DESIGN SPECIFICATION FOR (MPT)^2 PRODUCT 1

SYSTEM PERFORMANCE REQUIREMENTS ESTIMATION AID

Contract MDA903-86-C-0412

1 January 1988

Volume I

Prepared For:

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Prepared By:

Micro Analysis and Design
and
Dynamics Research Corporation

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SYSTEM PERFORMANCE REQUIREMENTS ESTIMATION AID
SECTION 1 - INTRODUCTION

1.1 Objective of Paper

This paper contains the software design specification for an aid to systematically estimate system performance requirements for Army weapon systems during the earliest phases of the acquisition process. This aid is one of six products being developed as the Army Research Institute's (ARI) Manpower, Personnel, and Training aids for the MANPRINT project.

The design specification describes requirements for this aid, presents a detailed description of the aid's steps and the techniques for developing them, and delineates the software design.

1.2 Overview of $(MPT)^2$ Products

Figure 1.2-1 displays the six $(MPT)^2$ products and their expected role in the Army's new streamlined Materiel Acquisition Process (MAP). The first four products, the System Performance Requirements Estimation Aid, the Manpower Constraints Estimation Aid, the Personnel Constraints Estimation Aid, and the Training Constraints Estimation Aid, will estimate MPT-related requirements and constraints during the Requirements/Technology Base Activities Phase of the MAP. These requirements and constraints will guide subsequent contractor design activities.

The System Performance Requirements Estimation Aid (SPREA) will help Army combat developers identify comprehensive and unambiguous system performance requirements needed to accomplish various missions.

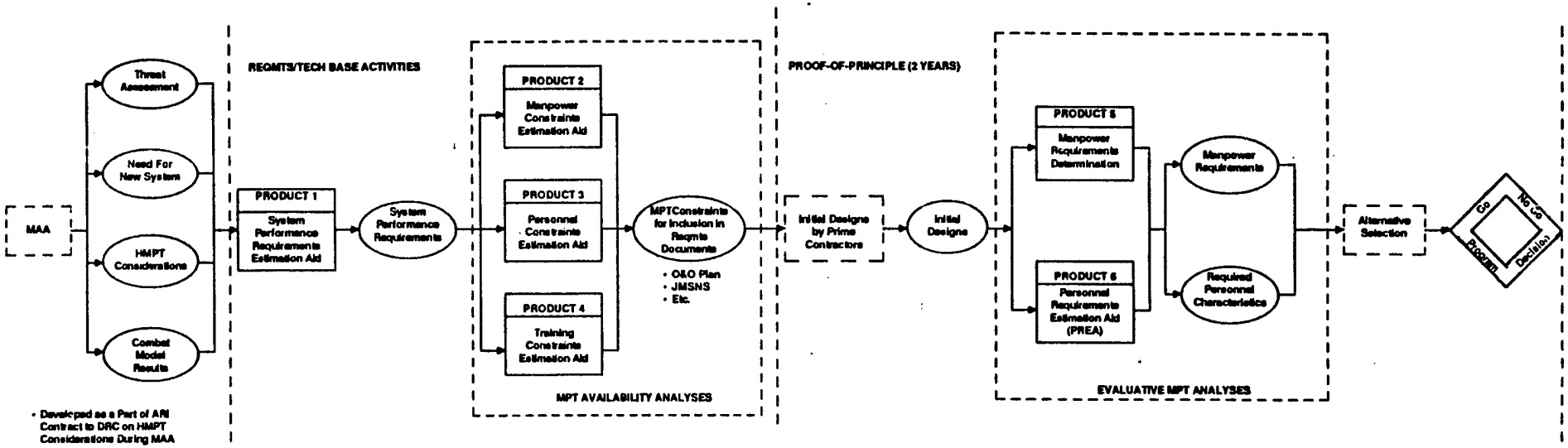


Figure 1. Expected Role of Six (MPT) 2 Products.

The next three $(MPT)^2$ products will determine MPT constraints. The Manpower Constraints Estimation Aid (MCEA) will identify the maximum crew size for operators and maintainers and the maximum Direct Productive Annual Maintenance Manhours (DPAMM) for maintainers. These constraints will be based on assessments of the manpower likely to be available to man the new system.

The Personnel Constraints Estimation Aid (PCEA) will estimate the significant personnel characteristics that describe and limit the capabilities of the probable soldier population from which the new system's operators and maintainers will come. The PCEA will identify the minimally acceptable boundaries for these characteristics.

The Training Constraints Estimation Aid (TCEA) will identify what the training program for the new system is likely to look like. It will also determine the maximum time needed to train the new system's operators and maintainers, given available training resources.

The last two aids will help evaluate contractor designs. The Manpower Determination Aid (MDA) and the Personnel Requirements Estimation Aid (PREA) will be used during the Proof-of-Principle Phase after initial contractor designs have been submitted, but before one design is chosen for development into a prototype. These products will evaluate initial contractor designs and identify personnel characteristic deficits. (Personnel characteristic deficits are discrepancies between the type and number of people required and the number of these people likely to be available when the system is fielded).

The MDA will determine the tasks, jobs, and quantitative manpower requirements associated with each contractor design. The PREA will determine the type and level of personnel characteristics required to perform each task associated with a

contractor design effectively. The results of these two evaluative aids will be used to select a specific design alternative for further development. As such, the results can be incorporated into higher-level analyses such as the Cost and Operational Effectiveness Analysis (COEA).

1.3 Organization of Paper

The remainder of the design specification is divided into nine sections. The second section provides an overview of the SPREA, its outputs, functional requirements, users, role in acquisition process, and a discussion of our approach to design specification.

The third section describes the steps the user would go through to apply the SPREA. Included in this description is a step-by-step presentation of the user interface of the SPREA.

The SPREA will contain two types of files -- libraries which describe "hardwired" input data and working files that are used to store results related to a particular application. The structure of each of these two types of files is described in the fourth and fifth sections. The description of the libraries also includes the actual values for the "hardwired" input data. This section also describes interfaces with other $(MPT)^2$ products and lists the format of all SPREA output reports.

The sixth section describes the models that will be used in the SPREA.

The seventh section provides a discussion of the documentation which will be produced during Phase 3 of this project.

SECTION 2 - GENERAL PRODUCT REQUIREMENTS

2.1 Objectives

The purpose of this product is to provide Army personnel and combat developers with a tool for systematically describing performance requirements for major weapon systems. These performance requirements must be derived from system mission requirements and linked to the battlefield combat models. In addition, the System Performance Requirements Estimation Aid (SPREA) will permit the estimation and analysis of objectively defined measures of system performance under a variety of environmental, operational, and tactical conditions. The tool will not distinguish who or what performs certain functions. Rather, it will determine what the functions and their associated performance standards must be under given conditions in order to achieve the required overall system performance.

2.2 Major Outputs

The primary SPREA output will be a detailed report containing:

- an explicit statement of the mission that was modeled and its composite functions and tasks. The statement will also list the performance criteria for each of the functions and tasks in each mission.

- the conditions in which each function will operate

- the minimally acceptable system performance including:

  - a system reliability estimate (i.e., the probability of mission completion)

- the operational availability requirement
- a system maintainability estimate
- system function accuracy estimates
- system function time estimates

Each of these areas are briefly discussed in the following paragraphs.

2.2.1 Mission, Function, and Task Documentation

The SPREA Report will fully document the mission which was modeled, as well as its composite functions and tasks. This documentation will also include a spreadsheet listing the tasks with their performance criteria. These performance criteria include:

- o most likely task performance time
- o accuracy of task performance

Finally, the documentation will supply a network drawing that indicates the predecessor/successor relationships between the tasks within each function and between the functions within each mission.

2.2.2 Conditions

The SPREA will remind the analyst of the task performance parameters that might be affected by changing tactical, operational, or environmental conditions. The SPREA will prompt the analyst to note which conditions he or she is assuming when setting the function performance criteria, and will include those notes for inclusion into the SPREA Report.

2.2.3 System Performance Time and Accuracy Criteria

The SPREA will aid the analyst in entering the minimally acceptable performance that the system must meet (as derived from combat models, the Mission Area Analysis, and other sources) and the allocation of these performance requirements to individual mission tasks. The SPREA Report will note any discrepancies between the minimally acceptable system performance and the system performance predicted by modeling the composite tasks. The SPREA Report will also document the source of these discrepancies (i.e., the "critical path" through the times and/or accuracies of the tasks included in each system performance measure). The SPREA will provide backsolving techniques to assist the analyst in identifying a set of functional performance allocations that will produce minimally acceptable performance.

The SPREA will use the task performance accuracy criteria to estimate function and mission accuracies. These estimates will be calculated by modeling the performance accuracies for the tasks that are in the mission model.

Reliability. One of the performance criteria which will be associated with each system is the reliability. In the SPREA, the measure of system reliability will consist of three subsets. First, the reliability of the armaments equipment group within the system will be measured using MRBF (mean rounds between failure). Second, the reliability of the mobility equipment group will be measured in MDBF (mean distance between failure, measured in miles or flight hours). Finally, the reliability of the other equipment groups (e.g., communications, electronics) will be measured in MTBF (mean time between failure). All of these measurements will be based on the usage level which applies to the particular equipment group. The usage levels will be part of the system Operational Mode Summary.

As an example, the usage levels for a system might be:

armaments = 411 rounds / day
mobility = 200 miles / day
other = 14 hours / day

The reliability of each equipment group will vary as a function of the usage level. The SPREA Report will include the reliabilities and their associated usage values.

Availability. Availability is an important piece of the performance measurement framework that guides the SPREA. There are many measures of availability; however, AR 702-3 states that operational availability (Ao) shall be used in all requirements documents. Appropriate combat models will produce an availability requirement and/or the composite pieces of the availability equation, and the analyst will be asked to supply these values as input into the SPREA.

Maintainability. Maintainability of the system is a measure of the time it takes to retain or restore the system to a specified operable condition. The SPREA will ask the analyst to input the MTTR (mean time to repair) and the MR (maintenance ratio i.e., maintenance manhours required per operational hour) for the system at each level (e.g., ORG, DS and GS). The SPREA will aid the analyst by displaying maintenance data from the library for the appropriate system type.

This system level maintenance requirement will then be allocated to the generic equipment types for the system. From there, the requirements will be allocated to the specific corrective maintenance tasks for each equipment type. Both of

the allocations will be automated using a percentage allocation chart from the SPREA libraries. The user will be able to modify the allocations if he/she wishes.

The SPREA Final Report will document the maintainability requirements for each equipment type (i.e., Avionics) at the maintenance task level (i.e., troubleshoot, replace, inspect).

