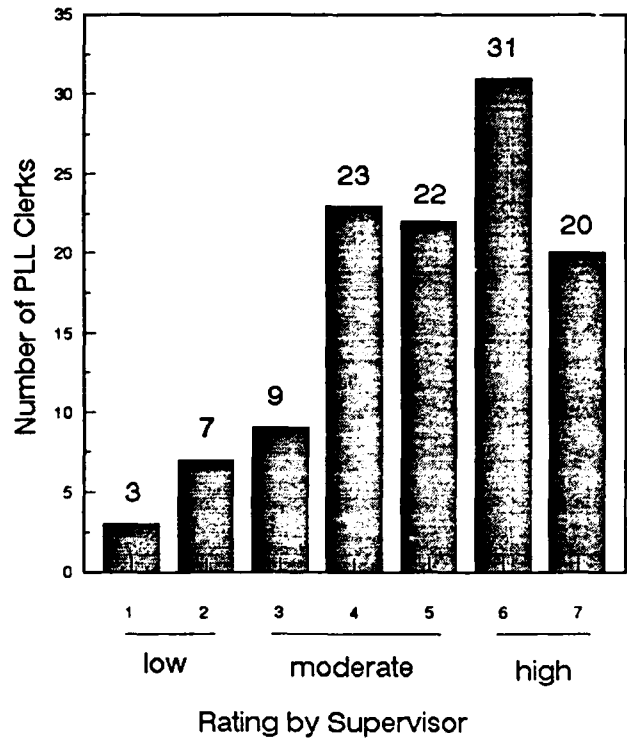
Scale H: FITNESS



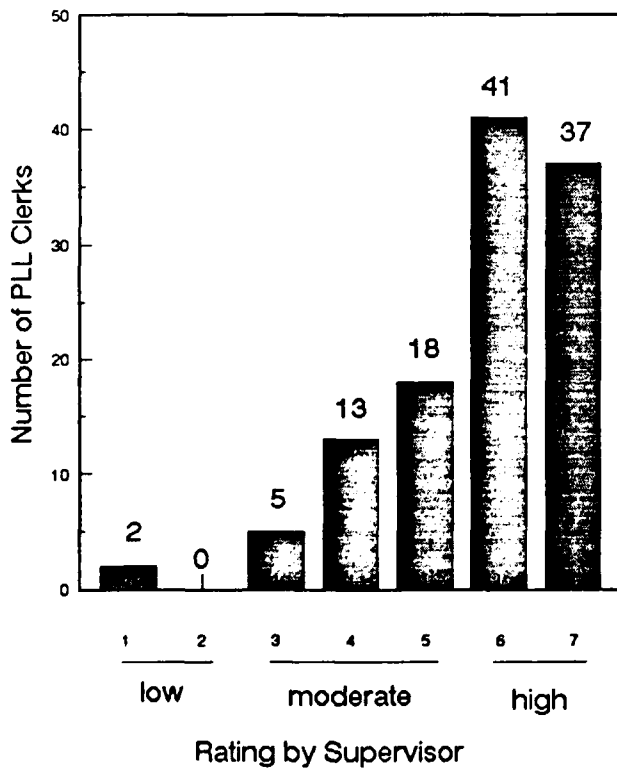
Scale I: SELF-DEVELOPMENT



Scale J: SELF-CONTROL



Scale K: RATER'S CONFIDENCE



Scale L: OVERALL EFFECTIVENESS

