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Effectiveness Testing of Embedded User Support for US Army Installation-Level Software

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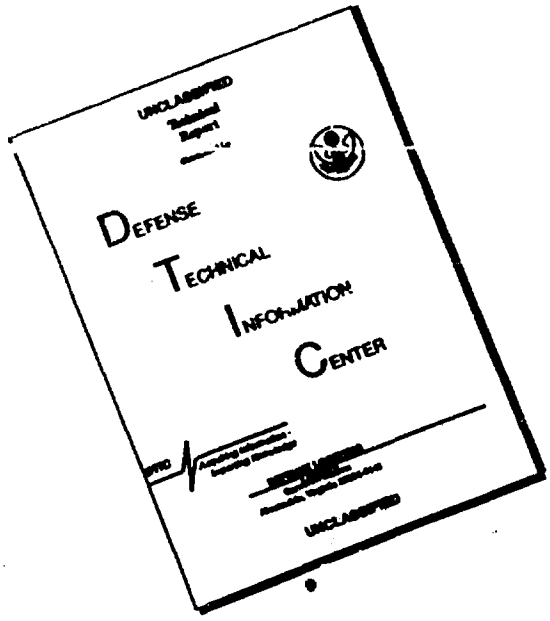

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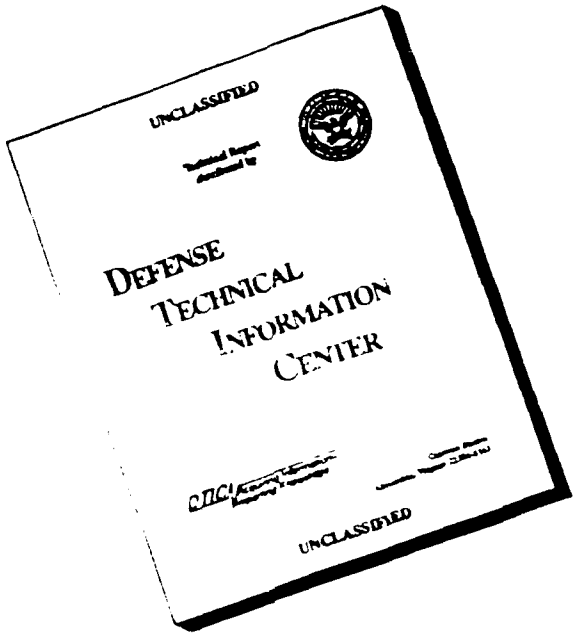

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This report addresses the actual development of the Dynamic Help module and the testing of the module as installed in the Consolidated Issue Facility (CIF) Installation Support Module (ISM) developed and maintained by Software Development Center-Atlanta (SDC-A). The test procedures, dynamic help development, test tasks, and results of actual tasks are shown in appendixes. Dynamic Help is an on-line user-invoked help message capability developed for supporting ISM modules identified by lthe PM-ISM. Messages are assembled froom stored phrases and the available state variables.

This information is of significant importance to the PM-ISM and the ISM Project Support Staff (Software Integration Group-SIG). Additionally, this information could prove to be of value to all software development activities throughout the Army and DoD.

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THIS REPORT HAS BEEN REVIEWED AND IS APPROVED

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EFFECTIVENESS TESTING OF EMBEDDED USER SUPPORT FOR US ARMY INSTALLATION-LEVEL SOFTWARE

A THESIS
Presented to
The Academic Faculty

by

Renee Suzanne Wolven

In Partial Fulfillment
of the Requirements for the Degree
Master of Science in Operations Research

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EFFECTIVENESS TESTING OF EMBEDDED USER SUPPORT

FOR US ARMY INSTALLATION-LEVEL SOFTWARE

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TABLE OF CONTENTS

LIST OF TABLES

SUMMARY

Dynamic Help, an online documentation system that displays a context-specific and state-specific message, has been given a prototype implementation in the US Army software package ACIFS (Automated Central Issue Facility System). A Dynamic Help message, assembled or retrieved for the specific screen, cursor location and data state, tries to answer all relevant questions (Where am I? What can I do here? . . .). This thesis reports a user test of the prototype, performed as part of the Embedded User Support project at Georgia Tech for the US Army Installation Support Modules (ISM) project office.

A group of 26 US Army supply clerks typifying the intended population of novice and intermittent users of ACIFS performed two versions (one with Dynamic Help available, one without) of challenging tasks. The tasks were designed to be realistic and dense in challenges (situations where novice and intermittent users might not be able to proceed without some sort of aid).

The primary aim of the user testing was to determine if Dynamic Help would improve ACIFS's accuracy, usability, productivity, as measured respectively by differences in error counts, differences in Dead End counts (where a Dead

End is that point in a task where the user requires outside assistance to proceed), differences in task durations, and user-satisfaction responses (measured by a direct question with a 5-point response from 1 = Very Helpful to 5 = Very Unhelpful). Supplementing this evaluative aim was a diagnostic one: to study how and under what conditions Dynamic Help could influence performance and satisfaction.

The ACIFS program was modified to provide automatic collection of all durations, certain errors, and diagnostic indicators such as counts and times of important keystrokes. Two of the 26 test clerks were used to run a pilot test, and their data was discarded. The author administered testing to the remaining clerks in daily pairs, each pair performing four tasks in the morning and four in the afternoon. Usable performance data on all tasks was collected from 22 users, who each performed four pairs of tasks with and without Dynamic Help, in randomized order. For some measures for some users for some tasks, portions of the automatically collected data were lost or not collected, or users failed to complete some parts of the task.

Users accessed Dynamic Help on average 4.682 times per task, spending an average of 46.623 seconds with each help message (from access to field entry).

Dynamic Help significantly improved usability, not only as a whole but for every task. Users averaged a total of

5.682 Dead Ends without Dynamic Help and only 2.091 Dead Ends with Dynamic Help.

In error performance, the users' behavior split the data into two groups: the nine Complete-Error-Data users for whom complete error data on all tasks was available, and all other users. For Complete-Error-Data users, Dynamic Help reduced the four-task number of errors per user from 7.11 to 5.555 (significant in a paired t-test at the 0.035 level). The other users committed more errors (8.73 errors per user for four tasks), and committed more (but not significantly more) errors with Dynamic Help than without.

In time performance, Dynamic Help did not save time either for Complete-Error-Data users or for others, but neither did it significantly slow users down. Under test conditions, user carelessness, lack of time discipline, and the Dead End alternative to spending time degraded the experiment's ability to measure Dynamic Help's effect on performance time. Dynamic Help does not appear to have potential for saving time unless the messages can be restructured to highlight and bring to the top the sentences most likely to be helpful.

Users seemed satisfied with Dynamic Help's helpfulness. 18 users classified it as "Very Helpful"; the other 6 as "Somewhat Helpful". Responses did indicate that Dynamic Help would perform better with restructuring.

The author also found that Dynamic Help decreased the number of wrong guesses for certain data entry locations in the software. Dynamic Help was not helpful in menu navigation, and is not useful when users do not realize the presence of challenges to accuracy and efficiency.

Recommendations include (1) a restructuring of both menu selection and data-entry screen help messages and (2) additional assistance in data-entry screens including a separate key to access lists of available choices. Also, future user tests should be designed to more closely resemble an actual job setting in terms of accuracy and time discipline.

CHAPTER I

COMPUTER INTERFACE IMPROVEMENT

There are many aspects of usability that the designer must consider during the development of a computer system, such as system performance, user interface, system functions, installation and field maintenance (Gould, 1988). Among these, the user interface is an area which has recently gained increasing recognition, and it is the only one that can be economically improved after the fact, because a face is easier to change than a fundamental structure.

The design of a computer system whose interface is transparent to any targeted user is a complex problem that is well documented. Many computer systems are developed for a particular type of user, such as a novice, intermittent or expert user. However, regardless of the user type, a high quality user interface will strive to include consistent command languages, clear operation sequences, organized display formats, consistent terminology, complete instructions, simple error recovery procedures and clear, nonthreatening error messages (Shneiderman, 1987).

The needs of an expert user are different from that of the novice user or the intermittent user (Shneiderman, 1987). The frequent user is familiar with the syntactic as well as the semantic aspects of the computer system while the novice user has no knowledge of syntax and may only have very little semantic knowledge of the computer system. The intermittent user will have knowledge of the system, but because he only uses it occasionally, his syntactical knowledge may be very weak. Because of these differences between user types, their user interface requirements will be quite different. The novice user will be most concerned with avoiding errors, while the expert user will be concerned with speed of task completion. The novice user requires a system with a small set of easy-to-learn commands and informative feedback after the accomplishment of each action. The expert user is concerned with getting the most work done through the least number of keystrokes or actions and desires minimum feedback. The needs of the intermittent user fall somewhere between those of the expert and the novice. Usually, intermittent users will desire a system which allows them to move through the program with the least demands on memory. Clear menus and/or prompts assist them in recognizing the proper sequence of actions to perform. Also, they desire meaningful feedback to assure them that tasks are properly completed.

Designing a computer system for any one of these user types is difficult. Designing one which meets the needs of more than one type is especially difficult.

1.1 Interface Difficulties For Novice or Intermittent Users

Novice and intermittent users of a computer system are not as confident as the expert user in their ability to interact with the computer. They are generally more cautious and slower in responding to the system, and hence, their productivity is lower than that of the frequent or expert user. An expert user or a user who specializes in a single function and operates only one or two software modules can tolerate and overcome great deficiencies in user interface design and user support. The user's familiarization and skills are refreshed daily and is amortized over thousands of performances. But, novice or intermittent users will not enjoy this continual familiarity with a software package. Instead, each time they use a package, they will have to relearn some of the skills, techniques, and commands that are required to accomplish a task. The problems of novice and intermittent users are compounded when software packages do not share reasonably consistent and easy-to-learn interfaces (Young, 1990a).

1.2 Approaches to Solving Interface Design Problems

There are three general ways to improve an existing computer system's user interface: fundamental redesign, interface redesign, and embedded user support (Young, 1990a).

1.2.1 Fundamental Redesign

First, the entire computer program could be rewritten from start to finish, integrating consistency in linguistics, style, and interface across the different functions within the package. Many interface difficulties arise from deficiencies in data structures and functional design. When the fundamental cause is awkwardly defined quantities poorly designed procedures, a complete rewrite can eliminate interface problems or sidestep them. If the goal is to improve the user interfaces of several different types of software, each computer program in the group could be rewritten, with the incorporation of a consistent set of linguistics, style and interfaces across all the entire group. This would provide a common platform and interface to all packages, allowing a user of any package to quickly learn the interface of another package in the group. The chief drawback to any rewrite policy is expense. The rewriting of multiple software packages to conform to a common user interface design may take many man-years of effort.

1.2.2 Interface Redesign

The second alternative in improving a deficient user interface is to rewrite only user interfaces. Programming effort can be reduced by patching a shell over the existing interface, but this may result in the program's being slowed down. The shell would be another layer of computer code to process.

1.2.3 Embedded User Support

In some cases, it takes too much time and money to rewrite a complete set of software packages or even to rewrite the user interface. Besides the programming time and expense, rewriting either whole packages or interfaces creates a need for retraining of users. What is desired in such cases is an economically attractive "patch" that with minimum time and effort can improve the usability of a computer program or set of programs by helping users to get past interface deficiencies. Thus, a third alternative in improving the user interface is with Embedded User Support (EUS)[1]. Embedded User Support involves adding dynamic help and documentation and/or embedded tutorials to an existing computer program. It does not attempt to change or improve

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[1]EUS, pronounced "use" as in "useful," is an acronym for Embedded User Support and is also the first part of the word "eusophy," which means "having the quality of being easy to learn," from the Greek "eu-" (easy or well) and "sophy" (wisdom or skill).

upon the existing user interface. Instead, it guides the user past pitfalls and shortcomings in the interface. Another benefit of EUS is that users with different skill levels can use the same interface without a degradation in performance. All users will have Help available whether they need it or not. EUS does not involve any rewriting of software. A EUS module can be written and tested in far less time than it takes to conduct a total rewrite of the package or to rewrite the user interface.

The expression "EUS" was first used by Dr. Donovan Young of the Georgia Institute of Technology in 1990 (Young,1990a). While working on the design of user interfaces for complex interactive project scheduling software, he discovered that a system can be programmed to monitor the context (location) and the data state of an interactive session. He also proposed that such context and state information could identify specific needs for documentation and information that a possible user might have at that point in the program, and that most of the desired documentation is capable of being automated. The following discussion of EUS and its features is largely paraphrased, with permission, from Dr. Young's EUS white paper (Young, 1990a).

It is first necessary to draw a distinction between functional training and software familiarization. A "user-

friendly" module is one for which the user can acquire the necessary computer program familiarization by simply interacting with the module. All computer programs, in particular all Army installation support modules, can be made user-friendly. On the other hand, the actual function being supported (equipment issue, housing requests) may require training. EUS does not teach the user what to do functionally, but provides a user-friendly interface to show how the computer does the function.

The purpose of EUS features is to make an interface sufficiently user-friendly so that the novice or intermittent user can easily answer all questions about vocabulary, interaction protocols, software capabilities, available actions, data requirements, and standard expectations merely by continuing to interact with the program. A EUS module can teach the user everything about its own behavior. The user must bring an understanding of the underlying functional concepts of the application.

Embedded User Support consists of a combination of one or more of the following features:

- dynamic help
- what-if data manipulation
- embedded tutorial
- interaction monitoring

1.2.3.1 Dynamic Help. Dynamic Help subsystems display state-specific messages that replace older collections of error messages, status reports, and prompts. A modern interactive system is almost always in an input-ready state, and at any one time there is a narrow range of appropriate inputs. A short message, usually stating what can now be done by the user, is on display at all times. Longer, more detailed Help messages are invoked by user requests. Both kinds of Help messages are dynamic; their content depends on the current state and on data values. The dynamic Help subsystem builds messages as part of each interactive response. Thus, the programmer or designer does not write specific messages, but only generic ones. The computer will fill in all the details of the help message.

1.2.3.2 What-if Data Manipulation. A module that is not part of an integrated database typically grants the user too much data destroying power. Modification to protect real data and allow manipulation of what-if data can be accomplished by changing the module's file manipulation capabilities.

Modern practice is for the system to load a copy of the relevant data in local disk storage or memory, interact with this, and then perform a verification or confirmation step to test validity of the overall set of transactions before issuing the command to change the real database. Protection

for a training or practice session is provided simply by suppressing the final step. The what-if data feature is useful not only for training, but for experienced users who want to explore more than one way of accomplishing a transaction. What-if data manipulation is essential in such packages as pricing in procurement, routing in logistics, or scheduling in planning.

1.2.3.3 Embedded Tutorials. Embedded tutorials differ from ordinary tutorials in that 1) the user can invoke the tutorial from within the module, and 2) a serial path through the tutorial is not enforced. While working on a job, if a user comes to a place where it is desirable to use an unfamiliar feature, he can invoke the tutorial, use it to learn the feature, and return to the job. Unfortunately, tutorials are very inefficient to program, requiring design work and programming work comparable to that of the program itself.

1.2.3.4 Interaction Monitoring. The final feature of EUS systems is interaction monitoring, which has been called "learning management" in the computer training arena. There are two alternative levels of interaction monitoring: record/playback, in which a file of user actions is built during a session so that the session can be reconstructed; and the history file, in which the sequence of major user actions is archived for later analysis. The former is very

useful for preparing and playing back demonstration sessions, which can be a good training device. The latter performs data aggregation and some analysis during the session, and is typically used as an input file for a separate statistical analysis program that draws conclusions about efficacy and efficiency of the product or of its user.

1.3 The Installation Support Modules Project

On US Army installations (posts, camps, and stations) there are dozens of interactive software packages in daily use. Many of these packages are installation-unique systems that were developed by the Major Army Command (MACOM). None of these have been developed and implemented in such a way as to be truly capable of satisfying all horizontal and vertical integration. There is no data sharing across functional areas. In fact, many of these data initiatives are redundant and are functionally duplicative. The total number of interactive software packages used daily on all US Army Installations is estimated to be between 150 to 200 (Installation Support Modules, [1990]).

Very few installation-unique systems have been developed in accordance with a standard system or information architecture. This makes it difficult to deploy them to other installations or use them across varying hardware platforms. The US Army Installation Support

Modules (ISM) project, a high priority project, has been established to enhance installation management Army-wide by integrating this large family of software into a coherent system (Installation Support Modules, [1990]). 1Some of the goals of the ISM project are to develop an interface that non-ADP users will find easy to use and to develop a standard data encyclopedia/dictionary for use at installation level.

The ISM project is applicable at all Army installations. It will support the sustaining software base and will interface with tactical and strategic systems. The ISM project will provide installation commanders with an Installation Level Integrated Data Base (ILIDB) and with software to effectively manage daily operations and perform the landlord functions outlined in AR 5-3, Installation Management and Organization. The Installation Software Modules will reduce redundant data entry and duplicative input terminals, serve as input and output mechanisms for the Standard Army Management Information Systems (STAMIS), interface with STAMIS via the ILIDB, and provide the required capability to share accurate and timely information at various levels of installation management. Together ISM and ILIDB will help meet the information needs of tenant activities and higher command echelons and provide the integration mechanism at installation level for tactical and

strategic systems (Installation Support Modules, [1990]).

1.4 The Embedded User Support Project

The Embedded User Support (EUS) Project is a project within the Installation Support Modules Program which will embed usability features within two existing US Army computer programs, minimizing the need to provide off-line training and additional documentation. The project is being conducted at the Army Institute for Research in Management Information, Communications and Computer Sciences (AIRMICS) located at The Georgia Institute of Technology. The purpose of incorporating EUS capabilities into software systems is to ease the learning process for a particular computer task by not requiring a user to recall a large amount of information at once. EUS standards will be developed and will incorporate principles of effective human-computer interface design.

The first phase of the EUS project is to add Dynamic Help to the interface for the Automated Central Issue Facility System (ACIFS) program. The ACIFS program is DBMS-based (built around a relational database management system), making the context and data state of the system very easy to monitor via queries in the standard query language SQL.

1.5 The Research Problem

Once Dynamic Help is added to portions of the ACIFS Program, it will be necessary to measure how effective it was in improving the user interface. The purpose of this thesis is to determine whether or not the Dynamic Help added to the ACIFS Program was effective, and at what places in the program it was most effective, where it could be improved and where, if ever, it had a negative effect. It will do so through the development of measures of user-support effectiveness for novice and intermittent users, the design and conduct of an experiment to compare pre- and post-conversion effectiveness, and the analysis of data collected during experimentation.

1.6 Guide to this Thesis

Chapter II reviews the background literature surrounding measures of effectiveness for user interfaces and user testing of software.

Chapter III examines the measures of effectiveness which will be collected during user testing of the ACIFS Program, the identification of potential areas of user confusion (challenges), the creation of the tasks, the conceptual hypotheses and the possible sources of variation.

Chapter IV describes the actual conduct of the experiment. Included in it are the data collection

procedures, the pre-testing instructions to participants and the administrative procedure instructions. It also describes the determination of the number of test subjects and includes the specifications for automatic variable collection and the resulting hypotheses to be tested at the conclusion of data collection and describes the analysis of the collected data in the three measures-of-effectiveness categories.

Chapter V describes the results of the tests of hypotheses. It then presents conclusions from the analysis and generalizes the results of the partial application of Dynamic Help to ACIFS to make conclusions about the usefulness of Dynamic Help to DBMS-based systems and recommendations of diagnostic improvements. It identifies prospective directions for further research in Embedded User Support.

CHAPTER II

LITERATURE SEARCH

2.1 User Interface Measures of Effectiveness

Gould (1988) and Karat (1988) both emphasize that measurable behavioral objectives are necessary to determine whether or not a particular computer program's user interface is "good" or "bad". A literature search of measures of user interface effectiveness yields measurement criteria options that range from very general to specific. Shneiderman (1987), Young, Miller and Coleman (1987), and Whiteside (1988) all offer similar sets of user interface effectiveness measures.

Ben Shneiderman (1987) defines five measures of human performance: time to learn, speed of performance, rate of errors by users, user subjective satisfaction and retention over time. He also explains that often there are forced tradeoffs between the 5 categories that may prevent success in every one. For instance, an emphasis on reduction in error rate may affect the speed of performance. Designers, purchasers, managers and evaluators must decide which of these measures are most appropriate for evaluation of their particular system.

Young, Miller and Coleman (1987) claimed that the "ultimate measure of the quality of the DSS (decision support system) is its performance" (p.3-43) and that aspects of human performance that are measurable in a user interface are accuracy (error rate), speed, training time, and user satisfaction. They also state that user satisfaction may be an acceptable substitute for the accuracy, speed, and training time measures when resource constraints make these measures difficult to obtain.

Whiteside (1988) gives a comprehensive list of 22 measurement criteria which includes:

1. time to complete a task
2. percent of task completed
3. ratio of successes to failures
4. time spent in errors
5. percent or number of errors
6. frequency of help and documentation use
7. time spent using help or documentation
8. percent of favorable/unfavorable user comments
9. number of available commands not invoked
10. number of times users need to work around a problem
11. number of times the user is disrupted from a work task
12. number of times user loses control of the system.

Each of these measures is quantifiable and objectively obtainable. The specific measures to be used in evaluating the user interface quality must be determined by the managers and the evaluators of the system. The measures are normally determined by the questions which are to be answered through testing. For example, if accuracy is of primary importance and management desires to know the accuracy rate with a current program, then frequency of errors may be the primary effectiveness measure. If a new help module has been added to a system, management may desire to know whether it is being accessed by users. In this case, frequency of help and documentation use would most likely be the effectiveness measure.

In Chapter III, the measures of effectiveness derived for this thesis will adhere to the concepts found in the above literature. The three general categories to be addressed are: speed (or productivity), accuracy and user satisfaction.

2.2 Methods of Measuring Effectiveness

There are several ways to collect user interface data. Data collection can be performed for either diagnostic or evaluative purposes. Diagnostic testing identifies needed improvements to a user interface. Evaluative testing determines how "good" a user interface is and/or identifies

the most desirable of two or more systems by means of user interface comparison. While diagnostic testing is useful in enhancing a user interface, it does not describe or measure how "good" or "bad" the interface is. This thesis will concentrate on evaluative testing for the primary purpose of determining whether or not Dynamic Help was useful. Secondarily, diagnostic measures will be used to determine where and how the Dynamic Help implementation can be improved. The literature on software evaluation methodologies, including Shneiderman (1987), Karat (1988), Whiteside (1988), and Young, Miller and Coleman (1987), recommends a combination of questionnaires and controlled experiments for software effectiveness testing.

Shneiderman (1987) states that there are several ways to measure user performance and attitudes. The evaluative methods he describes are written surveys, interviews, controlled psychologically oriented experiments, and continuous user performance data collection. He states that written surveys are "an inexpensive and generally acceptable approach with both management and users" (p.398) and may be "useful in demonstrating improvement to the interface as changes are made to training, online assistance, command structures, and so on" (p.399). On interviewing, Shneiderman states that "interviews with individual users can be productive because the interviewer can pursue

specific issues of concern" (p.407). However, he also states that "interviewing can be costly and time consuming so usually only small fractions of the user community are involved" (p.407). Controlled psychologically oriented experimentation combines human factors with the scientific method to study an interactive system. Future management decisions can be supported with the quantifiable results of a carefully controlled experiment. Shneiderman suggests

> Fractions of the user population could be given proposed improvements for a limited time and then performance could be compared with the control group. Dependent measures could include performance times, user-subjective satisfaction, error rates, and user retention over time (p.412).

Continuous user performance data describes "patterns of system usage, speed of user performance, rate of errors, or frequency of request for online assistance" (p.412). The data can also assist management in future acquisition and training decisions.

John Karat (1988) discusses two broad categories of software evaluation methodologies: User-Based Evaluations and Task-Based Evaluations. User-Based Evaluations concern the collection of data from individuals using a software system. Task-Based Evaluations are an analysis of the task which will be performed with the software and are considered more theoretical in nature. In User-Based Evaluations, Karat states that "surveys, questionnaires, and general

descriptive studies are often the evaluation of choice (p.895)" for existing systems. In discussing questionnaires, he states that surveys can be of several forms, but in order to be useful in evaluation, he recommends that survey questions be specific and about actual experiences with the software as opposed to opinions on forecasts of possible software changes. He claims that "the task of answering the question should not be an adventure in creative thinking for the subject, but should rather request a report of experience" (p.896).
He mentions that evaluations based on "logging user behavior during interaction with a software system" (pp.895-896) are more desirable in many ways than questionnaires. He states that "Evaluations by controlled experiments which are designed to collect objective measurements such as time to complete a task, or correct responses and errors are commonly used in system evaluation" (p.898). He also states that controlled experiments focus more on hypothesis testing than surveys and questionnaires, but that questionnaires may also be effectively used to collect data for hypothesis testing.

Whiteside (1988) suggests the following user interface measurement operations which include questionnaires and experimental testing:

1. Ask the user to perform a specific task.

2. Monitor user during free use (logging/observing).
3. Give user a questionnaire.
4. Interview user.
5. Survey users.
6. Ask user for critical incidents revealing successes or failures.

Young, Miller and Coleman (1987) cite that evaluative user testing may be used to determine "how good the DSS (decision support system) is, either in terms of objective performance measures or in terms of user satisfaction" (p.13-9). The data collection methods they suggest are: user behavior monitoring, interviews, and questionnaires. User behavior monitoring can be accomplished automatically through use of the computer, by videotape, and/or by observational notetaking.

Young, Miller and Coleman (1987) discuss two methods of automatic data collection which can be built into the computer system to monitor or record user behavior or performance. The first is automatic session recording (or data logging) in which each user input act is written to a file called a session record. The second is a history file which collects specified user input data as well as system state values and responses at predetermined points in the software. With either method, it is possible to begin/end data collection with starting/stopping commands and/or to

make provisions for recording of remarks during or after a session. Interviews may be conducted either before or after a testing session and questionnaires may be presented at the determined appropriate time.

Many system evaluators have used both controlled user testing and user questionnaires as data collection methods in software evaluation. Schleske-Peters (1980) designed his evaluation of an interactive generalized decision tree algorithm using methods of controlled user testing and questionnaires. Ledgard, Singer and Whiteside (1981) also chose the user testing/questionnaire combination to evaluate user performance and user satisfaction between two text editors. Villarreal-Ogushi (1984) used the same methods (user testing and questionnaires) to evaluate efficiency, effectiveness, and user satisfaction in the solution of resource-constrained scheduling problems using GITPASE. Also, during their user tests, Ledgard, Singer and Whiteside as well as Villarreal-Ogushi, automatically inserted the task session user inputs into a session record.

For purposes of this experimental work, the author will use controlled experimental testing and user opinion questionnaires to evaluate the usefulness of Dynamic Help. Automatic data collection and note taking will be used to collect data on user performance and the questionnaires will be used to collect data on user satisfaction.

2.3 Experimental Testing Procedures

Young, Miller and Coleman (1987), Karat (1988), and Reisner (1983) all suggest steps necessary to conduct experimental testing. The following is a synopsis of their procedures:

The basic procedure that Young, Miller, and Coleman advocate in administering an evaluative user test is:

1. Select a sample of users or surrogate users.
2. Have users exercise the system to solve the designed test problems.
3. Make observations to be used in analysis.

Karat (1988) offers the following steps as being required in experimental testing:

1. Pose the question to be answered by testing.
2. Determine objective measures to be taken.
3. Design the experiment.
4. Find representative users to test.
5. Collect the data.

In discussing controlled behavioral experiments, Reisner (1983) outlines an even more comprehensive set of steps in developing and conducting such experiments:

1. Obtain a running system
2. Determine the purpose or hypothesis
3. Determine the approach or method
4. Design the experiment

5. Develop test materials

6. Obtain experimental subjects

7. Acquire teaching materials

8. Acquire documentation

9. Develop measurement tools

10. "Debug" the experiment

11. Run the experiment

12. Analyze the data

13. Perform statistical tests.

The author will use a modified version of Reisner's method to perform the experiment. One of the goals of ISM is that users will be able to use computer systems without the need for extensive training or off-line documentation. Therefore, in the development of this experiment, Reisner's steps 7 and 8 will not be used.

CHAPTER III

METHODOLOGY

3.1 Objective

The primary aim of the experimental work in this thesis is to test the effectiveness of a Dynamic Help system that was added to the ACIFS Program in the first stage of the EUS Project. The underlying evaluative question is whether or not this first application demonstrates that Dynamic Help can improve software usability. A secondary aim is diagnostic: to study how and under what conditions Dynamic Help can influence user performance and satisfaction.

To achieve these aims, it was necessary to develop an experimental program to identify those areas in the ACIFS software where Dynamic Help actually improved or degraded usability and where specific Dynamic Help messages could be improved for the novice or intermittent user. It is assumed that a user has *tasks* to perform, and that in the performance of them certain *challenges* arise in which the appropriate user actions are unclear. It is hypothesized that a Dynamic Help message, if effective, can provide information that helps the user overcome a challenge. If Dynamic Help can be shown to give significant aid to users

in overcoming realistic challenges that commonly occur in everyday ACIFS tasks, then the hypothesized improvement in software usability is confirmed.

Effectiveness of a Dynamic Help message can be observed in terms of the user's saving time, avoiding "dead-end" points (described later), or avoiding errors. Section 3.4 will discuss the measures of effectiveness derived for this experiment.

This chapter also provides a description of the ACIFS system and the Dynamic Help modification (Section 3.2), creation of the ACIFS challenge and task specifications (Section 3.3), the hypotheses to be tested (Section 3.5),and the possible sources of variability (Section 3.6).

3.2 Description of System and Modification

3.2.1 The Automated Central Issue Facility Software

The Automated Central Issue Facility System (ACIFS) is a computer program that allows users to interactively perform most of the informational functions of a US Army Central Issue Facility (CIF). These functions are listed in Appendix 1. The ACIFS software package was designed, produced and fielded by the US Army Information Systems Command's Software Development Center - Atlanta located at Fort Gillem, Georgia. The system is designed to provide precise management of organizational clothing and equipment

in a CIF. It is an interactive relational database system driven by manual data entry from terminals. It provides instant access to status of property both in the CIF and in the hands of soldiers for a given installation. At each installation whose CIF uses ACIFS (some installations use a manual system, and others use a different computer program), the database includes only the equipment and soldiers served by that installation's CIF.

ACIFS was developed to run on a platform consisting of an Intel 320 Microcomputer equipped with a 144 MG hard disk drive, six Wyse 350 terminals, four Mannesmann Tally MT86 serial printers, and one CITOH 400 LPM parallel printer, using the Xenix 3.5 operating system, *Informix* SQL Version 2.1, and Informix 4GL Development Version 1.1. The ACIFS software interface has two types of screens: ***menu selection*** and ***data-entry***.

The menu screens were developed using the Informix menu utility, and the data-entry screens were developed using the Informix forms utility. Help is available in the current version only at the menu selection screens and is accessed by pressing the F10 key. The Help is static or "canned" and briefly describes the various functions displayed in the menu.

While in the Main Menu of the ACIFS program, one can select from a choice of nine different submenus:

CIF Main Menu

1 - Master File Maintenance Menu

2 - Adjustment Transactions

3 - Inventory Menu

4 - As Required Reports Menu

5 - End of Day Processing

6 - Document Register Actions Menu

7 - Clothing Issues Process

8 - Clothing Turn In Process

9 - Temp Loan/Hand Receipt Process

For purposes of this evaluation the EUS Project added a Dynamic Help package to both the menu screens and the data-entry screens of four of these submenu programs: 2 - Adjustment Transactions, 6 - Document Register Actions Menu, 7 - Clothing Issues Process and 8 - Clothing Turn In Process.

3.2.2 EUS Dynamic Help Specifications

As part of the EUS Project, Young specified the general help requirements of a user while using the ACIFS software and how Dynamic Help messages might be designed and structured to meet those requirements (Young, 1990b). Based upon these user requirements and the proposed Dynamic Help message structure, Young and the thesis author designed two

different structures for the Dynamic Help messages: one for the menu screens and the other for data entry screens. The author, a supply officer in the US Army, specified the logic and content of the Dynamic Help messages for the four submenu areas to be addressed by the evaluation.

In ***menu selection*** screens, it was determined that there were three broad categories or reasons why a user might need help:

1. General Orientation: help in determining where one came from, where one is, and where one can go back to (Navigation).
2. Help in understanding the meaning of the screens or functions listed (Meaning of Screens or Functions).
3. Help with Procedures: how to make selections, how to abort an entry, the effect of certain keys.

The menu Dynamic Help message has a ***global*** portion and a ***local*** portion: a ***global*** sentence in a help message answers a question that could arise anywhere on the menu screen; a ***local*** sentence refers only to the highlighted selection on the menu. The global portion provides a general orientation of what menu screen a user is currently in. The local portion describes what functions or tasks a user can perform if the menu item currently highlighted on the screen is selected. Also, the local portion of the message lists

applicable help with procedures, such as how to select the highlighted item. The structure of the menu Dynamic Help messages consists of the following sequence:

Global

General Orientation

Local

Meaning of Screen or Function

Help with Procedures

In *data-entry* screens, it was determined that there were five categories or reasons why a user might seek help:

1. Help in determining where one is and what one could do there (Location and Function)
2. Help in getting to another screen or back to a previous screen (Movement Between Screens)
3. Help in getting to the next data entry or back to a previous data entry (Movement Within Screen)
4. Help with "how to enter": how to complete the entry in a field, how to correct an entry, how to indicate you were finished with a data entry, how to deal with a "quirk", how to abort a data entry, the effect of certain keys (How to Enter)
5. Help with "what to enter": meaning of the entry in a field, range of acceptable entries in a field, where to find a datum on a supporting document, examples of possible entries, formats of

entries (What to Enter).

The data-entry screen Dynamic Help message also contains global and local portions. The global portion of the message applies to the entire data-entry screen, and the local portion of the message refers only to the field where the cursor is located. The global portion provides the user with information on location and function of the screen, movement between screens, and how to enter data. The local portion provided the user with information on the location or field that the cursor is in, movement within the screen, what data to enter, and how to enter data. The structure of the data-entry Dynamic Help messages consists of the following sequence:

Global

Location and Function

Movement between Screens

How to Enter

Local

Location and Function

Movement within Screen

What to Enter

How to Enter

Appendix 2, which reproduces Sections 2, 3 and 4 of "Specifications of User Requirements, and Dynamic Help System Standards for EUS Project and CIF Conversion" (Young,

1990b), explains the architecture and format of Dynamic Help messages in more detail.

Incorporation of Dynamic Help into ACIFS consisted of a modification to existing ACIFS program modules and the development of new modules for invocation and display of help messages. Specifications written by the author were issued. Some typical message specifications are reproduced in Appendix 3. Both modification and new development was written by Chris Smith of the Georgia Tech Software Engineering Research Center in the Informix-4GL database programming language, version 1.1. Program development was performed on an AT&T 3B2 machine with a System V Unix version 3.2.2 operating system located in the Georgia Tech Department of Electrical Engineering's AT&T Laboratory.

3.3 Challenge and Task Specifications

The four submenu functional areas (Adjustment Transactions, Document Register Actions, Clothing Issues Process, and Turn In Process) were chosen to be modified for the evaluation because they described the most common nontrivial tasks performed daily in a CIF.

Let a ***challenge*** be defined as an instance in a task performance where the potential exists for the user to be confused about the appropriate action to take. For ACIFS, most challenges are ***menu selection*** challenges, which occur

when the user can be confused about which function to select to complete the task, or *data-entry* challenges, which occur when the user can be confused about *how to enter* or *what to enter* as well as how to navigate through the screen.

There are three reasons motivating the definition and specification of tasks to be performed during the evaluation. First, a task is a vehicle for presenting challenges to the user in an organized manner. Secondly, it is an event with a well-defined start and finish which facilitates the production of measurable and meaningful data about the challenges from which user performance and satisfaction can be determined. Lastly, given a task that includes anticipated challenges, the assertion that Dynamic Help improves software usability can be tested by comparing performance of the task with and without Dynamic Help (two versions of the same task, each with different data). The performance of a single task or a subtask in ACIFS follows the following generic structure:

1. Navigation to a screen.
2. Performance of a data entry or sequence of entries.
3. Screen closure to be followed by navigation back to a menu.

Therefore, let a ***task*** be defined as a single job or a sequence of subjobs or subtasks (at most three) that are

performed in a single submenu (set of related screens) of the ACIFS Program. For instance, a task may instruct the user to perform a clothing turn-in (a single job) which is to be accomplished within the Clothing Turn In Process submenu. Or a task could instruct the user to make three different adjustments to the property book (a sequence of subtasks) which are all to be performed within the Adjustment Transactions submenu.

3.3.1 Challenge Identification

By performing common ACIFS functions within the four submenu areas, the author identified and listed the areas with greatest potential for confusing a novice or intermittent user. This prepared the author to be able to define realistic tasks whose performance would be expected to improve through the use of Dynamic Help. It was noted that some challenges, such as confusion about the proper format of a hat size entry, could occur in many different tasks. It was necessary for the challenges to be varied so that most of the Dynamic Help message categories (the 3 for menu screens and the 5 for data entry screens) could be tested for helpfulness. Once all potential challenges were identified, then only the most promising ones were selected to be used in the creation of tasks. The following is a list of the most promising challenges that were discovered

by the author in the four submenu areas:

1. Special Issue Military Occupational Specialty (MOS): How does a user determine which MOSs are authorized a special issue?
2. Clothing Size: The format for certain clothing items is unclear.
3. F1/F2 Keys: A user may have confusion on how to use these two keys to add or delete lines in the Manual-Turn-In Items-Returned (Man TI-Itms Rtnd) Worksheet.
4. Social Security Number (SSN): The format for the SSN entry may be unclear to the user.
5. Unit Identification Code (UIC): The user could possibly enter "o" for zero or vice versa, or could confuse the UIC with a different datum.
6. Grade: The user may have confusion as to the level of detail or the format.
7. Transferred Items: The user may not clearly understand that in order to process a record after inputting transferrable items, one must use the escape (ESC) Key.
8. Condition Code: It may not be readily apparent which condition code to enter for a Defense Resource Management Office Turn In document.