The reliability and maintainability estimates will be compared to the operational availability requirement to ensure that the three elements are consistent.

2.3 Role of Product Output in Acquisition Process

The output of Product 1 will feed several key acquisition documents. This section identifies those documents and indicates how the output is presented (i.e., format), where the information is obtained, and who is responsible for the document. There are two basic types of documents that describe system performance requirements -- Army requirements documents designed to provide guidance to the Army organizations in charge of system development and contractor specifications designed to provide detailed guidance for the contractor who is developing the system. There should be a close relationship between these two types of documents. In fact, the contractor specifications should be derived from the Army requirements documents.

2.3.1 Army Requirements Documents

The primary Army requirements documents into which the SPREA will feed are the Justification for Major System New Start (JMSNS), the Operations and Organizational (O&O) Plan, the Letter of Agreement (LOA), and the Required Operational Capability

(ROC). The JMSNS, O&O Plan, and the LOA should be produced during the Requirements/Technology Base Activities Phase of the Materiel Acquisition Process (MAP). The ROC should be produced during the Proof-of-Principle Phase.

The requirements documents described above (JMSNS, O&O Plan, LOA, and ROC) are typically prepared by the Directorate of Combat Development (DCD) within the proponent TRADOC schools in close coordination with the Army Materiel Command (AMC) proponent.

Missions. The JMSNS is typically the first document developed to describe the need for a major weapon system. It is a very high level document that must not exceed three pages. The JMSNS identifies mission areas but does not necessarily describe the missions.

TRADOC PAM 70-2 details the O&O Plan and states that the operational plan section must "describe how, what, when and where the system will be employed on the battlefield and how it will interface with other systems" (p. 3.6). It also requires that an Operational Mode Summary/Mission Profile (OMS/MP) be attached as an annex. The OMS/MP is also used as the mechanism for describing missions in the ROC and LOA.

Functions/Tasks. The O&O Plan, ROC, and LOA all require that the OMS/MP "reflect tasks analyzed in the Mission Area Analysis" that preceded the MAP. The regulations governing these documents provide little additional guidance on the nature of these functions/tasks. However, additional guidance is provided in the regulations (TRADOC PAM 11-8, Appendix C) developed for the mission area analysis (MAA) process. This guidance recommends that a hierarchy of tasks and subtasks be developed.

Once functional tasks are identified, the proponent analyzes each task and subtask to determine how each contributes to the mission's success. The analysis is done "using subjective but sound military judgment" (TRADOC PAM 11-8, p. C-11).

Conditions. TRADOC PAM 11-2 states that a brief paragraph in the O&O Plan and the O&O summary in the LOA and ROC must indicate:

a. How the equipment will be used;
b. Geographical areas of use;
c. Weather and climatological factors to be considered during equipment operations;
d. Battlefield conditions (such as ECM, smoke, and dust) in which the system will operate; and
e. The type of units that will use and support the equipment.

The OMS/MP Annex of the O&O Plan, LOA, and ROC also provide lists of conditions.

Minimally Acceptable Performance Requirements. Performance requirements are used in the O&O Plan to help:

> Describe the need for an operational capability to defeat the threat and eliminate an operational deficiency . . . (The need should be stated in broad characteristics only (e.g., a capability is needed to defeat enemy armor at "x" kilometers)). (TRADOC PAM 70-2, p. 3.6).

The LOA and ROC require that the performance characteristics of a proposed system be described in bands of

performance. The lower level of these bands should describe minimally acceptable performance. (TRADOC PAM 70-2, p. 5-17, 6-12, 7-13).

AR 702-3 provides specific guidance on the metrics that can be used to describe RAM requirements. The SPREA will consider a subset of these metrics as described in Section 3 of this document.

2.3.2 Documents for Presenting Requirements to Contractors

While the Army requirements documents described above define system performance requirements for Army organizations, these documents are typically not the primary mechanism used to present requirements to contractors. The Army requirements documents may be included in the RFP package as background information, but the contractor is not contractually bound to meet the requirements in these documents. Rather, the requirements documents that the contractor must adhere to are stated in the system specification. MIL-STD-490 describes procedures for describing system specifications. The first system specification that is typically developed for a major weapon is the System/Segment Specification (SSS) or Type A specification. The SSS should be initially developed during the Requirements/Technology Base Activities Phase of the MAP, but may be updated in the subsequent phase. It is typically developed by the combat developer within the proponent school but may be contracted. Data Item Description DI-CMAN-80008 describes the format for the SSS.

Compared to the Army requirements documents, the SSS Data Item Description (DID) provides much guidance on the format for

describing system functions/tasks and performance requirements. But it provides little guidance for describing missions and conditions.

In later MAP phases, more detailed system specifications are developed. However, these specifications require an allocation of functions among particular system steps, and they actually describe requirements at the step level. Consequently, these specifications are not relevant to the SPREA.

2.4 Users

2.4.1 Overview of Users and Their Functions

Primary Users. The primary SPREA users will be the combat developers within the TRADOC proponent schools who produce requirements documents for major systems (i.e., JMSNS, O&O Plan, LOA, and ROC) and who produce the SSS which guides early contractor design activities. The organization which typically accomplishes these functions is the Directorate of Combat Development (DCD). Within DCD, portions of the requirements documents and SSS may be completed by a Concepts and Studies Division, Materiel Logistics Support Division, or Requirements Division. Each DCD is organized slightly differently.

Secondary Users. Another major user is expected to be the AMC major subordinate command who may provide input to the TRADOC combat developer in constructing requirements documents. Since each AMC major subordinate command is organized differently, the exact user organization will vary. Typically, the AMC command will have an Advanced System Directorate (ASD) with a Requirements Analysis Division (RAD) responsible for coordinating requirements documents with TRADOC.

Other potential users are the reviewers of requirements documents which include HQ TRADOC (DCSCD), HQ AMC (AMCDRE), and the Requirements Division (DAMO-FOR) within DCSOPS; the MANPRINT Policy Office within ODCSPER (DAPE-ZAM); the MANPRINT points-of-contact within the TRADOC proponent schools and AMC subordinate command; and the ARI field office representatives who may provide MANPRINT support to TRADOC schools or AMC subordinate commands.

2.5 Assumptions

The assumptions underlying development of the SPREA are:

Major System Focus

The SPREA will be developed to describe system performance requirements for major weapon systems. This means that while the general logic of the SPREA could be applied to other types of systems, the automated tools in the SPREA will only be developed for major systems.

Input From Combat Models

Combat models may provide input to the SPREA on overall system performance requirements for each function. One of the SPREA's primary functions is to provide a tool to help analysts allocate these system level performance requirements to individual tasks.

2.6 High Level Functional Requirements/Constraints

2.6.1 Technical Requirements

Output. The SPREA will assist Army analysts in producing clear, unambiguous descriptions of system missions, functions, tasks, conditions, and performance requirements.

Emphasis on Functional Requirements. The SPREA will describe the minimally acceptable system performance requirements prior to the allocation of tasks to hardware, software, or humans. Thus, the requirements describe what has to be done without describing the mechanism that will perform the task.

Mission and Functions. The missions and functions must be stated in clear, unambiguous terms that facilitate the development of measurable performance requirements.

Conditions. The SPREA must describe environmental, operational, and tactical conditions.

Performance Requirements. Performance requirements must be stated in clear, unambiguous, and directly measurable terms. They must describe minimally acceptable performance levels under which the system functions must be performed.

Role In Acquisition Process. The SPREA information on missions, functions, functional tasks, conditions, and performance requirements must be designed to feed directly into Army requirements for major weapon systems (i.e. JMSNS, O&O Plan, LOA, and ROC) and the Type A specification that guides contractor designs. (See the information on Role in the Acquisition process earlier in this section.)

Users. The SPREA must be designed for the combat developers within the TRADOC proponent school who produce requirements documents for major systems (i.e., JMSNS, O&O Plan, LOA, and ROC) and who produce System/Segment Specification (SSS) which guide early contractor design activities (see the Overview of Users and Their Functions.)

2.6.2 Acceptability/Usability Requirements

The previous subsection presented an overview of the technical requirements that the SPREA must meet. This section describes some of the acceptability and usability requirements which must also be met by these tools.

Describe "How To" Procedures. Sufficient context-specific help will be included in the SPREA to allow Army users with minimal training to use each product. Many procedures will be automated to reduce user analysis requirements.

Minimize Organizational Impacts. The SPREA is designed to fit the user. It does not require additional personnel or cause restructuring of existing Army organizations; it will utilize computer hardware available at user locations or be accessible via secure lines.

Minimize User Training. Training time for the $(MPT)^2$ products will be minimized. User interfaces have been designed to require no prior computer experience. The interface will contain built-in job aids (e.g., help commands). Finally, if formal training is required, it will be developed in accordance with Army instructional system design principles and utilize only media that are readily available or accessible to users.

Security. The SPREA may be required to accept classified data and is designed to provide acceptable levels of security.

2.7 Overview of SPREA Technical Approach

This aid will help an Army analyst establish function and task performance criteria for missions that result in the system attaining the minimally acceptable system performance. In this summary, we briefly explain the steps that the analyst will take in using the SPREA to accomplish this task.

First, the analyst will use the SPREA "Missions by System Type" Library to specify the mission which the system is expected to accomplish.

This library will contain a variety of mission statements for a variety of systems (see Section 4.2 for a detailed listing of the library contents). The analyst will be able to use one of these statements and modify it to fit his/her needs. The analyst will also specify the minimally acceptable system performance requirements.

The analyst will then specify the conditions which apply to the mission. The analyst will choose conditions from the "Conditions by System Type" Library. The analyst will also specify whether the conditions will change from function to function. If the analyst indicates that the conditions will vary between functions, then the system will present the subset of conditions which apply to individual functions. This subset will be retrieved from the "Conditions by Function" Library. The analyst will then indicate which conditions he/she wishes to change.

During the third step of this process the analyst will specify the mission level performance time and accuracy requirements. These are the minimally acceptable performance time and accuracy for this system, on this mission.

In Step 4, the system RAM (reliability, availability, and maintainability) requirements will be entered and allocated to the tasks and functions. The analyst will be able to access RAM criteria from the appropriate system type and modify those values as appropriate. This data will be stored in the "Baseline RAM Values by System Type Library".

Steps 5 through 9 consist of the analyst using the "Functions by Mission", "Function Sequence by Mission", "Functions and Tasks by System Type", and "Task Sequence by Function" Libraries that are in the SPREA to specify the composite functions and tasks of the mission. The SPREA will assist the analyst in specifying the function and task performance criteria for each function or task which is a component of the mission. The performance criteria consists of time and accuracy estimates and are allocated from the system level performance requirements. These estimates will be pulled from the "Baseline Time and Accuracy Values by Function and Task" Library.