9. ESC Key: It may not be clear to the user that the ESC Key must be pressed to signal completion of certain portions of a worksheet.

10. Menu Selection: It may not be clear which menu item the user should select to accomplish the task.

11. The Total Price entry field in the Cancel-Report-of-Survey Screen: It may be confusing as to what should be entered in the Total Price field.

12. Required Fields in order to create a Supply Requisition: It is unclear which fields are required to have entries in order for a requisition to be processed. As a result, if the user has simple requisitions to create and is in a hurry it might be useful to know the shortest way through a requisition.

13. Corrections in a Worksheet: Once a mistake is made on the screen, it is unclear how to correct the error (to abort or to try to backtrack).

14. Negative Receipt: It is unclear how to reverse a document posting. A user may not realize that the Post Receipts Function may be used to correct errors made in posting documents.

15. Reopen Closed Documents: The error message which results when trying to post a closed document can

leave the user unsure of what to do in order to be able to post the document.

16. Fastest Movement through the Complete the Issue Worksheet: It is unclear how to move quickly through the screen without trial and error.
17. Non-Issue Quantity postings in the Issue Due-out Items Screen: The user may not realize that all listed items that are not being issued at the time must have a zero entry put in the DOQTY column.

3.3.2 Task Specifications

A well-conceived task is realistic (the scenario is similar to actual tasks users typically perform) and common (the task requirement appears often in the real world). Also, it contains a high density of promising challenges. The most severe challenges identified were used to create tasks (either as a single job or a sequence of subtasks). The tasks were designed to be of sufficient length to allow the user to reasonably exercise the system in the submenu area, yet not be so long as to cause user fatigue and carelessness.

Several tasks were designed around the identified challenges. They were then screened for deficiencies and the list of tasks was refined and updated as follows:

1. Candidate challenges were eliminated when they turned out to be already familiar to the user,

very well documented, or obvious, or easily overcome by trial and error.

2. Inessential tedious portions of tasks were eliminated to increase the density of the challenges remaining.
3. The tasks were restructured to approximately balance performance times.
4. The tasks were restructured to stay within a single submenu to eliminate unplanned navigation confusions.

In order to obtain an indication of how challenging or time-consuming each task would be to potential test subjects, it may be desirable to conduct a pilot test in order to further refine the task descriptions prior to the actual experiment.

The following is a description of the five resulting base tasks (which in the experiment were identified by the numbers 11 through 15):

1. Task 11, a single task under the Clothing Turn In Process Menu, consists of the posting of a manual turn-in of a soldier's clothing and equipment.
2. Task 12, a sequence of three subtasks under the Adjustment Transactions Menu, consists of:
    - 12.1 Posting a turn-in to DRMO.
    - 12.2 Posting a Statement of Charges (S/C).
    - 12.3 Modify a Report of Survey (R/S).

3. Task 13, a sequence of three subtasks under the Document Register Actions Menu, consists of:

    13.1 Create four supply requisitions.

    13.2 Create a supply requisition from an unreadable National Stock Number (NSN).

    13.3 Post a local cancellation to a requisition.

4. Task 14, a sequence of two subtasks under the Document Register Actions Menu, consists of:

    14.1 Posting a receipt.

    14.2 Correcting an incorrect receipt posting.

5. Task 15, a sequence of two subtasks under the Clothing Issues Process Menu, consists of:

    15.1 Post a completed clothing issue.

    15.2 Post an issue of due-out clothing items.

3.4 Measures of Effectiveness

Ideally, the measures of effectiveness to be used in the analysis should be robust quantitative expressions of how usable the software is, as indicated either by a resultant improvement in user performance or by user opinions that indicate perceptions of interface friendliness. Therefore, measures of effectiveness will be categorized under user performance and user satisfaction.

The measures defined below are based on assuming that when the user occasionally encounters a challenge in which it is unclear how to proceed, the available actions are:

1. To experiment by trial and error, making entries or selections intended to be rejected by the program or reversible by the user if incorrect, and hoping that error messages or recognizably inappropriate system responses will provide evidence as to whether an entry or selection was correct.
2. To invoke Dynamic Help, if available.
3. To give up, leaving the task incomplete.
4. To cheat or temporize, making an entry known to be incorrect but hoped to be accepted by the program.

As an example, if a user must enter the hat size known as "six and seven-eighths," such entries as "6-7/8" or "0678" might constitute trial-and-error experimentation; invoking Dynamic Help, if available, would yield a message showing that "6875" is the appropriate entry; giving up would constitute asking questions of other people or consulting written documentation; and entering a wrong but acceptable size such as "7" might constitute cheating (or temporizing, if the user intended to correct the entry later).

3.4.1 User Performance

Two types of attributes characterize user performance in ACIFS tasks: quality of performance and productivity. Quality of performance is usually described by accuracy or error rate and productivity is usually described by ability to perform (usability) and by production rate.

3.4.1.1 Accuracy. In CIF Operations, 100% accuracy is desired in proper inventory and accounting procedures with expert users of the system. In those cases, one could measure the rate of transaction completion (speed) without errors. However, when novice or intermittent users operate the system, a 100% accuracy standard is unrealistic, and some measurement of user accuracy should be taken. Since the relative seriousness of various kinds of errors is difficult to define, and since no baseline accuracy measure exists for a novice or intermittent user, a practical measure of accuracy is simply the number of errors a user makes. Of interest is how the addition of Dynamic Help affects the number of errors a user makes in task performance. An error is defined as any one of the following:

1. Erroneous omission or addition of clothing items to a soldier's clothing record.
2. Incorrect responses to queries about soldiers.
3. Incorrect posting of information into on-screen

documents.

Total Task Errors will be expressed in whole numbers per user per task per version (one version with and one without Dynamic Help).

3.4.1.2 Ability to Perform (Usability). It is possible for a place in the program to be so confusing that the user becomes frustrated and gives up, either committing an error (by omitting a data entry or entering an acceptable but incorrect datum) or interrupting the task to seek personal assistance or consult written documentation. Since the Army would like to reduce or eliminate costly software training, freedom from users' "giving up" is an important characteristic to measure. No means of separating frustration-caused "give-up" errors from ordinary "mistake" errors was found; however, the "dead-ends" described below are intended both to prevent "give-up" errors and to prevent huge frustration-interruption times from distorting production-rate data.

3.4.1.3 Production Rate. Given that the ability to perform is present, management personnel are concerned with user production rates. They would not desire a modified system which decreases user productivity. If at all possible, they desire a system which facilitates an increase in 1) user productivity and 2) user satisfaction (in that order). They might accept a system which increased user

satisfaction without affecting operation speed because of the perceived benefits of having a user-accepted system. For ACIFS user testing, two productivity variables will be measured: *speed* and *loss of control*.

There are several measures of *speed* in user testing. One measure is to calculate the percentage of task completion in a fixed time. This measure has been used in comparisons of text editors where a document is to be edited and the percentage of document completed (and therefore task completed) is a straightforward calculation (Ledgard, Singer and Whiteside, 1981). A more common measure is to record total task times from predefined starting points to finishing points. This measure seems more appropriate in evaluating the effect of Dynamic Help in the ACIFS software because of the variability in task type lengths and the complex set of solution methods. Also, it would not be meaningful to count extremely long performance times caused by a lack of user support, because under actual job conditions, users would eventually consult written documentation or take some other action rather than spending time in trial and error or Dynamic Help inspection. The units of Total Task Time will be calculated in seconds per user per task per version (one version with and one without Dynamic Help).

While becoming familiar with the ACIFS Program, the author discovered that there were several places in the program where a novice or intermittent user might become "stuck" and would not be able to complete the task without a manual or supervisor to refer to. Also, it was noted that there seemed to be no pattern to these "dead-end" or *loss of control* points. One could encounter several of these in the performance of one task or may not hit any of them at all in several tasks. In every case, though, use of a manual or supervisor for reference seemed necessary for satisfactory task continuance; alternatively, it seemed possible that a poorly motivated user might intentionally commit an error to get past the frustration. One of the important assumptions made for purposes of this evaluation was that outside help or user support would not be available to the user, who should be able to perform simple tasks without them. Therefore, it was found necessary to prevent an unusually long task performance or noncompletion of a task due to "dead-end" points, in order to ensure that time and error measurements are realistic and that all users experience task completion. In order to capture these "dead-end" points while at the same time allowing the user to continue performance of a task, let a ***Dead End*** be defined as that point in a task where the user is confused about how to use the computer to do the task and has unsuccessfully tried the

following:

1. Used Dynamic Help (if allowed)
2. Trial and error (experimenting)
3. Searched the screen for instructions.

Upon reaching this point, if the user thinks that it would still take a whole minute or more to discover how to proceed with the task, then the user declares a Dead End. The Test Administrator (person administering the experiment) notes the Dead End on a task observation worksheet and then provides the minimum assistance necessary for task continuance. Because the Dead End variable is dependent on the user's subjective evaluation of difficulty and time, it is unknown how it will affect Total Task Errors and Total Task Time. It should be noted that when a Dead End is declared by a user, virtually no user support time will be added to performance time as it would be in an actual job setting. It is expected that a task with many Dead Ends would take a lot longer to complete in an actual job setting because the user would have to ask a supervisor for help or look it up themselves in a manual (if user support were available). It is hoped that the declaration of a Dead End variable in the design will prevent frustration-caused intentional errors and will allow more conservative time differences between tasks done with and without Dynamic Help. Also, the Dead End variable definition will allow for

better test planning and scheduling, preventing unusually long task times having huge productivity gaps. Dead Ends will be expressed in whole numbers per user per task per version (one version with and one without Dynamic Help).

3.4.2 User Satisfaction

User perceptions of a computer program can be categorized as diagnostic or evaluative. They can be collected both during and after software testing through observations and questionnaires. Diagnostic perceptions can be collected during user testing in the form of observations of user comments during tasks and questionnaires between tasks. They may also be collected in a diagnostic questionnaire or interview once testing is completed. The diagnostic observations may then be used to identify strengths and weaknesses in the Dynamic Help messages. Evaluative user perceptions can be collected as part of a post-testing questionnaire and should be design comparative in nature. For ACIFS user testing, the evaluative user satisfaction variable will be defined as the user's opinion of how helpful the program with Dynamic Help was compared to the program without Dynamic Help. It will be measured on a 5-point scale (1 = Very Helpful, 2 = Somewhat Helpful, 3 = No Difference in Help (meaning no help at all), 4 = Somewhat Unhelpful, and 5 = Very Unhelpful (meaning it had a very detrimental effect)).

3.5 Conceptual Hypotheses

The general questions to be answered through this evaluation can be categorized under user performance and user satisfaction.

3.5.1 User Performance

General user performance questions that should be answered through testing are:

1. Is there any difference in Total Test Time (all tasks) between the software versions with and without Dynamic Help?
2. Is there any difference in Total Test Errors (all tasks) between the software versions with and without Dynamic Help?
3. Is there any difference in Total Test Dead Ends (all tasks) between the software versions with and without Dynamic Help?
4. Is there any difference in Total Task Time between the software versions with and without Dynamic Help?
5. Is there any difference in Total Task Errors between the software versions with and without Dynamic Help?
6. Is there any difference in Total Task Dead-ends between the software versions with and without Dynamic Help?

7. Is there any difference in Challenge Time (time to completion for each specific challenge) between the software versions with and without Dynamic Help?
8. Is there any difference in Number of Challenge Errors (for each specific challenge) between the software versions with and without Dynamic Help?
9. Is there any difference in Number of Challenge Dead Ends (for each specific challenge) between the software versions with and without Dynamic Help?
10. Did users use Dynamic Help when it was available?
11. Which Dynamic Help messages (if any) had a negative impact on performance?
12. Once Dynamic Help is called for a specific challenge, what is the average time it takes to complete an entry?

3.5.2 User Satisfaction

General user satisfaction questions which should be answered through testing and questionnaires are:

1. Is there any difference in User Satisfaction between the software versions with and without Dynamic Help?
2. What areas in the program caused confusion when Dynamic Help was not available?

3. When Dynamic Help was available and used, how helpful was it to the user?

3.6 Sources of Variability

The aim of the evaluation is to focus on the differences in friendliness in the interface with and without Dynamic Help. Therefore it is necessary to eliminate any other sources of variability that cannot be controlled.

User behavior and performance depend on many factors, some of which can be blocked out in careful design of the experiment. Some of these sources of variability are:

1. User familiarity with the task.
2. User familiarity with computers in general.
3. User familiarity with a CIF computer program other than ACIFS.
4. User familiarity with the ACIFS software package based upon previous use.
5. User skill in overcoming interface deficiencies.
6. Non-interface aspects of the software design, ie. data structure, speed, etc.
7. User familiarity with the ACIFS software based on recent experience, ie. learning during testing.

An initial step in the design process is to define and plan for the target population which will eventually use the

software. In this case, the target population consists of military and civilian clerk personnel who are currently novice or intermittent users of the ACIFS software. They are not computer experts, yet they may have worked with a computer in clerk tasks and are not considered to be computer novices. Also, they are familiar with the supply task they desire to perform, although they may not remember exactly how to use the computer to accomplish the task. In this case, they are familiar with simple supply tasks such as clothing issues, clothing turn-ins, creating supply requisitions, and posting property book adjustment documents. However, they are not necessarily familiar with high-level management tasks such as stock record maintenance or inventory processing.

Ideally, all test subjects fit into the target population. To ensure this occurs, careful specification of desired test subjects was communicated to the Installation Support Modules Project Office via AIRMICS. All selected test subjects were to be screened prior to testing to determine their computer and supply task skills. Only the data from those test subjects fitting into the prespecified population was to be analyzed. This prescreening process should help to filter out individuals who are not representative of the target population. Also, during the prescreen phase, those potential test subjects who had been

previously exposed to the ACIFS software were to be identified and omitted from the user testing. This eliminates any possible variation due to user familiarity with the ACIFS software.

An additional source of variation is user familiarity with a CIF computer program other than ACIFS. There are at least two other known CIF computer programs being used by various installations in the US Army: the WANG version and the TRADOC version. User familiarity with another CIF software might cause some CIF functions performed with ACIFS to be easier or more difficult depending on whether the other CIF software treats those same CIF functions similarly or differently. Users familiar with another CIF software were to be identified during the pre-screen process and results by type CIF software were to be analyzed as necessary.

To eliminate possible learning effects due to test subjects' familiarity with the software after the first versions of each task are completed, each user's task version sequence, Help and Non-Help sequence and overall task sequence were randomized. The purpose of this randomization is to block out any learning effect that may be encountered with the software use.

An additional source of variation which needs to be avoided during the experiment is the variability due to

non-interface changes made to the software design (such as data structure changes, etc.). During the evaluation, the focus is on changes made to the interface (to enhance user-friendliness) and measuring variables which will indicate the effect of those interface changes. Therefore, any non-interface changes which were made to the program were to be disabled if possible, eliminating the potential variation in interface variables that may result otherwise. If non-interface changes were somehow not disabled, then appropriate data collection rules and methods would need to be defined and adhered to.

CHAPTER IV

EXPERIMENTATION AND ANALYSIS

4.1 Design of the Experiment

As stated in Chapter III, the primary aim of the experimental work in this thesis is to test the effectiveness of a Dynamic Help system that was added to the ACIFS Program. The evaluative focus is on determining if Dynamic Help can improve ACIFS's usability, productivity, and accuracy. The secondary diagnostic goal is to study how and under what conditions Dynamic Help can influence user performance and satisfaction.

This chapter reports the design, implementation, and analysis of user tests to measure user performance (differences in errors, time, and Dead Ends) and user satisfaction by means of user testing which will consist of both performance testing and opinion questionnaires.

4.1.1 Designed User Population

The aim of the EUS Project is to make a computer program's interface sufficiently user-friendly (with Dynamic Help) so that the novice or intermittent user can perform tasks without outside support. The target population for

ISM software consists of military and civilian clerk personnel who are novice or intermittent users of at least one ISM computer program. They are neither computer experts nor computer novices. They are wellversed in the functional task they desire to perform, but they may not know how to use the computer to accomplish it.

In the US Army there is a large population of CIF-employed personnel at military installations around the world. To secure the most valid group of test subjects which represents this population, it is desirable to identify actual CIF personnel or general supply personnel (familiar with the supply processes) to test the ACIFS modification. As discussed in Chapter III, to minimize variation due to computer and supply skill, the ideal test participant should be fairly knowledgeable in supply matters (but not necessarily an expert) and have a low to moderate familiarity with computers in general. In this case, they should be familiar with simple supply tasks such as clothing issues, clothing turn-ins, creating supply requisitions, and posting property book adjustment documents. However, they should not necessarily be familiar with high-level management tasks such as stock record maintenance or inventory processing. Also, they would be novice users of the ACIFS software, although they might be familiar with other CIF programs.

Because of uncertainty in the availability of CIF personnel and general military supply personnel in the Atlanta area (due to Operation Desert Storm), the basic test subject definition was purposely broad enough to encompass a wide range of military or civilian supply personnel who may or may not work in a CIF. Considering the possible length of time that each participant would be available, the test length for each user was set at one man-day. Also, the author determined that she would be able to control up to two users at any one time. Because of the forecasted shortage of available personnel, the maximum number of test subjects forecasted to be available was set at 25. It was hoped that at least 20 personnel of the right type could be found to undergo testing. The user testing was designed around the following test subject specification:

> 25 military or civilian personnel who fit the following general description: grade E3 to E6; Military Occupational Specialty 76Y, 76V, 76C, or 76P; low or moderate computer terminal experience either in schooling or on the job.

A copy of the user testing personnel and equipment request submitted 4 February 91 to AIRMICS is given in Appendix 4.

4.1.2 Designed User Testing

As discussed in Section 3.3.2 of Chapter III, the author defined five base *task types* based on the most severe

challenges discovered in the four submenu areas. In order to directly measure the usefulness of Dynamic Help, it was determined that the tasks were to be performed with and without Dynamic Help. This would provide a difference in performance by user.

4.1.2.1 Test Structure. Because of the differences in length and difficulty between task types, direct comparisons of performance between tasks would be impractical. Therefore, two *versions* (of approximately equal difficulty) of each task were to be created so that direct performance comparisons by task type could be measured. Test subjects were to perform a total of ten tasks (five with and five without Dynamic Help) in one day. It was planned that each user would perform five tasks in the morning (one version of each task type) and five tasks in the afternoon (one version of each task type).

In order to block out learning effects which would occur between the morning and the afternoon performance of the tasks and effects due to task version differences, the order of performance of particular task versions and order of Dynamic Help use between users would be randomized. Also, to nullify any user anticipation of task type order in the afternoon (performing same task type sequence in the morning and afternoon), the task type sequences for morning and afternoon would also be randomized. The resulting data

should indicate the effect that Dynamic Help had on performance without the effects of learning and user anticipation.

User testing was designed to be the vehicle by which the user performance variables (Errors, Speed, and Dead Ends) would be measured. Because each user has a different task performance ability (some take longer, read more slowly, while others are quicker on the keyboard, read faster, etc.), the differences between users in the performance of a single task version with or without Help could be so great as to mask any true difference due to the inclusion of Dynamic Help. Therefore, the differences in performance should be measured within subjects and the paired t-test method should be used to determine whether significance is present in the data. Hines and Montgomery (1980) state that the paired t-test may be used when paired observations are made and the differences between observation pairs are non-homogeneous. The procedure is to collect the data in pairs, and then to analyze the differences between the pairs. This will eliminate the difference in performance between users not caused by the treatments (Non-Help or Help).

4.1.2.2 Paired T-Test. The following is a synopsis of the paired t-test method as described by Hines and

Montgomery (1980):

Let (X_{11}, X_{21}), $(X_{12}, X_{22}), \ldots, (X_{1n}, X_{2n})$ be a set of paired observations where it is assumed that X_1 is normally distributed with parameters μ_1 and σ_1^2 and X_2 is normally distributed with parameters μ_2 and σ_2^2. Let $D_j = X_{1j} - X_{2j}$, $j = 1,2,\ldots,n$ and assume that the differences are normally and independently distributed random variables with mean μ_D and variance σ_D^2. Testing the hypothesis H_0: $\mu_1 = \mu_2$ versus H_1: $\mu_1 \neq \mu_2$ is equivalent to testing

$$H_0: \mu_D = 0$$

$$H_1: \mu_D \neq 0$$

The corresponding test statistic would be

$$t_o = \frac{\overline{D}}{S_D/\sqrt{n}}$$

where

$$\overline{D} = \frac{\sum_{j=1}^{n} D_j}{n}$$

and

$$S_D^2 = \frac{\sum_{j=1}^{n} D_j^2 - \left[\left(\sum_{j=1}^{n} D_j\right)^2 / n\right]}{n-1}$$

are the sample mean and variances of the differences. H_0: $\mu_D = 0$ is rejected either if $t_o > t_{\alpha/2,n-1}$ or if $t_o < -t_{\alpha/2,n-1}$. One-sided alternatives are treated analogously.

4.1.2.3 Statistical Hypotheses. In general, errors would be defined as those incorrect responses to queries, incorrect data entries that remain uncorrected at the time of data processing, and incorrect omission or inclusion of items on soldier clothing records which a user commits during a period between a predefined starting and finishing point. To determine how Dynamic Help performed, a total of the differences of the number of errors by user would be measured. This would be done by aggregating the differences (Non-Help errors minus Help errors) of the five different task types by user. Once Total Test Errors were calculated by user, a paired t-test would be conducted. The Null Hypothesis would be that the Mean Difference in Errors between the two software versions is equal to zero. The Alternative Hypothesis would be that the Mean Difference in

Errors is greater than zero (ie. more errors without help). The α-level at which the one-sided t-statistic (t_o) becomes significant would then be determined and reported (the P value).

The speed of performance of a task would be defined as the amount of time in seconds elapsing between a predefined starting and stopping point. The differences in Total Test Time would then be calculated similarly to Total Test Errors as an aggregation of the five task performance time differences (Non-Help minus Help) by user. Once the differences in tasks had been aggregated by user, a paired t-test would be conducted. The Null Hypothesis would be that the Mean Difference in Time between the two software versions is equal to zero. The Alternative Hypothesis would be that the Mean Difference in Time is greater than zero (ie. longer time without help). The level at which the one-sided t-statistic (t_o) becomes significant would then be determined and reported.

Let Dead Ends be as defined in Section 3.4.1.3. Then the number of Dead Ends occurring between a predefined starting and finishing point determine the total number of Dead Ends for a particular task. The differences in Total Test Dead Ends would then be calculated similarly to Total Test Errors and Total Test Time as an aggregation of the five task Dead End differences (Non-Help minus Help) by

version of the task questionnaire would be completed after the performance of a task type with Dynamic Help available. It would ask the user whether or not he had used Dynamic Help at specific challenge points, the reasons why he had used Dynamic Help at those points, and how useful Dynamic Help was in helping him overcome the challenge. The information obtained from Help questionnaires could be used diagnostically to identify specific areas of Dynamic Help success or failure. The Non-Help version of the task type questionnaire would be completed after performance of a task without Dynamic Help available. It would ask the user whether or not he had been confused at the predetermined challenge points and what had been confusing to him about the challenge. The responses obtained from the Non-Help questionnaires could diagnostically verify (or nullify) the content of the Dynamic Help messages created for those specific challenges.

Once each user had completed the entire set of tasks, it would be useful to ask the users for their overall opinions of Dynamic Help. This would be accomplished in a post-test questionnaire via a question which would ask the user to compare ACIFS with and without Dynamic Help. User Satisfaction would be calculated with the user responses to this post-test evaluative question and would be reported by means of the mean and standard deviation of the responses.

Also in the post-test questionnaire, general preference questions about the Dynamic Help message structure would be asked in order to collect additional diagnostic information for the current Dynamic Help implementation.

4.2 Implementation of the Experiment

The experiment was administered from 20 March to 5 April 1991 at the Georgia Institute of Technology campus using military and civilian CIF personnel from various installations in the US.

4.2.1 User Population

The Installation Support Modules Project funded the travel for test personnel. A total of 26 personnel participated in testing: two personnel (USERIDs 1 and 2) performed tasks as part of a pilot test on 20 March 91, and 24 personnel participated in the user testing from 21 Mar to 5 Apr 91. Table 4.1 (see next page) describes the dates of testing, the User Identification (USERIDs) of test personnel, the installations providing the test personnel, and the versions of CIF software the test personnel had previously worked with.

The data for Users 19 and 21 was omitted from analysis. User 19's data from the first set of base tasks was not recorded and she was required to perform the first set of tasks again in order that data might be collected. Then she

user. Once the differences in tasks had been aggregated by user, a paired t-test would be conducted. The Null Hypothesis would be that the Mean Difference in Dead Ends between the two software versions is equal to zero. The Alternative Hypothesis would be that the Mean Difference in Dead Ends is greater than zero (ie. more Dead Ends without help). The level at which the one-sided t-statistic (t_o) becomes significant would then be determined and reported.

4.1.2.4 Performance Data Collection Design. During task performance, data from which Errors and Speed would be determined would be recorded automatically in a task session history file. Task history file specifications would be prepared and submitted to the programmer (the submitted task history file specifications are enclosed in Appendix 8). Also, two of the five tasks would generate printed output from which partial Error measurements could be made. Also during testing, Dead Ends would be recorded (User/Task/ Screen/Field) by the Test Administrator (the author) at the time of their occurrence on an observation worksheet (See Appendix 9).

It was hoped that the collected data would be robust enough to be used to generate secondary hypotheses which would explain interesting aspects about how Dynamic Help interacts with the user's performance. For instance, if Dynamic Help degraded user performance time, then it would

be of interest to know exactly in what tasks, subtasks, and challenges it slowed the user down. This would allow for speculation as to why time was spent in these identified areas and would allow for identification of possible means of improving Dynamic Help or specific Dynamic Help messages.

4.1.3 Design of User Questionnaires

Questionnaires to be completed by the users would be developed for three purposes:

1. To collect personal data (pre-screen)
2. To collect diagnostic perceptions from the users
3. To collect evaluative perceptions from the users (User Satisfaction).

Users would complete a pre-screen questionnaire in order to provide information on user supply knowledge, CIF knowledge, CIF software experience, and general computer skill. Then during testing, users would complete a questionnaire after the performance of each task. Each post-task questionnaire would ask specific questions about the challenges that should have been encountered in the task and whether or not the potential challenges were confusing. Then, if Dynamic Help was to be available during the task, it would be useful to know whether or not it was used and helpful. For each task type, there would be a questionnaire for the performance of the task with Help and another questionnaire for the performance of the task without Help. The Help

3LE 4.1 Profile of Users

DATE	USERIDS	INSTALLATION	SOFTWARE
21 MAR 91	7 & 8	Ft Bragg, NC	WANG
22 MAR 91	3 & 4	Ft Bragg, NC	WANG
25 MAR 91	5 & 6	Ft Sam Houston, TX	WANG
26 MAR 91	9 & 10	Ft Campbell, KY	WANG
27 MAR 91	11 & 12	Ft Carson, CO	WANG
28 MAR 91	13 & 14	Ft Carson, CO	WANG
29 MAR 91	15 & 16	Ft Polk, LA	Unknown
1 APR 91	17 & 18	Ft Sam Houston, TX	WANG
2 APR 91	19 & 20	Ft Campbell, KY	WANG
3 APR 91	21 & 22	Ft Stewart, GA	WANG
4 APR 91	23 & 24	Ft McClellan, AL	None
5 APR 91	25 & 26	Ft Sam Houston, TX	WANG

performed the second set of tasks as usual during the afternoon session. Since she performed the base tasks a total of three times each, her results on both sets of collected data (the second and third performances) were not included in data analysis.

User 21 was unable to complete the tasks. A review of the Pre-Test Questionnaire showed that his level of computer familiarity did not fall within the range of test personnel desired, and hence his data is not included in the analysis.

Also, during the performance of Task 15AN, User 20 apparently committed 31 posting errors for unknown reasons not believed to be related to predefined challenges. The maximum number of non-challenge errors made by any other user was 1. This anomolous error data was discarded.

4.2.2 User Testing

The pilot test and main user tests were to be conducted at the Software Development Center - Atlanta at Fort Gillem, GA from 20 Mar to 5 Apr 91. Due to unforeseen software and hardware problems, the test site was moved to the Georgia Tech campus. The data entry terminals used for the main user tests were DEC vt100s, as opposed to the WYSE 350 terminals for which the ACIFS software was developed. Since the terminals were different, some minor modifications had to be made to the program, such as function key definition changes. However, these modifications had no material

effect on the user interface.

4.2.2.1 Pilot Test. The pilot test was conducted at the Georgia Tech Department of Electrical Engineering's AT&T Laboratory on 20 Mar 91. As a result of the pilot test, the author determined that Task 14 was not challenging enough to adequately test Dynamic Help. Also, it appeared necessary to reduce the number of tasks to ensure complete performance of all tasks by users in one day. As a result, the five base tasks were reduced to four (Tasks 11, 12, 13 and 15).

4.2.2.2 Main Performance Test. The user testing was conducted at AIRMICS from 21 Mar to 5 Apr 91. During user testing each user was to perform a total of eight tasks: two versions of each remaining task type, half with Help and half without Help. Appendix 5 contains the final versions of the eight tasks. The daily testing schedule was as follows:

EVENT	TIME (approx.)
Initial Briefing to Participants	0800-0830
Pre-Screen Questionnaire	0830-0900
Four Tasks w/ Post-Task Questionnaires	0900-1130
Lunch	1130-1300
Four Tasks w/ Post-Task Questionnaires	1300-1530
Post-Test Questionnaire	1530-1600
Release of Participants	1600-1630

Before testing began each morning, test participants were briefed on the purpose of the testing, the planned sequence of the test and other pertinent information. A copy of the briefing information is enclosed in Appendix 6.

To ensure consistency of actions and non-interruption of testing in case of non-availability of the test administrator, a control handbook of test administration procedures was prepared. A copy of the control handbook (CIF Dynamic Help Experiment Handbook) minus enclosures is in Appendix 7.

4.2.2.3 Task Sequence Assignment. There were two versions of each of the four task types, and either version could be performed with or without Dynamic Help. To ensure that a sufficient amount of time elapsed between the performance of like tasks, one version of each task type was completed prior to the user's lunch break. The remaining version of each task type was performed after lunch. The order of task type performance before lunch as well as after lunch was random. For each day of testing there was an odd-numbered user and an even-numbered user. For the odd-numbered user, the version of each task type performed before lunch was random. The even-numbered user performed the other versions of each task type before lunch. This ensured database integrity while both users were testing. During the lunch break the database was reinitialized.

After lunch, the users performed the opposite versions of each task type (the versions they had not yet performed). For both users, the assignment of Help and Non-Help within the task sequence before lunch was random, while after-lunch versions of each task type received the opposite assignment of Help and Non-Help. The random numbers used for the assignment of task types, versions and Help/Non-Help were taken from Table XV of Hines and Montgomery (1980). The actual sequence assignments are given in Appendix 7.

4.2.2.4 Data Collection. Originally, Total Test Time and Total Test Errors were to be collected automatically during testing by means of task history database tables and other task data files which were to record specified user inputs during testing. From the Task History Table and Other Task Data File for each task and user, a Session Closure Report was to be generated. Automatic data collection as envisioned in the Task History Tables enclosed in Appendix 8 was not implementable in the Informix software. Instead, a different format was implemented from which an informative set of task session records was created. The fields collected in the Task History Tables were:

USERID

INDEX (Programmers reference)

DATE

TIME

SPECIAL KEY/HELP DESIGNATION

MENU LOCATION

FIELD IDENTITY

OTHER IMPORTANT INFORMATION (Start Time, LIN Numbers, etc.)

ACTUAL FIELD ENTRY BY USER

Automatic data collection for a particular task began at the time when the Header Call was completed by the Test Administrator. The Header Call was a subprogram built into the program which started the clock and table entries for a user and task. Then during the task performance, as each field was completed, information was written to a temporary table. Upon completion of a menu selection or upon processing an entire screen of data, the temporary table was written to the designated task history table. Upon completion of a task, the user informed the Test Administrator who then made the Closure Call for the task session. The Closure Call was a subprogram which closed out the task session in the task history table. The Closure Call also listed the start and finish times for the task on the screen, allowing the Test Administrator to make note of the times on the observation worksheets.

There were programming difficulties in writing the temporary table to the task history table. Many of the temporary tables were written to the wrong task history

table, creating difficulties in data extraction and necessitating the recording of task start and finish times on the observation worksheets. Also, entire tasks for some users (except for start and finish times) were not recorded in the task history tables for unknown reasons and therefore are considered lost data.

As implemented, the data collection program was not able to capture the use of Dynamic Help at menu selection screens, so testing about how useful Dynamic Help was for menu selection was weakened. Also, once Dynamic Help was implemented in the menu screens, the static or "canned" Help package was disabled. Therefore, any conclusions about the usefulness of Dynamic Help in menu selection screens will not be based on comparisons of Dynamic Help with "canned" Help, but only on comparison against having no Help.

During testing, Dead Ends data was recorded by the Test Administrator on the observation worksheets. Users were briefed and provided with written instructions on the definition of a Dead End and how to declare one (see Appendix 6 for Instructions to Test Participants). At the time a user declared a Dead End, the Test Administrator noted the Screen/Field location on the Observation Worksheet for that task and user. Then the Test Administrator provided the minimum assistance necessary for the user to proceed with the task.

4.2.3 User Questionnaires

User questionnaires were developed, created and administered as discussed in Section 4.1.3. A copy of the Pre-Screen Questionnaire is enclosed in Appendix 10. Copies of the Post-Task Questionnaires, designated as 11H, 11N, 12H, 12N, 13H, 13N, 15H and 15N (H = Help version and N = Non-Help version), are in Appendix 11. A copy of the Post-Test Questionnaire is enclosed in Appendix 12.

4.3 Analysis of the Data

This section covers how data analysis was performed. The results are given in the following chapter.

4.3.1 User Performance

Many users did not perform Task 11 as originally envisioned. Through fault of the task instructions rather than the interface, many users failed to post transferred items to the Manual-Turn-In Items-Transferred Screen. As a result, it was decided to exclude Error, Time, and Dead End data for that screen, and all Task 11 measurements are taken from the start of Task 11 to the processing point (ESC Key) of the Manual-Turn-In Items-Returned Screen. Data extraction for each of the performance variables is discussed in the following three subsections.

4.3.1.1 Errors. Let errors be as defined in Section 4.1.2.2. Total Test Errors for each user was

calculated and the paired t-test performed as discussed in Section 4.1.2.2. Error data which has been classified by task, subtask and challenge was used for diagnostic analysis.

For Task 11, errors were classified as ACIFS-generated "printout-challenge" errors, "printout-other" errors, and "other-data" errors (non-printout errors collected by the Task History Table). This was done for diagnostic reasons. Total errors for each version of Task 11 was determined by summing these three error types for each user. Then the difference in errors was determined by subtracting the Help error sum from the Non-Help error sum, by user.

Task 12 Errors were identified exclusively by inspection of user actions recorded in the task history tables. Errors were extracted by user for each of the three subtasks and summed to determine the task total per version. Then the Task 12 difference in errors was calculated by subtracting the Help data from the Non-Help data by user.

The Task 13 error extraction process mirrors that of Task 12 in that the data were identified in the task history tables for each of the three subtasks and calculated in a fashior similar to Task 12.

Task 15, which consisted of two subtasks, had its errors determined by ACIFS-generated printouts. Subtask 1's errors were classified as "challenge" errors and "other"

errors. Subtask 2's errors consisted only of challenge errors. Total errors for each version of Task 15 were determined by totalling the Subtask 1 and Subtask 2 errors for each user. Then the difference in errors for each user was determined by subtracting the Help data from the Non-Help data.

4.3.1.2 Dead Ends. Let Dead Ends be as defined in Section 3.4.1.3. Total Test Dead Ends for each user was calculated and the paired t-test performed as discussed in Section 4.1.2.2. Because Dead Ends were recorded by screen and field location, their user totals by task as well as by challenge and subtask (for diagnostic purposes) were easily extracted from the observation worksheets.

4.3.1.3 Time. Let the time of an event remain as defined in Section 4.1.2.2. Unless otherwise specified, the starting and stopping point times for a task are identified by the recorded Header and Closure Call times. Total Test Time for each user was calculated and the paired t-test performed as discussed in Section 4.1.2.2.

The time definitions of other diagnostic events are as follows. For subtasks, let the starting point be defined as either the beginning of a task (for subtask 1) or as the stopping point of the previous subtask. Let a subtask stopping point be normally defined as the time when the final data screen for the subtask is processed. The usual

stopping point for the last subtask of a task is defined as the Closure Call time. For data entry challenges (in general), let the starting time be the exit time from the previous field, and let the stopping time be the time of successful completion of the challenge field. For menu selection challenges, let the starting time be the processing time for the previous subtask, and let the stopping time be the time of correct menu selection (when it is then followed immediately by continuation of subtask performance). Differences in Help and Non-Help versions of subtasks and challenges was calculated and t-tests performed for diagnostic purposes.

4.3.2 User Satisfaction

User Satisfaction was determined by calculating the mean and standard deviation of user responses to a comparative question on the Post-Test Questionnaire (Question #3) as discussed in Section 4.1.3.

The data collected in the Post-Task Questionnaires was quite messy. Many user responses were inconsistent (as when users gave opinions on messages they did not access) and incomplete. As a result, the data on user opinions of how helpful Dynamic Help was when used may not be informative.

The responses collected by the diagnostic questions on the Post-Test Questionnaire appear informative and will be used to identify and rank the importance of each structural

part of both the data entry and menu selection screen Dynamic Help messages.

CHAPTER V

RESULTS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Results

This chapter presents evaluative and diagnostic results and conclusions of the experiment, recommendations for improvements to the implementation of Dynamic Help in ACIFS, and suggestions for further research in user testing of Embedded User Support (EUS).

5.1.1 Evaluative Results

Table 5.1 summarizes the main experimental results for evaluative measures (Dead Ends, errors, time, and user satisfaction), and frequency of Dynamic Help access per user. These results aggregate differences between Non-Help and Help versions of each task.