In Step 5, the composite functions will be identified, along with their time and accuracy performance estimates. The sequence of the functions within the mission will be specified in Step 6.

Step 7 consists of the user specifying the function accuracy weights. This weighting will dictate the amount that each function's accuracy measure will contribute to the probability of mission success (i.e., mission accuracy).

In Step 8, the tasks which compose each function will be identified. The task performance time and accuracy estimates will be identified.

Finally, in Step 9, then sequence of tasks within each function will be specified.

In Step 10, the SPREA will use the function and task performance criteria to build a model of each mission which the system is expected to accomplish. The models will be executed, and the predicted system performance will be reported to the analyst. These predictions will be based on the individual task performance criteria. Next, these predictions will be compared to the minimally acceptable performance criteria.

In Step 11, the results of the simulation model execution will be reported to the user. The user will be able to select the types of reports he/she wishes to see. The SPREA Final Report will document the explicit mission statement that was modeled, its composite functions and tasks, and the performance criteria for the mission, functions and tasks. The RAM criteria for the system will also be included in the report. Finally, the report will compare the predicted system performance to the minimally acceptable system performance.

If the predictions do not meet the minimally acceptable performance, then the individual task performance criteria must be altered to resolve the deficiencies. This resolution will be accomplished in Step 12 by the SPREA, employing backsolving techniques, under the direction of the analyst.

This process will iterate until all of the deficiencies have been resolved, or until the analyst interrupts the SPREA to stop the process.

2.8 Hardware/Software Configuration

The hardware system which the SPREA will be installed on consists of the following characteristics:

a. Enhanced graphics display - The EGA will support high resolution color graphics.
b. Enhanced graphics board with 256 K bytes RAM
c. 80286 processor
d. Hard disk with a minimum of 20 M bytes of storage
e. Up to 4 M bytes of enhanced memory
f. Bernoulli Box or its functional equivalent with two removable 20M disks
g. 80287 Math Coprocessor
h. 1200/2400 baud Hayes-compatible internal modem
i. One or more floppy drives that can read and write 360K floppy diskettes
j. Dot matrix printer capable of printing 132 characters per line. This printer will be capable of outputting IBM graphics.
k. IBM AT-compatible keyboard.

All the SPREA software will be developed under the most recent version of Microsoft C. At the present time, the operating system for the products will be DOS 3.2.

The data libraries in the SPREA will be built using R-Base V. We will sort, retrieve and store information in these files using code developed in-house via dbC Library routines. These library functions do not require any licensing fees and will be fully integrated into the SPREA code.

All of the data files which will be used by other $(MPT)^2$ products will be in delimited fixed ASCII format.

2.9 Overview of Interface Design

The SPREA will use the keyboard as the input device. All user queries, responses, and requests will be entered via the AT compatible keyboard.

There are 4 types of menus in the product. The first type of menu interface is the command bar. In this interface style, the commands will be listed horizontally across the top of the computer screen. The user will use the horizontal arrow keys to position the cursor and a carriage return to select the desired option. The command menu bar will be displayed on the third and fourth line of each display.

The main menu bar will present a list of single one word commands. Positioning the cursor on a particular command will highlight that command and a more detailed description will appear on the bottom line of the main menu bar. Further explanation will be available in HELP.

The command menu bar is always presented across the top of the display and has a dark blue background. More detailed information about the command menu bar can be found in the section on commands.

A command can be selected by keying in the first letter or hitting the return key.

There will be more than one level of command menus. Only the commands appropriate to the current process or display will be presented on the menu bar.

Three types of commands will be presented using the command bar interface:

(1) General action commands: enable the user to perform some process on the data (e.g., Insert, Copy, Paste, Delete, Sort, Report, Save, Switch)

(2) GoTo commands: enables the user to access a data library

(3) Specialized commands: commands which are specific to a process or step

The second type is a pull-down menu design. In this type of menu, the user will use the vertical arrow keys to position a highlighted menu bar at the desired menu choice. This results in a color change as the highlighted bar moves through the menu. The user will press the carriage return after he/she has used the cursor keys to select an option from the list.

These menus can be presented anywhere on the screen and are color coded by level. The first level has a light blue background and the second level has a green background.

Items will be presented within a menu according to logical order or frequency of use. Items will be presented in a numbered list. Less than 10 items will be presented at one time on any data menu. Items will be selected form the menu by keying in the number associated with that item.

The third type of menu is a spreadsheet interface. In this menu style, the user will use a combination of cursor keys and keyboard input. The cursor keys will be used to position the cursor in a cell of the spreadsheet. The keyboard will then be used to edit the information that is in the cell. If the entire spreadsheet does not fit on a screen, the user will be able to move from cell to cell in any direction.

All spreadsheet menus have a brown background with white lettering. The area for data entry will be visually defined on a spreadsheet by a gray background and black lettering.

The fourth type of menu interface is a command prompt. In this case, the user will respond to a specific prompt using the keyboard. For instance, the prompt "Confirm the system information? (Y/N)" The user will use the keyboard to enter 'y', 'n', 'Y', or 'N'.

All of these interfaces will be used appropriately in the product. If the user does not know how to respond to a prompt or an interface the function key 'F1' will always give the user a context-specific help screen. The help screen will provide a discussion of the information which is being requested. At any time, the user may also press the escape key. This will always take the user to the menu which immediately precedes the current menu. In this manner, the user can "back out" of the PCEA application.

At the top of every menu, there will be a "PATH>" line. This line will keep the user informed as to his/her current location in the hierarchical levels of the product. The mode will be displayed on the top line in the right hand corner. There are three modes: work, wait and help.

The SPREA interface also provides the user with a mechanism for resuming work at the last step that was complete before the system was turned off. This will consist of the software periodically updating a status file which will be referred to when a user powers up the system and accesses the SPREA.

Color specifications:

Type of interface	Background/ Lettering	Highlight
Command Bar	Drk bl/Wht	Lt Bl/Blk
First level pop-up	Lt bl/Blk	Lt Bl/yel
Second level pop-up	Grn/Bl	Gr/Yellow
Template (Data entry)	Brw/Wht	Gry/Blk
Libraries	Blk/Wht	Gry/Blk
Help	Drk Bl/Wht	Blk/White
Message	Red/White	

Keystroke specifications:

Following is a list of the general specifications for the functionality of global function and editing keys for the SPREA.

F1 Help - This key will always switch the system into the help mode. When this key is pressed, the system will display the first page of context specific help information explaining the current menu, screen, or prompt.

Shift F1 Help Index - When the F1 function key is pressed while holding down the shift key, the user is presented with an index of help information.

F2 Move-by-cell/Edit toggle - This key controls the function of the arrow cursor keys when the user is working in a spreadsheet-like template. In the default state, the arrow keys will move the cursor from cell to cell in the first character position. When the F2 key is pressed, the arrow keys move the cursor character by character (left and right) or line by line (up and down) within a cell. If the cursor is currently in the last character position in the cell for any particular direction, the cursor will move to the next cell in that direction. For example, if the cursor is in the first character position of a cell and the left arrow is pressed, the cursor will move to the next cell to the left of the current cell. If the cursor is in the topmost line of a particular cell and the up arrow is pressed, the cursor will move to the cell above the current cell. Repeated pressing of the F2 key will toggle between the move-by-cell and move-by-character states.

F3 Search - When this key is pressed, the user will be prompted for a string of characters or keystrokes that the system will search for. The string of keystrokes is terminated by pressing the F3 key a second time. After terminating the string, the system will search the current library, template, or list for a match for the input string. If a match is found, the cursor is moved to the matched input string. If no match is found, the cursor remains where it is and a message indicating no match found is displayed.

At times when the F3 key is not active, the user will receive a message indicating such.

F4 NOT USED AT THIS TIME

F5 NOT USED AT THIS TIME

F6 NOT USED AT THIS TIME

F7 NOT USED AT THIS TIME

F8 NOT USED AT THIS TIME

F9 Menu - Displays the active menu bar while working in a spreadsheet-like template.

F10 Save - Saves the current working file to the appropriate permanent file then returns to the current working status.

ESC quit - Always returns to the most recent previous state such as the most recent menu, screen, or prompt.

Backspace This key is only active when the system is allowing for input by the user. The backspace key moves the cursor one space to the left of its current position and erases any character from that position.

Return Terminates variable length user input.

Caps Lock Toggles the keyboard from a normal state to one that displays characters as if the shift key was being held down. When the keyboard is in the "shift key" state and the user holds down the shift key while pressing another key, the normal (non-shift) character displays.

Ins — Insert - Toggles the system from character insert for user input to typeover. When the state is character insert, the characters input by the user are inserted to the left of the current cursor position. When the state is typeover, characters are displayed at the current text cursor position. Any characters currently displayed at that position will be replaced.

Del — Delete - Deletes characters that are displayed at the current text cursor position.

Home — Moves the menu cursor to the top or the left most menu selection. Moves the cell cursor to the upper left corner of a spreadsheet-like template. Moves the text cursor to the upper left most typing position of the current input area (i.e., cell, field, etc.). See cursor definitions below.

End — The end key works the exact opposite of the home key. It moves the menu cursor to the bottom or the right most menu selection. It moves the cell cursor to the lower left corner of a spreadsheet-like template. It moves the text cursor to the lower right most typing position of the current input area. See cursor definitions below.

PgUp — Page Up - If the cursor (menu, text, of cell) position is not at the top of the current visible display or window, the cursor is moved to that position. If the cursor position is at the top of the current visible display or window, the cursor is moved to the top of the previous full screen or window-full of information.

PgDn

Page Down - If the cursor (menu, text, or cell) position is not at the bottom of the current visible display or window, the cursor is moved to that position. If the cursor position is at the bottom of the current visible window, the cursor is moved to the bottom of the next full screen or window-full of information.

Up Arrow - Moves the cursor (menu, text, or cell) up one position (line or cell).

Down Arrow - Moves the cursor (menu, text, or cell) down one position (line or cell).

Left Arrow - Moves the cursor left one position (character or cell).

Right Arrow - Moves the cursor right one position (character or cell).

Ctrl Up Arrow - Moves the cursor (menu, text, or cell) up one full screen or window-full of information to its same relative horizontal position.

Ctrl Down Arrow - Moves the cursor down one full screen or window-full of information to its same relative horizontal position.

Ctrl Left Arrow - Moves the cursor to the left by one screen or window-full of information to its same relative vertical position.