A particular user's data is included in the main result of a listed variable only if complete data (every version of every task) was present for that user. In Table 5.1 (and many other tables in this chapter), N is the number of users for which complete data was present. The Mean and Standard Deviation are defined as usual for sample statistics. Let t_o be defined as the calculated paired t-test statistic and let P be defined as the α level of statistical significance

Table 5.1 Main Evaluative Results of the Experiment

Measure	N	Mean	Std Dev	t_o	P
Time Difference	15	-470.13	1759.25	-1.03	0.84
Error Difference	9	1.556	2.242	2.08	0.035
Dead-End Difference	22	3.591	3.261	5.16	0.00
Avg # Dyn Hlp calls	11	18.727	9.7272	-	-
User Satisfaction	24	1.25	0.44233	-	-

for the result of the hypothesis test (H_0: $\mu_D = 0$ vs H_1: $\mu_D > 0$, where μ_D = Mean Difference (Without Dynamic Help minus With Dynamic Help)). Considering $\alpha = 0.05$ to be a standard threshold of significance and $\alpha = 0.10$ to be a threshold of suggestive data, the author will report P and will characterize the significance or suggestiveness of results by comparing P or 1 - P to 0.05 or 0.10, respectively. Interpretation of results is deferred to Section 5.2 (Conclusions).

5.1.1.1 Evaluative Results for Performance Time.

Table 5.1 shows that users performed on average 470.133 seconds more slowly with Dynamic Help than without Dynamic Help for an aggregated set of 15 users. The alternative hypothesis was that Dynamic Help would speed up performance

time. Reversing the alternative hypothesis (H_0: $\mu_D = 0$ vs H_1: $\mu_D < 0$) to consider the possibility of a slowdown, the average difference in performance time would be significant for α levels greater than 0.16. Thus the results are not significant at $\alpha = 0.05$ or suggestive at $\alpha = 0.10$, but a Dynamic Help slowdown is implied by the data. Virtually no user support time was added for each Dead End. However, if a penalty of 8.5 minutes had been added for each Dead End, then under the original alternative hypothesis, Dynamic Help would have **saved** an average of 19.37 minutes, suggestive at the $\alpha = 0.10$ level, and with a penalty of 12.5 minutes added for each Dead End, Dynamic Help would have **saved** an average of 32.17 minutes, significant at the $\alpha = 0.05$ level.

5.1.1.2 Evaluative Results for User Errors. Tables 5.1 and 5.2 show that Dynamic Help prevented errors for a subset of nine users. But Table 5.3 shows that Dynamic Help caused errors for the entire user population based upon the data available by task. Complete error-count data for the entire test was present for only nine users, including five WANG users and the four Non-WANG users. Many user results were incomplete either because of missing task history table data or because users failed to properly perform or complete the task. For this subset of nine users, the average number of errors per user for four tasks was 5.555 with Dynamic Help and 7.11 without, so that an average of 1.556 errors

Table 5.2 Error Results per Task for the Subset of Nine Complete-Error-Data Users

TASK	# Errors with Dyn Help	# Errors without Dyn Help	# Errors prevented by Dyn Help	# Errors prevented per user
11	14	24	10	1.1111
12	11	13	2	0.2222
13	12	16	4	0.4444
15	13	11	-2	-0.2222
Avg per usr for test	5.555	7.111	# Errors prevented per user per task	0.3888

were "prevented" by Dynamic Help (see Table 5.2). This 21.9 percent error reduction would be significant at an α level of at least 0.035, and thus is significant at $\alpha = 0.05$. This result may be biased to represent those users who carefully followed the task instructions and therefore generated the complete data necessary for inclusion in the result.

Table 5.3 summarizes the error results *by task* for all users where complete data was available for both versions of a task. Errors were not significantly reduced for any task. All 22 valid users are represented; there was complete data on at least one task for all of them, and on an average of 3.5 out of 4 tasks for them as a whole. In fact, Dynamic Help "caused" an average of 0.273 errors per user per task (an increase from 1.767 without Dynamic Help to 2.040 with Dynamic Help. In Task 15 there was a suggestive increase in errors with Dynamic Help at $\alpha = 0.10$ ($t_o = -1.51$ and $P = 0.07$). These mixed results (subset of nine vs. entire population of users) will be interpreted in Section 5.2.

5.1.1.3 Evaluative Results for Dead Ends. There were 22 users for whom complete Dead End data was collected. With Dynamic Help, the number of Dead Ends per user for four tasks was reduced to 2.091 from 5.682 without Dynamic Help. Thus, Dead Ends were "prevented" by Dynamic Help an average

Table 5.3 Error Results per Task for Entire User Population

TASK	# usrs w/ complete data	# Errors w/Dyn Hlp	# Errors w/o Dyn Hlp	# Errors Dyn Help prevented	# Errors prevented per user
11	21	52	50	-2	-0.095
12	21	31	31	0	0
13	18	26	25	-1	-0.056
15	17	47	31	-16	-0.941
-	-	-	-	# Errors prevented per user per task	-0.273

Table 5.4 Dead Ends Results per Task

TASK	# users w/ complete data	#DeadEnds w/Dyn Hlp	#Dead Ends w/o Dyn Hlp	#DeadEnds Dyn Hlp prevented	#DeadEnds prevented per user
11	22	5	45	40	1.818
12	22	12	32	20	0.909
13	22	10	17	7	0.318
15	22	19	31	12	0.545
-	-	-	-	#DeadEnds prevented per user per task	0.898

of 3.591 times per user during the four-task testing session. This is a highly significant result having t_o = 5.16 and P value near zero.

Table 5.4 summarizes the Dead End results by task for all users where complete data was available for both versions of a task. Dynamic Help prevented an average of 0.898 Dead Ends per user per task.

5.1.1.4 User Satisfaction Results. Compiling the responses from Question #3 of the Post-Test Questionnaire

yields a mean response of 1.25 (1 = Very Helpful, 2 = Somewhat Helpful, 3 = No Difference, 4 = Somewhat Unhelpful, and 5 = Very Unhelpful) as the users' average opinion of whether or not Dynamic Help was helpful while using the ACIFS program. Of 24 users, 18 of them gave the most favorable response on the 5-point response scale.

5.1.1.5 Use of Dynamic Help. When available, Dynamic Help was accessed 18.727 times per user on average during the testing session, or 4.682 times on average per task. When at a particular data entry field, users spent an average total of 43.623 seconds reading the Dynamic Help message and completing the field entry. The author suspects that some of the Dynamic Help accesses may have resulted from curiosity or an effort to please the Test Administrator.

5.1.2 Diagnostic Results

5.1.2.1 Diagnostic Results for Performance Time. During testing, the author observed the presence of three test condition effects which may have hampered Dynamic Help's ability to reduce performance time. These test condition effects are discussed in Section 5.2.2.1.

Locations Where Dynamic Help Saved Time. Table 5.5 shows the one location identified by the author where Dynamic Help saved performance time (measured in seconds). This same challenge (where "6875" was the only acceptable

entry for a six-and-seven-eighths hat size) also resulted in the most significant prevention of Dead Ends. This challenge was particularly difficult because it was virtually impossible for the user to guess an entry which would be accepted by the computer. The fact that Dynamic Help was so time-saving (over half a minute on average) is not surprising.

Table 5.5 Location Where Time was Saved

Location	N	Mean	Std Dev	t_o	P
Task11/Size K20163	19	32.895	99.761	1.44	0.084

Locations Where Dynamic Help Prolonged Time. Table 5.6 lists the locations identified by the author where Dynamic Help caused an increase in performance time (reversed alternative hypothesis). In every case, the time that the user spent reading Dynamic Help was much longer than the time the user would have spent in simple trial and error when Help was not available. In many cases, the information that a user searched for in a Dynamic Help message was located at the message's end, and many users would read the entire message before reaching the desired information.

Table 5.6 Locations Where Time was Prolonged

Location	N	Mean	Std Dev	t_o	P
TASK 15	18	-388.67	1096.11	-1.50	0.08
Task12/Subtask 2	21	-49.238	156.471	-1.44	0.08
Task13/Subtask 3	17	-129.12	300.01	-1.77	0.05
T12/Sub1/ESC-CondCd	18	-19.278	62.566	-1.31	0.10
T13/Sub3/MenuSelect Local Cancellation	16	-104.19	295.86	-1.41	0.09
T15/Sub2/DOQTY	16	-62.625	142.29	-1.76	0.05

Task 15 had a large increase in time that appears to have resulted from Dynamic Help use. A difficulty that users had which was not anticipated prior to testing was the menu selection for Subtask 1 (complete a soldier's initial issue). Although data was not collected on Dynamic Help use at the menu screens, the author observed users spending several minutes in Dynamic Help message screens attempting to determine the correct menu selection to begin Subtask 1, and in many cases users declared Dead Ends. The DOQTY challenge (also listed in Table 5.6) was significant against Dynamic Help for time. This contributed to the suggestive slowdown indicated by Task 15's time difference. The Dynamic Help message for the DOQTY challenge appeared to be

difficult to read for most users accessing it, and therefore the time spent reading the message probably caused the significant difference in performance time for that challenge.

In Task 13 Subtask 3 (Post a Local Cancellation), the difference in time was significant mainly because of the time it took to use Dynamic Help in the proper menu selection to begin the subtask (see T13/Sub3/MenuSelect Post Local Cancellation in Table 5.6).

5.1.2.2 Diagnostic Results for User Errors. Both with and without Dynamic Help, the nine Complete-Error-Data users (those for whom complete error data could be collected on all tasks) committed 114 errors in 72 task sessions, or 1.583 errors per user per task. The other users committed 179 errors in 82 task sessions, or 2.183 errors per user per task. Both these error rates are far greater than would be tolerated in an actual job setting. Throughout testing, the author observed that users were not motivated to use Dynamic Help for error prevention; they appeared "careless" and not as quality-conscious as expected. Although the tasks were designed to be as challenging as possible (and hence more error-prone than other typical CIF tasks), it appears that users tolerated a much higher error rate than would have been permitted in their actual job settings. The author suspects that the Complete-Error-Data users' behavior was

closer to that in a realistic job setting than the behavior of other users. In the remainder of this section, the author will analyze Dynamic Help's prevention and causing of errors with Dynamic Help and then will analyze Dynamic Help's prevention of errors for the nine Complete-Error-Data users.

Locations Where Dynamic Help Prevented Errors for the Entire User Population. Table 5.7 lists the single identified location where Dynamic Help prevented errors on the whole. Subtask 2 of Task 12 is the Statement of Charges creation and correction and will be discussed in Section 5.2.2.2.

Table 5.7 Location Where Errors were Prevented for the Entire User Population

Location	N	Mean	Std Dev	t_o	P
Task12/Subtask 2	21	0.429	1.207	1.63	0.06

Locations Where Dynamic Help Caused Errors for the Entire User Population. Table 5.8 shows those identified places in the ACIFS-modified program where a reversed alternative hypothesis test (H_0: $\mu_D = 0$ vs H_1: $\mu_D < 0$) showed Dynamic Help as causing errors for the entire user population.

Table 5.8 Locations Where Errors were Caused for the Entire User Population

Location	N	Mean	Std Dev	t_o	P
TASK 15	17	-0.412	1.121	-1.51	0.07
Task11/PrntOut Oth Errs	22	-0.273	0.827	-1.55	0.07
Task12/Subtask 1	21	-0.381	0.921	-1.90	0.04
Task13/Subtask 2	18	-0.222	0.548	-1.72	0.05
T12/Sub1/Condition Code	20	-0.2	0.696	-1.29	0.11
T15/Sub2/DOQTY	18	-0.111	0.3234	-1.46	0.08

For Task 15, most of the errors were made as "Other" errors in Subtask 1 or as errors in Subtask 2. Neither of these types of errors was significant by itself but in combination they force the data on errors to be suggestive that Dynamic Help caused errors in the task. The "Other" errors in Subtask 1 were non-challenge errors and were probably lack-of-attention-to-detail errors while errors made in Subtask 2 were mostly challenge-related errors which may have been aggrevated by poorly written Dynamic Help messages. In particular, the DOQTY challenge error results are significant against Dynamic Help and could very well have been caused by a poorly written or poorly structured Dynamic Help message. To identify how "bad" the Help

message was, the author determined whether the error results were still significant for those users who actually accessed Dynamic Help, and found that the results for users actually using Help remained against Dynamic Help (t_o = -1.51 and P = 0.08). This suggests that the help message had an adverse impact on error rates for that challenge.

The Task 11 "Printout-Other" (Non-Challenge) error results suggest that Dynamic Help caused errors and could have been caused by poorly written or incomplete Dynamic Help messages.

In Task 12 Subtask 1, errors occurred in the posting of NSN quantities or, more often, errors occurred in the input of the Condition Code. The incorrect postings of quantities were most likely caused by a failure to read the task documentation as opposed to any failure of Dynamic Help messages. According to the table, Condition Code errors were also significant against Dynamic Help at α levels greater than or equal to 0.11. But, in attempting to analyze how deficient the Condition Code Dynamic Help message was (whether or not it caused confusion which caused errors), the author found that in those cases where Help was actually accessed by the user, errors were not significant (t_o = 0.0 and P = 0.50). Thus, Dynamic Help did not cause the error significance in Task 12 Subtask 1 and in the Condition Code challenge.

In Task 13 Subtask 2 (create a supply requisition from an unreadable NSN) there was one potential challenge (correct the NSN). No errors were committed in the encounters of that particular challenge. Most of the errors users committed in this subtask were caused by a failure to follow task instructions. The author feels that the significance in errors for this subtask is not due to Dynamic Help.

Locations Where Errors were Prevented for the Nine Complete-Error-Data Users. Table 5.9 shows those identified locations where Dynamic Help prevented errors for the nine Complete-Error-Data users. In contrast to the corresponding results for the entire user population, these results are as expected, with statistically significant or suggestive error prevention at five locations that were challenging.

Task 11 errors overall, the Task 11 "Printout-Challenge" errors, and the Task 11 Size of D01857 and C08256 were significantly prevented by Dynamic Help. This is not unusual since Task 11 had several difficult Size challenges as well as other data input challenges. Without Dynamic Help, Complete-Error-Data users could be expected to use trial and error to complete some entries, resulting in incorrect yet range-acceptable guesses.

Subtask 3 of Task 12 (Modify a Report of Survey) was challenging to users for three reasons, two of which were

error-causing. First, users did not know what NSN and quantity to enter on the worksheet. As a result, those without access to Dynamic Help could not get an explanation of worksheet completion procedures. Most users would then guess and enter incorrect data which were within the range of acceptable entries. Second, users were confused about which datum to enter in the Total Price field of the worksheet and many would enter the wrong price. The error rate decreased with Dynamic Help for the first challenge and increased for the second. Therefore the Dynamic Help message for the worksheet completion procedures appears to be helpful, but the Dynamic Help message for the Total Price field may be unclear or need restructuring.

Table 5.9 Locations Where Errors were Prevented for the Nine Complete-Error-Data Users

Location	N	Mean	Std	t_o	P
TASK 11	9	1.111	1.269	2.63	0.015
Task11/PrntOut Chal Errs	9	1.222	1.093	3.35	0.005
Task12/Subtask 3	9	0.222	0.441	1.51	0.085
Task13/Subtask 3	9	0.222	0.441	1.51	0.085
T11/Size D01857 & C08256	9	0.444	0.527	2.53	0.018

In Subtask 3 of Task 13 users were instructed to perform a local cancellation on a supply requisition, and the only error-causing confusion in the associated worksheet was the Quantity to Cancel field. Many users without Dynamic Help were confused about what quantity to enter in the field and subsequently made incorrect guesses which were range-acceptable. Help users were able to access needed information, and thus were assisted in correctly completing the entry.

In contrast to the situation for the entire user population in which Dynamic Help seemed to cause errors (Table 5.8), for the Complete-Error-Data users there were no identifiable locations where there were significantly more errors with Dynamic Help than without.

5.1.2.3 Diagnostic Results for Dead Ends. ***Locations Where Dynamic Help Prevented Dead Ends.*** As shown in Table 5.10, the author identified 3 task types, 4 subtasks, and 9 challenge points where Dynamic Help prevented Dead Ends. Task 11 (Manual Turn In), along with its Size challenge for LIN Number K20163, had highly significant results (P value is near zero). Out of the nine significant challenges, five of them were Size input challenges where the user would not be likely to know the correct size format. In these cases, Dynamic Help provided the user with a list of correct size formats to choose from. The Task 12/Subtask 1/Condition

Table 5.10 Locations Where Dead Ends were Prevented

Location	N	Mean	Std Dev	t_o	P
TASK 11	22	1.818	1.402	6.08	0.0
TASK 12	22	0.909	1.306	3.26	0.002
TASK 15	22	0.545	1.945	1.32	0.10
Task 12/Subtask 1	22	0.455	0.739	2.89	0.004
Task 12/Subtask 2	22	0.1364	0.4676	1.37	0.093
Task 12/Subtask 3	22	0.318	0.716	2.08	0.025
Task 13/Subtask 1	22	0.227	0.752	1.42	0.085
Task11/SizeC07440	18	0.167	0.514	1.37	0.094
Task11/SizeK20163	22	0.7727	0.4289	8.45	0.00
Task11/SizeD01857&C08256	9	0.222	0.441	1.51	0.085
T12/Sub1/ESC to Cond Cd	20	0.10	0.3078	1.45	0.081
T12/Sub1/ConditionCode	21	0.333	0.483	3.16	0.003
T12/Sub2/ESC to TotPrice	21	0.1905	0.4024	2.17	0.021
Task15/Sub1/Size C07440	21	0.286	0.561	2.34	0.015
Task15/Sub1/Size N39848	22	0.2273	0.4289	2.49	0.011
Task15/Sub2/MenuSelect of Issue Due-Out Items	22	0.1364	0.4676	1.37	0.093

Code challenge is another test of user recall and recognition, and Dynamic Help provided the user with a list of choices and descriptions so that a proper selection could be determined. Two of the other challenges deal with the use of the ESC Key to move to another portion of the screen. The global portion of the Dynamic Help message laid out the procedure for moving within the screen, allowing the user enough information to continue with the task.

There are two table entries whose underlying reasons for Dead End prevention may not be apparent. They are the Subtask 3 of Task 12 and Subtask 1 of Task 13 entries. Subtask 3 of Task 12 may be significant because of two challenges: first, the proper menu selection to begin the subtask (whose significance level is $\alpha = 0.16$) and second, the total price to cancel on the Report of Survey modification (whose significance level is $\alpha = 0.16$). The combination of these two challenges provided statistical significance to the entire subtask. Subtask 1 of Task 13 involved the creation of supply requisitions, and the user may have been confused at many points about proper code entries when, in fact, many of those entries were optional. Without Dynamic Help, many users were unable to determine whether or not the code entries were optional in some fields, and they declared Dead Ends.

Locations Where Dynamic Help Caused Dead Ends. The author could identify no specific places where Dynamic Help actually caused a Dead End, although there were some places in the program where Dynamic Help was not clear enough, so that users declared Dead Ends, but not to a greater extent than without Dynamic Help.

5.1.2.4 Other Diagnostic Performance Results. Through analysis and personal observation, the author discovered several other indicators of the usefulness of Dynamic Help to novice ACIFS users.

When available, Dynamic Help was an alternative to trial-and-error data entry. A successful Dynamic Help access would presumably prevent further incorrect trials, so it was hypothesized that Dynamic help should reduce the number of incorrect guesses prior to a final data entry. The author determined the number of incorrect guesses or trials until the completion entry for certain challenge fields and analyzed whether the difference in the number of wrong guesses would be significant between the Non-Help and Help versions of the program. Table 5.11 shows that four of the data entry challenge results were significant or suggestive in the difference in number of wrong trials or guesses prior to the final entry. Three of the four were Size challenges and the other one was the Task12/Subtask1/ ESCtoCondCode challenge. These results may indicate that

Table 5.11 Locations Where Dynamic Help Prevented Wrong Guesses

Location	N	Mean	Std Dev	t_o	P
Task11/Size K20163	20	3.50	4.371	3.58	0.0
T12/Sub1/ESCtoCondCd	18	0.778	1.957	1.69	0.055
T12/Sub2/ESCtoTotPrice	20	2.40	8.513	1.26	0.11
T15/Sub1/Size C07440	17	1.294	3.424	1.56	0.069
T15/Sub1/Size N39848	17	1.176	2.628	1.85	0.042

Dynamic Help decreased the number of incorrect trials before entry completion for certain size fields and movement within screen actions.

If a user made incorrect guesses of a data entry after accessing Dynamic Help, this could indicate deficiencies in the help message. For instance, although the difference in wrong guesses overall for the T12/Sub2/ESCtoTotPrice challenge is in favor of Dynamic Help (t_o = 1.26 and P = 0.11), users made an average of 4.8571 wrong guesses after calling Dynamic Help for the first time. This may indicate that Dynamic Help was useful but that the message could be made clearer or more complete to facilitate better performance.

The author observed that most users had difficulty in selecting the proper menu item from the Main Menu to start a task. These initial menu selection problems were not anticipated by the author and seemed to be experienced most by users who were familiar with the WANG computer program. WANG users often would misinterpret the ACIFS terminology similar to that of their system. These misunderstandings were especially prevalent in the Main Menu and Submenu screens. This was substantiated by WANG user comments. The author also noted that the users from Ft. Polk who use a local computer program had no difficulty with menu selection in Subtask 2 of Task 15 (Issue Due-Out Items) where the WANG users were consistently challenged. The Ft. Polk CIF program may have been similar in terminology for that particular subtask menu selection. There were other performance errors that users made because of WANG experience, such as in the posting of turn-in quantities. WANG users normally post the clothing record with zeros (showing that soldier is no longer signed for any clothing) while the ACIFS program requires posting of actual turn-in quantities. But overall, most of the confusions and errors resulting from familiarity with another CIF program were observed in menu selection processes.

Although Dynamic Help was used in menu selection screens, users tended to use trial and error as their

primary means of determining correct menu choices. Users may have felt that it was much easier and quicker to simply try all of the few promising screens (2 to 5) before resorting to use of Dynamic Help.

The author also noted that there were several preidentified challenge points where user efficiency and accuracy could have been increased (in correction procedures, decision-making, or in determining a worksheet's quickest completion method) with the use of Dynamic Help. However, most users failed to use help because they did not realize that a challenge to their efficiency or accuracy was present and as a result, Dynamic Help was not found to be significantly helpful. Some of these potential challenges include the Special Issue question in Task 11. The required user action was to respond either "Y" or "N" to a query about the soldier's MOS. Most users made guesses based on experience, declared a Dead End very early, or answered "N" (because the attached paperwork did not contain the information) not realizing that information with which to make the correct decision was present in the Dynamic Help message. Another potential challenge was the method of quickest movement through the Complete-the-Issue Worksheet (Task 15/Subtask 1). Even though users were explicitly instructed to move through the worksheet as quickly as possible, most did not access Dynamic Help for information

on quickest movement. Many of these unrealized potential challenges were not data-entry, field-specific items. Most were global informational items. In all of these cases, because the user failed to recognize that there was a need for information, Dynamic Help was not accessed and therefore could not be useful.

5.1.2.5 Diagnostic User Opinion Results. In Question #2 of the Post-Test Questionnaire users were asked to rank, in order of importance, the three reasons why they might have sought Dynamic Help in a ***menu screen***, with a ranking of "1" being the information most sought and "3" being the least. Table 5.12 shows that users sought help for the Procedures category (how to make a menu selection) most often, with 12 of the 24 users ranking it first. They sought help to Understand the Meanings of listed menu selections the next most often and finally, users sought help for General Orientation the least often with 11 of the 24 users ranking it last.

In Question #1 of the Post-Test Questionnaire users were asked to rank, in order of importance, the five reasons why they might have sought Dynamic Help in a ***data-entry screen*** with a ranking of "1" being the information most sought and "5" the least. Table 5.13 shows that users clearly felt that they needed help most often for the What to Enter category with 15 out of 24 users ranking it most

Table 5.12 User Help-Seeking Preferences at Menus

Category	N	Mean	Std Dev
Procedures	24	1.667	0.7614
Understanding Meanings	24	2.083	0.8297
General Orientation	24	2.25	0.794

Table 5.13 User Help-Seeking Preferences at Data-Entry Screens

Category	N	Mean	Std Dev
What to Enter	24	1.542	0.833
How to Enter	24	2.2917	1.1971
Location	24	3.2083	1.3507
Movement Within Screens	24	3.75	0.944
Movement Between Screens	24	4.2083	0.833

important and no users ranking it least important. This is understandable because the most challenging locations in the program were at places where the user would not be able to determine the correct format of a data entry. The How to Enter category was second, with 5 out of 24 users ranking it first and 13 users ranking it second. Movement Between Screens was the category sought least often, which is understandable because ACIFS has a rigid screen sequence.

5.2 Conclusions

5.2.1 Evaluative Conclusions

Based upon the analysis and results discussed above, the author concludes that Dynamic Help significantly reduces novice and intermittent user Dead Ends. Also, it significantly reduces errors for users for whom complete error data was available, but for other users did not reduce errors under test conditions. Assuming that the Complete-Error-Data users behaved more like users in an actual job setting, then Dynamic Help reduces errors. Dynamic Help did not improve user performance times under test conditions. In fact, the results suggest that overall performance time was slightly increased when Dynamic Help was available for use. For the subset of nine Complete-Error-Data users, the slowdown was slightly greater, and the same conclusion applies as for all the users.

An analysis of the Post-Test Questionnaire indicated that users seemed satisfied with the helpfulness of Dynamic Help.

5.2.2 Diagnostic Conclusions

5.2.2.1 Diagnostic Conclusions for Time.

Table 5.14 summarizes the possible reasons for unfavorable time results with Dynamic Help. As discussed in Section 5.1.2.1, user performance times were enhanced by Dynamic Help only for those data entry fields where the user was required to recall difficult data entry formats from memory. In those cases, Dynamic Help saves part of the time that a user would spend searching their memory for and entering as many combinations of formats as necessary until the program accepts one. Otherwise, Dynamic Help does not significantly reduce performance time and may somewhat degrade it. This degradation occurs in part because the users must search the help text for the information they are seeking, and for many challenge points, the information desired was located at the end of the help message. This indicates that Dynamic Help messages may need structural changes to assist users in locating the information they are most likely to seek. A restructuring of Dynamic Help messages would possibly result in a reduction of user performance times.

Table 5.14 Possible Mechanisms Causing Unfavorable Time Results

Classification	Mechanism
1. Dynamic Help Deficiencies	* Poor message structure
	* Message content unclear
2. Control of Test Conditions	* Overuse of Help due to curiosity & desire to please
	* Poor time discipline
	* High user tolerance for errors

Another reason for lengthy help message reading may be that users cannot quickly interpret the information located in the help message either because the message is unclear or the information is not clearly translated. For instance, in certain size fields, such as that for LIN C07440 in Task 11, the format for entry is highly unusual (5 1/2 Regular = 055R), and the help message does not clearly show a user how to decide what datum to enter. Therefore, it takes an unacceptable amount of time (approximately 82 seconds) for users to choose and input the correct size because there is no translation or description of how to determine the correct datum from the listed entries.

The author found several factors degrading Dynamic Help's improvement of performance time that were attributable to test conditions (see Table 5.14). First, in an actual job setting, Dynamic Help would have been accessed less frequently; curiosity and desire to please the Test Administrator would not be present. A decrease in non-essential use would reduce the overall degradation of performance time.

Secondly, time was disciplined poorly because of user calendar requirements and the possible resultant user interactions. Users for any given test day would have previously made flight arrangements for the late afternoon, both leaving on the same flight. One user would perform tasks more quickly than the other user. Users could have applied pressure on each other to speed up or slow down. During their lunch break, both users could have agreed on a set target completion time to ensure they had ample time to make their flight. The slower of the two users could be in a hurry in the afternoon and possibly would risk more errors. The quick user could slow down, and possibly would overuse Dynamic Help.

All of this is consistent with the much faster performance times in the afternoon sessions (which could also be due to a simple learning effect). It would seem to explain the greatly increased error rate in the afternoon,

especially since the afternoon error rate should have been *decreased* by the learning effect. The afternoon rate of 2.1585 errors per user per task, versus 1.8333 in the morning, strongly suggests carelessness or fatigue in the afternoon. It is easy to imagine that time-pressured users would avoid investing time in reading help messages, while more skilled, non-pressured users would browse. This would explain why the test showed Dynamic Help as costing time rather than saving time.

The final test condition effect on the time results is user tolerance for error. During the test a user had three choices in dealing with confusing locations in the program and moving on with a task: 1) spend additional time making guesses, searching the screen for instructions, etc., 2) declare a Dead End (in lieu of user support), or 3) make an error (with or without an intention to correct it later). While doing the same task in an actual job setting the user would not have the third choice (make an error), but would have to spend additional time trying to resolve the confusion either by trial and error or by accessing user support. The author observed that users tended to have a high tolerance for errors during testing. This observation is supported by the fact that user errors were greater in the afternoon than in the morning (see preceding paragraph), contrary to what would be expected from a learning effect.

As users went through a day of testing, their tolerance for errors seemed to increase. As user error tolerance increased, the time spent resolving confusing situations decreased. This had an unanticipated impact on Dynamic Help's ability to reduce performance times.

Because these three conditions were present during testing, the author concludes that the testing has not shown that Dynamic Help would fail to save time in an actual job setting. It is possible that in a better test or in an actual job setting, Dynamic Help would save time.

It should be noted that in the current implementation most help messages were retrieved intact from files rather than assembled by query at run time. Thus, message access was rapid, and the author observed no significant degradation in performance time due to message retrievals. Retrievals occurred faster than user reading speed. If the building of help messages becomes slow in future implementations, performance time may be further increased by Dynamic Help.

5.2.2.2 Diagnostic Conclusions for Errors. ***Diagnostic Conclusions for Errors for the Entire User Population.*** The author found one location where errors were significantly reduced by Dynamic Help for the entire population of users, but Dynamic Help was not the primary cause for the reduction of errors in that case. The author feels that there are two

areas in Subtask 2 of Task 12 that accounted for most of the errors. The first is the user's failure to properly correct an entry in the Worksheet (as instructed midway through the subtask). The second is the user's failure to enter the correct Total Price. Neither of these were defined as potential challenges. The most likely reason why users made these mistakes is a failure to follow instructions and read the provided documentation. The author sees no mechanism to ascribe this error prevention directly to the availability and use of Dynamic Help.

In general, the entire population of users seemed to commit more errors with Dynamic Help under test conditions as opposed to the number of errors they would be likely to commit in an actual job setting. The author concludes that there are two main reasons for the increased error rate because of Dynamic Help. First, users may become more confident when they have access to help and therefore are less careful in their actions, and second, certain Dynamic Help messages are poorly written or incomplete and users misinterpret the information contained in the message. However, because user tolerance for errors should be lower in an actual job setting than occurred in the user testing (see Section 5.2.2.1 for discussion of error tolerance), the author would expect users to be more careful and that Dynamic Help would be accessed more often specifically for

error prevention. As a result, it is hoped that errors would be significantly reduced by the Dynamic Help implementation.

Diagnostic Conclusions for the Nine Complete-Error-Data Users. The results for the subset of nine users discussed in Section 5.1.2.2 indicate that Dynamic Help prevented data-entry as well as worksheet instruction errors and support the conclusion that Dynamic Help would be useful in preventing errors for Complete-Error-Data users, who are assumed to closely approximate users in an actual job setting. However, some help messages need to be clarified or restructured (i.e. Total price field in Modify Report of Survey).

5.2.2.3 Diagnostic Conclusions for Dead Ends. Because Dynamic Help prevents Dead Ends so significantly, especially in data entry fields where a user must recall the correct format or the correct method of movement (see Table 5.9), the author concludes that Dynamic Help is most useful in those areas where the computer program will not allow the user to move ahead with a task unless the data entry format is correct, and the user is unable to recall the correct format entry from memory. The addition of Dynamic Help allows novice and intermittent users to traverse through these difficult areas, assisting completion of the most common tasks with almost no prior training. However,

Dynamic Help does not reduce Dead Ends to zero, and thus does not hold the promise of substituting for all training, other documentation, and user assistance.

5.2.2.4 Other Diagnostic Conclusions for Performance. For certain size fields and movement-within-screen actions Dynamic Help decreases the number of wrong guesses prior to completion of the field or action. However, Dynamic Help does not totally eliminate wrong guesses after invocation in certain instances, and the author concludes that continued wrong guessing is due to unclear or poorly structured Dynamic Help messages where users cannot find the information they seek because it is ambiguous or is hidden in the body of the message.

The ACIFS program has many user interface deficiencies, but it does allow the user to use trial and error in task performance. Many older computer programs are very unforgiving of user errors or guesses and would interrupt task sessions with the introduction of unacceptable data entries. In ACIFS, trial and error is the main competitor against Dynamic Help. Therefore, the author concludes that Dynamic Help would be especially useful in older, unforgiving programs where trial and error is not permitted and cannot compete with Dynamic Help.

Although data on Dynamic Help use at the *menu selection* screens was not collected, the author concludes (based on

personal observation) that Dynamic Help did not appear to be helpful overall for menu navigation. Users clearly had difficulties in menu selection, regardless of whether or not Dynamic Help was available, especially in deciding the correct submenu item with which to begin a task. This was especially true for the WANG users in certain cases where the ACIFS program differed from the WANG program. However, users preferred trial and error over Dynamic Help because it seemed easier and quicker to explore all promising menu choices, recognizing the desired data-entry screen by viewing candidate screens, rather than accessing and reading Dynamic Help first. Difficulties in menu selection could have been prevented by a rewording of the choices listed on the menu, or by clearer descriptions of menu functions in the Dynamic Help messages.

Dynamic Help is not useful for situations where the user does not realize that a challenge to efficiency or accuracy is present. If a user does not know that Dynamic Help can assist him at a particular point, then Dynamic Help will not be accessed and therefore is not useful. Dynamic Help cannot increase efficiency and accuracy unless the user recognizes that the Dynamic Help message contains helpful information.

5.2.2.5 Diagnostic Conclusions Based on User Opinions. Based on the results of Question #2 of the Post-Test

Questionnaire, the author concludes that users seek help for Procedures more often than Understanding the Meanings, which is sought more often than General Orientation. Based on the observation that users spend too much time reading help message text trying to find the information they seek, the author feels that a restructuring of the menu messages may assist the users in locating the information they seek the most often. In particular, the results indicate that users would prefer to see the local portion of the Dynamic Help message before the global portion.

The results from Post-Test Questionnaire Question #1 indicate that users sought help most for the What to Enter category which is normally listed near the end of the data-entry Dynamic Help messages, causing users to waste time searching through most if not all of the help text for the information they sought. The author concludes that the Dynamic Help messages could be improved by a restructuring of the data-entry Dynamic Help messages, both by a reversing of order in the sequence of the global and local portions and by resequencing the local portion to present the most sought after information first. Also, since users clearly sought Dynamic Help for What to Enter information, which usually contains lists of items from which the user must choose, the author concludes that users might be aided even more by having a separate help key for only the list of

choices. With a separate key, users who desire a list may gain quick access to the list without being required to read a complete help message.

5.3 Recommendations

5.3.1 Improvements to the Current Implementation

Based on the results and conclusions, the author recommends the following improvements to the current implementation of Dynamic Help in ACIFS.

To reduce the overall time users spend using Dynamic Help in menu selection screens, the author recommends that Dynamic Help messages be restructured to appear in the following sequence:

Local

Help with Procedures

Meaning of Screen or Function

Global

General Orientation

Also, functional descriptions of the menu items should be clarified or reworded.

To reduce the overall time users spend using Dynamic Help in data-entry screens and to inform users when decision-making information is available, the author recommends that data-entry Dynamic Help messages be restructured, that a separate "List of Choices" key be

provided to users, and that a signal or "flag" be created to appear on the screen whenever the List of Choices is available for a field the user is currently in. This will also increase help use on occasions the user may otherwise not recognize a need for help. For example, in the Special Issue field in Task 11, the user must answer the query with "Y" or "N". If the "flag" appeared upon entry to that field, the user would be reminded that a List of Choices is available to assist him in his decision. Without the appearance of this "flag", the user does not realize that decision-making assistance is available.

As recommended above, the data-entry Dynamic Help messages should be restructured as follows:

<u>Local</u>

What to Enter

How to Enter

Location

Movement within Screen

<u>Global</u>

How to Enter

Location and Function

Movement between Screens

All of the What to Enter portions of the Size Dynamic Help messages should clearly indicate how a user is to decide which datum to choose. For example, in the LIN C07440 Size field, the listing of acceptable size entries should also include an example of translation, such as 5-1/2 Regular = 055R. It might also be helpful for this translation information to be present in the List of Choices message for the Size fields.

Since the author has recommended that global portions of the Dynamic Help messages should follow instead of precede the local portions, it may be helpful to highlight (in color) the portions of the global message that include general instructions on how to fill out a worksheet in the data-entry Dynamic Help messages. This would be especially helpful for users who do not understand how to move the cursor to another portion of the worksheet and need information on use of the ESC key or other special keys.

If practical, all Dynamic Help messages should be reviewed to ensure clarity and completeness of confusion-reducing information. It may also be helpful to use color to highlight those key points of information in Dynamic Help messages for those parts of the ACIFS program where interface deficiencies are the greatest. For example, for the Task 15 Subtask 2 DOQTY challenge, users were very confused about what quantities to enter in the DOQTY column

for those items not currently being issued. It would be very helpful if the help sentence for that particular confusion was highlighted so that the user would locate the information quickly.

5.3.2 Future Research

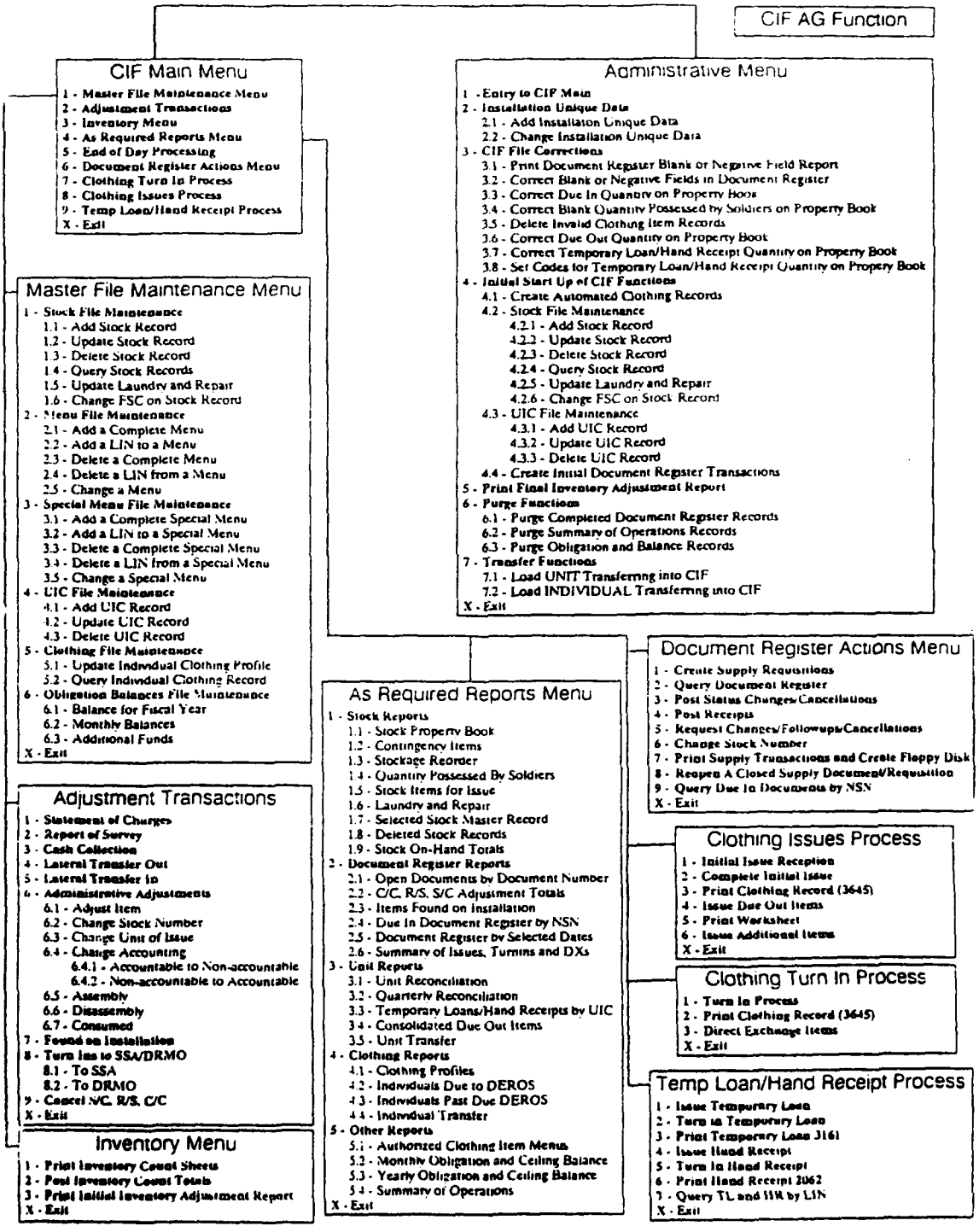
In future user testing of Dynamic Help applications, the user tests should be carefully controlled so that user accuracy and performance times more closely resemble those of an actual job setting.

This thesis makes conclusions about the effectiveness of Dynamic Help as defined by ***usability*** in a pre-existing computer program. The next phase of research would be to focus on the ***efficiency*** of providing Dynamic Help. It might be useful to test the efficiency and the effectiveness of Dynamic Help messages that were ***automatically specified*** from requirements documentation.

APPENDIX 1

AUTOMATED CENTRAL ISSUE FACILITY SYSTEM (ACIFS) FUNCTIONS

AUTOMATED CENTRAL ISSUE FACILITY SYSTEM (ACIFS)



APPENDIX 2

ARCHITECTURE AND FORMAT OF DYNAMIC HELP MESSAGES

APPENDIX 2: Excerpt from Young, 1990b.

Specifications for other conversions beyond CIF will follow later.

2. Generic User Requirements

Dynamic Help messages are built rather than retrieved. As is true of all interactive systems, the interaction cycles among three superstates: idling, inputting and processing (see Appendix 2). Dynamic Help is to be available during the idling and inputting superstates.

To work most effectively, a Dynamic Help system requires the basic interaction design to allow two-step (selection and closure) rather than only one-step (selection = closure) user actions. A one-step or *premature-closure* menu selection action exists, for example, where pressing a single key both selects the menu item and invokes it. If the user can first highlight an item (say by using arrow keys or a mouse) and then invoke the highlighted item (say by <CR>), Dynamic Help can be specifically available for each menu item; otherwise one message must cover all items. A one-step or premature-closure data-entry action exists, for example, where filling the field automatically causes closure. A two-step entry (typing, then <CR>) prevents accidentally getting beyond the point where Help is needed.

Effective Dynamic Help also requires a true neutral state to be provided on all screens—a state in which no object is highlighted. This does not mean there should not be a default highlighted object (as having the cursor on the assumed first data-entry field upon screen entry), but only that it should be possible to get to a neutral state.

2.1 Global, Context and Navigation Sentences

During idling, when the interaction is in a neutral superstate waiting for user input, there is a *context*, which for the user is characterized by a sense of "where" the user is: what screen is displayed, the history of recent navigations among contexts, whether any data has been changes "here" yet, and the identity of "loaded" c. immediately-available data.

For a screen in which there is no true neutral state, the first sentence in the Dynamic Help message is a *global* sentence, which is a **Ready to** sentence exactly like the *context* sentence described in the next paragraph, except that it refers to the neutral context rather than the context of the highlighted item.

For each neutral superstate, a Dynamic Help sentence starting with the phrase **Ready to** will be followed by one or more context-dependent *imperative-verb* phrases, the first one of which will describe the most typical user action, such as "issue clothing to a <G> soldier," where <G> will be a distinguishing phrase if there are separate screens for issuing clothing to separate kinds of soldier or under separate circumstances. If the same context supports other typical actions (except the standard ones listed below), one or more **or** phrases will follow, such as "or revise a <G> soldier's <H> size" (where

<H> names the class of clothing).

Note that although the purpose of the **Ready to** sentence is to orient the user to "where" the user is, the sentence says *what the user can do*. Names for context "places" such as "Clothing Issue Form" are not as useful or transparent as phrases that describe the functions they support, and the names are often already on display.

After the **Ready to** context sentence will appear a *navigation* sentence having two clauses. The *back-navigation* clause is "To return to <I> <J>" where <I> is the imperative-verb phrase from the last previous context, such as "choose soldier in-processing function," and <J> is a set of instruction phrases that give the method of losing or reversing all data changes and the method of keeping all data changes (suppressed when no data has been changed since context entry). The *forward-navigation* clause is "To go to <K> <J>" where <K> is the imperative-verb phrase for the typically-next context.

2.2 Meaning, Domain, Content and Format Sentences

During inputting, when the system is in an input-procedure superstate, the following sentences are optionally provided:

Meaning Sentence. This tells the semantic meaning, in application-environment language, of the datum currently being entered. As an example, in correcting a "report-of-survey" in the CIF system, the TOTAL datum could be interpreted by the user as meaning the corrected report-of-survey total (wrong) or as the amount to be subtracted from the report-of-survey and thus added to inventory (correct).

Domain Sentence. This gives limits on the datum being entered, such as whether it is textual or numeric, whether it has upper or lower limits or impermissible values, and the maximum or required number of characters.

Content Sentence. This gives a list of legal or illegal entries. (Because recognition is easier than recall, good interface design provides that a user should be able to view a list when asked to make an input that essentially chooses from one.) Dynamic Help should not provide a list when the list is intentionally withheld for quality-control, security or validation purposes.

Format Sentence. This exemplifies or describes the acceptable format of an entry.

2.3 Procedure Sentences: Complete, Pre-Completion Correction, Undo, Key Effect

Completion Sentence. During data entry, this sentence describes how the entry can be completed or aborted. If there are quirks such as unexpected behavior of the backspace key or automatic completion upon filling the field, this is the sentence that

informs the user of quirks.

Pre-Completion Correction Sentence. During data entry, this sentence describes how the entry can be changed before being completed (such as by using the backspace key), if the description is not included in the completion sentence.

Undo Sentence. During data entry, this sentence describes how the entry, if completed, can later be undone (reversed).

Key Effect. During data entry, this sentence describes what would be the effect of pressing standard keys such as ESC, DEL, BREAK, F1, or any other keys that have a globally consistent meaning that may be misinterpreted or inconsistently implemented with respect to this data entry.

3. General CIF User Requirements

CIF is DBMS-based and is organized by *function*, where almost all of the functions are to add, update, delete and query database data. CIF functions are organized by hierarchial menus, with a single-page *menu screen* for the main menu, a single-page *menu screen* for each submenu, and a multi-page *forms screen* for each leaf of the menu. Thus almost all the screens are of two types-menu and form. The menu screens were developed using the INFORMIX menu utility, and the forms screens were developed using the INFORMIX forms utility.

3.1 Existing Help and Error Message Files

CIF has an existing system of static Help message files. The Dynamic Help system will neither replace the existing Help message files nor supplement them. The existing Help files and access path should be left in place, but the new Dynamic Help system will not assume use of the existing Help system, and may write over some of the existing system's messages.

3.2 Dynamic Help for CIF Menu Screens

Menu selection protocol is normally one-step in CIF; the user does not first highlight a menu item and then select it. However, two-step selection is also provided using arrow keys and <CR>. Dynamic Help for menu selections will be available only for two-step selection.

The **Ready to** sentence for menu screens will say "Ready to select <L>" where <L> is the designator of the highlighted menu item (these designators are numbered 1,2,...,X, X being the exit item), followed by the phrase "to", followed by the imperative-verb phrase for the selected screen's context sentence (<K>). Example: "Ready to select 1 to post a Statement of Charges." The **navigation** sentence is "To return to <I>"

wh . . I . . .e imperative-verb phrase from the last previous screen's context sentence, followed by the instruction phrase "move to X and press RETURN" (X is always the back-navigation menu item), followed by ". To make a different selection, move to it."

3.3 Dynamic Help for CIF Form Screens

CIF form screens are for data entry and provide a window currently being used for informative messages positioned beside their respective data fields. Dynamic Help messages will replace these messages (write over them) and will normally use the whole window from the top instead of just the area to the right of the highlighted item.

The **Ready to** sentence for forms screens will say "Ready to provide <M>" where <M> is a supply-language descriptor of the datum. The *navigation* sentence will be ad-hoc, telling how best to get to the last-previous and next data-entry items; for example, on the *Complete Initial Issue* screen there must be a phrase or clause telling how to get to the next size datum entry field, since arrow keys go only to the next line whereas entries occur only on a few lines. The back-navigation clause will explain the sometimes complex rules of what data is saved and what is lost when the DEL or ESC keys are pressed.

The *meaning* sentence will be provided for each entry by a logistics officer (CPT Wolven).

The *domain* sentence will start "Entry must be" and will continue with a list of descriptors such as "positive" (mention the word "negative" whenever negative entries are legal). In CIF, the lengths of fields are already on display, so the maximum or required number of characters in the entry need not be mentioned.

The *content* sentence will give a list of legal or illegal entries (obtained, where appropriate, via an SQL query) or directions on how to determine legal or illegal entries. CIF withholds some data intentionally: social security numbers of soldiers are not displayed, and in posting inventory counts, the on-hand data with which the counts are compared is not displayed. We will not second-guess the CIF designers in cases such as this; where omission is intentional, we will not supply lists.

The *format* sentence will give an example of the correct format or describe a correct format, whichever is more informative. Not all legal format variations need be covered, but the example(s) should show the most efficient (such as omitting leading zeros). Where CIF entries have the quirk of being automatically completed upon filling of the field, this should be noted (since <CR> can unintentionally skip the next field).

The *procedure* sentences will be ad-hoc, to tell how to abort the entry, how to complete the entry, how to make a pre-completion correction (CIF has quirky backspace rules), how to undo or reverse the entry without affecting other data, and what the effect would be if the user pressed the DEL, ESC, <CR> or other globally-meaningful keys

now.

If it proves possible to invoke dynamic Help while in a field after individual keystrokes have been made, these specifications will be revised to exploit that capability.

4. Dynamic Help System Standards

4.1 Context Monitoring

DBMS-based interactive programs maintain an identifier for the current screen and for the last previous screen. The Dynamic Help system must be able to query these identifiers. The Dynamic Help system will also keep in its own knowledge base (which should be ordinary tables in the database, not programmer-defined ad-hoc constructs) a table of *ordinarily-next screens*, the data for which will be provided by a logistics officer (CPT Wolven) for the CIF program. For the CIF program, these three identifiers and the identity of the currently highlighted screen object (the highlighted menu item for a menu screen, or the cursor-located datum for a forms screen) constitute the entire context. (In other programs, the recent user actions, session history, and identity of loaded data files could also be part of the context.

The CIF Dynamic Help system will have continual access to the current-screen identifier, the previous-screen identifier, the ordinarily-next-screen identifiers, and the currently-highlighted screen object.

4.2 State Monitoring

For CIF and any other DBMS-based software systems, the data state of the system will always be available to the Dynamic Help system through its capability to issue SQL queries to the database.

4.3 Message Architecture, Generation and Assembly

Dynamic Help messages are built of *sentences* that contain *clauses* that contain *phrases* (informally we use the word "phrase" sometimes to mean a set of phrases). Each sentence has a generic name; these are

Context (Ready to)
Navigation with back-navigation and forward-navigation clauses
Meaning (semantic)
Domain
Context
Format
Completion
Pre-Completion Correction
Undo

Each phrase is either a constant phrase (such as **Ready to**) or a variable phrase. Phrases, clauses and sentences are allowed to be null.

A whole Dynamic Help message consists of all its defined sentences, in fixed order. The variable phrases are materialized into text by query and assembled with the constant phrases to form the single text object that is the message.

4.4 Message Display

In general, it is best for Dynamic Help messages to use a pop-up utility by which they can temporarily overwrite arbitrary displays.

For CIF, it is believed there is no pop-up capability, but a message window is provided. Dynamic Help messages will be written in this window when invoked, and removed upon the next user action.

When necessary, existing messages should be suppressed if they interfere or if Dynamic Help messages interfere with them. Most will be made redundant by Dynamic Help. In CIF, there are many that persist too long; rather than providing for timely removal, simply suppress them.

Suppression of interfering or competing messages should be the only Dynamic Help programming required outside the Dynamic Help system itself.

4.5 Invocation of Dynamic Help

A standard invocation for Dynamic Help will be the F1 key. This should be used for CIF if possible, but not if it requires detailed programming to redefine other existing uses of the F1 key.

CIF uses the F10 key for static Help, which does not compete or interfere with Dynamic Help and should be left as is.

Upon invocation, the Dynamic Help system generates, assembles and displays the message. Upon the next user action (next keystroke preferably, or next completed entry) the message is removed.

4.6 Tone

Where details or content of messages is left to the programmer, this general guidance applies: the proper tone is empty of any meta-communication and directly tells the user what to do. Vocabulary should be that of the application; CIF concerns shoes and inventory, not windows and menu items.

APPENDIX 3

SAMPLE ACIFS DYNAMIC HELP MESSAGE SPECIFICATIONS

Date 21 Jan91 HELP Message Specifications (INPUT - GLOBAL) Page 81

LOCATION INFORMATION:

A. Current Screen: Change Stock Number

B. Previous Screen: Administrative Adjustment Menu

C. Ord Next Screen <NU>

HEADING: <A>

GLOBAL CONTEXT: (Where the user is and what the user can do)

"Ready to <CH> the NSN of an <ITM> on the <PB>. <ENTER>

old <↕> new NSN. <ESC> to <PROC><RCDS>, <DEL><R><B><QUIT>.

BACKWARD NAVIGATION: "To return to B. <NU>"

FORWARD NAVIGATION: "To go to C. <NU>"

COMPLETION: "To complete an entry. <CR>"

QUIRKS: "NOTE: <FATAL>"

PRE-COMPLETION CORRECTION: "To make a correction while ~~the cursor~~ still in the entry field. <BACK>"

UNDO: "To make a correction. <NU>"

KEY EFFECT:

KEY	EFFECT
ESC	<NU>
DEL	
F3	
F4	

1Date 6 Jan 91 HELP Message Specifications(INPUT - LOCAL) Page 31

LOCATION INFORMATION:

<A> Current Screen: Statement of Charges

<X> Current Data Object: NSN

<Y> Last Data Object: <NU>

<Z> Next Data Object Quantity

HEADING: <X>

LOCAL CONTEXT:

"Ready to <ENTER> <X> or <ITEM> listed or <CR>.

NAVIGATION:

BACKWARD: "To return to <A>. <NU> ."

BACKWARD: "To return to <Y>. <NU> ."

FORWARD: "To go to <Z>. <NU> ."

FORWARD: "To go to <Z>. <ENTER> <X> <E> <CR> "

MEANING: " <NU> ."

DOMAIN: (if necessary) " <ACCEPT> <ZE> <E> <POS> "

CONTENT: (List or Directions)

LIST
(Query Call.

or

<NU>

DIRECTIONS

FORMAT: (Example or Description)

EXAMPLE

<EXAM>

or

[841501194135Z]

DESCRIPTION

PROCEDURE SENTENCES:

COMPLETION: "To finish entering ... <CR> .

"To cancel this entry. <NU> .

QUIRKS: (Backspace key or auto completion when a line is full

"Note: <NU>

PRE-COMPLETION CORRECTION: "To make a correction while [redacted] still in the [redacted] mode. <BACK> <CR> .

UNDO: "To make a correction. <NU> .

KEY EFFECT:

KEY	EFFECT
ESC	<NU>
DEL	
BREAK	(
F1	(
F4	(
—	(
—	

Dictionary of HELP Message Codes

CODE	DEFINITION/MEANING
<100>	Up to 100 NSNs allowed
<&>	and
<A>	*Current Screen Definition
<ACCEPT>	Acceptable entries are
<ADDL>	additional
<APP>	if applicable
<AR>	See AR725-50 for specific codes
<AUTH>	authorized
<AUTO>	automated
<B>	*Previous Screen Definition
<BACK>	use BACKSPACE and overstrike incorrect data
<BCKSP>	press BACKSPACE Key
<BFR>	before completing
<BLAK>	BACKSPACE Key does not erase data
<C>	*Ordinarily Next Screen
<CARR>	carried
<CH>	change
<CLO>	clothing
<CMPD>	completed
<COM>	complete
<COMP>	complete all
<CR>	press Return Key
<CUR>	cursor jumps to
<DEL>	press DEL (Delete) Key
<DES>	desiring
<DESD>	is desired
<DN>	press DOWN Arrow Key
<DNR>	document number
<DOC>	document
<DOCS>	documents
<DR>	document register
<DU>	due-out
<DX>	direct exchange
<ELSE>	Otherwise,
<ENTER>	enter the
<ENTRS>	entries
<ERR>	an error occurs
<ESC>	press ESC Key
<EXAM>	**EXAMPLE:
<EXCH>	exchanged
<FATAL>	If a fatal error occurs, all work is lost and must be reentered once problem is corrected.
<FILA>	Filling a field signals completion
<FILT>	Filling the field signals completion
<FIN>	to complete
<G>	to go to
<HLT>	highlight
<IND>	individual
<INDS>	individual's
<INFO>	information

( ) - Phrase [ ] - Example, List or Format

{ } - Query

(2)

<INIT>	initial
<N>	another installation
<ITM>	item
ITMS	items
ISS	issue
ISSD	issued
<LRAH>	use LEFT & RIGHT Arrow keys to highlight
<LT>	press LEFT Arrow key
<MANU>	manual
<MATCH>	matches displayed
<MF>	"M" for male and "F" for female
<NEC>	necessary
<NEED>	as needed
<NEG>	negative numbers
<NEX>	next data field
<NOARR>	Do NOT use Arrow keys on this screen.
<NOTE>	**NOTE:
<NOUSE>	Do not use this option if
<NU>	*NULL entry
<OH>	letter O and 0 are different
<OMIT>	To omit leading zeros, enter significant digits
<ONHD>	on hand
<OPT>	desired option number
<OVER>	overstrike
<PB>	Property Book
<PERF>	perform entry again
<POS>	positive numbers
<PR>	press
<PRN>	print
<PROC>	process
<PRCD>	processed
<PRCG>	processing
<QTY>	quantity
<QTYS>	quantities
<QUIT>	without saving entries
<R>	to return to
<RCD>	record
<RCDS>	records
<REOPEN>	Closed documents must be reopened using option 8 before using this option.
<REQ>	requisition
<REQS>	requisitions
<RQD>	This entry is required to process the transaction.
<RT>	press RIGHT Arrow key
<SISS>	special issue
<SUP>	supply
<SZ>	size
<SZS>	sizes
<SZD>	sized
<SUCH>	such as
<TB>	to be
<TI>	turn in
<TID>	turned in
<TR>	transaction

(3)

```
<TRS      transactions
<TRNSF    transferable
<UP       press UP Arrow key
<UPDT     current record will be processed
<WKSH     worksheet
<X        *Current Data Field
<Y        *Previous Data Field
<YN       "Y" or "N"
<YNCR     enter "Y" and press Return key.  Otherwise, enter "N"
          and press Return key.
<Z        *Next Data Field
<ZE       zero


[ADVICE]  Entry should be of the form "A#" where
          "A" denotes a letter and
          "#" denotes a number.

[DATE]    Format is (MM/DD/YY)

[GRADE]   Enlisted - E01 - E10
          Officer  - O01 - O10
          Warrant  - W01 - W05
          Civilian - G01 - G15
          Korean   - K01 - K15

[JDAT]    Format is (YDDD).  5 Jan 91 = 1005.

[LIN]     Entry should be of the form "A######"  where
          "A" denotes a letter and
          "#" denotes a number.

[MOS]     Enter the 3 to 5 letter code corresponding to an
          individual's Military Occupational Specialty, such as
          11B20 - infantry (E5)
          95B   - military police
          92B   - supply officer

[SSN]     123456789 for US soldier
          K23456789 for KATUSA
          KC3456789 for Korean civilian

[STATUS]  Entry should be of the form "A#" or "AA" where
          "A" denotes a letter and
          "#" denotes a number.

{SISSUE}  select unique MOSD from aeb02t
          where SISSUE="Y";

{SZ-f___} select unique SIZ from aeb01t where LIN=(f___);

{TRF}     select unique LIN, NOMEN from aeb01t
          where LIN=(select unique LIN from aeb06t
          where TRF="Y");
```

```
(UIC)       select UIC from aeb04t
            where '0' in UIC and '0' in UIC:
            select UIC from aeb04t
            where ASSG=(select max(ASSG) from aeb04t):
```

* - Identifies location or state (not literal text)
** - Items should be highlighted with different text color

APPENDIX 4

PERSONNEL AND EQUIPMENT REQUEST

1 4 Feb 91

MEMORANDUM FOR Director, AIRMICS, ATTN: ASQB-GM (MAJ Mizell), 115 O'Keefe Building, Atlanta, GA 30332-0800

SUBJECT: CBIET Effectiveness Testing Personnel and Equipment Request

1. Effectiveness testing of the ISM Computer Based Instruction Embedded Training (CBIET) pilot project's converted CIF software is tentatively 4-25 Mar 91.

2. Request that Software Development Center - Atlanta provide two Wyse Computer terminals and other supporting hardware for experimental testing during the period 4-25 Mar 91.

3. Request that 25 individuals (as described in paragraph #4) be provided to undergo experimental testing of the CIF software conversion's user-friendliness during the period 7-25 Mar 91. It is anticipated that all tasked individuals will complete a pre-screen survey questionaire on 7 Mar 91. On 8 Mar 91, each qualifying test subject will be scheduled for two 4-hour blocks of testing(8 hours total per individual) during 11-22 Mar 91. Testing will be conducted at Software Development Center - Atlanta, Bldg 207, Ft. Gillem.

4. To ensure that test results are relevant to the overall ISM project, individuals who will participate in the testing should fit the following profile:

E3 - E6, 76Y,76V,76C, or 76P (or civilian equivalent) who has low or moderate computer terminal experience either in schooling or on the job.

5. Request that this tasking originate from AIRMICS. It is urgent that the availability of the 25 individuals be confirmed by 22 Feb 91 and that the names and phone numbers of the individuals be available by 28 Feb 91.

6. Points of contact for this request are CPT Renee Wolven (894-4824) or Dr. Donovan Young (894-2321).

DONOVAN B. YOUNG
Associate Professor

APPENDIX 5

USER TESTING TASKS

TASK 11A

Instructions:

You are at the **CIF Main Menu.** When you are ready to begin this task, ask the System Administrator to make the **Header Call.** Once the **Header Call** is complete, turn to next page and begin the Task.

TASK 11A

11.1 Situation:

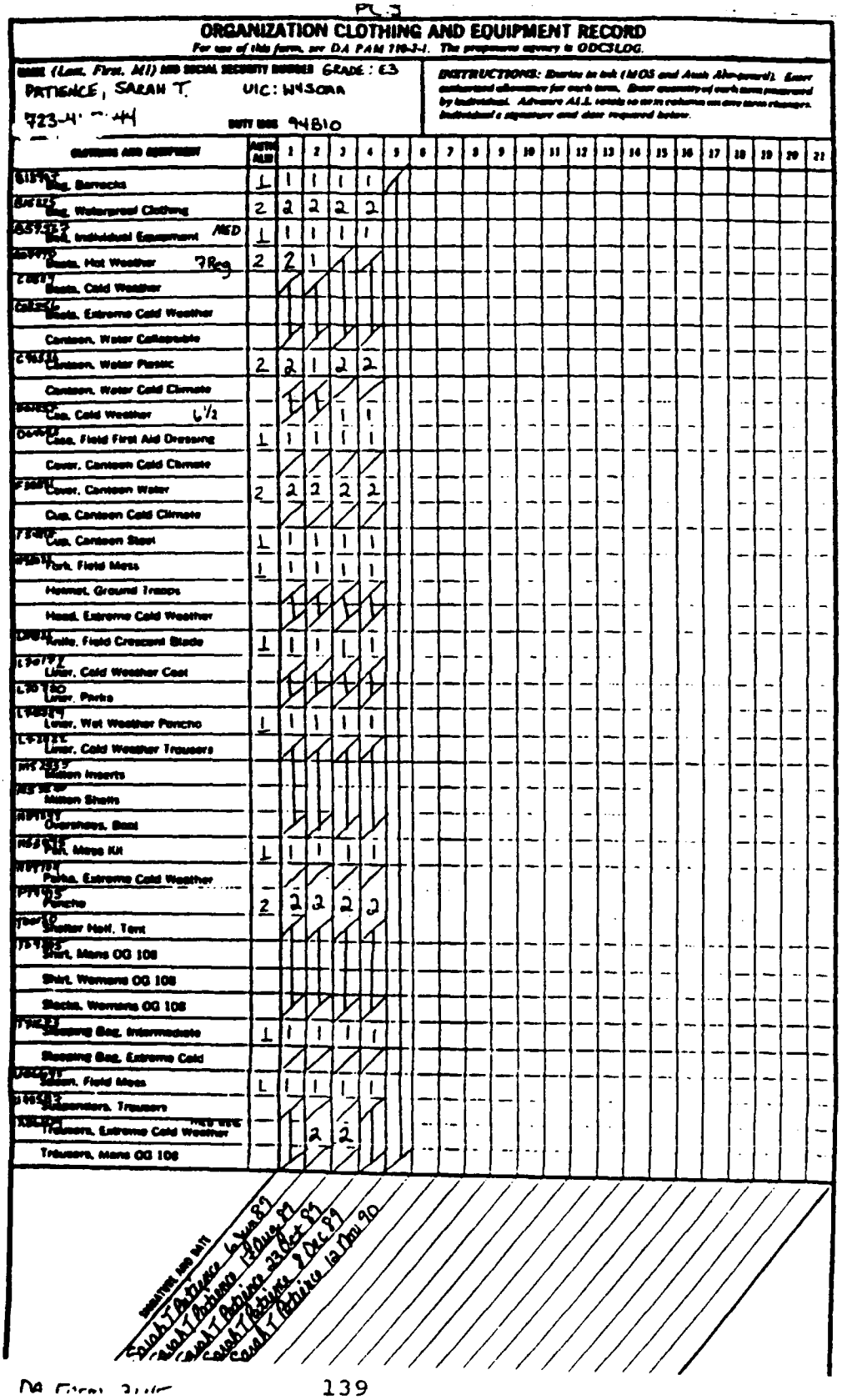
A departing soldier has completely turned in her OCIE as indicated on her DA Form 3645s (manual). She will be carrying some items with her to her next duty station and she is still signed for them on her DA Form 3645s (manual).

11.2 Requirements:

Post the completed turn-in and the transferred items to the soldier's clothing record.

11.3 Attachments:

DA Form 3645
DA Form 3645-1



ORGANIZATION CLOTHING AND EQUIPMENT RECORD

For use of this form, see DA PAM 710-3-1. The proponent agency is ODCSLOG.

NAME (Last, First, MI) AND SOCIAL SECURITY NUMBER: PATIENCE, SARAH T. 723-4[illegible]4 GRADE: E3 UIC: W45DAA DUTY MOS: 94B10

INSTRUCTIONS: Entries in ink (MOS and Auth Abbreviated). Enter authorized allowance for each item. Enter quantity of each item presented by individual. Advance All. needs to be reclaimed on one item changes. Individual's signature and date required below.

CLOTHING AND EQUIPMENT	AUTH ALLW	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Bag, Barracks	1	1	1	1	1																	
Bag, Waterproof Clothing	2	2	2	2	2																	
Bag, Individual Equipment MED	1	1	1	1	1																	
Boots, Hot Weather 7Reg	2	2	1																			
Boots, Cold Weather																						
Boots, Extreme Cold Weather																						
Canteen, Water Collapsible																						
Canteen, Water Plastic	2	2	1	2	2																	
Canteen, Water Cold Climate	—																					
Cap, Cold Weather 6½	—			1	1																	
Case, Field First Aid Dressing	1	1	1	1	1																	
Cover, Canteen Cold Climate	—																					
Cover, Canteen Water	2	2	2	2	2																	
Cup, Canteen Cold Climate	—																					
Cup, Canteen Steel	1	1	1	1	1																	
Fork, Field Mess	1	1	1	1	1																	
Helmet, Ground Troops	—																					
Hood, Extreme Cold Weather	—																					
Knife, Field Crescent Blade	1	1	1	1	1																	
Liner, Cold Weather Coat	—																					
Liner, Parka	—																					
Liner, Wet Weather Poncho	1	1	1	1	1																	
Liner, Cold Weather Trousers																						
Mitten Inserts	—																					
Mitten Shells	—																					
Overshoes, Black	—																					
Pack, Mess Kit	1	1	1	1	1																	
Parka, Extreme Cold Weather	—																					
Poncho	2	2	2	2	2																	
Shelter Half, Tent																						
Shirt, Mens OG 108																						
Shirt, Womens OG 108																						
Socks, Womens OG 108																						
Sleeping Bag, Intermediate	1	1	1	1	1																	
Sleeping Bag, Extreme Cold																						
Spoon, Field Mess	1	1	1	1	1																	
Suspenders, Trousers	—																					
Trousers, Extreme Cold Weather MED WTC	—			2	2																	
Trousers, Mens OG 108	—																					

SIGNATURE AND DATE

Sarah T Patience 6 Jan 89
Sarah T Patience 12 June 89
Sarah T Patience 23 Oct 89
Sarah T Patience 3 Dec 89
Sarah T Patience 10 April 90

ADDITIONAL ORGANIZATION CLOTHING AND EQUIPMENT RECORD

For use of this form, see DA PAM 710-2-1. The proponent agency is ODCSLOG

NAME (Last, First, MI) AND SOCIAL SECURITY NUMBER GRADE: E3
PATIENCE, SARAH T. UIC: W4SOAA
723-41-7644
DUTY MOS 94B10

INSTRUCTIONS: *Overprinting authorized. Entries in ink (MUS and Auth Allowance). Enter authorized allowance for each item. Enter the item description of issued items in the Clothing and Equipment block. Enter quantity of each item processed by individual. Advance ALL totals to next column on any item changes. Individual's signature and date required below.*

CLOTHING AND EQUIPMENT	AUTH ALW	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
B14729 BAG DUFFEL	1	1	1	1	1																	
B71225 BLANKET WOOL OG	1	1	1	1	1																	
C14956 COAT HW BDU MED SHORT	4	4	4	4	4																	
C36399 CANTEEN PLASTIC 2QT	2	2	2	2	2																	
D11812 CARRIER INTRENCHING TOOL	1	1	1	1	1																	
F30117 COVER CANTEEN 2QT	2	2	2	2	2																	
H39925 FIELD PACK W/O LINER LARGE	1	1	1	1	1																	
H40005 FRAME FIELD PACK W/STRAPS	1	1	1	1	1																	
J18014 GLOVES WORK LEATHER SIZE 2	1	1	1	1	1																	
K70163 HAT SUN WOODLAND 6 7/8	1	1	1	1	1																	
K15092 INSECT BAR FLD TYPE	1	1	1	1	1																	
L00210 INTRENCHING TOOL	1	1	1	1	1																	
M59042 MAT SLEEPING	1	1	1		1																	
N37152 TROUSERS WET WEATHER MED	1	1	1	1	1																	
N70110 PARKA WET WEATHER MED	1	1	1	1	1																	
T52343 TROUSERS H W BDU MED REG	4	4	4	4	4																	
U73323 SUSPENDERS NYLON LC 1	1	1	1	1	1																	
A86297 APRON FOOD HANDLERS	8	8	8	8	8																	
S84846 SMOCK FOOD HANDLERS MED	8	8	7	7	7	7																
T86211 TROUSER FOOD HANDLERS 32-30	8	8	8	8	8	8																
C95280 COAT WMS MATERNITY SIZE 12 SHORT					2																	
S16769 SLACKS WMS MATERNITY SIZE 14 REG					2																	

SIGNATURE AND DATE

	1	2	3	4	5
SIGNATURE AND DATE	Sarah T Patience 6 June 89	Sarah T Patience 12 Aug 89	Sarah T Patience 30 Oct 89	Sarah T Patience 8 Dec 89	Sarah T Patience 12 Nov 90

DA F[illegible] 3645-1

TASK 11A

Instructions:

Please ensure that you have returned to the **CIF Main Menu.**

Now, ask the System Administrator to make the **Closure Call** for this Task.

A hard copy of the soldier's turn in will be printed out. Please inform the System Administrator so that the printout may be retrieved from the printer.

TASK 11B

11.1 Situation:

A departing soldier has completely turned in his OCIE as indicated on his DA Form 3645s (manual). He will be carrying some items with him to his next duty station and he is still signed for them on his DA Form 3645s (manual).

11.2 Requirements:

Post the completed turn-in and the transferred items to the soldier's clothing record.

11.3 Attachments:

DA Form 3645
DA Form 3645-1

TASK 12A

12.1.1 Situation:

DA Form 2765-1's have been prepared for some excess items (still in depot-pack) that have been turned in to DRMO. The document number for the turn-in is 0331-0006.

12.1.2 Requirements:

Post the DRMO turn-in to the Property Book.

Once the DRMO turn-in is posted, return to the **Adjustment Transactions Menu.**

12.1.3 Attachments:

DA Form 2765-1's

12.2.1 Situation:

Several CIF items have been lost, damaged or destroyed and have been accounted for on a Statement of Charges.

12.2.2 Requirements:

Begin posting the Statement of Charges to adjust the on-hand quantities on the Property Book. Once you have input **all** the NSNs and quantities **stop work** prior to moving to the Total Price block.

Turn page for instructions on the continuation of this situation.

12.2.3 Attachments:

DD Form 362 (Statement of Charges)

12.2.4 Situation:

At this time you have just been informed by your supervisor that there was a mistake on the document and that instead of **Boots Hot Weather 8430-00-141-0791 1 PR** being lost, it was in fact **Boots Hot Weather 8430-00-141-0796 2 PR** that were lost and the new Total Price of the Statement of Charges is **$72.47.**

12.2.5.Requirements:

With this information, finish posting the Statement of Charges.

Once the Statement of Charges is completed, return to the **Adjustment Transactions Menu.**

12.2.6 Attachments:

DD Form 362 (Statement of Charges)

12.3.1 Situation:

A pair of **Boots, Cold Weather** listed as lost on a Report of Survey has been recovered, and the original R/S document needs to be adjusted to exclude the recovered item.

Recovered NSN: 8430-00-823-7041

12.3.2 Requirements:

Modify the Report of Survey to exclude the recovered pair of **Cold Weather Boots.**

Once the Report of Survey has been modified, return to the **CIF Main Menu.**

12.3.3 Attachments:

DA Form 4697 (Report of Survey)

TASK 12B

12.1.1 Situation:

DA Form 2765-1's have been prepared for some non-reparable items that have been turned in to DRMO. The document number for the turn-in is 0331-0007.

12.1.2 Requirements:

Post the DRMO turn in to the Property Book.

Once the DRMO turn-in is posted, return to the **Adjustment Transactions Menu.**

12.1.3 Attachments:

DA Form 2765-1's

12.2.1 Situation:

Several CIF items have been lost, damaged or destroyed and have been accounted for on a Statement of Charges.

12.2.2 Requirements:

Begin posting the Statement of Charges to adjust the on-hand quantities on the Property Book. Once you have input **all** the NSNs and quantities **stop work** prior to moving to the Total Price block.

Turn page for instructions on the continuation of this situation.

12.2.3 Attachments:

DD Form 362 (Statement of Charges)

12.2.4 Situation:

At this time you have just been informed by your supervisor that there was a mistake on the document and that instead of **Bag Barracks Ctn OG 1 EA** being lost it was **1 EA Bag Duffel 8465-01-117-8699** that was lost and the new Total Price of the Statement of Charges is **$54.20.**

12.2.5 Requirements:

With this information, finish posting the Statement of Charges.