Ctrl Right Arrow - Moves the cursor to the right by one full screen or window-full of information to its same relative vertical position.

SECTION 3 - STEPS TO APPLY THE SPREA

This section presents a discussion of the steps that the user will take while using the SPREA. The discussion of each step is organized into the following parts:

1. Input - the data that is required for the completion of this step. Input data consist of two types:

   - o External - inputs supplied by sources external to the SPREA
   - o Internal - data supplied by sources within the SPREA

2. Process - the process that the user will take during this step

3. Output - the data that will be generated as a result of this step

4. User Interface - a description of the way that the user will be prompted throughout this step. This section is a very detailed discussion of each screen the user will see, the potential error messages, etc.

3.0 Step 0 - Enter the SPREA

In this step, the user will gain access to the SPREA system. From the first level of SPREA interfaces the user will indicate whether he/she wishes to resume work-in-progress on a mission, begin analyzing a new system, or use any of the utility functions provided.

Input

The only input to this step is the executable SPREA file. This file should be installed on the user's system, and will be named "sprea.exe".

Process

First, the user will type "SPREA" to make Product 1 active on his/her computer system. Then, using the keyboard, the user will indicate whether he/she wishes to use simple utility commands (one of which will give the user a status report of the level of completion of the mission descriptions in the system), or whether he/she wishes to begin analyzing a mission using the product. Once the user responds, control will be given to Step 1.

Output

There is no significant output from this step.

User Interface

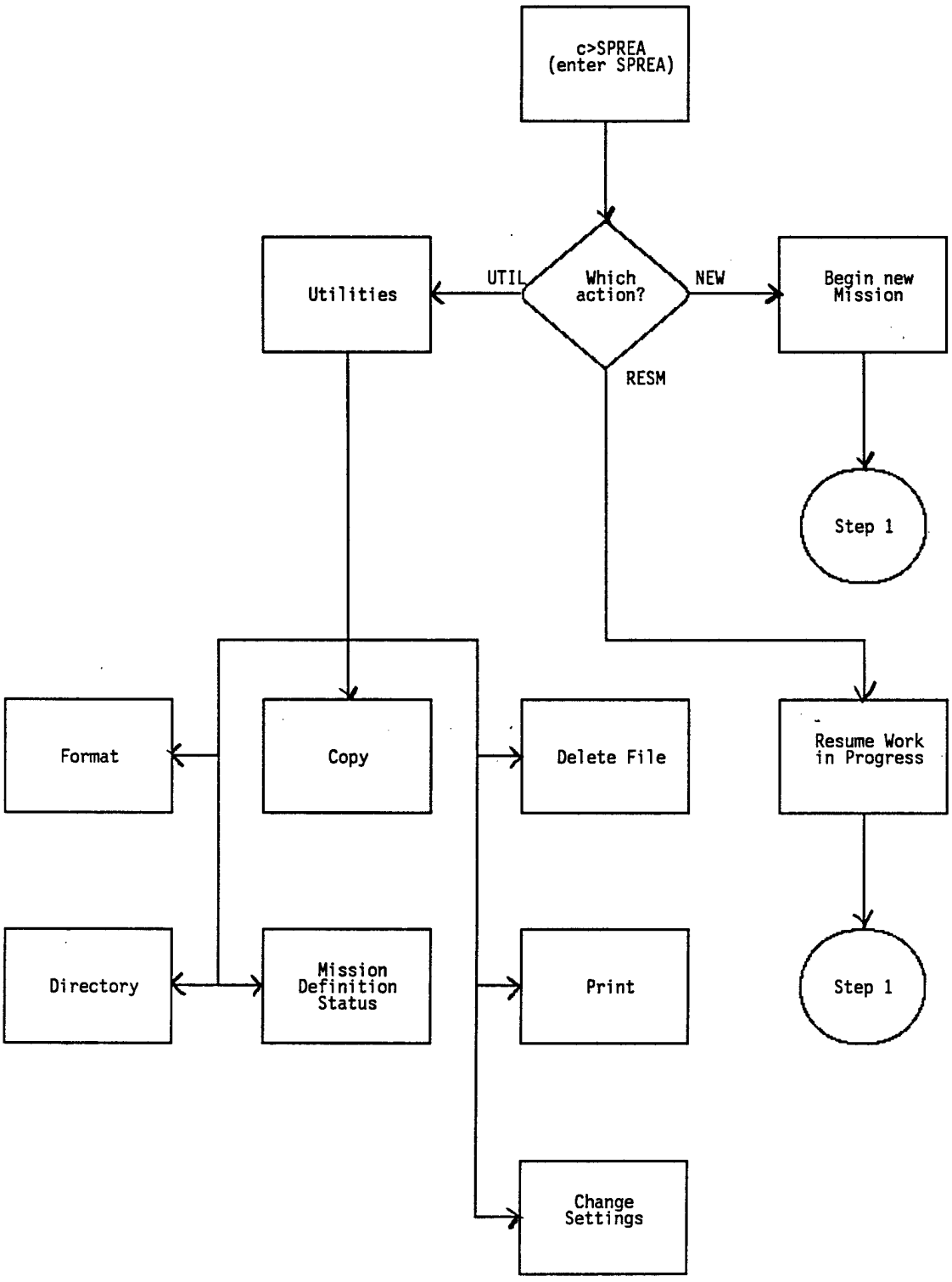
The user interfaces which apply to this step are described in detail on the following pages. Please note that the screen numbers are coded in the following manner:

All screens for Step 0 are labeled "Screen 0.X"
All screens for Step 1 are labeled "Screen 1.X"
etc.

This numbering scheme is intended to make it easier to

identify the sequence of screens within the SPREA user interface discussion.

STEP 0: Entering SPREA



Screen 0.1 - Access the SPREA Application by typing "SPREA" at the C> prompt.

User Action: Use the keyboard to type "SPREA"

Input Files: sprea.exe

Output Files: None

Algorithms: None

Following Screen: Screen 0.2. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If "SPREA" is misspelled or the application has not been installed, the system will respond "File not found", and will return the user to the C> prompt.

Screen 0.2 - Begin using the SPREA system.

User Action: Press carriage return to enter SPREA, press escape to exit.

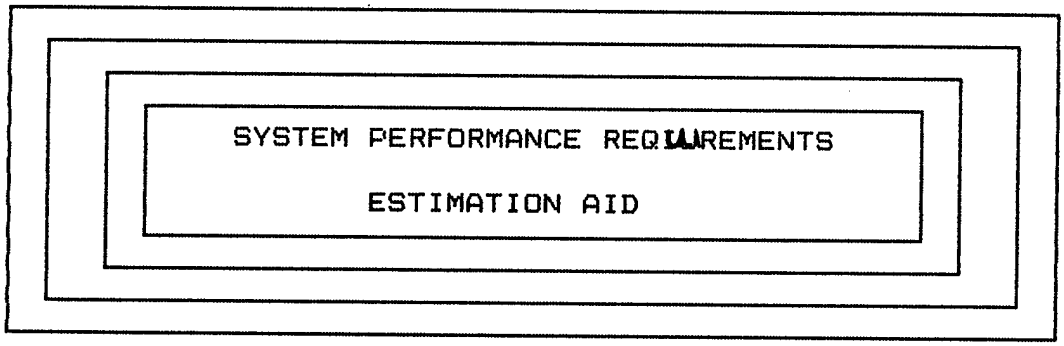
Input Files: None

Output Files: None

Algorithms: None

Following Screen: If carriage return, Screen 0.3. If escape, exit to C>. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If the user presses any key other than carriage return, escape, or F1, then "Please press 'carriage return' or 'escape'."



Press (Enter ⏎) to continue or (Esc) to quit

Screen 0.3 - SPREA Main Menu

User Action: Use the arrow keys to move the highlight bar, use the carriage return to select one of the listed options.

Input Files: None

Output Files: None

Algorithms: None

Following Screen: If the user selects "Begin work on new system then Screen 1.7. If the user selects "Resume work on existing system, then Screen 1.1. If the user selects "Utilities" then Screen 0.4. If the user selects "quit" then Screen 0.2. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not an arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key."

PATH: SPREA MODE: WORK

SPREA Main Menu
1. Begin work on a new system 2. Resume work on an existing system 3. Utilities

Screen 0.4 - Select the utility function that is desired.

User Action: Use the arrow keys to move the highlight bar, use the carriage return to select one of the listed options.

Input Files: None

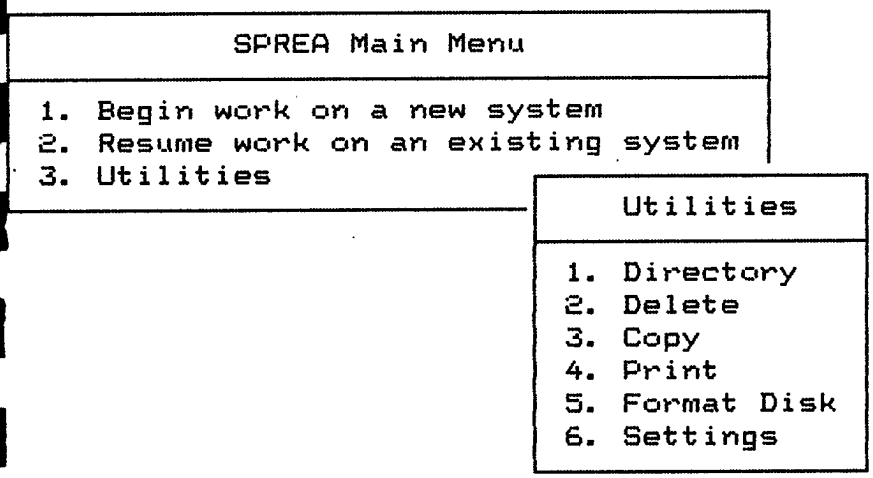
Output Files: None

Algorithms: None

Following Screen: If "Format", Screen 0.5. If "Copy", Screen 0.6. If "Delete", Screen 0.7. If "Directory", Screen 0.8. If "Settings", Screen 0.9. If "Print", Screen 0.10. If "escape", Screen 0.3. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a vertical arrow, carriage return, or F1) "Please use the arrow keys to move the highlight bar, select an option by pressing the return key."

PATH: SPREA>UTILITIES MODE: WORK



Screen 0.5 - Format Diskette

User Action: The system will prompt the user to place the new diskette in drive A, and press any key to begin formatting. After the format is complete, the system will ask the user whether he/she wishes to "format another? (y/n)". The user will respond "y", "Y", "n", or "N".