Once the Statement of Charges is completed, return to the **Adjustment Transactions Menu.**

12.2.6 Attachments:

DD Form 362 (Statement of Charges)

12.3.1 Situation:

A **Helmet, GTNP Parachutist** listed as lost on a Report of Survey has been recovered, and the original R/S document needs to be adjusted to exclude the recovered item.

Recovered NSN: 8470-01-092-7528

12.3.2 Requirements:

Modify the Report of Survey to exclude the recovered **Helmet, GTNP Parachutist.**

Once the Report of Survey has been modified, return to the **CIF Main Menu.**

12.3.3 Attachments:

DA Form 4697 (Report of Survey)

TASK 13A

13.1.1 Situation:

The following items need to be ordered to replenish stock.

NSN	QTY	UI	PRI	Document Number
8405-00-782-2121	10	EA	13	_____
8465-00-001-6477	200	EA	06	_____
8430-01-021-5978	100	PR	13	_____
8460-00-606-8366	20	EA	06	_____

13.1.2 Requirements:

Generate supply requisitions (DIC A0A or A0E) for the items and write the computer-assigned document numbers in the right-hand column.

Once the requisitions are completed, return to the **Document Register Actions Menu.**

13.2.1 Situation:

The following item needs to be ordered to replenish stock.
You are not sure of the correct NSN because the last digit is unreadable but you know that the item is a **Case First Aid Kit** which the CIF stocks. The last digit is either a 9 or a 4.

NSN	QTY	UI	PRI	Document Number
8465-00-935-681x	250	EA	06	_____

13.2.2 Requirements:

Generate a supply requisition (DIC A0A) for the item. Try inputting the NSN with 9 as the last digit first.

Once you realize that the NSN is incorrect (because the one you input is not on the Stock Master Record), then try again to generate the appropriate supply requisition using 4 as the last digit of the NSN.

Write the computer-assigned document number in the indicated column above.

Once the requisition is completed, return to the **Document Register Actions Menu.**

13.3.1 Situation:

A supply requisition created earlier in the day needs to be reduced in order quantity. The requisition for the item needs to be modified now, before it is passed forward to higher supply levels at close of business.

Document Number 0331-0003
Quantity to Cancel 4 EA

13.3.2 Requirements:

Post a modification to the document.

Once the supply requisition has been modified, return to the **CIF Main Menu**.

TASK 13B

13.1.1 Situation:

The following items need to be ordered to replenish stock.

NSN	QTY	UI	PRI	Document Number
8405-00-001-8026	100	PR	13	_____
8415-00-782-2887	60	EA	06	_____
8440-00-782-2173	150	PR	06	_____
8410-01-170-7556	30	PR	13	_____

13.1.2 Requirements:

Generate supply requisitions (DIC A0A or A0E) for the items and write the computer-assigned document numbers in the right-hand column.

Once the requisitions are completed, return to the **Document Register Actions Menu.**

13.2.1 Situation:

The following item needs to be ordered to replenish stock. You are not sure of the correct NSN because the last digit is unreadable but you know that the item is a **Hood Balaclava** which the CIF stocks. The last digit is either a 4 or a 9.

NSN	QTY	UI	PRI	Document Number
8415-01-111-115x	150	EA	06	_____

13.2.2 Requirements:

Generate a supply requisition (DIC A0A) for the item. Try inputting the NSN with 4 as the last digit first.

Once you realize that the NSN is incorrect (because the one you input is not on the Stock Master Record), then try again to generate the appropriate supply requisition using 9 as the last digit of the NSN.

Write the computer-assigned document number in the indicated column above.

Once the requisition is completed, return to the **Document Register Actions Menu.**

13.3.1 Situation:

An item ordered earlier in the day is no longer required. The requisition for the item needs to be cancelled now, before it is passed forward to higher supply levels at close of business.

Document Number 0331-0004
Quantity to Cancel 20 EA

13.3.2 Requirements:

Post a local cancellation to the document.

Once the supply requisition has been cancelled, return to the **CIF Main Menu**.

TASK 15A

15.1.1 Situation:

A new soldier has arrived at your desk carrying a Worksheet which has been annotated with the sizes and quantities of items issued to her. Behind her is a long line of soldiers who are also waiting to see you with their issue paperwork.

15.1.2 Requirements:

Begin posting the sizes and quantities to the soldier's record in the **fastest way possible** and once you are at **LIN F54817** and have entered the quantity issued **stop work.**

Turn the page for instructions on the continuation of this situation.

15.1.3 Attachments:

Worksheet (1st Half)

15.1.4.Situation:

While you were posting the issue, the soldier noticed that both pairs of **Boots Hot Weather** that were issued to her were in fact defective and when she went to get serviceable ones off the line she came back with two pairs of a new size **- 4-1/2 Regular.**

15.1.5 Requirements:

Make a correction to her record on the screen and complete her issue as quickly as possible.

Once you have completed posting the issue, return to the **Clothing Issues Process Menu.**

15.1.3 Attachments:

Worksheet (1st Half)
Worksheet (2nd Half)

15.2.1 Situation:

A soldier has just been issued items which previously were not available for issue at the time of his initial issue.

SSN:	405-78-3380
LINs Issued:	C07440 & F30391
QTYs Issued:	2 1

15.2.2 Requirements:

Post the issue of these items to the soldier's clothing record.

Once the issue of due-out items has been posted, return to the **CIF Main Menu**.

TASK 15B

15.1.1 Situation:

A new soldier has arrived at your desk carrying a Worksheet which has been annotated with the sizes and quantities of items issued to her. Behind her is a long line of soldiers who are also waiting to see you with their issue paperwork.

15.1.2 Requirements:

Begin posting the sizes and quantities to the soldier's record in the **fastest way possible** and once you are at **LIN W06645** and have entered the quantity issued **stop work.**

Turn the page for instructions on the continuation of this situation.

15.1.3 Attachments:

Worksheet (1st Half)

15.1.4 Situation:

While you were posting the issue, the soldier noticed that the **Overshoes, Vinyl OG** that were issued to her were in fact the wrong size and when she went to get serviceable ones off the line she came back with Overshoes of a new size - **8.**

15.1.5 Requirements:

Make a correction to her record on the screen and complete her issue as quickly as possible.

Once you have completed posting the issue, return to the **Clothing Issues Process Menu.**

15.1.6 Attachments:

Worksheet (2nd Half)

15.2.1 Situation:

A soldier has just been issued items which previously were not available for issue at the time of his initial issue.

SSN:	583-42-7075		
LIN Issued:	D11812	&	L00210
QTY Issued:	1		1

15.2.2 Requirements:

Post the issue of these items to the soldier's clothing record.

Once the issue of due-out items has been posted, return to the **CIF Main Menu**.

APPENDIX 6
INSTRUCTIONS TO TEST PARTICIPANTS

INSTRUCTIONS TO TEST PARTICIPANTS

1. **Purpose of Testing**. The purpose of the testing is to determine to what extent **Dynamic HELP** is useful to a supply clerk using the CIF program. The CIF software you will be using today has many confusing aspects to it, and we have NOT attempted to fix it. We are trying to see how well **Dynamic HELP** can get you around the confusing aspects in the software so that you can perform your job more quickly and accurately.

2. **Dynamic HELP**. A Dynamic HELP Message is a message based upon where you are in the program and what state the program is in at the time the HELP message is called. The message is specific to what kinds of questions the user might ask at that particular point in the program. During half of the test you will be permitted to use Dynamic HELP. You are strongly encouraged to use **Dynamic HELP** whenever you are unsure or confused while in any data-entry or menu selection screen.

3. **Sequence of Testing**. There are 3 phases of testing.

A. **Phase** I is the Pre-Test Survey where personal data and information on your supply experience, CIF work experience, and computer terminal experience will be collected.

B. **Phase II** - Task Testing.

1) Task Performance. You will perform 8 tasks on the computer. For 4 of the tasks you may use the **Dynamic HELP Key (F4)** anytime. For the other 4 tasks you may not use Dynamic HELP. Those tasks which you may use **Dynamic HELP** with are clearly marked. In order to perform the 8 tasks, you will need a basic understanding of the following forms:

DA Form 2765-1 (Request for Issue or Turnin)
DA Form 3645/3645-1 (Clothing Record)
DA Form 2064 (Document Register for Supply Actions)
DA Form 4697 (Report of Survey)
DD Form 362 (Statement of Charges)

If you are not familiar with all of the above documents, please inform the System Administrator. During testing, you may use a pencil (provided) to write on the supply forms that accompany the task instructions. You may use a non-permanent marker (also provided) to annotate the task instruction paperwork.

2) Post-Task Surveys. After each task, you will complete a post-task survey to describe any interface difficulties you encountered while performing the task.

.) Lunch. You will complete 4 tasks and the corresponding post-task surveys prior to the lunchbreak. The System Administrator will tell you when to return from lunch to resume testing.

C. **Phase III** is the Post-Test Survey which consists of general questions about Dynamic HELP.

4. **Questions During Testing**.

A. Surveys. While completing any survey, you may ask the System Administrator to clarify any unclear question meanings or response instructions.

B. Task Performance. Perform each task as accurately and rapidly as the software will let you. This is a test of the software, not of you. If the **task itself** is confusing, ask the System Administrator for clarification immediately. But if **how to use the computer** to do the task is unclear (in other words, you are stuck) don't stop work, try the following:

1) **Use Dynamic HELP** (if allowed)
2) **Trial and error** (experimenting)
3) **Search the Screen for Instructions**

Ask the System Administrator for computer-related assistance only if you think it would take a whole minute or more to discover how to proceed. Tell the System Administrator you have reached a Dead-End (where you would normally have to get out the manuals or ask someone what to do). At that point, the System Administrator will do the minimum necessary to assist you in resuming task performance.

5. **Task Interruption**.

A. Machine Shutdown. If there is an interruption or machine breakdown please notify the System Administrator immediately. If task data is lost, you will be asked to restart the task from the beginning.

B. Other Interruptions. If there is an interruption due to external forces, such as a fire drill or a latrine break, please notify the System Administrator. Leave data undisturbed. The System Administrator will record the time of the interruption and resumption, when you resume the task session.

6. **Program Problems**. While using this program, you may experience a couple of "odd" occurrences. The first type of problem is when you hit a key while in the middle of a task, and the program sends you all the way out to the CIF Main Menu. The second type of problem is when you are at the end of a screen and you press ESC or some other key to process the information, and the program jumps the cursor back up to the beginning of the screen or page. If either of these two problems occur while you are working, notify the System Administrator immediately. Also, if any other unexpected problems occur, inform the System Administrator.

7. **Assignment of USER ID**. A USERID will be used to identify you throughout testing and post-testing data analysis. **Your USERID is** _____.

APPENDIX 7
CIF DYNAMIC HELP EXPERIMENT HANDBOOK
(WITHOUT ENCLOSURES)

CIF DYNAMIC HELP EXPERIMENT HANDBOOK

1. **Purpose and Structure of Experiment**. The purpose of this experiment is to determine whether and to what extent **Dynamic HELP** is helpful to a supply clerk using the CIF Program to perform CIF functions. An incidental purpose is to gather diagnostic information to indicate relationships between different kinds or parts of Dynamic HELP messages and different user situations or confusions. The experiment gathers information about the user in a Pre-Test Survey, gathers observations of user actions and task results in the user's performance of ten CIF tasks with and without Dynamic HELP, and gathers user opinions in a Post-Test Survey. The user is assumed to be attempting to perform tasks as accurately and quickly as the CIF software will allow.

For a given task, or a given part of a task, the evidence being gathered about Dynamic HELP's usefulness is

A. The user's frequency of using it when available.

B. The avoidance of Dead-Ends.

C. Reduction in measures of effort and confusion, such as elapsed time, number of departures from a direct path, number of corrections or re-entries, number of keystrokes, etc.

D. Accuracy of the task result, as measured in correctness of the data changes and reports that the task generated.

E. User opinion as to whether or to what extent Dynamic HELP was useful.

2. **Purpose of Handbook**. The purpose of this handbook is to set forth guidelines and procedures to allow for administration and control of the User Testing of the converted CIF software at Information Systems Command's Software Development Center at Fort Gillem, Georgia.

3. **The Experimental Sequence**.

A. Daily Schedule.

Initial Briefing	0800-0830
Pre-Test Survey	0830-0900
Testing: 2 users per day	
Task Testing (5 tasks) & Post-Task Surveys	0900-1130
Lunch Break	1130-1330
Task Testing (5 tasks) & Post-Task Surveys	1330-1600
Post-Test Survey	1600-1615
Recheck/Release	1615-1630

B. Daily Starting Procedures. Each morning, the following actions will be performed prior to the start of testing (0800 hrs):

1) Logon to system (2 Wyse terminals).

2) Database reinitialization.

3) Ensure testing materials are prepared:

a. Instructions to Test Participants

b. Pre-Testing Survey

c. Task Notebooks

i. Sequence of a.m. tasks
ii. Availability of task forms
iii. Post-Task Surveys

d. Observation Worksheets

e. Post-Test Surveys

f. Pencils, Grease Pencils and Cleaner

g. Notebook with p.m. tasks

4) Diagnostic check of tasks by System Administrator.

5) Call up CIF Main Menu on both Wyse terminals.

C. Initial Briefing to Participants.

1) Test participants will be briefed on or will read

the Initial Instructions prior to the Pre-Test Survey. See Instructions to Test Participants (Enclosure 1) for specific content.

D. Pre-Test Survey.

1) Description. The Pre-Test Survey collects personal data and information on supply experience, CIF work experience, and computer terminal experience. It is to be completed prior to the beginning of the Task Sessions. See Enclosure 2.

2) Participant Questions. While completing the survey, test participants may ask the System Administrator to clarify any unclear question meanings or response instructions.

3) Materials Required. Each test participant will receive the pre-test survey and a pencil with which to complete it.

E. Task Testing.

1) Task Performance.

a. Description of Tasks. Each test participant will perform a total of 10 tasks, 5 with Dynamic HELP disabled and 5 with Dynamic HELP enabled. See Enclosure 3 for copies of the 10 base tasks. The System Administrator will ensure task sequences are assigned as specified in paragraph 4. The tasks will be within the following submenu areas of the CIF Program:

Clothing Issue Processes
Clothing TurnIn Processes
Document Register Actions
Adjustment Transactions

b. Physical Control of Dynamic HELP Key. For those task sessions where the Dynamic HELP key is not allowed to be used, the key will be physically covered to prevent the test participant from accidentally using it during task performance.

c. Session Sequence.

i. Header Call
ii. Task Session
iii. Closure Call
Dead-End Encounters
Remarks

d. Dead End Encounters.

i. Definition. A Dead-End is defined as the point a test participant reaches where he/she realizes that it would take at least one minute more to discover how to proceed with or finish a task because of confusion with the computer interface.

ii. Procedures. The test participants will be thoroughly briefed on the definition and procedures of a Dead-End. When a test participant declares to be at a Dead-End Point, the System Administrator will note the Task ID, USER ID, Subtask ID, Screen/Field ID and other descriptive information on the Observation Worksheet. Then the System Administrator will do the minimum actions necessary to assist the test participant in resuming and finishing the task session. The System Administrator will enter the Dead-End Encounter information at the Closure Call for the task session in which it occurred.

e. Allowable Questions. While engaged in a task session, test participants may ask the System Administrator to clarify any confusion on the intention of a task itself, but may not ask for clarification on how to use the computer to perform the task.

f. Observations by System Administrator.

i. Dead Ends. See Paragraph 3.E.1)d.

ii. Interrupts. See Paragraph 5A.

iii. Other Observations. During the task sessions, the System Administrator will make note of any unusual behavior by test participants onto the Observation Worksheet (See Enclosure 4) and will enter any notes made during the session under Remarks at the Closure Call. Also, if a participant consistently exhibits any behavior which might impact on the test results, the System Administrator should record the information. For instance, if the user appeared to be ill, a record should be made of the user and the illness observation so that the information is available during data analysis.

g. Materials Required. Each test participant will receive a notebook with 5 sequenced tasks prior to the beginning of testing (pre-lunch and post-lunch). The notebook will contain all necessary references or paperwork for each task. The test participant will also be provided with a non-permanent marker, as some tasks require the participant to write down document numbers, etc. on task paperwork. Also, the test participant will be given a pencil which may be used to mark on accompanying

supply forms such as DA Form 3645s, etc. to assist in task completion.

2) Post-Task Surveys.

a. Description. The Post-Task Surveys collect task-specific information regarding the use of Dynamic HELP and identifies those areas of the task session where the user was confused by the interface. There is a HELP and Non-HELP version of the survey for each task type. A Post-Task Survey will be completed by the test participant after each task session. See Enclosure 5 for copies of the post-task surveys.

b. Participant Questions. While completing the survey, test participants may ask the System Administrator to clarify any unclear question meanings or response instructions.

c. Materials Required. Each test participant will receive the applicable post-task survey and a pencil with which to complete it at the time of the Closure Call.

3) Lunch. Each test participant will be released to eat lunch at the discretion of the System Administrator. In general, test participants will have a lunch break after the first 5 tasks and post-task surveys. The lunch break will be no longer than 2 hours in length. During the lunch break, the System Administrator will prepare task notebooks for post-lunch testing (ie, erase grease pencil markings and rearrange tasks) and may begin entering pre-survey data into USER database table. Also, the System Administrator may view the Task History Tables to ensure data is being posted correctly.

F. Post-Test Surveys.

a. Description. The Post-Test Survey collects general user opinions on Dynamic HELP. It will be completed by each test participant after he/she has completed all task sessions. See Enclosure 6 for a copy of the post-test survey.

b. Participant Questions. While completing the survey, test participants may ask the System Administrator to clarify any unclear question meanings or response instructions.

c. Materials Required. Each test participant will receive the post-test survey and a pencil with which to complete it.

G. Release of Participants. Test participants will be released from the experiment by the System Administrator after a final check of survey paperwork.

H. Daily Shutdown Procedures. Each evening, the following actions will be performed after the conclusion of testing (1700 hrs):

1) Collect all surveys and task printouts.

2) Run Session Closure Reports (?)

3) Reinitialize database.

4) Prepare next day's task sequences, surveys,etc.

5) Logout of system (2 Wyse terminals).

4. **Task Sequence Assignments**.

A. Assignment Procedure. There are five task types. There are two versions of each task type and either version can be performed with or without Dynamic HELP. To ensure that a sufficient amount of time has transpired between performance of "like" tasks, one version of each task type will be completed prior to the user's lunch break. The remaining version of each task type will be completed after a two-hour lunch. At most two users will undergo testing during a day. If one user undergoes testing, he/she is considered the odd-numbered user. If a second participant also undergoes testing the same day, he/she is considered the even-numbered user

The orders of task type performance before lunch as well as well as after lunch are random. The version of each task type performed before lunch is random for the odd-numbered users (the even-numbered user will perform the other task type versions before lunch to ensure database integrity). During the lunch break, the database will be reinitialized. Then, the users will perform the remaining version of the tasks (the task type versions they have not yet performed) after lunch. The assignment of HELP and Non-HELP within the task sequence before lunch is random while after lunch versions of each task type will receive the opposite assignment of HELP and Non-HELP. For instance, given that the task types are numbered 1-5 and the two versions are named A and B, with a random number generator one could assign the following before lunch task type sequence for participant #1:

5 3 4 1 2

and an after lunch sequence of:

5 1 2 4 3

This randomization will nullify any "anticipation" effects of

users performing the same sequence of task types after lunch.

Random assignment of task type versions could then yield:

Before Lunch: 5A 3A 4A 1B 2B

and

After Lunch: 5B 1A 2A 4B 3B

Then, random assignment of HELP and Non-HELP could yield:

Before Lunch: 5AH 3AN 4AH 1BN 2BH

and

After Lunch: 5BN 1AH 2AN 4BN 3BH

where "5AH" corresponds to Task Type 5, Version A, to be performed with Dynamic HELP.

B. Actual Assignment for Experiment. The same logic was used to generate random task performance sequences for all 20-25 test participants. Using Table XV from Hines and Montgomery's Probability and Statistics in Engineering and Management Science and given that the task types are numbered 11-15, versions are designated A and B, HELP is designated as H and Non-HELP is designated as N, the resultant task perfomance sequence was:

USER#	AM	PM
1	15AH 13AN 14AH 11BN 12BH	15BN 11AH 12AN 14BN 13BH
2	12AH 11AH 13BH 15BN 14BH	13AN 15AH 14AN 12BN 11BN
3	14AH 13AN 11AH 15BH 12AN	13BH 14BH 15AN 12BH 11BN
4	12BH 11BH 13BN 14BH 15AH	11AN 13AH 15BN 14AN 12AN
5	13BN 15BN 14BN 11BN 12AN	14AH 11AH 15AH 13AH 12BH
6	15AH 11AN 14AH 13AN 12BH	15BN 11BH 13BH 12AN 14BN
7	15BH 13AN 11BH 12AH 14AN	15AN 11AN 14BH 12BN 13BH
8	14BN 12BH 15AH 13BN 11AH	12AN 11BN 15BN 13AH 14AH
9	14BN 15BH 12BN 13AH 11AN	12AH 15AN 14AH 13BN 11BH
10	15AH 11BN 12AH 13BH 14AH	13AN 15BN 12BN 14BN 11AH
11	14AN 13AH 12BN 15BN 11BH	13BN 11AN 12AH 15AH 14BH
12	15AN 14BN 13BN 11AH 12AN	15BH 11BN 13AH 12BH 14AH
13	13BN 14BN 12AH 15AN 11AH	13AH 14AH 12BN 11BN 15BH
14	12BN 15BN 13AN 14AH 11BH	11AN 13BH 12AH 14BN 15AH

USER#	AM	PM
15	12BN 14AH 11BH 13AH 15BH	13BN 14BN 15AN 12AH 11AN
16	14BN 13BH 12AN 15AN 11AH	12BH 14AH 13AN 15BH 11BN
17	12BN 15AH 14BH 11BN 13BN	14AN 11AH 12AH 13AH 15BN
18	12AH 11AH 15BH 14AN 13AN	13BH 14BH 15AN 11BN 12BN
19	15BN 14AH 11AH 13AN 12BN	11BN 13BH 15AH 12AH 14BN
20	12AH 11BN 14BH 15AN 13BH	14AN 15BH 12BN 13AN 11AH
21	13AH 11BN 12BH 15BH 14AH	11AH 13BN 15AN 12AN 14BN
22	15AN 11AN 12AN 13BH 14BN	14AH 12BH 15BH 11BH 13AN
23	14AH 11AH 15BH 12BN 13AH	15AN 11BN 13BN 12AH 14BN
24	12AH 11BN 13BN 15AN 14BN	14AH 13AH 11AH 12BN 15BH
25	11BN 14BH 13AH 15BH 12BH	12AN 14AN 11AH 13BN 15AN
26	15AH 13BN 11AN 12AH 14BN	15BN 11BH 14AN 12BN 13AH

Note that the odd-numbered users had their task type versions randomly assigned in the a.m. and therefore their p.m. task type versions were opposite those of the a.m. Also, the even-numbered users' task type versions are opposite those of the preceding odd-numbered user both in the a.m. and p.m. This will ensure database integrity throughout testing. Note: This sequence assignment assumes that two participants will be present each day with the possible exception of one day.

5. **Special Instructions**.

A. Task Interruption.

1) Machine Shutdown. If at any time during a task session, there is an interruption due to machine breakdown where task performance data is lost, the task must be restarted after database reinitialization. Any Task History Table or Session File entries from the earlier interrupted task will be rewritten to a separate "interruption data" table and will be available for analysis if necessary.

2) Other Interruptions. If at any time during a task session there is an interruption due to external forces, such as a fire drill or a latrine break, and the task performance data is undisturbed, then the System Administrator must record the time of the interruption. Once the interruption is concluded and the task session resumes, the System Administrator must record the time of resumption. Both times should be annotated in the Closure Call for the task session.

B. Guidelines for Administrator. Administrator actions can affect the validity of the experiment. In particular, the System Administrator should consistently observe the following guidelines:

1) Do not influence or advise the user except to mention whether or not Dynamic HELP is available for the given task.

2) Note any interruptions and record their time.

3) Note any departures from usual assumed behavior that may invalidate results. If possible, ensure that the user is attempting to perform tasks as accurately and quickly as the CIF software allows. Prevent, or note, frivolity, anger, and idle-curiosity exploration.

4) Make the definition of Dead-Ends consistent and known to the user. Dead-Ends are counted separately from elapsed time because one Dead-End could cause a huge elapsed time that would statistically overwhelm the results. When a confusion is believed to be deep enough that a whole minute of further effort would be required to proceed, a Dead-End is declared, and the user is given the minimum personal help to proceed.

5) Answer all questions about supply procedures or surveys. Answer no questions about computer procedures.

Enclosures:

1 - Instructions to Test Participants
2 - Pre-Test Survey
3 - The 10 Base Tasks
4 - Observation Worksheet
5 - Post-Task Surveys
6 - Post-Test Survey

APPENDIX 8
SPECIFICATION FOR SESSION HISTORY DATA COLLECTION & REPORT

SPECIFICATION FOR SESSION HISTORY DATA COLLECTION & REPORT

1. In the Design of the Evaluation of the converted CIF Program there are ten separate **tasks** that participants will perform. A **session** is defined as a user's performance of a single task. During each session, records will be inserted into the **Task History Table (THT)** for the task and at session closure, a **Session Closure Report (SCR)** will be generated.

2. **Task History Table (THT)**. There will be 10 THT's, each with a name that identifies its task. Queries from the **THT** will be sorted in increasing date/time order. **Enclosure 1** lists the THT column headings for each task. Criteria for insertion into the THT are given in **Enclosure 2** for each task. Each THT's criteria consists of Key Collection Identifications, Other Collection Attributes, and Table Inclusion Logic.

3. **Session Closure Report (SCR)**. The **SCR** is a text file whose filename will identify the task and user. It will consist of the following sequence of items:

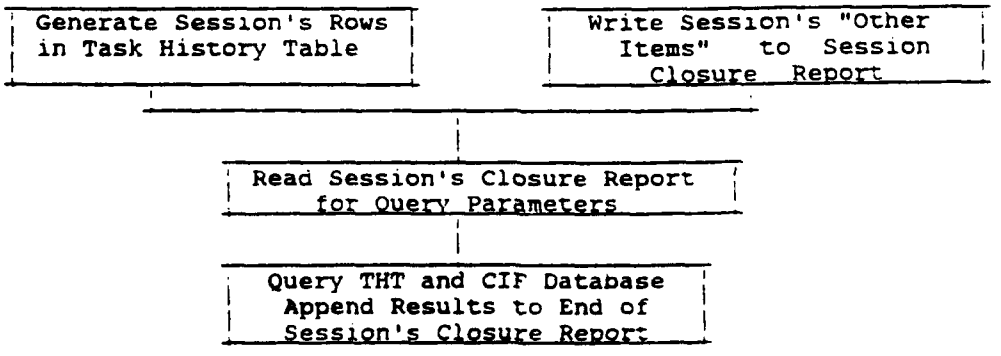
   a) **Header Stamp** (See **Enclosure 3** for description)

   b) ***"Other Items"*** *not necessarily* **available from queries of the THT(including quality checks and special key totals). Parameters which will then be used by queries to the THT are denoted by (&parametername). These are also specified in Enclosure 4.**

   c) **Results of Queries to the THT and CIF DBase. Enclosure 4 contains the specific query logic in pseudo-sql for each task.**

   d) **Closure Stamp.** (See **Enclosure 3**)

4. The following diagram depicts the sequence of events occuring within any particular session:



5. Please "create" the ten required THTs (ie establish column headings and appropriate domains). For each task, insert logic into the CIF program modules:

a) To make insertions into the THTs.

b) To collect the Header Stamp.

c) To collect on-the-fly non-query items for the SCR.

d) To perform THT and CIF DBase queries for Session Closure Reports.

e) To collect the Closure Stamp.

f) To assemble the Session Closure Report, generate its filename and save it.

g) To cause the database to be reinitialized at time of Closure.

6. In support of the data collected during user-testing, there is a need for a User Table which will be indexed by User ID and will contain each user's name and other data relevant to the testing sessions. The User Table will be created with column names and domains specified by CPT Wolven (to be provided at a later date). Actual data entry will be performed by CPT Wolven.

ENCLOSURE 1

TASK HISTORY TABLE COLUMN HEADINGS

TASK 11 (A & B) (TableNames T11A & T11B)

Column Heading	Description
User	User Identification Code
Date/Time	Date/Time Code
Key	Key Identification Code
Scr/Fld	Screen and Field Identification Code
LIN	LIN Number

TASK 12 (A & B) (TableNames T12A & T12B)

Column Heading	Description
User	User Identification Code
Date/Time	Date/Time Code
Key	Key Identification Code
Scr/Fld	Screen and Field Identification Code

TASK 13 (A & B) (TableNames T13A & T13B)

Column Heading	Description
User	User Identification Code
Date/Time	Date/Time Code
Key	Key Identification Code
Scr/Fld	Screen and Field Identification Code

TASK 14 (A & B) (TableNames T14A & T14B)

Column Heading	Description
User	User Identification Code
Date/Time	Date/Time Code
Key	Key Identification Code
Scr/Fld	Screen and Field Identification Code

TASK 15 (A & B) (TableNames T15A & T15B)

Column Heading	Description
User	User Identification Code
Date/Time	Date/Time Code
Key	Key Identification Code
Scr/Fld	Screen and Field Identification Code
LIN	LIN Number

ENCLOSURE 2

INSERTION CRITERIA TO TASK HISTORY TABLES

TASK 11 (A & B)

Table Inclusion Logic: Entry is made whenever:

1. The Key ID matches one of those specified in the Key Collection IDs Section of this task (See below).

OR

2. The Screen/Field ID changes its value. While in a screen where a LIN column exists, if the value under LIN column matches one of those specified in the Other Collection Attributes Section below, the value of LIN will be inserted (otherwise insertions will have NULL LIN values).

Key Collection IDs: Entries will be made into the THT any time any of the following keys or keytypes are pressed:

<CR>
Arrow Keys
All Integer Keys
<-> *(the minus sign)*
<ESC>
<DEL>
F1
F2
Non-Dynamic Help
Dynamic Help
<Backspace>

Other Collection Attributes:

TASK 11A	TASK 11B
LIN	LIN
D01857	C07440
K20163	C08256
T36211	K20163

ENCL 2 cont

TASK 12 (A & B)

Table Inclusion Logic: Entry is made whenever:

1. The Key ID matches one of those specified within the Key Collection IDs Section of this task (See below).

OR

2. The Screen/Field ID changes its value.

Key Collection IDs: Entries will be made into the THT any time any of the following keys or keytypes are pressed:

<CR>
Right Arrow Key
Left Arrow Key
Up Arrow Key
Down Arrow Key
All Integer Keys
<ESC>
<DEL>
Non-Dynamic Help
Dynamic Help
<Backspace>

Other Collection Attributes: Not applicable.

ENCL 2 cont

TASK 13 (A & B)

Table Inclusion Logic: Entry is made whenever:

1. The Key ID matches one of those specified within the Key Collection IDs Section of this task (See below).

OR

2. The Screen/Field ID changes its value.

Key Collection IDs: Entries will be made into the THT any time any of the following keys or keytypes are pressed:

<CR>
Right Arrow Key
Left Arrow Key
Up Arrow Key
Down Arrow Key
<ESC>
<DEL>
Non-Dynamic Help
Dynamic Help
<Backspace>
All Integer Keys
'X'

Other Collection Attributes: Not applicable.

ENCL 2 cont

TASK 14 (A & B)

Table Inclusion Logic: Entry is made whenever:

1. The Key ID matches one of those specified within the Key Collection IDs Section of this task (See below).

OR

2. The Screen/Field ID changes its value.

Key Collection IDs: Entries will be made into the THT any time any of the following keys or keytypes are pressed:

<CR>
Right Arrow Key
Left Arrow Key
Up Arrow Key
Down Arrow Key
<ESC>
<DEL>
Non-Dynamic Help
Dynamic Help

Other Collection Attributes: Not applicable.

ENCL 2 cont

TASK 15 (A & B)

Table Inclusion Logic: Entry is made whenever:

1. The Key ID matches one of those specified within the Key Collection IDs Section of this task (See below).

OR

2. The Screen/Field ID changes its value. While in a screen where a LIN column exists, if the value under LIN column matches one of those specified in the Other Collection Attributes Section below, the value of LIN will be inserted (otherwise insertions will have NULL LIN values).

Key Collection IDs: Entries will be made into the THT any time any of the following keys or keytypes are pressed:

<CR>
Right Arrow Key
Left Arrow Key
Up Arrow Key
Down Arrow Key
<ESC>
<DEL>
Non-Dynamic Help
Dynamic Help
All Integer Keys
'X'

Other Collection Attributes:

TASK 15A	TASK 15B
LIN	LIN
C07440	C07440
F54817	N39848
N39848	U06645

ENCLOSURE 3

HEADER/CLOSURE DESCRIPTION

HEADER

The Header will be called at the beginning of each session while the user is at the CIF Main Menu. Header entries will be entered by the Session Administrator at the start of a session. The following is the format of the Header Stamp as it should appear in the Session Closure Report:

TASK ID__*___
USER ID__*___
HELP?____*____
SESSION START___**____

The format of screen support of Header entries should be similar. Entries should end with <CR> and the <CR> for the "HELP" entry should trigger the recording of session start time (which need not be echoed to the user).

CLOSURE

The Closure will be called at the end of a session when the user has returned to the CIF Main Menu. Closure entries will be entered by the Session Administrator at the end of a session. Once the Closure entries are complete then the database will be reinitialized prior to the start of a new session. The following is the format of the Closure Stamp as it should appear in the Session Closure Report:

SESSION STOP ____**_____ (Also echo previously recorded SESSION START to the screen)
REMARKS:
= DEAD END POINTS___*____
OTHER _____*_____
_____
_____

OTHER is text entered by the Session Administrator. A single <CR> is a line delimiter and causes a linefeed and carriage return. Two successive <CR>'s cause closure of the REMARKS entry, which causes assembly (filename generation and saving) of the Session Closure Report.

* - To be entered by the Session Administrator.
** - To be recorded by the computer.

ENCLOSURE 4

QUERY RESULTS AND "OTHER ITEMS"

TASK 11A

QUERY RESULTS

QUERY	FORMAT IN SCR
1. Special Issue {Manual Turn In}	Special Issue
select date/time from THT11A where user=___ & key=<CR> & scr/fld=ManTI/DutyMOS.	Start of SISSUE_____
select date/time from THT11A where user=___ & key=<CR> & scr/fld=ManTI/SISSUE.	End of SISSUE_____
count * from THT11A where user=___ & key=NDH & scr/fld=ManTI/SISSUE.	= times NonDynHlp_____
count * from THT11A where user=___ & key=DynHlp & scr/fld=ManTI/SISSUE.	= times DynHlp_____
2. SIZE {Manual TurnIn-Itms Rtned}	SIZE
A. D01857	D01857
select date/time from THT11A where user=____ & key=<CR> & scr/fld=ManTI-ItmRtn/IQTY & LIN=D01857.	End of SIZE/IQTY Fld _____ _____ _____
count * from THT11A wnere user=___ key=NDH & scr/fld= ManTI-ItmRtn/SIZE & LIN= D01857.	= times NonDynHlp_____
count * from THT11A wnere user=___ key=DynHlp & scr/fld=ManTI-ItmRtn/SIZE	= times DynHlp_____

& LIN=D01857.

B. K20163 K20163

select date/time from THT11A where user=____ & key=<CR> & scr/fld=ManTI-ItmRtn/IQTY & LIN=K20163.

End of SIZE/IQTY Fld
_____
_____
_____

count * from THT11A where user=___ key=NDH & scr/fld=ManTI-ItmRtn/SIZE & LIN=K20163.

times NonDynHlp_____

count * from THT11A where user=___ key=DynHlp & scr/fld=ManTI-ItmRtn/SIZE & LIN=K20163.

times DynHlp_____

C. T36211 T36211

select date/time from THT11A where user=____ & key=<CR> & scr/fld=ManTI-ItmRtn/IQTY & LIN=T36211.

End of SIZE/IQTY Fld
_____
_____
_____

count * from THT11A where user=___ key=NDH & scr/fld=ManTI-ItmRtn/SIZE & LIN=T36211.

times NonDynHlp_____

count * from THT11A where user=___ key=DynHlp & scr/fld=ManTI-ItmRtn/SIZE & LIN=T36211.

times DynHlp_____

3. F1/F2{Manual TurnIn-Itms Rtned} F1/F2

count * from THT11A where user=___ & key=F1 & scr/fld=ManTI-ItmRtn/*.

times F1_____

count * from THT11A where user=___ # times F2_____
& key=F2 & scr/fld=ManTI-ItmRtn/*.

count * from THT11A where user=___ # times NonDynHlp pressed
& key=NDH & scr/fld=ManTI-ItmRtn/*. in ManTI scr_____

count * from THT11A where user=___ # times DynHlp pressed
& key=DynHlp & scr/fld= in ManTI scr_____
ManTI-ItmRtn/*.

4. SSN {Turn In Screen} SSN

select date/time from THT11A where End of SSN_____
user=___ & key=<CR> & scr/fld=
TurnIn/SSN.

count * from THT11A where user=___ # integers pressed_____
& key in(any integer) &
scr/fld=TurnIn/SSN.

count * from THT11A where user=___ # dashes pressed_____
& key='-' & scr/fld=TurnIn/SSN.

count * from THT11A where user=___ # times NonDynHlp_____
& key=NDH & scr/fld=TurnIn/SSN.

count * from THT11A where user=___ # times DynHlp_____
& key=DynHlp & scr/fld=TurnIn/SSN.

5. UIC {Manual TurnIn Screen} UIC

select date/time fromTHT11A where Start of UIC_____
user=___ & (key=<CR> OR key=<DN>)
& scr/fld=ManTI/DEROS.

select date/time fromTHT11A where End of UIC_____
user=___ & (key=<CR> OR key=<DN>)
& scr/fld=ManTI/UIC.

count * from THT11A where user=___ # times NonDynHlp_____
& key=NDH & scr/fld=ManTI/UIC.

count * from THT11A where user=___ # times DynHlp_____
& key=DynHlp & scr/fld=ManTI/UIC.