Input Files: Command.com, Format.com

Output Files: None

Algorithms: None

Following Screen: After the format is complete, if the user chooses to format another, Screen 0.5. If the user indicates he/she does not want to format another, Screen 0.6. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed in response to the "format another?" prompt (i.e., not "y", "Y", "n", or "N"), then "Please press "Y" or "N. (Return to Continue)"

PCEA)UTILITIES)FORMAT MODE: WORK

FORMAT DISK

Enter disk to be formatted in drive A: and press (CR) when ready

Disk Formatting ..... completed

Format another disk (Y/N)

Screen 0.6 - Copy File

User Action: The system will prompt the user to enter the name of the source file, then enter the name of the target file. The user will input the file names using the keyboard.

Input Files: Command.com, Copy.com, yyyyyyyy.yyy = the source file

Output Files: xxxxxxxx.xxx = the target file

Algorithms: None

Following Screen: Screen 0.4. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If the source file can not be located in the directory, then "File not found. (Return to Continue)". If the target filename is an illegal DOS file name (see DOS file naming rules), then "Illegal file specification. (Return to Continue".

Screen 0.7 - Delete File

User Action: The system will prompt the user to enter the DOS path name of the file that he/she wishes to delete. Then the user will respond to the "Are you sure? (y/n)" prompt.

Input Files: Command.com, Delete.com, yyyyyyyy.yyy = the file the user wishes to delete.

Output Files: None

Algorithms: None

Following Screen: Screen 0.4. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If the file can not be located in the directory, then "File not found. (Return to Continue)". If an inappropriate key is pressed in response to the "Are you sure?" prompt (i.e., not "y", "Y", "n", or "N"), then "Please press 'Y' or 'N'. (Return to Continue)".

Screen 0.8 - Directory

User Action: The system will ask the user to identify the path name of the files for which the user wants the directory listing. The system will present the default directory, the user will press the carriage return if the default directory is the correct directory. If it is not, the user will use the keyboard to enter the correct path name.

Input Files: Command.com, dir.com.

Output Files: None

Algorithms: None

Following Screen: Screen 0.4. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If the directory can not be located, then "File not found. (Return to Continue)". If the entered directory is an illegal DOS path name (see DOS file naming rules), then "Illegal path specification. (Return to Continue)".

ATH: SPREAD UTILITIES>DIRECTORY MODE: WORK

CURRENT SYSTEM STATUS AND MISSION IDENTIFICATION		
System Name: apache IV		
Mission Name	Date Created	Percent Completed
Destroy Enemy Troops	02/03/87	100
Destroy Enemy Fixed Emplacements	02/10/87	35
Destroy Enemy Helicopters	02/11/87	54

Screen 0.9 - Settings

User Action: The system will ask the user to identify the correct SPREA settings. This consists of identifying foreground and background colors for all of the menu and command bar structures. The user will be able to revert to the default settings at any time.

Input Files: None

Output Files: None

Algorithms: None

Following Screen: Screen 0.4. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: None

Screen 0.10 - Print

User Action: The system will prompt the user to enter the DOS path name of the file that he/she wishes to print.

Input Files: Command.com, Print.com, yyyyyyyy.yyy = the file the user wishes to print. The file will be printed to "prn:"

Output Files: None

Algorithms: None

Following Screen: Screen 0.4. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If the file can not be located in the directory, then "File not found. (Return to Continue)".

PCEA>UTILITIES>PRINTING MODE: WORK

DIRECTORY

ARMOR.SPC	2157	09/25/87
CHOPPER.SPC	1867	09/01/87
HOWITZR.SPC	10163	07/30/87
TRUCK1.DOC	810	05/09/87
TRUCK.DOC	1017	05/11/87

Select file to print using cursor controls then press <CR> when ready...

3.1 Step 1 - Define the System and Identify the Mission

In this step, the user will identify the mission area, system type, system name and mission name that he/she wishes to study. The analyst may also identify a comparable mission from the "Missions by System Type" Library which is similar to the mission the user wants to build. If a comparable mission is identified, then that entire mission description (including the functions, tasks, conditions, RAM, and performance criteria) will be copied into the working space of the new mission. In latter steps of this process, the user will then add, modify, or delete the elements of the comparable mission to customize it to fit the new system.

Input

The primary input will be the "Missions by System Type" Library from which the user can call up the missions typically associated with the system type of the system he or she is studying. The user will also have knowledge of the mission area, system type, system name, and mission name he/she wishes to study.

External. The user will probably want to modify the mission selected from the library, based on available system documentation and/or knowledge about the system he or she is analyzing.

Internal. The internal input consists of the "Missions by System Type" Library and the list of system types that have been entered into the SPREA. The "Missions by System Type" Library will contain representative mission statements classified within different mission areas and system types. The "Missions by System Type" Library is discussed in Section 4, page ????.

Process

The SPREA will prompt the user to identify the mission area, system type and system name of the system he/she is analyzing. After the user enters this information, the SPREA will search the "Missions by System Type" Library to determine whether there are any missions currently in the library which have been developed for this system. If there are, then the SPREA will present this list of missions to the user and ask the user whether he/she wishes to select one of the existing missions to resume work in progress, or whether he/she would like to develop an additional mission for the system. If the system is not currently in the "Missions by System Type" Library, then the SPREA will inform the user that this is a new system.

Next, the SPREA will ask the user to enter the name of the new mission which he/she wishes to analyze. Finally, the SPREA will ask the user if there might be a mission description which is currently in the "Missions by System Type" Library which he/she would like to use as a starting point for the new mission description. This selection of a comparable mission from the library will be aided by the SPREA presenting the library listing by system type. If the user can not identified a comparable mission within the system type, the SPREA will present all of the missions in the library which are in the same mission area. If the user still can not identified a comparable mission, then the user can view the entire "Missions by System Type" Library. If the user fails to identify a comparable mission, then in all of the succeeding steps of the SPREA process, the input forms will be blank. If the user is able to identify a comparable mission, then all of the input forms for the succeeding steps will present the data from the comparable mission as default data.

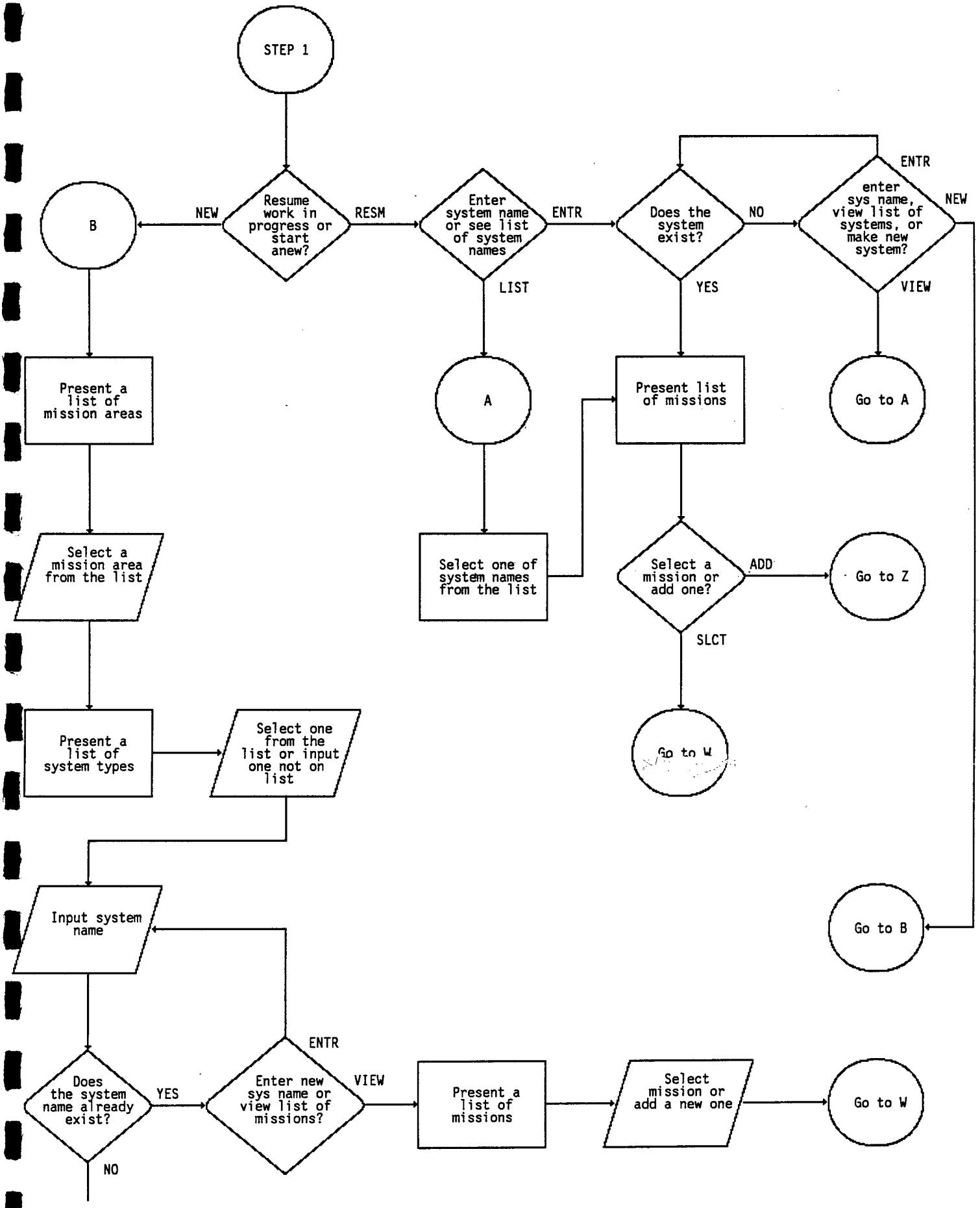
Output

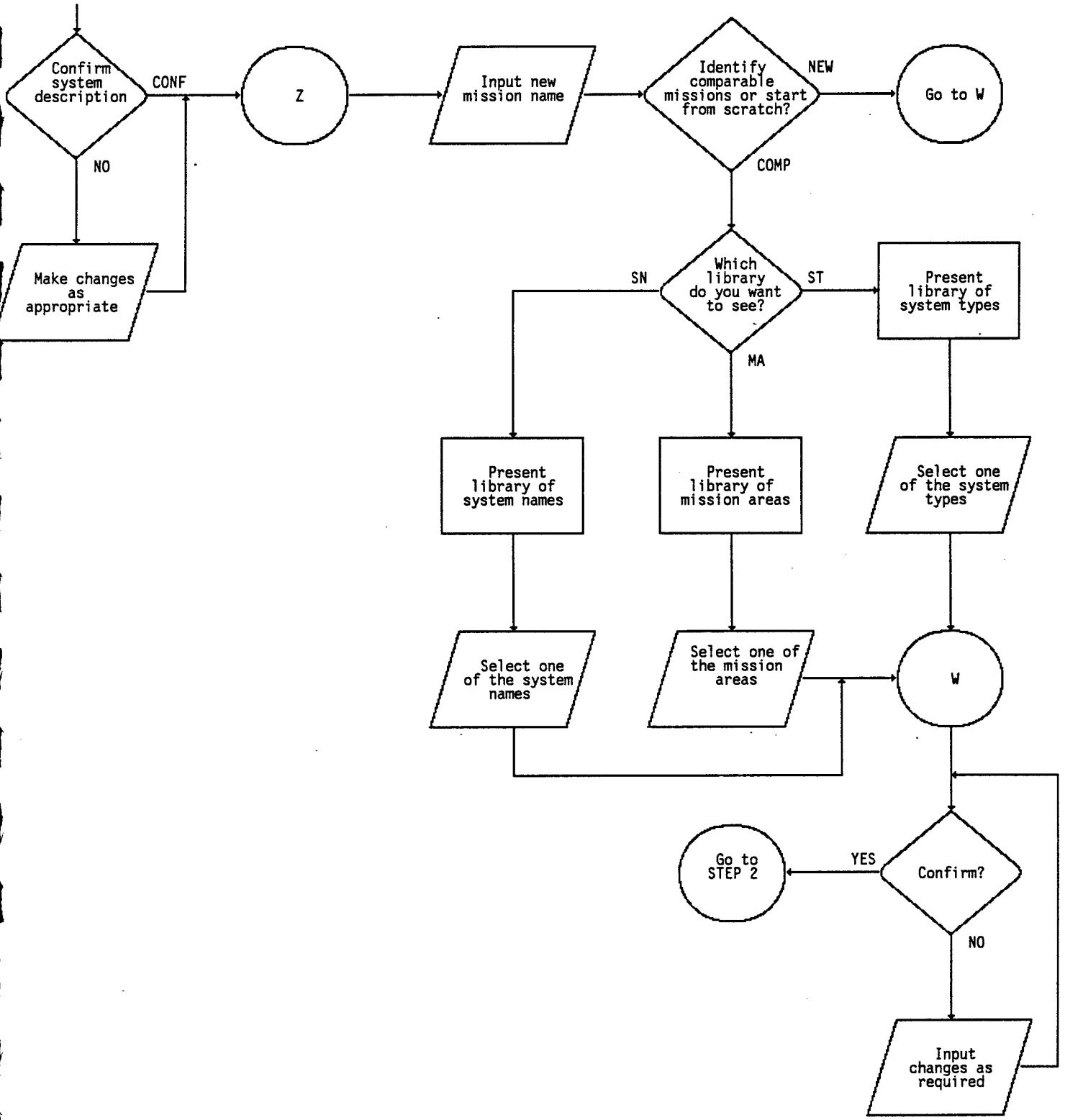
The output of this step will be the identification of the mission area, system type and system name of the system the user wishes to analyze. Also, the name of the mission that the user wishes to describe will be an output. In most cases, the user will also have identified a comparable mission from the SPREA "Missions by System Type" Library.

User Interface

The user interface for this step is described in detail on a screen-by-screen basis.

Step 1: Define System / Identify Mission




Confirm system description
CONF
NO
Z
Input new mission name
Identify comparable missions or start from scratch?
NEW
Go to W
COMP
Make changes as appropriate
Which library do you want to see?
SN
ST
MA
Present library of system types
Present library of system names
Present library of mission areas
Select one of the system types
Select one of the system names
Select one of the mission areas
W
Confirm?
YES
Go to STEP 2
NO
Input changes as required

Screen 1.1 - Begin using the SPREA to set performance criteria. The user will choose to either enter the system name, or get a listing of all the systems which have SPREA files.

User Action: Use the arrow keys to move the highlight bar, use the carriage return to select one of the listed options.

Input Files: None

Output Files: None

Algorithms: None

Following Screen: If the user chooses "Enter the system name" then Screen 1.2, if "Get a listingof the existing systems" then Screen 1.2.1, if the user presses "escape" then Screen 0.3. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not an arrow, carriage return, escape, or F1) then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key."

PATH: SPREA>RESUME>SYSTEM MODE: WORK

SPREA Main Menu

1. Begin work on a new system
2. Resume work on an existing system
3. Perform

1 Enter the system name
2 Get listing of the existing systems

Screen 1.2 - Enter the system name. The SPREA will prompt the user. System name will be entered via the keyboard.

User Action: Use the keyboard to enter the system name

Input Files: The SPREA DBMS search routines will be used to search the system names that are currently encoded in the file "systems.dat" to verify that this system name currently exists in the SPREA library.

Output Files: None

Algorithms: A standard forward-search algorithm will be employed to search systems.dat.

Following Screen: If the system is entered in systems.dat, Screen 1.3. If the system is not currently in systems.dat, then Screen 1.6. If "escape", then Screen 0.3. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: None

PATH: SPREA>RESUME>SYSTEM MODE: WORK

SPREA Main Menu

1. Begin work on a new system
2. Resume work on an existing system
3. Perform

1 Enter the system name apache
2 Get listing of the existing systems

Screen 1.2.1 - Get a listing of existing systems. The user will be able to move the highlight bar to select one of the systems listed.

User Action: Use the vertical arrow keys to select a system name, or escape to exit from the screen

Input Files: The SPREA DBMS retrieval routines will be used to retrieve the system names that are currently encoded in the file "systems.dat."

Output Files: None

Algorithms: None

Following Screen: If a system is selected, Screen 1.3. Otherwise, Screen 1.2. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: None

PATH: SPREA) RESUME) SYSTEM MODE: WORK

Select

Select the highlighted system

EXISTING SPREA SYSTEMS		
Mission Area	System Type	System Name
Air defense	rear operations a.d.	---
	forward area a.d.sys. mobile gun systems	---
	man-portable systems	stinger II
	other	---
Aviation	attack helicopter	apache IV LHX
	cargo helicopter	huey III
	utility helicopter	---
	scout helicopter	---

Screen 1.3 - The SPREA will present the list of missions to the user. The user will be asked either "Add", "Select", "Delete", "Copy", or "Move" with a menu bar which is at the top of the menu. The prompt "Select one of the above options" will appear at the bottom of the menu.

User Action: Use the arrow keys to move the highlight bar horizontally across the menu bar, use the carriage return to select one of the listed options.

Input Files: The DBMS data retrieval software will retrieve the mission list from the XXXXXXXX system file.

Output Files: None

Algorithms: None

Following Screen: If the user chooses to "Add", then Screen 1.5. If the user chooses to "Select", then Screen 1.4. If the user chooses to "Quit" or "escape" then Screen 0.3. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a horizontal arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key."

PATH: SPREA) RESUME) SYSTEM

MODE: WAIT

SPREA is now retrieving the files for the specified system.

When this process completes the system status will be displayed.

You will identify missions to be developed for this system from the status screen.

PATH: SPREA>RESUME>SYSTEM>MISSION MODE: WORK

Select Add Delete Copy Move

Select this item

CURRENT SYSTEM STATUS AND MISSION IDENTIFICATION		
System Name: apache IV		
Mission Name	Date Created	Percent Completed
Destroy Enemy Troops	02/03/87	100
Destroy Enemy Fixed Emplacements	02/10/87	35
Destroy Enemy Helicopters	02/11/87	54

Screen 1.4 - The highlighted menu bar is now placed at the first mission in the mission list. The prompt "Select one of the above options" will appear at the top of the menu.

User Action: Use the arrow keys to move the highlight bar vertically through the mission list, use the carriage return to select one of the listed options.

Input Files: None

Output Files: If the user selects one of the missions, then the mission name will be appended to the file temp.dat.

Algorithms: None

Following Screen: If the user selects one of the missions, then Screen 1.32. If "escape" then Screen 1.3. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a verical arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key."

PATH: SPREA>RESUME>SYSTEM>MISSION MODE: WORK

Select Add Delete Copy Move

Select this item

CURRENT SYSTEM STATUS AND MISSION IDENTIFICATION		
System Name: apache IV		
Mission Name	Date Created	Percent Completed
Destroy Enemy Troops	02/03/87	100
Destroy Enemy Fixed Emplacements	02/10/87	35
Destroy Enemy Helicopters	02/11/87	54

Screen 1.5 - The highlighted menu bar is now placed at a blank line positioned under the last mission in the mission list. The prompt "Input the new mission name" will appear at the bottom of the menu.

User Action: Use the keyboard to enter the new mission name.

Input Files: None

Output Files: The new mission name will be appended to the file temp.dat.

Algorithms: None

Following Screen: Screen 1.15. If "escape" then Screen 1.3. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not an alpha-numeric character, carriage return, or F1), then "Please use enter the new mission name and press the carriage return."

ATH: SPREA)RESUME)SYSTEM)MISSION MODE: WORK
elect Add Delete Copy Move
Add a new item to the list

CURRENT SYSTEM STATUS AND MISSION IDENTIFICATION		
System Name: apache IV		
Mission Name	Date Created	Percent Completed
Destroy Enemy Troops	02/03/87	100
Destroy Enemy Fixed Emplacements	02/10/87	35
Destroy Enemy Helicopters	02/11/87	54

Screen 1.6 - Inform the user that the system name he/she specified in Screen 1.2 does not have an existing description in the SPREA data files.

User Action: The user will receive the message "The named system name does not exist". The user will use the arrow keys to select the next action. The user can either enter a new system name, view the listing of current systems, or make this a new system.

Input Files: None

Output Files: None

Algorithms: None

Following Screens: If the user chooses to enter a new name, then Screen 1.2. If the user chooses to view the listing of current systems, then Screen 1.2.1. If the user wishes to make this a new system, then Screen 1.7. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If the user enters anything other than a carriage return, then the system will respond "Please press the carriage return."

ATH: SPREA> RESUME> SYSTEM MODE: WORK

SPREA Main Menu

1. Begin work on a new system
2. Resume work on an existing system
3. Perform

1 Enter the system name apache
2 Get listing of the existing systems

The named system does not exist

1. Enter a new name
2. View the listing of current systems
3. Make this a new system

Screen 1.7 - Select mission area from the list that is presented

User Action: Use the vertical arrow keys to move the highlight bar to select the specific mission area of choice. The user will press the carriage return to complete the entry.