6. GRADE {Manual TurnIn Screen} GRADE

select date/time fromTHT11A where Start of GRADE_____
user=___ & (key=<CR> OR key=<DN>)
& scr/fld=ManTI/UIC.

select date/time fromTHT11A where End of GRADE_____
user=___ & (key=<CR> OR key=<DN>)
& scr/fld=ManTI/GRADE.

count * from THT11A where user=___ # times NonDynHlp_____
& key=NDH & scr/fld=ManTI/GRADE.

count * from THT11A where user=___ # times DynHlp_____
& key=DynHlp & scr/fld=ManTI/GRADE.

7. TRANSFERRED ITEMS TRANSFERRED ITEMS
{Manual TurnIn - Items Transferred}

select date/time from THT11A where End of Screen_____
user=___ & key=<ESC> & scr/fld=
ManTI-ItmTrn/*.

count * from THT11A where user=___ # <CR>s_____
& key=<CR> & scr/fld=ManTI-ItmTrn/*.

count * from THT11A where user=___ # Arrow Keys_____
& (key=<UP> or key=<DN> or key=<LT>
or key=<RT>) & scr/fld=ManTI-ItmTrn/*.

count * from THT11A where user=___ # times NonDynHlp_____
& key=NDH & scr/fld=ManTI-ItmTrn/*.

count * from THT11A where user=___ # times DynHlp_____
& key=DynHlp & scr/fld=ManTIItmTrn/*.

"OTHER ITEMS" TO BE COLLECTED {11A}

DESCRIPTION	FORMAT IN SCR
1. Special Issue{Manual TurnIn}	Special Issue
Total # keys pressed while in Special Issue field of the Manual Turn In screen.	#keys prsd(SISSUE)_____
2. SIZE {Manual TurnIn-Itms Rtn}	SIZE
Date/time of entry into SIZE fld for LIN D01857.	Enter D01857_____
Date/time of entry into SIZE fld for LIN K20163.	Enter K20163_____
Date/time of entry into SIZE fld for LIN T36211.	Enter T36211_____
3. SSN {Turn Ins screen}	SSN
Date/time of entry into TurnIns Screen.	Enter SSN_____
4. UIC {Manual TurnIn screen}	UIC
Total # keys pressed while in UIC field.	# keys pressed(UIC)_____
5. GRADE {Manual TurnIn screen}	GRADE
Total # keys pressed while in GRADE field.	# keys prsd(GRADE)_____
6. TRANSFERRED ITEMS {Manual Turn In - Items Transferred Screen}	TRANSFERRED ITEMS

Date/time of entry into screen.

Total # keys pressed in screen.

Record the actual entries in the screen at the time <ESC> is pressed.

Start of Trnsfd Itms_____

keys prsd(TrnfItm)_____

TRANSFERRED ITEM POSTINGS

LIN	SIZE	QTY
___	____	___
___	____	___

TASK 11B

QUERY RESULTS

QUERY	FORMAT IN SCR
1. Special Issue {Manual TurnIn}	Special Issue
select date/time from THT11B where user=___ & key=<CR> & scr/fld=ManTI/DutyMOS.	Start of SISSUE_____
select date/time from THT11B where user=___ & key=<CR> & scr/fld=ManTI/SISSUE.	End of SISSUE_____
count * from THT11B where user=___ & key=NDH & scr/fld=ManTI/SISSUE.	# times NonDynHlp_____
count * from THT11B where user=___ & key=DynHlp & scr/fld=ManTI/SISSUE.	# times DynHlp_____
2. SIZE{Manual TurnIn-Itms Rtned}	SIZE
A. C07440	C07440
select date/time from THT11B	End of SIZE/IQTY Fld

where user=____ & key=<CR> &
:cr/fld=ManTI-ItmRtn/IQTY &
LIN=C07440.

count * from THT11B where
user=___ key=NDH & scr/fld=
ManTI-ItmRtn/SIZE & LIN=
C07440.

count * from THT11B where
user=___ key=DynHlp &
scr/fld=ManTI-ItmRtn/SIZE
& LIN=C07440.

times NonDynHlp_____

times DynHlp_____

B. K20163

select date/time from THT11B
where user=____ & key=<CR> &
scr/fld=ManTI-ItmRtn/IQTY &
LIN=K20163.

count * from THT11B where
user=___ key=NDH & scr/fld=
ManTI-ItmRtn/SIZE & LIN=
K20163.

count * from THT11B where
user=___ key=DynHlp &
scr/fld=ManTI-ItmRtn/SIZE
& LIN=K20163.

K20163

End of SIZE/IQTY Fld
_____
_____
_____

times NonDynHlp_____

times DynHlp_____

C. C08256

select date/time from THT11B
where user=____ & key=<CR> &
scr/fld=ManTI-ItmRtn/IQTY &
LIN=C08256.

count * from THT11B where
user=___ key=NDH & scr/fld=
ManTI-ItmRtn/SIZE & LIN=
C08256.

C08256

End of SIZE/IQTY Fld
_____
_____
_____

times NonDynHlp_____

```
count * from THT11B where      # times DynHlp_______
user=___ key=DynHlp &
scr/fld=ManTI-ItmRtn/SIZE
& LIN=C08256.
```

3. F1/F2{Manual TurnIn-Itms Rtned} F1/F2

```
count * from THT11B where user=___   # times F1___________
& key=F1 & scr/fld=ManTI-ItmRtn/*.

count * from THT11B where user=___   # times F2___________
& key=F2 & scr/fld=ManTI-ItmRtn/*.

count * from THT11B where user=___   # times NonDynHlp pressed
& key=NDH & scr/fld=ManTI-ItmRtn/*.  in ManTI scr___________

count * from THT11B where user=___   # times DynHlp pressed
& key=DynHlp & scr/fld=              in ManTI scr___________
ManTI-ItmRtn/*.
```

4. SSN {Turn In Screen} SSN

```
select date/time from THT11B where  End of SSN_____________
user=___ & key=<CR> & scr/fld=
TurnIn/SSN.

count * from THT11B where user=___    # integers pressed_____
& key in(any integer) &
scr/fld=TurnIn/SSN.

count * from THT11B where user=___    # dashes pressed_______
& key='-' & scr/fld=TurnIn/SSN.

count * from THT11B where user=___    # times NonDynHlp_______
& key=NDH & scr/fld=TurnIn/SSN.

count * from THT11B where user=___    # times DynHlp___________
& key=DynHlp & scr/fld=TurnIn/SSN.
```

5. UIC {Manual Turn In}

UIC

select date/time fromTHT11B where user=___ & (key=<CR> OR key=<DN>) & scr/fld=ManTI/DEROS.

Start of UIC_____

select date/time fromTHT11B where user=___ & (key=<CR> OR key=<DN>) & scr/fld=ManTI/UIC.

End of UIC_____

count * from THT11B where user=___ & key=NDH & scr/fld=ManTI/UIC.

times NonDynHlp_____

count * from THT11B where user=___ & key=DynHlp & scr/fld=ManTI/UIC.

times DynHlp_____

6. GRADE {Manual Turn In}

GRADE

select date/time fromTHT11B where user=___ & (key=<CR> OR key=<DN>) & scr/fld=ManTI/UIC.

Start of GRADE_____

select date/time fromTHT11B where user=___ & (key=<CR> OR key=<DN>) & scr/fld=ManTI/GRADE.

End of GRADE_____

count * from THT11B where user=___ & key=NDH & scr/fld=ManTI/GRADE.

times NonDynHlp_____

count * from THT11B where user=___ & key=DynHlp & scr/fld=ManTI/GRADE.

times DynHlp_____

7. TRANSFERRED ITEMS
{Manual Turn In - Items Transferred}

TRANSFERRED ITEMS

select date/time from THT11B where user=___ & key=<ESC> & scr/fld= ManTI-ItmTrn/*.

End of Screen_____

count * from THT11B where user=___ & key=<CR> & scr/fld=ManTI-ItmTrn/*.

<CR>s_____

count * from THT11B where user=___ & (key=<UP> or key=<DN> or key=<LT>

Arrow Keys_____

or key=<RT>) & scr/fld=ManTI-ItmTrn/*.

count * from THT11B where user=___ # times NonDynHlp_____
& key=NDH & scr/fld=ManTI-ItmTrn/*.

count * from THT11B where user=___ # times DynHlp_____
& key=DynHlp & scr/fld=ManTIItmTrn/*.

"OTHER ITEMS" TO BE COLLECTED {11B}

DESCRIPTION	FORMAT IN SCR
1. Special Issue {Manual TurnIn}	Special Issue
Total # keys pressed while in Special Issue field of the Manual Turn In screen.	#keys prsd(SISSUE)_____
2. SIZE {Manual TurnIn-Itms Rtn}	SIZE
Date/time of entry into SIZE fld for LIN C07440.	Enter C07440_____
Date/time of entry into SIZE fld for LIN K20163.	Enter K20163_____
Date/time of entry into SIZE fld for LIN C08256.	Enter C08256_____
3. SSN {Turn Ins screen}	SSN
Date/time of entry into TurnIns Screen.	Enter SSN_____
4. UIC {Manual TurnIn screen}	UIC
Total # keys pressed while in UIC field.	# keys pressed(UIC)_____
5. GRADE {Manual TurnIn screen}	GRADE
Total # keys pressed while in GRADE field.	# keys prsd(GRADE)_____

6. TRANSFERRED ITEMS
{Manual Turn In - Items Transferred Screen}

TRANSFERRED ITEMS

Date/time of entry into screen.

Start of Trnsfd Itms_____

Total # keys pressed in screen.

keys prsd(TrnfItm)_____

Record the actual entries in the screen at the time <ESC> is pressed.

TRANSFERRED ITEM POSTINGS

LIN	SIZE	QTY
___	___	___
___	___	___

TASK 12A

QUERY RESULTS

QUERY	FORMAT IN SCR
1.1 Condition Code & ESC Key {Turn In to DRMO Screen}	Condition Code & ESC Key
select date/time from THT12A where user=___ & key=<ESC> & (scr/fld=TItoDRMO/* & scr/fld<>TItoDRMO/Condition).	Enter Condition_____
select date/time from THT12A where user=___ & (key=<CR> or key=<ESC>) & scr/fld=TItoDRMO/ Condition.	Exit Condition_____
count * from THT12A where user=___ & key=NDH & scr/fld=TItoDRMO/ Condition.	# times NonDynHlp_____
count * from THT12A where user=___ & key=DynHlp & scr/fld=TItoDRMO/ Condition.	# times DynHlp_____
2.1 Corrections & ESC Key {S/C Screen}	Corrections & ESC Key
select date/time from THT12A	Exit S/C Screen_____

```
where user=___ & (key=<CR> or
key=<ESC>) & scr/fld=S/C/TotPri.

count * from THT12A where user=___   # UP Arrow_____
& key=<UP> & scr/fld=S/C/*

count * from THT12A where user=___   # Down Arrow_____
& key=<DN> & scr/fld=S/C/*

count * from THT12A where user=___   # Right Arrow_____
& key=<RT> & scr/fld=S/C/*

count * from THT12A where user=___   # Left Arrow_____
& key=<LT> & scr/fld=S/C/*

count * from THT12A where user=___   # Backspaces_____
& key=<BCKSP> & scr/fld=S/C/*

count * from THT12A where user=___   # times NonDynHlp_____
& key=NDH & scr/fld=S/C/*.

count * from THT12A where user=___   # times DynHlp_____
& key=DynHlp & scr/fld=S/C/*.

count * from THT12A where user=___   # integers_____
& key in(any integer) &
scr/fld=S/C/*.

3.1 Menu Selection                   Menu Selection
{Adjustment Transactions Menu to Cancel S/C,R/S,C/C}

count * from THT12A where user=___   # times NonDynHlp_____
& key=NDH & date/time from
&entadjtrns to &entcancrepsur.

count * from THT12A where user=___   # times DynHlp_____
& key=DynHlp & date/time from
&entadjtrns to &entcancrepsur.

3.2 Total Price                      Total Price
{Cancel S/C,R/S,C/C}

select date/time from THT12A         Enter Total Price_____
where user=___ & key=<ESC> &
```

(scr/fld=CancelS/C,R/S/* &
scr/fld<>CancelS/C,R/S/TotPri).

select date/time from THT12A where user=___ & (key=<CR> or key=<ESC>) & scr/fld=CancelS/C, R/S/TotPri.

Exit Total Price_____

count * from THT12A where user=___ & key=NDH & scr/fld=CancelS/C, R/S/TotPri.

times NonDynHlp_____

count * from THT12A where user=___ & key=DynHlp & scr/fld=CancelS/C, R/S/TotPri.

times DynHlp_____

"OTHER ITEMS" TO BE COLLECTED {12A}

DESCRIPTION	FORMAT IN SCR
1. Condition Code & ESC Key {TurnIn to DRMO Screen}	Condition Code & ESC Key
Record date/time of entry into the TurnIn to DRMO Screen.	Enter TItoDRMO_____
Total # keys pressed in the TurnIn to DRMO Screen.	Total # keys(TIDRMO)____
Total # keys pressed in the Condition Code field of the TurnIn to DRMO Screen.	Total # keys(Condition)____

ERROR CHECKS

Record the NSNs & quantities on the screen at the time <ESC> key is pressed and scr/fld<>TItoDRMO/ Condition.

	S/C	
	NSN	QTY
	___	___
	___	___

Record the Condition Code on the Screen at time of exit from screen.

Condition Code_____

2. Corrections & ESC Key
{S/C Screen}

Corrections & ESC Key

Record the date/time of entry into the Statement of Charges Screen from the Adjustment Transactions Menu Screen.

Enter S/C Screen_____

Total # keys pressed in the S/C Screen.

Total # keys(S/C)_____

Total # keys pressed in the Total Price field of the S/C Screen.

Total # keys(TotPri)_____

ERROR CHECKS

Record the NSNs & quantities on the screen at the time <ESC> key is pressed and scr/fld<>S/C/TotPri.

	S/C	
	NSN	QTY
	___	___

Record the Total Price on the Screen at time of exit from screen.{key=<CR> or <ESC>}

Total Price_____

3.1 Menu Selection
{Adjustment Transactions Menu to Cancel S/C,R/S,C/C}

Menu Selection

{&entadjtrns} = the date/time when user reentered the Adj Trans Menu Screen from previous subtask {#12A.2}.

Enter Adj Trans_____

{&entcancrepsur} = the date/time of entry into Cancel S/C,R/S,C/C Screen from the Adj Trans Menu Screen.

Enter Cancel R/S_____

Record total # key presses made from time of reaching Adj Trans Menu Screen after Subtask 12A.2

keys pressed to get to Cancel R/S _____

to time of entering the Cancel S/C,R/S,C/C Screen.

3.2 Total Price
{Cancel S/C,R/S,C/C Screen}

Total # keys pressed in Total Price field of the Cancel S/C, R/S,C/C Screen.

Total Price

keys in Total Price of Cancel R/S_____

ERROR CHECKS

Record the NSNs & quantities on the screen at the time <ESC> key is pressed and scr/fld<>Cancel S/C,R/S,C/C/TotPri.{ie NSNs & Qtys at time of entry into Tot Pri}

CANCEL R/S

NSN	QTY
___	___

Record the Total Price on the Screen at time of exit from Cancel S/C,R/S,C/C Screen. {key=<CR> or <ESC>}

Total Cancelled_____

TASK 12B

QUERY RESULTS

QUERY	FORMAT IN SCR
1.1 Condition Code & ESC Key {Turn In to DRMO Screen}	Condition Code & ESC Key
select date/time from THT12B where user=___ & key=<ESC> & (scr/fld=TItoDRMO/* & scr/fld<>TItoDRMO/Condition).	Enter Condition_____
select date/time from THT12B	Exit Condition_____

where user=___ & (key=<CR> or
key=<ESC>) & scr/fld=TItoDRMO/
Condition.

count * from THT12B where user=___ # times NonDynHlp_____
& key=NDH & scr/fld=TItoDRMO/
Condition.

count * from THT12B where user=___ # times DynHlp_____
& key=DynHlp & scr/fld=TItoDRMO/
Condition.

2.1 Corrections & ESC Key Corrections & ESC Key
{S/C Screen}

select date/time from THT12B Exit S/C Screen_____
where user=___ & (key=<CR> or
key=<ESC>) & scr/fld=S/C/TotPri.

count * from THT12B where user=___ # UP Arrow_____
& key=<UP> & scr/fld=S/C/*

count * from THT12B where user=___ # Down Arrow_____
& key=<DN> & scr/fld=S/C/*

count * from THT12B where user=___ # Right Arrow_____
& key=<RT> & scr/fld=S/C/*

count * from THT12B where user=___ # Left Arrow_____
& key=<LT> & scr/fld=S/C/*

count * from THT12B where user=___ # Backspaces_____
& key=<BCKSP> & scr/fld=S/C/*

count * from THT12B where user=___ # times NonDynHlp_____
& key=NDH & scr/fld=S/C/*.

count * from THT12B where user=___ # times DynHlp_____
& key=DynHlp & scr/fld=S/C/*.

count * from THT12B where user=___ # integers_____

& key in(any integer) &
scr/fld=S/C/*.

3.1 Menu Selection — Menu Selection
{Adjustment Transactions Menu to Cancel S/C,R/S,C/C}

count * from THT12B where user=___ & key=NDH & date/time from &entadjtrns to &entcancrepsur. — # times NonDynHlp_____

count * from THT12B where user=___ & key=DynHlp & date/time from &entadjtrns to &entcancrepsur. — # times DynHlp_____

3.2 Total Price — Total Price
{Cancel S/C,R/S,C/C}

select date/time from THT12B where user=___ & key=<ESC> & (scr/fld=CancelS/C,R/S/* & scr/fld<>CancelS/C,R/S/TotPri). — Enter Total Price_____

select date/time from THT12B where user=___ & (key=<CR> or key=<ESC>) & scr/fld=CancelS/C, R/S/TotPri. — Exit Total Price_____

count * from THT12B where user=___ & key=NDH & scr/fld=CancelS/C, R/S/TotPri. — # times NonDynHlp_____

count * from THT12B where user=___ & key=DynHlp & scr/fld=CancelS/C, R/S/TotPri. — # times DynHlp_____

"OTHER ITEMS" TO BE COLLECTED {12B}

DESCRIPTION	FORMAT IN SCR
1. Condition Code & ESC Key {TurnIn to DRMO Screen}	Condition Code & ESC Key

Record date/time of entry into the TurnIn to DRMO Screen.

Enter TItoDRMO_____

Total # keys pressed in the TurnIn to DRMO Screen.

Total # keys(TIDRMO)____

Total # keys pressed in the Condition Code field of the TurnIn to DRMO Screen.

Total # keys(Condition)____

ERROR CHECKS

Record the NSNs & quantities on the screen at the time <ESC> key is pressed and scr/fld<>TItoDRMO/Condition.

S/C NSN	QTY
___	___
___	___

Record the Condition Code on the Screen at time of exit from screen.

Condition Code_____

2. Corrections & ESC Key {S/C Screen}

Corrections & ESC Key

Record the date/time of entry into the Statement of Charges Screen from the Adjustment Transactions Menu Screen.

Enter S/C Screen_____

Total # keys pressed in the S/C Screen.

Total # keys(S/C)____

Total # keys pressed in the Total Price field of the S/C Screen.

Total # keys(TotPri)____

ERROR CHECKS

Record the NSNs & quantities on the screen at the time <ESC> key is pressed and scr/fld<>S/C/TotPri.

S/C NSN	QTY
___	___

Record the Total Price on the Screen at time of exit from screen.

Total Price_____

{key=<CR> or <ESC>}

3.1 Menu Selection — Menu Selection
{Adjustment Transactions Menu to Cancel S/C,R/S,C/C}

{&entadjtrns} = the date/time when user reentered the Adj Trans Menu Screen from previous subtask {#12B.2}. — Enter Adj Trans_____

{&entcancrepsur} = the date/time of entry into Cancel S/C,R/S,C/C Screen from the Adj Trans Menu Screen. — Enter Cancel R/S_____

Record total # key presses made from time of reaching Adj Trans Menu Screen after Subtask 12B.2 to time of entering the Cancel S/C,R/S,C/C Screen. — # keys pressed to get to Cancel R/S _____

3.2 Total Price — Total Price
{Cancel S/C,R/S,C/C Screen}

Total # keys pressed in Total Price field of the Cancel S/C, R/S,C/C Screen. — # keys in Total Price of Cancel R/S_____

ERROR CHECKS

Record the NSNs & quantities on the screen at the time <ESC> key is pressed and scr/fld<>Cancel S/C,R/S,C/C/TotPri.

CANCEL R/S	
NSN	QTY

Record the Total Price on the Screen at time of exit from Cancel S/C,R/S,C/C Screen. {key=<CR> or <ESC>} — Total Cancelled_____

TASK 13A

QUERY RESULTS

QUERY	FORMAT IN SCR
1. Required Fields & Correction See "Other Items" to be Collected.	
2. Menu Selection {Subtask 13A.3} {Document Register Actions Menu to Cancellations}	Menu Selection Post Status Changes and/or
count * from THT13A where user=___ & (key=<UP> or key=<DN> or key=<RT> or key=<LT>) & date/time from {&entdocreg} to {&entpostcanc}.	# Arrow keys from Doc Reg Menu to Post Ch/Canc Screen_____
count * from THT13A where user=___ & (key in(any integer) or key='X') & date/time from {&entdocreg} to {&entpostcanc}.	# integers or 'X'chosen between Doc Reg Menu to Post Ch/CancScreen_____
count * from THT13A where user=___ & key=<CR> & date/time from {&entdocreg} to {&entpostcanc}.	# <CR>'s between Doc Reg Menu and Post Ch/CancScreen_____
count * from THT13A where user=___ & key=NDH & date/time from {&entdocreg} to {&entpostcanc}.	# times NonDynHlp pressed between Doc Reg Menu and Post Ch/CancScreen_____
count * from THT13A where user=___ & key=DynHlp & date/time from {&entdocreg} to {&entpostcanc}.	# times DynHlp pressed between Doc Reg Menu and Post Ch/CancScreen_____

"OTHER ITEMS" TO BE COLLECTED {13A}

DESCRIPTION	FORMAT IN SCR
1. Required Fields & Correction {Subtasks 13A.1 & 13A.2} {Create Supply Requisitions}	Required Fields & Correction

For each sojourn in the Create Supply Requisitions Screen, collect the following:

Date/time of entry	Entry Date/time_____
Date/time of exit	Exit Date/time_____
# <UP> keys pressed	# UP keys _____
# <DN> keys pressed	# Down keys_____
# <DEL> keys pressed	# DEL keys_____
# <ESC> keys pressed	# ESC keys_____
# <CR>'s pressed	# <CR>'s_____
# <BCKSP> keys pressed	# Backspaces_____
# times NonDynHlp pressed	# times NonDynHlp_____
# times DynHlp pressed	# times DynHlp_____
# keystrokes per screen	Total # keystrokes_____

ERROR CHECKS

Record the following items at the time of each non-delete type exit from the Create Supply Requisitions Screen:

	REQUISITIONS						
Document Number (Date & Serial)	DATE	SER	NSN	DIC	QTY	DMD	PRI
NSN	___	___	___	___	___	___	___
Document Identifier Code	___	___	___	___	___	___	___
Quantity	___	___	___	___	___	___	___
Demand Code	___	___	___	___	___	___	___
Priority Code							

2. Menu Selection

Menu Selection

{Subtask 13A.3}
{Document Register Actions Menu to Post Status Changes and/or Cancellations}
{&entdocreg} = date/time of entry into the Document Register Actions Menu from the Create Supply Requisitions Screen at the end of Subtask 13A.2.

Enter Doc Reg Actions_____

{&entpostcanc} = date/time of every entry into the Post Status Changes and/or Cancellations Screen from the Doc Reg Menu.

Enter Post Changes/ Cancellations Screen_____

Record # keystrokes when date/time value is between START and END as defined above(Query-Menu Selection)

keystrokes between Doc Reg Actions Menu & Post Changes/Cancellations Screen_____

ERROR CHECKS

Record the following items at time of exit from the Post Status Change and/or Cancellation Screen:

Document # (Date & Serial)
NSN
Quantity Requested
Status Code
Expected Delivery Date
Quantity Cancelled

REQUISITIONS						
DATE	SER	NSN	QTYREQ	STAT	QTYCANC	EDD

TASK 13B

QUERY RESULTS

QUERY	FORMAT IN SCR
1. Required Fields & Correction See "Other Items" to be Collected.	
2. Menu Selection {Subtask 13B.3} {Document Register Actions Menu to Post Status Changes and/or Cancellations}	Menu Selection
count * from THT13B where user=___ & (key=<UP> or key=<DN> or key=<RT> or key=<LT>) & date/time from {&entdocreg} to {&entpostcanc}.	# Arrow keys from Doc Reg Menu to Post Ch/Canc Screen_____

count * from THT13B where user=___ & (key in(any integer) or key='X') & date/time from {&entdocreg} to {&entpostcanc}.	# integers or 'X' chosen between Doc Reg Menu to Post Ch/CancScreen_____
count * from THT13B where user=___ & key=<CR> & date/time from {&entdocreg} to {&entpostcanc}.	# <CR>'s between Doc Reg Menu and Post Ch/CancScreen_____
count * from THT13B where user=___ & key=NDH & date/time from {&entdocreg} to {&entpostcanc}.	# times NonDynHlp pressed between Doc Reg Menu and Post Ch/CancScreen_____
count * from THT13B where user=___ & key=DynHlp & date/time from {&entdocreg} to {&entpostcanc}.	# times DynHlp pressed between Doc Reg Menu and Post Ch/CancScreen_____

"OTHER ITEMS" TO BE COLLECTED {13B}

DESCRIPTION	FORMAT IN SCR
1. Required Fields & Correction {Subtasks 13B.1 & 13B.2} {Create Supply Requisitions}	Required Fields & Correction
For each sojourn in the Create Supply Requisitions Screen, collect the following:	
Date/time of entry	Entry Date/time_____
Date/time of exit	Exit Date/time_____
# <UP> keys pressed	# UP keys _____
# <DN> keys pressed	# Down keys_____
# <DEL> keys pressed	# DEL keys_____
# <ESC> keys pressed	# ESC keys_____
# <CR>'s pressed	# <CR>'s_____
# <BCKSP> keys pressed	# Backspaces_____
# times NonDynHlp pressed	# times NonDynHlp_____
# times DynHlp pressed	# times DynHlp_____
# keystrokes per screen	Total # keystrokes_____

ERROR CHECKS

Record the following items at the time of each non-delete type exit from the Create Supply Requisitions Screen:

Document Number (Date & Serial)
NSN
Document Identifier Code
Quantity
Demand Code
Priority Code

REQUISITIONS						
DATE	SER	NSN	DIC	QTY	DMD	PRI
____	___	___	___	___	___	___
____	___	___	___	___	___	___
____	___	___	___	___	___	___
____	___	___	___	___	___	___

2. Menu Selection — Menu Selection
{Subtask 13B.3}
{Document Register Actions Menu to Post Status Changes and/or Cancellations}

{&entdocreg} = date/time of entry into the Document Register Actions Menu from the Create Supply Requisitions Screen at the end of Subtask 13B.2.

Enter Doc Reg Actions_____

{&entpostcanc} = date/time of every entry into the Post Status Changes and/or Cancellations Screen from the Doc Reg Menu.

Enter Post Changes/ Cancellations Screen_____

Record # keystrokes when date/time value is between START and END as defined above(Query-Menu Selection)

keystrokes between Doc Reg Actions Menu & Post Changes/Cancellations Screen_____

ERROR CHECKS

Record the following items at time of exit from the Post Status Change and/or Cancellation Screen:

Document # (Date & Serial)

REQUISITIONS

NSN
Quantity Requested
Status Code
Expected Delivery Date
Quantity Cancelled

DATE	SER	NSN	QTYREQ	STAT	QTYCANC	EDD

TASK 14A

QUERY RESULTS

QUERY — FORMAT IN SCR

1. Negative Receipt & Reopen Closed Documents
{Post Receipts & Reopen Closed Documents}

ERROR CHECKS

```
select docnr_dt,docnr_nm,
qtyreq,qtyrecvd,compdte from
aeb09t where docnr_dt=0096
& (docnr_nm=0048 or docnr_nm=
0049).
```

FINAL DOCUMENTS

DATE	SER	QTYREQ	QTYRECD	COMP

"OTHER ITEMS" TO BE COLLECTED {14A}

DESCRIPTION — FORMAT IN SCR

1. Neg Rcpt & Reopen Closed Docs — Neg Rcpt & Reopen Closed Docs
{Subtasks 14A.1 & 14A.2}
{Post Receipts & Reopen Closed Documents}

For each sojourn in the Post Receipts Screen, collect the following: — Post Receipts

Date/time of entry — Enter Post Rcpts_____
Date/time of exit — Exit Post Rcpts_____
times NonDynHlp pressed — # NonDynHlp(PstRcpt)_____
times DynHlp pressed — # DynHlp(PostRcpt)_____
keystrokes per screen — # keystrokes(PostRcpt)_____

For each sojourn in the Reopen Closed Documents Screen, collect the following:

Post Receipts

Date/time of entry
Date/time of exit
times NonDynHlp pressed
times DynHlp pressed
keystrokes per screen

Enter REOPEN_____
Exit REOPEN_____
NonDynHlp(REOPEN)_____
DynHlp(REOPEN)_____
keystrokes(REOPEN)_____

Determine # keystrokes from beginning of session to the entry into the Reopen Closed Documents Screen.

keystrokes from Start of Session to REOPEN Screen_____

TASK 14B

QUERY RESULTS

QUERY

FORMAT IN SCR

1. Negative Receipt & Reopen Closed Documents

{Post Receipts & Reopen Closed Documents}

ERROR CHECKS

```
select docnr_dt,docnr_nm,
qtyreq,qtyrecvd,compdte from
aeb09t where docnr_dt=9226
& (docnr_nm=0080 or docnr_nm=
0081).
```

FINAL DOCUMENTS

DATE	SER	QTYREQ	QTYRECD	COMP
____	___	_____	_____	____
____	___	_____	_____	____

"OTHER ITEMS" TO BE COLLECTED {14B}

DESCRIPTION

FORMAT IN SCR

1. Neg Rcpt & Reopen Closed Docs
{Subtasks 14B.1 & 14B.2}
{Post Receipts & Reopen Closed Documents}

Neg Rcpt & Reopen Closed Docs

For each sojourn in the Post

Receipts Screen, collect the following:	Post Receipts
Date/time of entry	Enter Post Rcpts_____
Date/time of exit	Exit Post Rcpts_____
# times NonDynHlp pressed	# NonDynHlp(PstRcpt)_____
# times DynHlp pressed	# DynHlp(PostRcpt)_____
# keystrokes per screen	# keystrokes(PostRcpt)_____

For each sojourn in the Reopen Closed Documents Screen, collect the following:	Post Receipts
Date/time of entry	Enter REOPEN_____
Date/time of exit	Exit REOPEN_____
# times NonDynHlp pressed	# NonDynHlp(REOPEN)_____
# times DynHlp pressed	# DynHlp(REOPEN)_____
# keystrokes per screen	# keystrokes(REOPEN)_____

Determine # keystrokes from beginning of session to the entry into the Reopen Closed Documents Screen.	# keystrokes from Start of Session to REOPEN Screen_____

TASK 15A

QUERY RESULTS

QUERY	FORMAT IN SCR
1.1 Fastest Movement & Correction {Complete the Issue Screen}	Fastest Movement & Correction
select date/time from THT15A where user=___ & scr/fld=ComplIssue/IQTY & LIN=F54817 & (key=<CR> or key=<UP> or key=<DN>).	Exit IQTY of LIN F54817 _____ _____
select date/time from THT15A where user=___ & scr/fld=ComplIssue/IQTY &	Exit IQTY of LIN C07440 _____

LIN=C07440 & (key=<CR> or key=<UP> or key=<DN>).

count * from THT15A where user=___ & key=NDH & scr/fld=CompIssue/*.

times NonDynHlp in Complete the Issue Screen_____

count * from THT15A where user=___ & key=DynHlp & scr/fld=CompIssue/*.

times DynHlp in Complete the Issue Screen_____

1.2 SIZE {Complete the Issue}

SIZE

A. C07440

C07440

select date/time from THT15A where user=___ & (key=<CR> or key=<DN>) & scr/fld=CompIssue/IQTY & LIN=C07440.

End of SIZE/IQTY Field

count * from THT15A where user=___ & key=NDH & scr/fld=CompIssue/SIZE & LIN=C07440.

times NonDynHlp(C07440)

count * from THT15A where user=___ & key=DynHlp & scr/fld=CompIssue/SIZE & LIN=C07440.

times DynHlp(C07440)

B. N39848

N39848

select date/time from THT15A where user=___ & (key=<CR> or key=<DN>) & scr/fld=CompIssue/IQTY & LIN=N39848.

End of SIZE/IQTY Field

count * from THT15A where user=___ & key=NDH & scr/fld=CompIssue/SIZE & LIN=N39848.

times NonDynHlp(N39848)

count * from THT15A where user=___ & key=DynHlp & scr/fld=CompIssue/SIZE &

times DynHlp(N39848)

LIN=N39848.

2.1 Menu Selection {Clothing Issues Menu to Issue Due-Out Items}	Menu Selection
select date/time from THT15A where user=___ & scr/fld=ClothIssMenu/* & (key in(any integer) or key='X' or key=<CR>).	EXIT Clothing Issues Menu _____ _____ _____
select date/time from THT15A where user=___ & scr/fld=IssueDueOut/SSN & (key=<CR> or key=<RT>).	Complete SSN in Issue Due-Out Items Screen _____
2.2 Non-Issue Quantity {Issue Due-Out Items}	Non-Issue Quantity
select date/time from THT15A where user=___ & scr/fld=IssueDueOut/* & key=<ESC>.	EXIT Due-Out Items Screen_____ _____
count * from THT15A where user=___ & key=NDH & scr/fld=IssueDueOut/*.	# times NonDynHlp in Screen_____
count * from THT15A where user=___ & key=DynHlp & scr/fld= IssueDueOut/*.	# times DynHlp in Screen_____

"OTHER ITEMS" TO BE COLLECTED {15A}

DESCRIPTION	FORMAT IN SCR
1.1 Fastest Movement & Correction {Complete the Issue Screen}	Fastest Movement & Correction
Record date/time of entry into the Complete the Issue Screen.	Entry into Complete the Issue Screen_____
Record # keystrokes from 1st entry into LIN F54817 and re-entry into SIZE fld of C07440.	# keystrokes F54817 to C07440 _____

Record Date/time of exit from screen (ie <ESC> accepted by program).	EXIT Complete the Issue Screen_____
1.2 SIZE {Complete the Issue}	SIZE
Date/time of entry into SIZE field for LIN C07440.	Enter C07440 _____ _____ _____
Date/time of entry into SIZE field for LIN N39848.	Enter N39848 _____ _____
2.1 Menu Selection {Clothing Issues Menu to Issue Due-Out Items}	Menu Selection
Record date/time of re-entry into Clothing Issue Process Menu from the Complete the Issue Screen.	Re-Enter Clothing Issue Menu_____
Record # keystrokes between re-entry into Clothing Issues Process Menu and entry into Issue Due-Out Items Screen.	# keystrokes between Clothing Issue Menu & Due-Out Items Screen _____
Record # times NonDynHlp key pressed between re-entry into Clothing Issues Process Menu & Complete the Issue Screen.	# times NonDynHlp between Clothing Issues Menu reentry & Issue Due-Out Items Screen_____
Record # times DynHlp key pressed between re-entry into Clothing Issues Process Menu & Complete the Issue Screen.	# times DynHlp between Clothing Issues Menu reentry & Issue Due-Out Items Screen_____
2.2 Non-Issue Quantity {Issue Due-Out Items}	Non-Issue Quantity
Record # keystrokes made in	# keystrokes in Issue

Issue Due-Out Items Screen. Due-Out Items Screen_____

TASK 15B

QUERY RESULTS

QUERY	FORMAT IN SCR
1.1 Fastest Movement & Correction {Complete the Issue Screen}	Fastest Movement & Correction
select date/time from THT15B where user=___ & scr/fld=CompIssue/IQTY & LIN=U06645 & (key=<CR> or key=<UP> or key=<DN>).	Exit IQTY of LIN U06645 _____ _____
select date/time from THT15B where user=___ & scr/fld=CompIssue/IQTY & LIN=N39848 & (key=<CR> or key=<UP> or key=<DN>).	Exit IQTY of LIN N39848 _____ _____
count * from THT15B where user=___ & key=NDH & scr/fld=CompIssue/*.	# times NonDynHlp in Complete the Issue Screen_____
count * from THT15B where user=___ & key=DynHlp & scr/fld=CompIssue/*.	# times DynHlp in Complete the Issue Screen_____
1.2 SIZE {Complete the Issue}	SIZE
A. C07440	C07440
select date/time from THT15B where user=___ & (key=<CR> or key=<DN>) & scr/fld=CompIssue/IQTY & LIN=C07440.	End of SIZE/IQTY Field _____ _____ _____
count * from THT15B where user=___ & key=NDH & scr/fld=CompIssue/SIZE & LIN=C07440.	# times NonDynHlp(C07440) _____

count * from THT15B where user=___ & key=DynHlp & scr/fld=CompIssue/SIZE & LIN=C07440.

times DynHlp(C07440)
_____

B. N39848

N39848

select date/time from THT15B where user=___ & (key=<CR> or key=<DN>) & scr/fld=CompIssue/IQTY & LIN=N39848.

End of SIZE/IQTY Field
_____
_____
_____

count * from THT15B where user=___ & key=NDH & scr/fld=CompIssue/SIZE & LIN=N39848.

times NonDynHlp(N39848)
_____

count * from THT15B where user=___ & key=DynHlp & scr/fld=CompIssue/SIZE & LIN=N39848.

times DynHlp(N39848)
_____

2.1 Menu Selection
{Clothing Issues Menu to Issue Due-Out Items}

Menu Selection

select date/time from THT15B where user=___ & scr/fld=ClothIssMenu/* & (key in(any integer) or key='X' or key=<CR>).