Input Files: None

Output Files: Append the selected mission area to temp.dat

Algorithms: None

Following Screen: Screen 1.11 unless the user presses "escape". If "escape" then Screen 1.2. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a vertical arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key"

PATH: SPREA>NEW>AREA

MODE: WORK

SPREA Main Menu

1. Begin work on a new system
2. Resume work on an existing system
3. Utilities

Select a Mission Area

1. Air defense
2. Aviation
3. Close combat, heavy
4. Close combat, light
5. Combat service support
6. Combat support, engineer, mine warfare
7. Command and control
8. Communications
9. Fire support
10. Intelligence and electronic warfare
11. NBC
12. Special operations

Screen 1.11 - Identify system type by examining the list that is presented.

User Action: Use the vertical arrow keys to move the highlight bar to select the specific system type of choice. The user will press the carriage return to complete the entry. If the user needs to add a new system type, he/she will choose the last option on the list "Add a new system type."

Input Files: None

Output Files: Append the selected system type to temp.dat

Algorithms: None

Following Screen: Screen 1.15 unless the user chooses to add a new system type, then Screen 1.13. If "escape" then Screen 1.7. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a vertical arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key"

PATH: SPREA)NEW)AREA)SYSTYPE MODE: WORK

Mission Area: Aviation
Select a System Type
1. Attack helicopter 2. Cargo helicopter 3. Utility helicopter 4. Scout helicopter 5. Fixed wing 6. Add a new system type

Screen 1.13 - Enter a new system type

User Action: The SPREA will prompt the user to enter a new system type. The user will use the keyboard to enter the new system type. The user will press the carriage return to complete the entry.

Input Files: None.

Output Files: None

Algorithms: None

Following Screen: Screen 1.15. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements:

PATH: SPREA>NEW>AREA>SYSTYPE MODE: WORK

Mission Area: Aviation
Select a System Type
1. Attack helicopter 2. Cargo helicopter 3. Utility helicopter 4. Scout helicopter 5. Fixed wing 6. Add a new system type

Enter the name of the new system type:

Screen 1.15 - Enter the system name. The SPREA will prompt the user. System name will be entered via the keyboard.

User Action: Use the keyboard to enter the system name.

Input Files: The SPREA DBMS search routines will be used to search the system names that are currently encoded in the file "systems.dat" to verify that this system name is new.

Output Files: Append the system name to temp.dat

Algorithms: None

Following Screen: If the system is new, Screen 1.22. If the system is not new, then Screen 1.16. If "escape", then Screen 1.11. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements:

PATH: SPREA) NEW) AREA) SYSTYPE) SYSNAME MODE: WORK

Mission Area: Aviation
Select a System Type
1. Attack helicopter 2. Cargo helicopter 3. Utility helicopter 4. Scout helicopter 5. Fixed wing 6. Add a new system type

Enter the new system name:

Screen 1.16 - The system name which the user entered is not new. The system will query the user on whether he/she wants to view the missions that are in the library for this system name, or to enter a different system name.

User Action: Use the keyboard to respond to the system prompt. The SPREA will ask, "This system name currently exists. Do you wish to : Enter a different name, or View the missions for this sytem name".

Input Files: The SPREA DBMS search routines will be used to search the system names that are currently encoded in the file "systems.dat" to verify that this system name is new.

Output Files: Append the system name to temp.dat

Algorithms: None

Following Screen: If the user wants to view missions already entered for this system, then Screen 1.17. If he/she wants to enter a new system name, then Screen 1.15. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a vertical arrow key or a carriage return, or F1), then "Please press the arrow keys, then the carriage return. (Return to Continue)".

PATH: SPREA) NEW) AREA) SYSTYPE) SYSNAME MODE: WORK

Mission Area: Aviation

Select a System Type

1. Attack helicopter
2. Cargo helicopter
3. Utility helicopter
4. Scout helicopter
5. Fixed wing
6. Add a new system type

Enter the new system name: LHX

This system name currently exists.
Do you wish to:

1. Enter a different name
2. View the missions for this system name

Screen 1.17 - The mission list is presented. The user can return to the new system definition and enter a new name or resume work on this system.

User Action: Use the vertical arrow keys to move the highlight bar to select an option. Select the option by pressing the carriage return.

Input Files: The list of missions will be retrieved from the "Missions by System Type" Library.

Output Files: None

Algorithms: None

Following Screen: Screen 1.15 if entering a new system name. Screen 1.3 if resuming work on the existing system. If "escape" then Screen 1.15. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a horizontal arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key"

PATH: SPREA)NEW)AREA)SYSTYP)SYSNAME)VIEW MODE: WORK

System Name: LHX
System Type: Attack helicopter
Mission Area: Aviation

Missions

Perform Reconnaissance
Delay/Suppress Enemy Activity
Destroy Enemy Troops

You may do one of the following:

1. Return to the new system definition and enter a new name

2. Resume work on this system

Screen 1.21 - Ask the user at which point he/she wishes to resume work on the system. The mission area, system type, and system name which the user has selected will be presented. The user will also be shown the mission name and the comparable mission which was selected (when the user first began defining the new mission).

User Action: The user will respond to the prompt by identifying which point he/she wishes to resume work. The user will press escape if he/she wishes to return to the mission status listing.

Input Files: The mission area, system type, and system name will be retrieved from the SPREA system file.

Output Files: If verified correct, the data will be stored in working.dat.

Algorithms: None

Following Screens: If the user wishes to resume at "define conditiosn" then Screen 2.0. If the user wishes to resume at "set mission level criteria", then Screen 3.1. If the user wishes to resume at "define system RAM", then Screen 4.1. If the user wishes to identify functions, then Screen 5.1. If the user wishes to define the function sequence, then Screen 6.1. If the user decides to weight the function accuracies, then Screen 7.1. If the user wishes to execute the function, then Screen 10.1. If the user wishes to receive a report on the last execution run, then Screen 11.1. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements:

PATH: SPREA> RESUME> SYSTEM> MISSION MODE: WORK

Mission Area	: Aviation
System Type	: Attack helicopter
System Name	: Apache IV
Mission	: Destroy Enemy Arm Veh.
Comparable Mission	: Destroy Enemy Fixed Emplacements

At what point do you wish to resume work?

1. Define conditions
2. Set mission level criteria
3. Define system RAM
4. Identify functions
5. Define function sequence
6. Weight function accuracies
7. Execute
8. Report

Screen 1.22 - Verify the system description. The mission area, system type, and system name which the user has selected will be presented.

User Action: The user will respond to the prompt by selecting either "Confirm", "Change mission area", "Change system type", or "Change system name".

Input Files: The mission area, system type, and system name will be retrieved from temp.dat

Output Files: If verified correct, the data will be stored in working.dat.

Algorithms: None

Following Screens: If the user verifies the information, then Screen 1.25. If the user says the information is incorrect, then Screen 1.24. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements:

PATH: SPREA> NEW> AREA> SYSTYPE> SYSNAME MODE: WORK

NEW SYSTEM DEFINITION
Mission Area : Aviation System Type : Attack helicopter System Name : LHX
1. Confirm 2. Change mission area 3. Change system type 4. Change system name

Screen 1.23 - Correct the information in Screen 17. The user will be asked to identify which of the fields contain incorrect information.

User Action: Use the arrow keys to move the highlight bar, use the carriage return to select the field he wishes to change.

Input Files: None

Output Files: Write the changes to temp.dat

Algorithms: None

Following Screen: If the user selects "mission area", then the following screen is Screen 1.7. If the user selects "system type" then the following screen is Screen 1.11. If the user selects "system name", then the following screen is Screen 1.15. If the user presses "escape", then Screen 1.21. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not an arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key".

Screen 1.24 - Correct the information in Screen 1.22. The user will be asked to identify which of the fields contain incorrect information.

User Action: Use the arrow keys to move the highlight bar, use the carriage return to select the field he wishes to change.

Input Files: None

Output Files: Write the changes to temp.dat

Algorithms: None

Following Screen: If the user selects "mission area", then the following screen is Screen 1.7. If the user selects "system type" then the following screen is Screen 1.11. If the user selects "system name", then the following screen is Screen 1.15. If the user chooses "mission name", then Screen 1.17. If the user presses "escape", then Screen 1.22. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to .return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not an arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key".

Screen 1.25 - Enter the name of the new mission for which the user wants to define system performance requirements.

User Action: Use the keyboard to enter the mission name

Input Files: The SPREA DBMS search routines will be used to search the mission names, if any, that are currently encoded in the "Missions by System Type" Library for this system name.

Output Files: Append the mission name to temp.dat

Algorithms: None

Following Screen: Screen 1.26. If the user presses "escape", then Screen 1.21. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If the mission name is found in the "Missions by System Type" Library under the entered system name, then "The mission YYYYYYYYY YYYYYYY YYYYYY is already entered for the system XXXXX. (Return to Continue)".

PATH: SPREA)NEW)AREA)SYSTYPE)SYSNAME)MISSION MODE: WORK

Enter Mission Name: Destroy Enemy Armored Vehicles

PATH: SPREA) NEW) AREA) SYSTYPE) SYSNAME) MISSION

MODE: WORK

MISSION DEFINITION
Mission Area : Aviation System Type : Attack helicopter System Name : LHX Mission : Destroy Enemy Armored Vehicles
1. Define mission from scratch 2. Define mission using a comparable mission

Screen 1.26.1 - Query the user on the library which he/she wishes to view for selection of a comparable mission.

User Action: Use the vertical arrow keys to move the highlight bar to select "System Type", or "Mission Area". Select the option by pressing the carriage return.

Input Files: None.

Output Files: None

Algorithms: None

Following Screen: Screen 1.29 if "system type". Screen 1.30 if "mission area." If the user presses "escape" then Screen 1.26. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a horizontal arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key"

PATH: SPREA) NEW) AREA) SYSTYPE) SYSNAME) MISSION

MODE: WORK

MISSION DEFINITION
Mission Area : Aviation System Type : Attack helicopter System Name : LHX Mission : Destroy Enemy Armored Vehicles
1. Define mission from scratch 2. Define mission using a comparable mission

Select a comparable mission from those missions with the same:

1. System type
2. Mission area

Screen 1.29 - Present a list of missions that exist in the libraries under the same system type, (if any).

User Action: Use the vertical arrow keys to move the highlight bar to select a mission.

Input Files: The DBMS retrieval routines will be used to access the mission library and retrieve all the missions entered under the system type entered in Screen 1.21. The mission performance time and accuracy will also be retrieved from the mission library.