EXIT Clothing Issues Menu
_____
_____
_____

select date/time from THT15B where user=___ & scr/fld=IssueDueOut/SSN & (key=<CR> or key=<RT>).

Complete SSN in Issue Due-Out Items Screen
_____

2.2 Non-Issue Quantity
{Issue Due-Out Items}

Non-Issue Quantity

select date/time from THT15B where user=___ & scr/fld=IssueDueOut/* & key=<ESC>.

EXIT Due-Out Items Screen_____
_____

count * from THT15B where user=___ & key=NDH & scr/fld=IssueDueOut/*.

times NonDynHlp in Screen_____

re-entry into Clothing Issues Process Menu and entry into Issue Due-Out Items Screen.	Clothing Issue Menu & Due-Out Items Screen _____
Record # times NonDynHlp key pressed between re-entry into Clothing Issues Process Menu & Complete the Issue Screen.	# times NonDynHlp between Clothing Issues Menu reentry & Issue Due-Out Items Screen_____
Record # times DynHlp key pressed between re-entry into Clothing Issues Process Menu & Complete the Issue Screen.	# times DynHlp between Clothing Issues Menu reentry & Issue Due-Out Items Screen_____
2.2 Non-Issue Quantity {Issue Due-Out Items}	Non-Issue Quantity
Record # keystrokes made in Issue Due-Out Items Screen.	# keystrokes in Issue Due-Out Items Screen_____

count * from THT15B where user=___ & key=DynHlp & scr/fld= IssueDueOut/*.

times DynHlp in Screen_____

"OTHER ITEMS" TO BE COLLECTED {15B}

DESCRIPTION	FORMAT IN SCR
1.1 Fastest Movement & Correction {Complete the Issue Screen}	Fastest Movement & Correction
Record date/time of entry into the Complete the Issue Screen.	Entry into Complete the Issue Screen_____
Record # keystrokes from 1st entry into LIN U06645 and re-entry into SIZE fld of N39848.	# keystrokes U06645 to N39848 _____
Record Date/time of exit from screen (ie <ESC> accepted by program).	EXIT Complete the Issue Screen_____
1.2 SIZE {Complete the Issue}	SIZE
Date/time of entry into SIZE field for LIN C07440.	Enter C07440 _____ _____ _____
Date/time of entry into SIZE field for LIN N39848.	Enter N39848 _____ _____
2.1 Menu Selection {Clothing Issues Menu to Issue Due-Out Items}	Menu Selection
Record date/time of re-entry into Clothing Issue Process Menu from the Complete the Issue Screen.	Re-Enter Clothing Issue Menu_____
Record # keystrokes between	# keystrokes between

APPENDIX 9
OBSERVATION WORKSHEET

OBSERVATION WORKSHEET

USER ID: _____ TASK ID: _____

INTERRUPT TIME: _____ RESUMPTION TIME: _____

Reason for Interrupt: _____

DEAD-END ENCOUNTERS:

Subtask ID _____ Screen/Field _____

Description _____

Subtask ID _____ Screen/Field _____

Description _____

Subtask ID _____ Screen/Field _____

Description _____

Subtask ID _____ Screen/Field _____

Description _____

Bombing of Program: _____

_____

_____

Other Observations: _____

_____

_____

_____

_____

_____

_____

_____

_____

APPENDIX 10
PRE-TEST QUESTIONNAIRE

PRE-SURVEY

USER ID _____

Basic Data:

Last Name _____ First Name _____ MI _____

GRADE _____ Duty MOS _____ Unit Phone # _____

Unit Name/Address _____

_____

The highest level of education I have completed is (Circle appropriate number):

1 - Grade School
2 - High School
3 - 2 years of college or Associates Degree
4 - Bachelors Degree
5 - Enrolled in Masters Degree Program
6 - Masters Degree or higher

Supply Knowledge:

Answer questions 1-11 by circling the number which indicates the correct response.

How long ago has it been since you:	Within Past Month	Within Past 3 Months	Within Past Year	Within Past 3 Years	Longer Than 3 Yrs ago	Never Have
1. Processed paperwork for the TurnIn of an item or prepared a DA Form 2765-1 for an item turnin?	1	2	3	4	5	6
2. Processed paperwork for a Request for Issue or prepared a DA Form 2765-1 for to request an issue?	1	2	3	4	5	6
3. Entered supply requisitions into an automated system (ie keypunching 2765-1 data)?	1	2	3	4		6
4. Prepared or annotated a DA Form 3645/DA Form 3645-1 (Manual Clothing Record)?	1	2	3	4	5	6

	Within Past Month	Within Past 3 Months	Within Past Year	Within Past 3 Years	Longer Than 3 Yrs ago	Never Have
5. Processed paperwork dealing with Statements of Charges or actually prepared a DD Form 362 (Statement of Charges)?	1	2	3	4	5	6
6. Processed paperwork dealing with Reports of Survey or actually prepared a DA Form 4697 (Report of Survey)?	1	2	3	4	5	6
7. Maintained a Document Register?	1	2	3	4	5	6

8. Approximately how many US Army or Installation-level Supply Management Courses have you completed (to include AIT, PLL courses, etc)?

1 - None
2 - One to Two
3 - Three to Four
4 - Five to Six
5 - Seven or More

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
9. I consider myself to be knowledgeable in unit and organizational supply functions.	1	2	3	4	5
10. I consider myself to be knowledgeable in direct support supply functions.	1	2	3	4	5
11. I consider myself to be knowledgeable in direct support warehousing operations.	1	2	3	4	5

CIF Experience:

Answer questions 12-20 by circling the number indicating the correct response or by writing a response in the space provided.

12. Have you ever worked in a Central Issue Facility?

1 - YES
2 - NO (Skip to Question 21)

13. When did you last work at a Central Issue Facility (Year)?

_____

14. How many total years CIF working experience do you have?

1 - Less than one year
2 - One to less than two years
3 - Two to less than three years
4 - Greater than three years

15. Have you ever worked at an automated CIF?

1 - YES
2 - NO (Skip to Question 21)

16. Where was the last automated CIF that you worked at located?

_____

17. What year did you last work at an automated CIF?

_____

18. In the automated CIF, did you ever work at a computer terminal?

1 - YES
2 - NO (Skip to Question 21)

19. In the automated CIF what software/hardware did you work with?

1 - WANG System
2 - TRADOC System
3 - Other _____
4 - Unknown

20. Approximately how many hours per week did you work at the CIF computer terminal?

1 - Less than one
2 - One to less than five
3 - Five to less than ten
4 - Ten to less than fifteen
5 - Greater than fifteen

2 - 3

Computer Knowledge:

Answer questions 21-27 by circling the number indicating the correct response or by writing a response in the space provided.

21. I have completed the following number of computer courses while enrolled in formal schooling (ie grade school, high school and college).

1 - None
2 - One or Two
3 - Three or four
4 - Five or more

22. I have completed the following number of US Army or Department of Defense courses in which I became somewhat familiar with a computer software. (Approximately)

1 - None
2 - One
3 - Two
4 - Three
5 - Four
6 - Five or more

23. Have you ever written a computer program?

1 - YES
2 - NO (Skip to Question 26)

24. When did you most recently write a computer program (Year)?

_____

25. List any or all programming languages in which you have done computer programming, no matter how trivial.

_____
_____
_____
_____

26. In your current job, approximately how many hours per week do you sit at a computer terminal to work?

1 - None
2 - Less than one hour
3 - One to less than five hours
4 - Five to less than ten hours
5 - Ten to less than fifteen hours
6 - Greater than fifteen hours

27. I am able to type the following number of words per minute (approximately). If you have no idea how many words per minute you can type, then do not answer this question.

1 - 30 or less
2 - 31 to 50
3 - 51 to 70
4 - 71 to 90
5 - Greater than 90

Attitudes Toward the Computer:

If you have never used a computer, skip questions 28-33. Otherwise circle the response which most appropriately describes your feelings and attitudes while working on a computer.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
28. I feel comfortable working at a computer terminal.	1	2	3	4	5
29. I often have trouble reading from a computer screen.	1	2	3	4	5
30. Whenever I use a computer terminal, my main concern is the avoidance of mistakes or errors while performing a task.	1	2	3	4	5
31. Whenever I use a computer terminal, my main concern is to perform the task as rapidly as possible.	1	2	3	4	5

	Strongly Agree		Neutral		Strongly Disagree
	Agree			Disagree	
32. Whenever using a computer, I prefer to use a program which allows me to choose the function I wish to perform from several choices displayed on the screen over a program where I would be required to type in commands in order to perform the function.	1	2	3	4	5

33. Whenever you are confused about how to enter a data item into a computer terminal, approximately how many times will you attempt to "guess" the proper data entry or format before you stop your work and locate a manual or printout with which to look up the correct entry or format?

1 - None, I always look up items if I am confused. I do not make "guess" entries.
2 - Once, then I go to look up the correct entry or format.
3 - Twice.
4 - Three or more times.

END OF SURVEY

Please return this survey and all responses to the System Administrator. You will then be given further instructions.

APPENDIX 11
POST-TASK QUESTIONNAIRES

POST-TASK 11H SURVEY

USER ID _____

1. If you used Dynamic HELP in **Social Security Number** data entry, indicate all the applicable points of confusion or reasons for accessing HELP. (Circle all applicable numbers) If you did not use Dynamic HELP in this case, skip to question 3.

1 - Format of the data entry.
2 - Common data entry mistakes such as confusing letter o with zero.
3 - Movement to next data entry in the screen.
4 - Movement to previous data entry in the screen.
5 - How to finish making the data entry.
6 - How to abort the data entry.
7 - How to get to previous screen.
8 - How to process the data entries and move to next screen.
9 - To view a list to choose from.
10 - Not clear how to use the key.
11 - To clarify the input expected by example or explanation.
12 - Needed clearer description of a Menu function.
13 - Curiosity.
14 - Other _____
_____

2. How well did Dynamic HELP assist you with the **Social Security Number** data entry?

1 - Dynamic HELP was essential to the completion of the entry. (Prevented a Dead-End)
2 - Dynamic HELP was very helpful (ie, saved more than 30 seconds of task time).
3 - Dynamic HELP was helpful (ie, saved 10 to 30 seconds of task time).
4 - Dynamic HELP was unhelpful (ie, did not assist me or save me any time).

3. If you used Dynamic HELP in the UIC data entry, indicate all the applicable points of confusion or reasons for accessing HELP. (Circle all applicable numbers) If you did not use Dynamic HELP in this case, skip to question 5.

1 - Format of the data entry.
2 - Common data entry mistakes such as confusing letter o with zero.
3 - Movement to next data entry in the screen.
4 - Movement to previous data entry in the screen.
5 - How to finish making the data entry.
6 - How to abort the data entry.
7 - How to get to previous screen.
8 - How to process the data entries and move to next screen.
9 - To view a list to choose from.
10 - Not clear how to use the key.
11 - To clarify the input expected by example or explanation.
12 - Needed clearer description of a Menu function.
13 - Curiosity.
14 - Other _____
_____

4. How well did Dynamic HELP assist you with the UIC data entry?

1 - Dynamic HELP was essential to the completion of the entry. (Prevented a Dead-End)
2 - Dynamic HELP was very helpful (ie, saved more than 30 seconds of task time).
3 - Dynamic HELP was helpful (ie, saved 10 to 30 seconds of task time).
4 - Dynamic HELP was unhelpful (ie, did not assist me or save me any time).

5. If you used Dynamic HELP in the **GRADE** data entry, indicate all the applicable points of confusion or reasons for accessing HELP. (Circle all applicable numbers) If you did not use Dynamic HELP in this case, skip to question 7.

1 - Format of the data entry.
2 - Common data entry mistakes such as confusing letter o with zero.
3 - Movement to next data entry in the screen.
4 - Movement to previous data entry in the screen.
5 - How to finish making the data entry.
6 - How to abort the data entry.
7 - How to get to previous screen.
8 - How to process the data entries and move to next screen.
9 - To view a list to choose from.
10 - Not clear how to use the key.
11 - To clarify the input expected by example or explanation.
12 - Needed clearer description of a Menu function.
13 - Curiosity.
14 - Other _____
_____

6. How well did Dynamic HELP assist you with the **GRADE** data entry?

1 - Dynamic HELP was essential to the completion of the entry. (Prevented a Dead-End)
2 - Dynamic HELP was very helpful (ie, saved more than 30 seconds of task time).
3 - Dynamic HELP was helpful (ie, saved 10 to 30 seconds of task time).
4 - Dynamic HELP was unhelpful (ie, did not assist me or save me any time).

7. If you used Dynamic HELP to assist you in answering the question about whether or not a **Special Issue** was authorized, indicate all the applicable points of confusion or reasons for accessing HELP. (Circle all applicable numbers) If you did not use Dynamic HELP in this case, skip to question 13.

1 - Format of the data entry.
2 - Common data entry mistakes such as confusing letter o with zero.
3 - Movement to next data entry in the screen.
4 - Movement to previous data entry in the screen.
5 - How to finish making the data entry.
6 - How to abort the data entry.
7 - How to get to previous screen.
8 - How to process the data entries and move to next screen.
9 - To view a list to choose from.
10 - Not clear how to use the key.
11 - To clarify the input expected by example or explanation.
12 - Needed clearer description of a Menu function.
13 - Curiosity.
14 - Other _____
_____

8. How well did Dynamic HELP assist you with the question about **Special Issue** authorization?

1 - Dynamic HELP was essential to completion of the question. (Prevented a Dead-End)
2 - Dynamic HELP was very helpful (ie, saved more than 30 seconds of task time).
3 - Dynamic HELP was helpful (ie, saved 10 to 30 seconds of task time).
4 - Dynamic HELP was unhelpful (ie, did not assist me or save me any time).

9. If you used Dynamic HELP in completing **SIZE** entries for certain LIN items indicate all the applicable points of confusion or reasons for accessing HELP. (Circle all applicable numbers) If you did not use Dynamic HELP for any of the **SIZE** entries, skip to question 9.

1 - Format of the data entry.
2 - Common data entry mistakes such as confusing letter o with zero.
3 - Movement to next data entry in the screen.
4 - Movement to previous data entry in the screen.
5 - How to finish making the data entry.
6 - How to abort the data entry.
7 - How to get to previous screen.
8 - How to process the data entries and move to next screen.
9 - To view a list to choose from.
10 - Not clear how to use the key.
11 - To clarify the input expected by example or explanation.
12 - Needed clearer description of a Menu function.
13 - Curiosity.
14 - Other _____
_____

10. How well did Dynamic HELP assist you with the **SIZE** entries for certain LIN items?

1 - Dynamic HELP was essential to the completion of some of the entries. (Prevented Dead-Ends)
2 - Dynamic HELP was very helpful (ie, saved more than 30 seconds of task time).
3 - Dynamic HELP was helpful (ie, saved 10 to 30 seconds of task time).
4 - Dynamic HELP was unhelpful (ie, did not assist me or save me any time).

11. If you used Dynamic HELP to learn how to use the **F1 key (Add a LIN)** or the **F2 key (Delete a LIN)**, indicate all the applicable points of confusion or reasons for accessing HELP. (Circle all applicable numbers) If you did not use Dynamic HELP in this for either of these keys, skip to question 11.

1 - Format of the data entry.
2 - Common data entry mistakes such as confusing letter o with zero.
3 - Movement to next data entry in the screen.
4 - Movement to previous data entry in the screen.
5 - How to finish making the data entry.
6 - How to abort the data entry.
7 - How to get to previous screen.
8 - How to process the data entries and move to next screen.
9 - To view a list to choose from.
10 - Not clear how to use the key.
11 - To clarify the input expected by example or explanation.
12 - Needed clearer description of a Menu function.
13 - Curiosity.
14 - Other _____
_____

12. How well did Dynamic HELP assist you with the **F1 key (Add a LIN)** or the **F2 key (Delete a LIN)**?

1 - Dynamic HELP was essential to the use of the key. (Prevented a Dead-End)
2 - Dynamic HELP was very helpful (ie, saved more than 30 seconds of task time).
3 - Dynamic HELP was helpful (ie, saved 10 to 30 seconds of task time).
4 - Dynamic HELP was unhelpful (ie, did not assist me or save me any time).

13. If you used Dynamic HELP in the **Transferred Items Screen**, indicate all the applicable points of confusion or reasons for accessing HELP. (Circle all applicable numbers) If you did not use Dynamic HELP in this screen, skip to End of Survey.

1 - Format of the data entry.
2 - Common data entry mistakes such as confusing letter o with zero.
3 - Movement to next data entry in the screen.
4 - Movement to previous data entry in the screen.
5 - How to finish making the data entry.
6 - How to abort the data entry.
7 - How to get to previous screen.
8 - How to process the data entries and move to next screen.
9 - To view a list to choose from.
10 - Not clear how to use the key.
11 - To clarify the input expected by example or explanation.
12 - Needed clearer description of a Menu function.
13 - Curiosity.
14 - Other _____
_____

14. How well did Dynamic HELP assist you with the **Transferred Items Screen**?

1 - Dynamic HELP was essential to the completion of the screen entries. (Prevented a Dead-End)
2 - Dynamic HELP was very helpful (ie, saved more than 30 seconds of task time).
3 - Dynamic HELP was helpful (ie, saved 10 to 30 seconds of task time).
4 - Dynamic HELP was unhelpful (ie, did not assist me or save me any time).

END OF POST-TASK 11H SURVEY

POST-TASK 11N SURVEY

USER ID _____

1. During this task, if the **Social Security Number** data entry was confusing, indicate all the applicable points of confusion. If the data entry was not confusing, skip to question 2.

1 - Format of the data entry.
2 - Confused letter o with zero or other common data entry mistakes.
3 - Movement to next data entry in the screen.
4 - Movement to previous data entry in the screen.
5 - How to finish making the data entry.
6 - How to abort the data entry.
7 - How to get to previous screen.
8 - How to process the data entries and move to next screen.
9 - Needed a list to choose from.
10 - Not clear how to use the key.
11 - Needed an example or explanation of the expected input.
12 - Needed clearer description of a Menu function.
13 - Other _____
_____

2. During this task, if the **UIC** data entry was confusing, indicate all the applicable points of confusion. If the data entry was not confusing, skip to question 3.

1 - Format of the data entry.
2 - Confused letter o with zero or other common data entry mistakes.
3 - Movement to next data entry in the screen.
4 - Movement to previous data entry in the screen.
5 - How to finish making the data entry.
6 - How to abort the data entry.
7 - How to get to previous screen.
8 - How to process the data entries and move to next screen.
9 - Needed a list to choose from.
10 - Not clear how to use the key.
11 - Needed an example or explanation of the expected input.
12 - Needed clearer description of a Menu function.
13 - Other _____
_____

3. During this task, if the **GRADE** data entry was confusing, indicate all the applicable points of confusion. If the data entry was not confusing, skip to question 4.

1 - Format of the data entry.
2 - Confused letter o with zero or other common data entry mistakes.
3 - Movement to next data entry in the screen.
4 - Movement to previous data entry in the screen.
5 - How to finish making the data entry.
6 - How to abort the data entry.
7 - How to get to previous screen.
8 - How to process the data entries and move to next screen.
9 - Needed a list to choose from.
10 - Not clear how to use the key.
11 - Needed an example or explanation of the expected input.
12 - Needed clearer description of a Menu function.
13 - Other _____
_____

4. During this task, if the question about whether or not a soldier was authorized a **Special Issue** was confusing, indicate all the applicable points of confusion. If the question was not confusing, skip to question 5.

1 - Format of the data entry.
2 - Confused letter o with zero or other common data entry mistakes.
3 - Movement to next data entry in the screen.
4 - Movement to previous data entry in the screen.
5 - How to finish making the data entry.
6 - How to abort the data entry.
7 - How to get to previous screen.
8 - How to process the data entries and move to next screen.
9 - Needed a list to choose from.
10 - Not clear how to use the key.
11 - Needed an example or explanation of the expected input.
12 - Needed clearer description of a Menu function.
13 - Other _____
_____

5. During this task, if the **SIZE** data entries for some of the LIN items were confusing, indicate all the applicable points of confusion. If the **SIZE** data entries were not confusing, skip to question 6.

1 - Format of the data entry.
2 - Confused letter o with zero or other common data entry mistakes.
3 - Movement to next data entry in the screen.
4 - Movement to previous data entry in the screen.
5 - How to finish making the data entry.
6 - How to abort the data entry.
7 - How to get to previous screen.
8 - How to process the data entries and move to next screen.
9 - Needed a list to choose from.
10 - Not clear how to use the key.
11 - Needed an example or explanation of the expected input.
12 - Needed clearer description of a Menu function.
13 - Other _____
_____

6. During this task, if use of the **F1 key (Add a LIN)** or **F2 key (Delete a LIN)** was confusing, indicate all the applicable points of confusion. If neither of the keys was confusing, skip to question 7.

1 - Format of the data entry.
2 - Confused letter o with zero or other common data entry mistakes.
3 - Movement to next data entry in the screen.
4 - Movement to previous data entry in the screen.
5 - How to finish making the data entry.
6 - How to abort the data entry.
7 - How to get to previous screen.
8 - How to process the data entries and move to next screen.
9 - Needed a list to choose from.
10 - Not clear how to use the key.
11 - Needed an example or explanation of the expected input.
12 - Needed clearer description of a Menu function.
13 - Other _____
_____

7. During this task, if any entry or key in the **Transferred Items Screen** was confusing, indicate all the applicable points of confusion. If the **Transferred Items Screen** was not confusing, skip to End of Survey.

1 - Format of the data entry.
2 - Confused letter o with zero or other common data entry mistakes.
3 - Movement to next data entry in the screen.
4 - Movement to previous data entry in the screen.
5 - How to finish making the data entry.
6 - How to abort the data entry.
7 - How to get to previous screen.
8 - How to process the data entries and move to next screen.
9 - Needed a list to choose from.
10 - Not clear how to use the key.
11 - Needed an example or explanation of the expected input.
12 - Needed clearer description of a Menu function.
13 - Other _____
_____

END OF POST-TASK 11N SURVEY

POST-TASK 12H SURVEY

USER ID _____

1. If you used Dynamic HELP in the **Condition Code** data entry, indicate all the applicable points of confusion or reasons for accessing HELP. (Circle all applicable numbers) If you did not use Dynamic HELP for the **Condition Code**, skip to question 3.

1 - Format of the data entry.
2 - Common data entry mistakes such as confusing letter o with zero.
3 - Movement to next data entry in the screen.
4 - Movement to previous data entry in the screen.
5 - How to finish making the data entry.
6 - How to abort the data entry.
7 - How to get to previous screen.
8 - How to process the data entries and move to next screen.
9 - To view a list to choose from.
10 - Not clear how to use the key.
11 - To clarify the input expected by example or explanation.
12 - Needed clearer description of a Menu function.
13 - Curiosity.
14 - Other _____
_____

2. How well did Dynamic HELP assist you with the **Condition Code** data entry?

1 - Dynamic HELP was essential to the completion of the entry. (Prevented a Dead-End)
2 - Dynamic HELP was very helpful (ie, saved more than 30 seconds of task time).
3 - Dynamic HELP was helpful (ie, saved 10 to 30 seconds of task time).
4 - Dynamic HELP was unhelpful (ie, did not assist me or save me any time).

3. Did you use Dynamic HELP in the **DRMO TurnIn Screen** to determine how to move to the **Condition Code** field (using the **ESC key**)?

1 - YES
2 - NO (Skip to question 5)

12H - 1

4. How well did Dynamic HELP assist you with determining how to move to the **Condition Code** field (by using the **ESC key**)?

1 - Dynamic HELP was essential to the movement to the field. (Prevented a Dead-End)
2 - Dynamic HELP was very helpful (ie, saved more than 30 seconds of task time).
3 - Dynamic HELP was helpful (ie, saved 10 to 30 seconds of task time).
4 - Dynamic HELP was unhelpful (ie, did not assist me or save me any time).

5. Did you use Dynamic HELP in the **Statement of Charges Screen** in order to determine how to make **corrections** to previous entries?

1 - YES
2 - NO (Skip to question 7)

6. How well did Dynamic HELP assist you with determining how to make **corrections** to previous entries?

1 - Dynamic HELP was essential to the completion of the corrections. (Prevented a Dead-End)
2 - Dynamic HELP was very helpful (ie, saved more than 30 seconds of task time).
3 - Dynamic HELP was helpful (ie, saved 10 to 30 seconds of task time).
4 - Dynamic HELP was unhelpful (ie, did not assist me or save me any time).

7. Did you use Dynamic HELP in the **Statement of Charges Screen** to determine how to move to the **Total Price** field (using the **ESC key**)?

1 - YES
2 - NO (Skip to question 9)

8. How well did Dynamic HELP assist you with determining how to move to the **Total Price** field (by using the **ESC key**)?

1 - Dynamic HELP was essential to the movement to the field. (Prevented Dead-Ends)
2 - Dynamic HELP was very helpful (ie, saved more than 30 seconds of task time).
3 - Dynamic HELP was helpful (ie, saved 10 to 30 seconds of task time).
4 - Dynamic HELP was unhelpful (ie, did not assist me or save me any time).

9. While you were in the **Adjustment Transactions Menu**, was it clear which menu item to select in order to modify the **Report of Survey**?

1 - YES (Skip to question 12)
2 - NO

10. What did you use to determine the correct menu item?

1 - Dynamic HELP.
2 - Trial and Error. (If so, skip to question 12)
3 - Trial and Error & Dynamic HELP.
4 - Canned HELP - F10 key. (If so, skip to question 12)
5 - System Administrator. (If so, skip to question 12)

11. How well did Dynamic HELP assist you in choosing the correct menu item to accomplish the task?

1 - Dynamic HELP was essential to the correct menu selection. (Prevented a Dead-End)
2 - Dynamic HELP was very helpful (ie, saved more than 30 seconds of task time)
3 - Dynamic HELP was helpful (ie, saved 10 to 30 seconds of task time)
4 - Dynamic HELP was unhelpful (ie, did not assist me or save me any time)

12. If you used Dynamic HELP in the **Total Price** data entry while modifying the **Report of Survey**, indicate all the applicable points of confusion or reasons for accessing HELP. (Circle all applicable numbers. If you did not use Dynamic HELP in this case, skip to question 14.

1 - Format of the data entry.
2 - Common data entry mistakes such as confusing letter o with zero.
3 - Movement to next data entry in the screen.
4 - Movement to previous data entry in the screen.
5 - How to finish making the data entry.
6 - How to abort the data entry.
7 - How to get to previous screen.
8 - How to process the data entries and move to next screen.
9 - To view a list to choose from.
10 - Not clear how to use the key.
11 - To clarify the input expected by example or explanation.
12 - Needed clearer description of a Menu function.
13 - Curiosity.
14 - Other _____
_____

13. How well did Dynamic HELP assist you with the **Total Price** data entry while modifying the **Report of Survey**?

1 - Dynamic HELP was essential to the completion of the entry. (Prevented a Dead-End)
2 - Dynamic HELP was very helpful (ie, saved more than 30 seconds of task time).
3 - Dynamic HELP was helpful (ie, saved 10 to 30 seconds of task time).
4 - Dynamic HELP was unhelpful (ie, did not assist me or save me any time).

END OF POST-TASK 12H SURVEY

POST-TASK 12N SURVEY

USER ID _____

1. During this task, if the **Condition Code** data entry was confusing, indicate all the applicable points of confusion. If the data entry was not confusing, skip to question 2.

1 - Format of the data entry.
2 - Confused letter o with zero or other common data entry mistakes.
3 - Movement to next data entry in the screen.
4 - Movement to previous data entry in the screen.
5 - How to finish making the data entry.
6 - How to abort the data entry.
7 - How to get to previous screen.
8 - How to process the data entries and move to next screen.
9 - Needed a list to choose from.
10 - Not clear how to use the key.
11 - Needed an example or explanation of the expected input.
12 - Needed clearer description of a Menu function.
13 - Other _____
_____

2. While in the **DRMO TurnIn Screen**, was it clear how to move from the NSN and QTY section of the screen to the **Condition Code** field?

1 - YES
2 - NO

3. In the **Statement of Charges Screen**, was it clear how to make **corrections** to previous entries in the NSN and QTY section of the screen?

1 - YES
2 - NO

4. While in the **Statement of Charges Screen**, was it clear how to move to the **Total Price** field from the NSN and QTY section of the screen?

1 - YES
2 - NO

5. While you were in the **Adjustment Transactions Menu**, if it was unclear how to select the menu item to modify the **Report of Survey**, the difficulty was: (If it was clear, skip to question 6)

1 - The meaning of Menu Item Names was unclear.
2 - The Task itself was unclear.
3 - Other _____
_____
_____

6. While modifying the **Report of Survey**, if the **Total Price** data entry was confusing, indicate all the applicable points of confusion. If the data entry was not confusing, skip to End of Survey.

1 - Format of the data entry.
2 - Confused letter o with zero or other common data entry mistakes.
3 - Movement to next data entry in the screen.
4 - Movement to previous data entry in the screen.
5 - How to finish making the data entry.
6 - How to abort the data entry.
7 - How to get to previous screen.
8 - How to process the data entries and move to next screen.
9 - Needed a list to choose from.
10 - Not clear how to use the key.
11 - Needed an example or explanation of the expected input.
12 - Needed clearer description of a Menu function.
13 - Other _____
_____

END OF POST-TASK 12N SURVEY

POST-TASK 13H SURVEY

USER ID _____

1. If you used Dynamic HELP while creating the first four **Supply Requisitions** of this task, indicate all the applicable points of confusion or reasons for accessing HELP. (Circle all applicable numbers) If you did not use Dynamic HELP for the first four **Supply Requisitions** of this task, skip to question 3.

1 - Format of the data entry.
2 - Common data entry mistakes such as confusing letter o with zero.
3 - Movement to next data entry in the screen.
4 - Movement to previous data entry in the screen.
5 - How to finish making the data entry.
6 - How to abort the data entry.
7 - How to get to previous screen.
8 - How to process the data entries and move to next screen.
9 - To view a list to choose from.
10 - Not clear how to use the key.
11 - To clarify the input expected by example or explanation.
12 - Needed clearer description of a Menu function.
13 - Curiosity.
14 - Other _____

2. How well did Dynamic HELP assist you with the first four **Supply Requisitions** entries?

1 - Dynamic HELP was essential to the completion of the requisitions. (Prevented a Dead-End).
2 - Dynamic HELP was very helpful (ie, saved more than 30 seconds of task time).
3 - Dynamic HELP was helpful (ie, saved 10 to 30 seconds of task time).
4 - Dynamic HELP was unhelpful (ie, did not assist me or save me any time).

3. If you used Dynamic HELP while creating a **Supply Requisition** from the unreadable NSN, indicate all the applicable points of confusion or reasons for accessing HELP. (Circle all applicable numbers) If you did not use Dynamic HELP in this case, skip to question 5.

1 - Format of the data entry.
2 - Common data entry mistakes such as confusing letter o with zero.
3 - Movement to next data entry in the screen.
4 - Movement to previous data entry in the screen.
5 - How to finish making the data entry.
6 - How to abort the data entry.
7 - How to get to previous screen.
8 - How to process the data entries and move to next screen.
9 - To view a list to choose from.
10 - Not clear how to use the key.
11 - To clarify the input expected by example or explanation.
12 - Needed clearer description of a Menu function.
13 - Curiosity.
14 - Other _____
_____

4. How well did Dynamic HELP assist you with the creation of the **Supply Requisition** for the unreadable NSN?

1 - Dynamic HELP was essential to the completion of the requisition. (Prevented a Dead-End)
2 - Dynamic HELP was very helpful (ie, saved more than 30 seconds of task time).
3 - Dynamic HELP was helpful (ie, saved 10 to 30 seconds of task time).
4 - Dynamic HELP was unhelpful (ie, did not assist me or save me any time).

5. While you were in the **Document Register Actions Menu**, was it clear which menu item to select in order to modify the quantity of the **Supply Requisition** ordered earlier in the day?

1 - YES (Skip to question 8)
2 - NO

6. What did you use to determine the correct menu item to modify the quantity of the **Supply Requisition**?

1 - Dynamic HELP.
2 - Trial and Error. (If so, skip to question 8)
3 - Trial and Error & Dynamic HELP.
4 - Canned HELP - F10 key. (If so, skip to question 8)
5 - System Administrator.(If so, skip to question 8)

7. How well did Dynamic HELP assist you in choosing the correct menu item to accomplish the task?

1 - Dynamic HELP was essential to the correct menu selection. (Prevented a Dead-End)
2 - Dynamic HELP was very helpful (ie, saved more than 30 seconds of task time)
3 - Dynamic HELP was helpful (ie, saved 10 to 30 seconds of task time)
4 - Dynamic HELP was unhelpful (ie, did not assist me or save me any time)

END OF POST-TASK 13H SURVEY

POST-TASK 13N SURVEY

USER ID _____

1. While creating the first four **Supply Requisitions** in this task, if any entries in the **Create Supply Requisitions Screen** were confusing, indicate all the applicable points of confusion. If the entries were not confusing, skip to question 2.

1 - Format of the data entry.
2 - Confused letter o with zero or other common data entry mistakes.
3 - Movement to next data entry in the screen.
4 - Movement to previous data entry in the screen.
5 - How to finish making the data entry.
6 - How to abort the data entry.
7 - How to get to previous screen.
8 - How to process the data entries and move to next screen.
9 - Needed a list to choose from.
10 - Not clear how to use the key.
11 - Needed an example or explanation of the expected input.
12 - Needed clearer description of a Menu function.
13 - Other _____
_____

2. While creating a **Supply Requisition** from an unreadable NSN in this task, if any entries in the **Create Supply Requisitions Screen** were confusing, indicate all the applicable points of confusion. If the entries were not confusing, skip to question 3.

1 - Format of the data entry.
2 - Confused letter o with zero or other common data entry mistakes.
3 - Movement to next data entry in the screen.
4 - Movement to previous data entry in the screen.
5 - How to finish making the data entry.
6 - How to abort the data entry.
7 - How to get to previous screen.
8 - How to process the data entries and move to next screen.
9 - Needed a list to choose from.
10 - Not clear how to use the key.
11 - Needed an example or explanation of the expected input.
12 - Needed clearer description of Menu function.
13 - Other _____
_____

3. While you were in the **Document Register Actions Menu**, if it was unclear how to select the menu item to modify the quantity of the **Supply Requisition** ordered earlier in the day, the difficulty was: (If it was clear, skip to question End of Survey)

1 - The meaning of Menu Item Names was unclear.
2 - The Task itself was unclear.
3 - Other _____ _____
_____ _____
_____

END OF POST-TASK 13N SURVEY

POST-TASK 15H SURVEY

USER ID _____

1. While you were in the **Complete the Issue Screen**, if you used Dynamic HELP in completing **SIZE** entries for certain LIN items, indicate all the applicable points of confusion or reasons for accessing HELP. (Circle all applicable numbers) If you did not use Dynamic HELP for any of the **SIZE** entries, skip to question 3.

1 - Format of the data entry.
2 - Common data entry mistakes such as confusing letter o with zero.
3 - Movement to next data entry in the screen.
4 - Movement to previous data entry in the screen.
5 - How to finish making the data entry.
6 - How to abort the data entry.
7 - How to get to previous screen.
8 - How to process the data entries and move to next screen.
9 - To view a list to choose from.
10 - Not clear how to use the key.
11 - To clarify the input expected by example or explanation.
12 - Needed clearer description of a Menu function.
13 - Curiosity.
14 - Other _____
_____

2. How well did Dynamic HELP assist you with the **SIZE** entries for certain LIN items?

1 - Dynamic HELP was essential to the completion of some of the entries. (Prevented Dead-Ends)
2 - Dynamic HELP was very helpful (ie, saved more than 30 seconds of task time).
3 - Dynamic HELP was helpful (ie, saved 10 to 30 seconds of task time).
4 - Dynamic HELP was unhelpful (ie, did not assist me or save me any time).

3. Did you use Dynamic HELP in the **Complete the Issue Screen** to determine the **fastest way** to move through a Worksheet?

1 - YES
2 - NO (Skip to question 5)

15H - 1

4. How well did Dynamic HELP assist you with **moving quickly** through the Worksheet?

1 - Dynamic HELP was essential to quick movement through the Worksheet. (Prevented a Dead-End)
2 - Dynamic HELP was very helpful (ie, saved more than 30 seconds of task time).
3 - Dynamic HELP was helpful (ie, saved 10 to 30 seconds of task time).
4 - Dynamic HELP was unhelpful (ie, did not assist me or save me any time).

5. Did you use Dynamic HELP in the **Complete the Issue Screen** in order to determine how to make **corrections** to previous entries?

1 - YES
2 - NO (Skip to question 7)

6. How well did Dynamic HELP assist you with determining how to make **corrections** to previous entries?

1 - Dynamic HELP was essential to the completion of the corrections. (Prevented a Dead-End)
2 - Dynamic HELP was very helpful (ie, saved more than 30 seconds of task time).
3 - Dynamic HELP was helpful (ie, saved 10 to 30 seconds of task time).
4 - Dynamic HELP was unhelpful (ie, did not assist me or save me any time).

7. While you were in the **Clothing Issues Process Menu**, was it clear which menu item to select in order to **issue the due-out items** to the soldier?

1 - YES (Skip to question 10)
2 - NO

8. What did you use to determine the correct menu item?

1 - Dynamic HELP.
2 - Trial and Error. (If so, skip to question 10)
3 - Trial and Error & Dynamic HELP.
4 - Canned HELP - F10 key. (If so, skip to question 10)
5 - System Administrator. (If so, skip to question 10)

9. How well did Dynamic HELP assist you in choosing the correct menu item to accomplish the task?

1 - Dynamic HELP was essential to the correct menu selection. (Prevented a Dead-End)
2 - Dynamic HELP was very helpful (ie, saved more than 30 seconds of task time).
3 - Dynamic HELP was helpful (ie, saved 10 to 30 seconds of task time).
4 - Dynamic HELP was unhelpful (ie, did not assist me or save me any time).

10. While in the **Issue Due-Out Items Screen**, if you used Dynamic HELP in the **DOQTY** data entry, indicate all the applicable points of confusion or reasons for accessing HELP. (Circle all applicable numbers) If you did not use Dynamic HELP in this case, skip to question 12.

1 - Format of the data entry.
2 - Common data entry mistakes such as confusing letter o with zero.
3 - Movement to next data entry in the screen.
4 - Movement to previous data entry in the screen.
5 - How to finish making the data entry.
6 - How to abort the data entry.
7 - How to get to previous screen.
8 - How to process the data entries and move to next screen.
9 - To view a list to choose from.
10 - Not clear how to use the key.
11 - To clarify the input expected by example or explanation.
12 - Needed clearer description of a Menu function.
13 - Curiosity.
14 - Other _____

_____

11. How well did Dynamic HELP assist you with the DOQTY data entry?

1 - Dynamic HELP was essential to the completion of the entry. (Prevented a Dead-End)
2 - Dynamic HELP was very helpful (ie, saved more than 30 seconds of task time).
3 - Dynamic HELP was helpful (ie, saved 10 to 30 seconds of task time).
4 - Dynamic HELP was unhelpful (ie, did not assist me or save me any time).

END OF POST-TASK 15H SURVEY

POST-TASK 15N SURVEY

USER ID _____

1. While you were in the **Complete the Issues Screen**, if the **SIZE** data entries for some of the LIN items were confusing, indicate all the applicable points of confusion. If the **SIZE** data entries were not confusing, skip to question 2.

1 - Format of the data entry.
2 - Confused letter o with zero or other common data entry mistakes.
3 - Movement to next data entry in the screen.
4 - Movement to previous data entry in the screen.
5 - How to finish making the data entry.
6 - How to abort the data entry.
7 - How to get to previous screen.
8 - How to process the data entries and move to next screen.
9 - Needed a list to choose from.
10 - Not clear how to use the key.
11 - Needed an example or explanation of the expected input.
12 - Needed clearer description of a Menu function.
13 - Other _____
_____

2. While in the **Complete the Issue Screen**, was the method of **fastest movement** through the Worksheet clear?

1 - YES
2 - NO

3. In the **Complete the Issue Screen**, was it clear how to make **corrections** to previous entries on the screen?

1 - YES
2 - NO

4. While you were in the **Clothing Issue Process Menu**, if it was unclear how to select the menu item to **Issue Due-Out Items** to a soldier, the difficulty was: (If it was clear, skip to question 5)

1 - The meaning of Menu Item Names was unclear.
2 - The Task itself was unclear.
3 - Other _____
_____
_____

5. While in the **Issue Due-Out Items Screen**, if the DOQTY data entry was confusing, indicate all the applicable points of confusion. If the data entry was not confusing, skip to End of Survey.

1 - Format of the data entry.
2 - Confused letter o with zero or other common data entry mistakes.
3 - Movement to next data entry in the screen.
4 - Movement to previous data entry in the screen.
5 - How to finish making the data entry.
6 - How to abort the data entry.
7 - How to get to previous screen.
8 - How to process the data entries and move to next screen.
9 - Needed a list to choose from.
10 - Not clear how to use the key.
11 - Needed an example or explanation of the expected input.
12 - Needed clearer description of a Menu function.
13 - Other _____
_____

END OF POST-TASK 15N SURVEY

15N - 2

APPENDIX 12
POST-TEST QUESTIONNAIRE

POST-TEST SURVEY

USER ID _____

1. From "1" ("most often") to "5" ("least often"), mark each of the following kinds of **Dynamic HELP** you sought in **Data-Entry** screens:

_____ Help in determining <u>where</u> you were and <u>what</u> you could do there (Location and Function).

_____ Help in getting to another screen or back to a previous screen (Movement between screens).

_____ Help in getting to next data entry or back to a previous data entry (Movement within screen).

_____ Help with **"how to enter"**: how to complete the entry in a field, how to correct an entry, how to indicate you were finished with a data entry, how to deal with a "quirk", how to abort a data entry, what was the effect of certain keys, etc.

_____ Help with **"what to enter"**: meaning of the entry in a field, range of acceptable entries in a field, where to find a datum on a document so it can be entered on the screen, examples of possible entries, etc.

2. From "1" ("most often") to "3" ("least often"), mark each of the following kinds of **Dynamic HELP** you sought in **Menu Selection screens**:

_____ <u>General Orientation</u>: Help in determining where you came from, where you are, and where you can go back to.

_____ Help in <u>understanding the meaning</u> of screens or functions listed.

_____ Help with <u>procedures</u>: how to make selections, how to abort a data entry, what was the effect of certain keys, etc.

3. How helpful is **Dynamic HELP** in the CIF software when you compare it to the CIF software without Dynamic HELP?

1 - Very Helpful
2 - Somewhat Helpful
3 - No Difference in Help
4 - Somewhat Unhelpful
5 - Very Unhelpful

4. If possible, **Dynamic HELP** should be included in all complex US Army interactive computer programs (similar to CIF).

1 - Strongly Agree
2 - Agree
3 - Neutral
4 - Disagree
5 - Strongly Disagree

END OF POST-TEST SURVEY

APPENDIX 13
USER TESTING DATA

Test Data					TASK II							
Usr	Time	Err	DEs	DyHlp	User	Time	Err	DE	DH	DAT	OTH	CHA
7	*	*	2	*	7	-56	-3	2	1	-1	0	2
8	-1816	*	3	14	8	-976	1	1	1	0	0	1
3	*	*	6	*	3	-229	-1	1	1	0	0	1
4	-1042	*	2	*	4	389	1	1	1	0	0	1
5	3542	*	10	*	5	367	1	3	1	0	-1	2
6	396	*	1	*	6	1221	-3	3	1	0	0	-3
9	80	*	3	*	9	1017	-2	2	1	1	0	-3
10	-2846	*	-2	*	10	137	-1	0	1	0	0	-1
11	*	*	3	*	11	*	*	2	1	*	0	0
12	347	3	7	8	12	-1436	2	1	1	0	0	2
13	*	0	5	*	13	-589	0	1	1	0	0	0
14	474	3	1	3	14	-1575	3	0	1	0	0	3
15	-2693	1	-2	24	15	-1300	1	0	1	0	0	1
16	-980	5	8	36	16	-897	2	2	1	0	0	2
17	*	*	3	*	17	*	*	1	1	*	0	1
18	*	*	7	*	18	*	*	3	1	*	-3	1
19	*	*	*	*	19	*	*	*	*	*	*	*
20	-220	*	1	9	20	1100	0	2	1	1	0	-1
21	*	*	*	*	21	*	*	*	*	*	*	*
22	1308	2	8	22	22	1319	2	4	1	1	1	0
23	-3331	-3	0	20	23	-1485	-1	1	1	-1	-2	2
24	*	2	5	25	24	325	0	2	1	1	-1	0
25	-96	*	6	28	25	1719	-2	6	1	1	0	-3
26	-175	1	2	17	26	702	1	2	1	0	0	1

User = Usr = User Identification
Time = # of seconds difference
Err = Er = Error difference
DEs = Dead End difference
DyHlp = DH = # times Dyn Help used
DAT = difference in non-printout errors
OTH = difference in printout-other errors
CHA = difference in printout-challenge errors

TASK 12					TASK 13					TASK 15				
User	Time	Err	DEs	DH	User	Time	Err	DE	DH	User	Time	Err	DE	DH
7	*	*	-1	0	7	733	-2	1	0	7	-1181	-3	0	7
8	-497	-3	1	3	8	44	*	0	0	8	-387	-1	1	5
3	-178	1	2	2	3	857	0	3	0	3	*	*	0	*
4	-1081	0	0	15	4	54	*	0	*	4	-404	2	1	6
5	754	-1	1	0	5	309	*	2	*	5	2112	-2	4	3
6	-128	6	-1	1	6	1309	*	0	0	6	-2006	0	-1	9
9	443	-1	2	1	9	-1005	*	0	*	9	-375	0	-1	8
10	-395	0	2	5	10	-97	-1	0	2	10	-2491	*	-4	*
11	320	-1	1	1	11	-1389	-1	-2	7	11	*	0	2	*
12	1186	-1	2	0	12	338	1	1	0	12	259	1	3	3
13	-569	0	1	6	13	138	0	1	4	13	*	0	2	*
14	432	-1	0	0	14	790	1	0	0	14	827	0	1	0
15	623	0	1	5	15	-854	0	-2	2	15	-1162	0	-1	7
16	484	0	4	1	16	-1256	3	-1	15	16	689	0	3	3
17	1057	0	2	0	17	12	*	0	0	17	-652	*	0	4
18	-891	-1	3	9	18	342	-1	4	0	18	-815	-1	-3	3
19	*	*	*	*	19	*	*	*	*	19	*	*	*	*
20	-1595	-2	-1	6	20	-231	0	0	0	20	506	*	0	1
21	*	*	*	*	21	*	*	*	*	21	*	*	*	*
22	207	0	0	4	22	-718	1	1	10	22	500	-1	3	2
23	421	-1	0	0	23	-1012	0	-1	4	23	-1255	-1	0	5
24	-1755	4	1	13	24	-172	-1	0	4	24	*	-1	2	2
25	-360	0	0	8	25	-570	0	0	2	25	-885	*	0	8
26	-757	1	0	6	26	156	-1	0	1	26	-276	0	0	4

User = Usr = User Identification
Time = # of seconds difference
Err = Er = Error difference
DEs = Dead End difference
DyHlp = DH = # times Dyn Help used

Sub 1 Task 12

User	Time	Err	DEs	DH
7	*	*	-1	0
8	-337	-1	0	1
3	23	-1	0	1
4	-581	0	0	4
5	234	-1	1	0
6	-57	0	0	0
9	215	0	1	1
10	-267	1	0	2
11	174	-1	1	1
12	955	-1	2	0
13	-367	0	1	3
14	190	-1	0	0
15	201	-1	0	3
16	208	0	2	1
17	633	0	1	0
18	-645	-1	1	3
19	*	*	*	*
20	-852	-2	0	1
21	*	*	*	*
22	311	0	1	1
23	234	-1	0	0
24	-899	2	0	6
25	-31	-1	0	1
26	-189	1	0	2

Sub 2 Task 12

User	Time	Err	DEs	DH
7	*	*	0	0
8	-137	-1	0	1
3	-15	1	1	1
4	-344	0	0	6
5	177	0	0	0
6	-149	5	-1	1
9	148	0	0	0
10	-228	0	1	3
11	99	0	0	0
12	-149	1	0	0
13	-104	0	0	1
14	186	0	0	0
15	78	0	1	0
16	104	0	0	0
17	77	0	0	0
18	-26	0	1	3
19	*	*	*	*
20	-209	0	0	3
21	*	*	*	*
22	-110	0	0	3
23	90	0	0	0
24	-274	2	0	2
25	-73	1	0	1
26	-175	0	0	1

Sub 3 Task 12

User	Time	Err	DEs	DH
7	*	*	0	0
8	-23	-1	1	1
3	-186	1	1	0
4	-156	0	0	5
5	345	0	0	0
6	57	1	0	0
9	80	-1	1	0
10	100	-1	1	0
11	47	0	0	0
12	710	-1	0	0
13	-98	0	0	2
14	56	0	0	0
15	344	1	0	2
16	232	0	2	0
17	347	0	1	0
18	-350	0	1	3
19	*	*	*	*
20	-534	0	-1	2
21	*	*	*	*
22	6	0	-1	0
23	97	0	0	0
24	18	0	1	5
25	-454	0	0	6
26	-393	0	0	3

User = Usr = User Identification
Time = # of seconds difference
Err = Er = Error difference
DEs = Dead End difference
DyHlp = DH = # times Dyn Help used

Sub 1 Task 13					Sub 2 Task 13					Sub 3 Task 13				
User	Time	Err	DEs	DH	User	Time	Err	DEs	DH	User	Time	Err	DEs	DH
7	315	0	0	0	7	86	-1	0	0	7	332	-1	1	0
8	193	1	0	0	8	122	0	0	0	8	*	*	0	0
3	701	1	2	0	3	12	-1	0	0	3	144	0	1	0
4	*	*	0	*	4	*	*	0	*	4	*	*	0	*
5	*	*	1	*	5	*	*	0	*	5	*	*	1	*
6	100	0	0	0	6	*	*	0	0	6	*	*	0	0
9	-643	0	0	7	9	*	*	0	*	9	*	*	0	*
10	-146	0	0	2	10	-93	-1	0	0	10	142	0	0	0
11	-707	-1	-1	5	11	-147	0	0	0	11	-535	0	-1	2
12	259	0	1	0	12	*	0	0	0	12	-57	1	0	0
13	78	0	0	0	13	41	0	0	0	13	29	0	1	4
14	330	1	0	0	14	131	0	0	0	14	329	0	0	0
15	-294	0	0	2	15	-125	0	-1	0	15	-435	0	-1	0
16	-862	3	-1	9	16	-192	0	0	2	16	-202	0	0	4
17	-10	0	0	0	17	*	-1	0	0	17	-247	*	0	0
18	146	-1	2	0	18	*	0	1	0	18	-111	0	1	0
19	*	*	*	*	19	*	*	*	*	19	*	*	*	*
20	-243	0	0	0	20	-70	0	0	0	20	82	0	0	0
21	*	*	*	*	21	*	*	*	*	21	*	*	*	*
22	-487	-1	0	7	22	*	1	0	0	22	-147	1	1	3
23	-336	0	0	2	23	-31	0	0	0	23	-645	0	-1	2
24	284	-1	1	0	24	87	0	0	0	24	-543	0	-1	4
25	-317	0	0	2	25	108	0	0	0	25	-361	0	0	0
26	211	0	0	0	26	-85	-1	0	1	26	30	0	0	0

User = Usr = User Identification
Time = # of seconds difference
Err = Er = Error difference
DEs = Dead End difference
DyHlp = DH = # times Dyn Help used

Sub 1 Task 15

User	Time	ChEr	OEr	DEs	DH
7	-1142	-3	0	6	
8	-181	0	0	1	3
3	•	2	0	0	•
4	-204	1	1	0	3
5	1304	-1	-1	3	2
6	-577	1	0	-1	5
9	-16	0	0	-1	6
10	•	•	•	-3	•
11	565	0	0	2	2
12	77	1	0	1	3
13	•	0	0	2	•
14	563	0	0	1	0
15	-673	0	0	-1	2
16	456	0	0	2	3
17	-799	0	0	0	3
18	-942	0	-1	-2	3
19	•	•	•	•	•
20	•	2	•	0	1
21	•	•	•	•	•
22	159	1	0	2	2
23	-318	1	0	0	2
24	•	-1	0	2	1
25	•	•	•	0	4
26	-1055	0	0	0	3

Sub 2 Task 15

User	Time	Err	DEs	DH
7	2	0	0	1
8	-266	-1	0	2
3	•	•	0	•
4	-167	0	1	3
5	227	0	1	1
6	-1429	-1	0	4
9	-359	0	0	2
10	•	1	-1	1
11	234	0	0	•
12	182	0	2	0
13	•	0	0	•
14	264	0	0	0
15	-489	0	0	5
16	233	0	1	0
17	148	•	0	1
18	127	0	-1	0
19	•	•	•	•
20	283	0	0	0
21	•	•	•	•
22	331	0	1	0
23	-217	0	0	3
24	•	0	0	1
25	-298	0	0	4
26	-181	0	0	1

User = Usr = User Identification
Time = # of seconds difference
Err = Er = Error difference
DEs = Dead End difference
DyHlp = DH = # times Dyn Help used
ChEr = difference in challenge errors
OEr = difference in other errors

Task 11 UIC

User	Time	Er	DE	DH	1st	Guh	Wr	Hti
7	28	0	0	0	*	0	3	*
8	13	0	0	0	*	0	1	*
3	70	0	0	0	*	0	4	*
4	0	0	0	0	*	0	0	*
5	126	0	0	0	*	0	6	*
6	24	0	0	0	*	0	1	*
9	-37	0	0	0	*	0	0	*
10	7	0	0	0	*	0	0	*
11	*	*	0	*	*	0	0	*
12	30	0	0	0	*	0	1	*
13	2	0	0	0	*	1	-1	*
14	-35	0	0	0	*	1	-1	*
15	-15	0	0	0	*	1	-1	*
16	-49	0	0	1	31	3	-3	27
17	*	*	0	*	*	*	*	*
18	*	*	0	*	*	*	*	*
19	*	*	*	*	*	*	*	*
20	6	0	0	0	*	0	1	*
21	*	*	*	*	*	*	*	*
22	7	0	0	0	*	0	0	*
23	-146	0	0	1	56	5	-5	100
24	35	0	0	0	*	2	0	*
25	53	0	1	0	*	0	2	*
26	26	0	0	0	*	0	0	*

Task 11 Special Issue

User	Time	Err	DE	DH	1st	Guh	Wr	Hti
7	1	0	0	0	*	*	0	*
8	3	0	0	0	*	*	0	*
3	-57	0	0	1	14	*	0	47
4	*	0	0	1	*	*	0	*
5	-3	0	0	0	*	*	0	*
6	7	0	0	0	*	*	0	*
9	-27	0	0	1	6	0	0	30
10	2	0	0	0	*	*	0	*
11	*	*	0	*	*	*	0	*
12	2	0	0	0	*	*	0	*
13	27	0	0	0	*	*	0	*
14	-3	-1	0	0	*	*	0	*
15	-42	0	0	0	*	*	0	*
16	-7	0	0	1	26	0	0	19
17	*	*	0	*	*	*	*	*
18	*	*	0	*	*	*	*	*
19	*	*	*	*	*	*	*	*
20	19	0	0	0	*	*	0	*
21	*	*	*	*	*	*	*	*
22	-44	0	1	1	14	*	0	32
23	8	-1	0	0	*	*	0	*
24	37	1	0	0	*	*	0	*
25	11	1	0	0	*	*	0	*
26	-26	0	0	1	9	0	0	22

User = Usr = User Identification
Time = # of seconds difference
Err = Er = Error difference
DEs = Dead End difference
DyHlp = DH = # times Dyn Help used
1st = # seconds until help called
Guh = # wrong guesses until help called
Wr = difference in # of wrong guesses
Hti = time to entry after help called

Task 11 Size C07440

User	Time	Err	DE	DH	1st	Guh	Wr	Hti
7	20	0	0	0	*	*	0	*
8	-60	0	0	0	*	*	-1	*
3	*	*	*	*	*	*	*	*
4	*	*	*	*	*	*	*	*
5	7	0	0	0	*	*	-1	*
6	12	0	0	2	5	0	-1	62
9	75	0	0	1	13	1	5	30
10	154	0	0	0	*	0	2	*
11	*	*	0	*	*	*	0	*
12	5	0	0	0	*	*	1	*
13	*	*	*	*	*	*	*	*
14	-32	0	0	0	*	*	0	*
15	-209	0	-1	2	134	6	-7	105
16	*	*	*	0	*	*	*	*
17	*	*	0	*	*	*	*	*
18	*	*	0	*	*	*	*	*
19	*	*	*	*	*	*	*	19
20	267	0	1	0	*	*	13	*
21	*	*	*	*	*	*	*	*
22	143	0	1	0	*	*	12	*
23	-173	0	0	3	35	1	-6	168
24	81	0	1	0	*	*	-6	*
25	56	0	1	1	26	1	19	73
26	-15	0	0	0	*	*	-1	*

Task 11 Size K20163

User	Time	Err	DE	DH	1st	Guh	Wr	Hti
7	-57	0	0	1	29	1	-1	49
8	70	0	1	1	54	1	6	36
3	168	0	1	1	12	0	1	26
4	-11	1	0	2	6	0	3	127
5	89	0	1	1	25	1	3	86
6	59	0	1	1	14	1	3	36
9	124	0	1	1	8	0	10	25
10	-75	0	1	1	*	0	1	*
11	*	*	1	*	*	*	9	*
12	-199	0	1	1	98	2	1	208
13	-46	0	1	1	36	3	1	91
14	-25	0	0	1	28	0	7	139
15	-28	0	0	1	23	0	1	51
16	13	0	1	1	13	0	1	30
17	*	*	1	*	*	*	*	*
18	*	*	0	*	*	*	*	*
19	*	*	*	*	*	*	*	*
20	213	0	1	0	*	*	8	*
21	*	*	*	*	*	*	*	119
22	41	0	1	1	10	0	7	35
23	-11	0	1	1	33	1	-1	34
24	60	0	1	1	114	15	-7	51
25	57	-1	1	2	13	0	9	97
26	183	0	1	1	9	0	8	74

User = Usr = User Identification
Time = # of seconds difference
Err = Er = Error difference
DEs = Dead End difference
DyHlp = DH = # times Dyn Help used
1st = # seconds until help called
Guh = # wrong guesses until help called
Wr = difference in # of wrong guesses
Hti = time to entry after help called

Task 11 Size C08256/D01857

User	Time	Err	DE	DH	1st	Guh	Wr	Hti
7	16	0	1	1	23	1	3	35
8	*	0	*	*	*	*	*	*
3	-9	-1	0	1	7	0	1	24
4	-10	0	0	1	6	0	1	20
5	*	1	*	0	*	*	*	*
6	*	0	*	*	*	*	*	*
9	*	0	*	*	*	*	*	*
10	-208	0	0	3	32	1	-9	220
11	*	*	0	*	*	*	*	*
12	*	0	*	*	*	*	*	*
13	10	0	0	1	17	1	4	23
14	*	1	*	0	*	*	*	*
15	*	0	*	*	*	*	*	*
16	*	1	*	1	6	0	*	15
17	*	*	*	*	*	*	*	*
18	*	*	*	*	*	*	*	*
19	*	*	*	*	*	*	*	*
20	-23	0	0	0	*	*	-1	*
21	*	*	*	*	*	*	*	*
22	8	0	0	1	17	1	2	15
23	*	1	*	1	21	1	*	24
24	*	1	*	1	11	1	*	25
25	*	-1	*	*	*	*	*	*
26	100	0	1	0	*	*	9	*

User = Usr = User Identification
Time = # of seconds difference
Err = Er = Error difference
DEs = Dead End difference
DyHlp = DH = # times Dyn Help used
1st = # seconds until help called
Guh = # wrong guesses until help called
Wr = difference in # of wrong guesses
Hti = time to entry after help called

Task 12 ESC to Condition Code

User	Time	Er	DE	DH	1st	Guh	Wr	Hti
7	*	*	0	*	*	*	*	*
8	*	*	*	*	*	*	*	*
3	1	*	0	0	*	*	0	*
4	-225	*	0	2	19	0	7	261
5	0	*	0	0	*	*	0	*
6	29	*	0	0	*	*	2	*
9	0	*	0	0	*	*	0	*
10	-60	*	0	1	17	2	-1	63
11	-67	*	1	1	48	1	3	84
12	-6	*	0	0	*	*	0	*
13	8	*	0	0	*	*	1	*
14	0	*	0	0	*	*	0	*
15	-17	*	0	1	21	2	-1	34
16	58	*	1	0	*	*	2	*
17	34	*	0	0	*	*	1	*
18	*	*	*	*	*	*	*	*
19	*	*	*	*	*	*	*	*
20	-26	*	0	0	*	*	-1	*
21	*	*	*	*	*	*	*	*
22	13	*	0	0	*	*	2	*
23	9	*	0	0	*	*	-1	*
24	*	*	0	*	*	*	*	*
25	-10	*	0	0	*	*	0	*
26	-88	*	0	1	23	1	0	77

Task 12 Condition Code

User	Time	Er	DE	DH	1st	Guh	Wr	Hti
7	*	*	0	*	*	*	*	*
8	*	*	*	*	*	*	*	*
3	-61	-1	0	1	35	*	*	48
4	-245	0	0	2	43	*	*	229
5	105	-1	1	0	*	*	*	*
6	0	0	0	0	*	*	*	*
9	83	0	1	1	7	*	*	46
10	-9	1	0	1	18	*	*	39
11	88	-1	1	0	*	*	*	*
12	34	-1	1	0	*	*	*	*
13	39	0	1	1	21	*	*	46
14	54	1	0	0	*	*	*	*
15	17	-1	0	0	*	*	*	*
16	60	0	1	1	5	*	*	17
17	-8	0	0	0	*	*	*	*
18	-8	0	0	0	*	*	*	*
19	*	*	*	*	*	*	*	*
20	-73	0	0	1	7	*	*	92
21	*	*	*	*	*	*	*	*
22	20	0	1	1	9	*	*	24
23	-4	-1	0	0	*	*	*	*
24	-20	0	0	0	*	*	*	*
25	46	-1	0	1	17	*	*	51
26	12	1	0	1	5	*	*	24

Task 12 ESC to Total Price

User	Time	Er	DE	DH	1st	Guh	Wr	Hti
7	*	*	*	*	*	*	*	*
8	-44	*	0	1	6	3	16	87
3	108	*	1	0	*	*	1	*
4	-5	*	0	*	*	*	0	*
5	1	*	0	0	*	*	0	*
6	-63	*	0	1	37	7	-7	34
9	0	*	0	0	*	*	0	*
10	62	*	1	2	21	9	8	87
11	34	*	0	0	*	*	6	*
12	-28	*	0	0	*	*	-2	*
13	59	*	0	0	*	*	21	*
14	38	*	0	0	*	*	3	*
15	36	*	1	0	*	*	8	*
16	31	*	0	0	*	*	2	*
17	16	*	0	0	*	*	9	*
18	*	*	1	0	*	*	*	*
19	*	*	*	*	*	*	*	*
20	-44	*	0	1	9	2	1	46
21	*	*	*	*	*	*	*	*
22	-88	*	0	2	17	0	19	90
23	59	*	0	0	*	*	4	*
24	22	*	0	0	*	*	8	*
25	-52	*	0	1	14	5	5	51
26	-20	*	0	1	9	4	-4	18

User = Usr = User Identification
Time = # of seconds difference
Err = Er = Error difference
DEs = Dead End difference
DyHlp = DH = # times Dyn Help used
1st = # seconds until help called
Guh = # wrong guesses until help called
Wr = difference in # of wrong guesses
Hti = time to entry after help called

Task 12 Menu Selection

User	Time	Err	DE	DH	1st	Guh	Wr	Hti
7	*	*	-1	*	*	*	*	*
8	-201	*	0	*	*	*	*	*
3	92	*	1	*	*	*	*	*
4	-16	*	0	*	*	*	*	*
5	311	*	0	*	*	*	*	*
6	-22	*	0	*	*	*	*	*
9	71	*	1	*	*	*	*	*
10	-18	*	1	*	*	*	*	*
11	63	*	0	*	*	*	*	*
12	262	*	0	*	*	*	*	*
13	-126	*	0	*	*	*	*	*
14	171	*	0	*	*	*	*	*
15	370	*	0	*	*	*	*	*
16	183	*	1	*	*	*	*	*
17	357	*	1	*	*	*	*	*
18	51	*	1	*	*	*	*	*
19	*	*	*	*	*	*	*	*
20	-534	*	-1	*	*	*	*	*
21	*	*	*	*	*	*	*	*
22	-30	*	-1	*	*	*	*	*
23	53	*	0	*	*	*	*	*
24	113	*	0	*	*	*	*	*
25	-202	*	0	*	*	*	*	*
26	-331	*	0	*	*	*	*	*

Task 12 Total Price (R/S)

User	Time	Err	DE	DH	1st	Guh	Wr	Hti
7	*	*	*	*	*	*	*	*
8	62	0	0	0	*	*	*	*
3	-15	1	0	0	*	*	*	*
4	-76	0	0	2	22	*	*	65
5	9	0	0	0	*	*	*	*
6	15	0	0	0	*	*	*	*
9	-27	-1	0	0	*	*	*	*
10	39	-1	0	0	*	*	*	*
11	-27	0	0	0	*	*	*	*
12	48	-1	0	0	*	*	*	*
13	-15	0	0	0	*	*	*	*
14	12	0	0	0	*	*	*	*
15	-48	1	0	1	27	*	*	28
16	23	0	1	0	*	*	*	*
17	7	0	0	0	*	*	*	*
18	2	0	0	0	*	*	*	*
19	*	*	*	*	*	*	*	*
20	-1	0	0	0	*	*	*	*
21	*	*	*	*	*	*	*	*
22	-5	0	0	0	*	*	*	*
23	26	0	0	0	*	*	*	*
24	-9	-1	0	0	*	*	*	*
25	29	0	0	0	*	*	*	*
26	-2	0	0	0	*	*	*	*

User = Usr = User Identification
Time = # of seconds difference
Err = Er = Error difference
DEs = Dead End difference
DyHlp = DH = # times Dyn Help used
1st = # seconds until help called
Guh = # wrong guesses until help called
Wr = difference in # of wrong guesses
Hti = time to entry after help called

Task 13 Menu Selection

User	Time	Er	DE	DH	1st	Guh	Wr	Hti
7	343	*	1	*	*	*	*	*
8	*	*	0	*	*	*	*	*
3	-45	*	0	*	*	*	*	*
4	*	*	0	*	*	*	*	*
5	*	*	1	*	*	*	*	*
6	*	*	0	*	*	*	*	*
9	*	*	0	*	*	*	*	*
10	131	*	0	*	*	*	*	*
11	-424	*	-1	*	*	*	*	*
12	80	*	0	*	*	*	*	*
13	2	*	1	*	*	*	*	*
14	333	*	0	*	*	*	*	*
15	-420	*	-1	*	*	*	*	*
16	-171	*	0	*	*	*	*	*
17	*	*	0	*	*	*	*	*
18	69	*	1	*	*	*	*	*
19	*	*	*	*	*	*	*	*
20	82	*	0	*	*	*	*	*
21	*	*	*	*	*	*	*	*
22	-143	*	1	*	*	*	*	*
23	-658	*	-1	*	*	*	*	*
24	-550	*	-1	*	*	*	*	*
25	-282	*	0	*	*	*	*	*
26	-14	*	0	*	*	*	*	*

User = Usr = User Identification
Time = # of seconds difference
Err = Er = Error difference
DEs = Dead End difference
DyHlp = DH = # times Dyn Help used
1st = # seconds until help called
Guh = # wrong guesses until help called
Wr = difference in # of wrong guesses
Hti = time to entry after help called

Task 15 Size for C07440

User	Time	Er	DE	DH	1st	Guh	Wr	Hti
7	-296	0	-1	2	145	3	-3	170
8	-84	0	0	1	45	3	-3	55
3	*	*	0	*	*	*	*	*
4	11	0	0	1	11	1	2	19
5	164	0	1	1	13	2	7	55
6	-94	1	0	1	39	1	-1	66
9	*	*	*	2	15	0	*	183
10	*	*	0	*	*	*	*	*
11	99	0	1	1	17	1	0	30
12	46	0	1	1	17	1	5	59
13	*	*	1	*	*	*	*	*
14	119	0	1	0	*	*	3	*
15	-31	0	0	1	2	0	-1	49
16	84	0	1	1	14	1	4	24
17	-142	0	0	1	85	3	-3	66
18	-35	0	0	1	11	0	1	51
19	*	*	*	*	*	*	*	*
20	-4	0	0	0	*	*	1	*
21	*	*	*	*	*	*	*	*
22	104	0	1	1	31	2	9	25
23	-24	0	0	1	16	1	0	32
24	*	*	0	1	9	1	*	37
25	-45	0	0	1	12	0	1	50
26	-84	0	0	1	30	1	0	85

Task 15 Size for N39848

User	Time	Er	DE	DH	1st	Guh	Wr	Hti
7	75	0	1	1	28	1	4	34
8	-7	0	0	0	*	*	0	*
3	*	*	0	*	*	*	*	*
4	-11	0	0	1	11	1	0	14
5	113	0	1	0	*	*	7	*
6	-8	0	0	1	4	0	0	15
9	-28	0	0	1	23	1	0	22
10	*	*	0	*	*	*	*	*
11	36	0	1	0	*	*	3	*
12	10	0	0	0	*	*	0	*
13	*	*	0	*	*	*	*	*
14	15	0	0	0	*	*	0	*
15	-15	0	0	1	10	1	-1	14
16	-18	0	0	1	9	1	-2	19
17	0	0	0	0	*	*	2	*
18	-32	0	0	1	21	1	-1	18
19	*	*	*	*	*	*	*	*
20	74	1	0	0	*	*	7	*
21	*	*	*	*	*	*	*	*
22	31	0	1	1	8	1	1	16
23	-18	0	0	1	15	0	0	15
24	*	*	1	0	*	*	*	*
25	*	*	0	2	33	2	*	60
26	-6	0	0	0	*	*	0	*

Task 15 Menu Selection

User	Time	Er	DE	DH	1st	Guh	Wr	Hti
7	-53	*	0	*	*	*	*	*
8	0	*	0	*	*	*	*	*
3	*	*	0	*	*	*	*	*
4	-24	*	1	*	*	*	*	*
5	208	*	1	*	*	*	*	*
6	-167	*	0	*	*	*	*	*
9	-110	*	0	*	*	*	*	*
10	*	*	0	*	*	*	*	*
11	*	*	0	*	*	*	*	*
12	-34	*	1	*	*	*	*	*
13	*	*	0	*	*	*	*	*
14	232	*	0	*	*	*	*	*
15	-126	*	0	*	*	*	*	*
16	121	*	0	*	*	*	*	*
17	-148	*	0	*	*	*	*	*
18	-12	*	-1	*	*	*	*	*
19	*	*	*	*	*	*	*	*
20	203	*	0	*	*	*	*	*
21	*	*	*	*	*	*	*	*
22	178	*	1	*	*	*	*	*
23	-69	*	0	*	*	*	*	*
24	*	*	0	*	*	*	*	*
25	24	*	0	*	*	*	*	*
26	-60	*	0	*	*	*	*	*

User = Usr = User Identification
Time = # of seconds difference
Err = Er = Error difference
DEs = Dead End difference
DyHlp = DH = # times Dyn Help used
1st = # seconds until help called
Guh = # wrong guesses until help called
Wr = difference in # of wrong guesses
Hti = time to entry after help called

Task 15 Due-Out Qty

User	Time	Er	DE	DH	1st	Guh	Wr	Hti
7	-86	0	0	0	*	*	*	*
8	-211	-1	0	2	96	*	*	207
3	*	*	0	*	*	*	*	*
4	-139	0	0	2	27	*	*	161
5	*	0	0	0	*	*	*	*
6	-193	0	0	2	49	*	*	186
9	-201	0	0	2	93	*	*	158
10	-91	-1	0	1	87	*	*	125
11	*	*	0	*	*	*	*	*
12	188	0	1	0	*	*	*	*
13	*	*	0	*	*	*	*	*
14	25	0	0	0	*	*	*	*
15	*	0	0	*	*	*	*	*
16	95	0	1	0	*	*	*	*
17	18	0	0	1	2	*	*	36
18	90	0	0	0	*	*	*	*
19	*	*	*	*	*	*	*	*
20	58	0	0	0	*	*	*	*
21	*	*	*	*	*	*	*	*
22	51	0	0	0	*	*	*	*
23	-143	0	0	3	36	*	*	228
24	*	*	0	0	*	*	*	*
25	-337	0	0	4	101	*	*	289
26	-126	0	0	1	130	*	*	50

User = Usr = User Identification
Time = # of seconds difference
Err = Er = Error difference
DEs = Dead End difference
DyHlp = DH = # times Dyn Help used
1st = # seconds until help called
Guh = # wrong guesses until help called
Wr = difference in # of wrong guesses
Hti = time to entry after help called

BIBLIOGRAPHY

Gould, John D. (1988). How to Design Usable Systems, In Helander, M. (Editor), *Handbook of Human-Computer Interaction,* Elsevier Science Publishers B.V. North-Holland, 757-789.

Hines, William W. and Montgomery, Douglas C. (1980). *Probability and Statistics in Engineering and Management Science.* Wiley Publishing Company, New York, New York.

Installation Support Modules. [1990]. A briefing paper dated 12 September. Office of the Project Manager, Installation Support Modules, Fort Belvior, VA. Photocopied.

Jolliffe, F.R. (1986). *Survey Design and Analysis.* Ellis Horwood Lmtd., Chichester, West Sussex England.

Karat, John (1988). Software Evaluation Methodologies, In Helander, M. (Editor), *Handbook of Human-Computer Interaction,* Elsevier Science Publishers B.V. North-Holland, 891-903.

Ledgard, Henry, Singer, A., and Whiteside, J. (1981). Directions in Human Factors for Interactive Systems, In Goos, G. and Hartmanis, J., (Editors), *Lecture Notes in Computer Science, 103,* Springer-Verlag, New York, 163-175.

Reisner, Phyllis (1983). Analytic Tools for Human Factors of Software, In Goos, G. and Hartmanis, J., (Editors), *Lecture Notes in Computer Science, 150,* Springer-Verlag, New York, 94-121.

Schleske-Peters, Ricardo (1980). *User Interface Design, Enhancement, and User Evaluation of an Interactive Generalized Decision Tree Algorithm.* Master's Thesis, School of Industrial and Systems Engineering, Georgia Institute of Technology, Atlanta, GA.

Shneiderman, Ben (1987). *Designing the User Interface: Strategies for Effective Human-Computer Interaction.* Addison-Wesley Publishing Co., Reading, MA.

Villarreal-Ogushi, Jose (1984). *User Testing of an Interactive Project Scheduling System.* Master's Thesis, School of Industrial and Systems Engineering, Georgia Institute of Technology, Atlanta, GA.

Whiteside, John (1988). Usability Engineering: Our Experience and Evolution, In Helander, M. (Editor), *Handbook of Human-Computer Interaction,* Elsevier Science Publishers B.V. North-Holland, 791-817.

Young, Donovan, Miller, M. Wayne, Jr. and Coleman, James P., Jr., (1987). *Guide to DSS Development, Vol 1.* Computer Systems and Technology Division, Electronics and Computer Systems Laboratory, Georgia Tech Research Institute and School of Industrial and Systems Engineering, Georgia Institute of Technology, Atlanta, GA.

Young, Donovan (1990a). *Embedded User Support for U.S. Army Installation Software.* Industrial and Systems Engineering Department, Georgia Institute of Technology, Atlanta, GA.

Young, Donovan (1990b). *Specification of User Requirements and Dynamic Help System Standards for EUS project and CIF Conversion.* Industrial and Systems Engineering Department, Georgia Institute of Technology, Atlanta, GA.