Output Files: None

Algorithms: None

Following Screen: Screen 1.32. If the user presses "escape" then Screen 1.26. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a horizontal arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key"

PATH: SPREA)NEW)AREA)SYSTYPE)SYSNAME)MISSION MODE: WORK

Select

Select the highlighted mission

MISSIONS FOR SYSTEM TYPE : Attack helicopter
Destroy Enemy Troops Destroy Enemy Fixed Emplacements Destroy Enemy Helicopters Delay/Suppress Enemy Activity Escort/Screen Friendly Forces

Screen 1.30 - Present a list of missions that exist in the libraries under the same mission area, (if any).

User Action: Use the vertical arrow keys to move the highlight bar to select a mission.

Input Files: The DBMS retrieval routines will be used to access the "Missions by System Type" Library and retrieve all the missions entered under the mission area entered in Screen 1.25. The mission performance time and accuracy will also be retrieved from the "Missions by System Type" Library.

Output Files: None

Algorithms: None

Following Screen: Screen 1.32. If the user presses "escape" then Screen 1.26. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a horizontal arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key"

Screen 1.32 - A mission name has been selected, and if desired a comparable mission has been selected from the "Missions by System Type" Library. In this screen, the user will confirm his choices.

User Action: Use the horizontal arrow keys to move the highlight bar to select "confirm", "change mission name", or "change comparable mission". Select the option by pressing the carriage return.

Input Files: None

Output Files: None

Algorithms: None

Following Screen: Screen 2.0 if "Confirm". Screen 1.26.1 if "change comparable mission". Screen 1.25 if "change mission name". If the user presses "escape" then Screen 1.26. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a horizontal arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key"

PATH: SPREA) NEW) AREA) SYSTYPE) SYSNAME) MISSION

MODE: WORK

MISSION DEFINITION
Mission Area : Aviation System Type : Attack helicopter System Name : LHX Mission Name : Destroy Enemy Arm. Veh. Comparable Mission : Destroy Enemy Fixed Emplacements
1. Confirm 2. Change mission name 3. Change comparable mission

3.2 Step 2 - Identify Conditions

Knowledge of the tactical and environmental operating conditions of the system is necessary in order to simulate each function realistically. In this screen, the user will also be able to select different tactical and environmental conditions from the conditions taxonomy.

Input

External. The conditions under which the new system will perform are also external inputs to this screen. As with other inputs that the user must supply, if the user is not sure of the specific values he or she will be able to try different values and study their effects to determine the model's sensitivity to assumptions regarding different tactical and environmental conditions.

Internal. The internal input also consists of a list of the conditions typically associated with different system types performing different missions. This data is supplied in the "Conditions by System Type" Library.

Process

The process of specifying conditions for the mission which is being analyzed is long. This is due to the fact that there is a very large set of conditions that could apply.

If the user has selected a comparable mission, then when he/she begins this step, the conditions connected with that mission description will be displayed as the default conditions for the new mission. The user will have an opportunity to change any of these conditions.

If the user has not specified a comparable mission, he/she will be presented with a set of "normal" conditions. This "normal" condition set will be retrieved from the "Conditions by System Type" Library. The user will be asked whether he/she wishes to change any of these conditions, or whether he/she wishes to begin over to specify a new condition set. If the user changes any of these conditions, or starts over, then the user will be asked to name the new condition set.

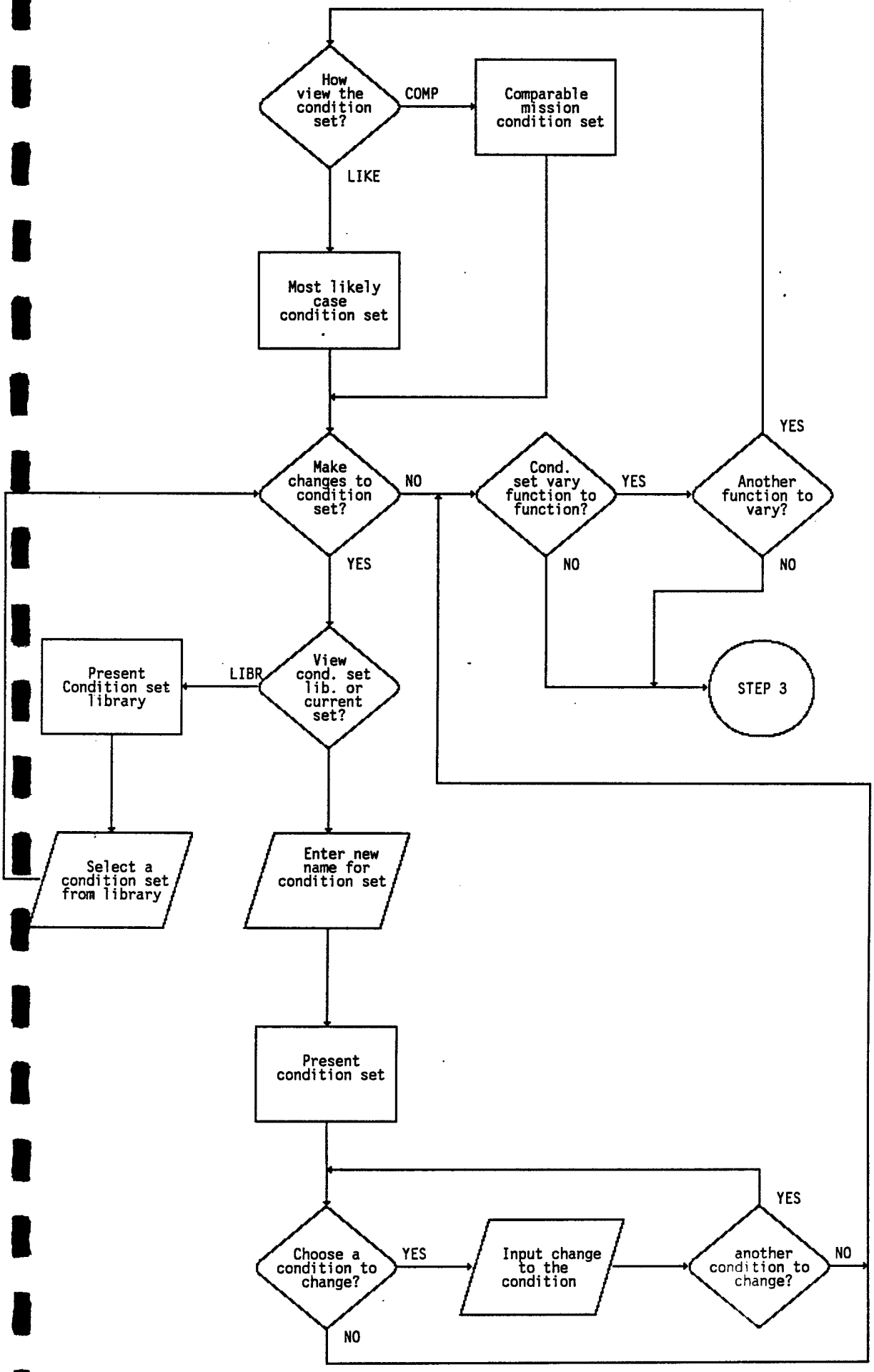
If the user decides to change a condition, then the SPREA will ask the user to indicate, using the highlight bar and arrow keys, which condition needs to be changed. The possible inputs for that condition will then be presented to the user for his/her selection.

If the user has indicated that he/she wishes to start over in specifying a condition set, then the SPREA will step through first the basic conditions, and then will ask the user whether he/she wishes to see any additional conditions (for specific condition list by system type, refer to Appendix C). The user will select the applicable conditions by moving the highlight bar using the arrow keys, and pressing the carriage return.

After the user has completed the mission condition specifications, the SPREA will ask the user whether the conditions will vary from function to function. For example, if the mission is a very long one, some of the functions may be undergone under "day" condition and others may be modeled under "night" condition. If the user indicates that the conditions may vary from function to function, then as the functions are specified in Step 4 of this process, the conditions which apply to that function will be presented and the user will be asked at that time whether any of the conditions should be changed.

User Interface

The user interface for this step is quite straightforward, however if the user indicates that he/she wishes to go through the entire condition library to specify conditions for the mission, then the process will be a long and tedious one.


How view the condition set?
COMP
Comparable mission condition set
LIKE
Most likely case condition set
Make changes to condition set?
NO
Cond. set vary function to function?
YES
Another function to vary?
YES
NO
NO
YES
Present Condition set library
LIBR
View cond. set lib. or current set?
STEP 3
Select a condition set from library
Enter new name for condition set
Present condition set
YES
Choose a condition to change?
YES
Input change to the condition
another condition to change?
NO
NO

Screen 2.0 - Ask the user whether he/she would like to use the the "normal" condition set for the specified system type, or other condition sets which are entered in the SPREA.

User Action: The user will use the move the horizontal arrow keys to indicate whether he/she wishes to start with the "normal" condition set, or whether he/she would lik,e to define or modify other condition sets.

Input Files: None

Output Files: None

Algorithms: None

Following Screen: If the user wants to examine the "typical case" condition set, the following screen is 2.1. If the user chooses to view the library of conditions, then the following screen is 2.0.1. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a horizontal arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key"

PATH: SPREA)CONDITIONS MODE: WORK

MISSION CONDITION SETS	
Mission Area	: Aviation
System Type	: Attack helicopter
System Name	: Apache IV
Mission Name	: Destoy Enemy Arm. Veh.
Comparable Mission	: Destroy Fixed Emplace.
Condition Set	:

1. Define/modify the typical case condition set
2. Define/modify other condition sets

Screen 2.0.1 - The user has indicated that he/she wishes to view the condition sets which are present in the library. In this step, the user will have the opportunity to select one of the listed sets.

User Action: The user will use the vertical arrow keys and the carriage return to select a condition set.

Input Files: "Conditions by System Type" Library

Output Files: None

Algorithms: None

Following Screen: Screen 2.1. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: None

PATH: SPREA>CONDITIONS>OTHER MODE: WORK

MISSION CONDITION SETS
Mission Area : Aviation System Type : Attack helicopter System Name : Apache IV Mission Name : Destoy Enemy Arm. Veh. Comparable Mission : Destroy Fixed Emplace. Condition Set :
1. Define/modify the typical case condition set 2. Define/modify other condition sets
1. Select from existing condition sets 2. Define a new condition set

ATH: SPREA>CONDITIONS>OTHER MODE: WORK
elect
Select highlighted item

EXISTING CONDITION SETS FOR Destroy Enemy Armored Vehicles

1. Typical
2. Worst case 1
3. Mideast
4. Mideast 2
5. European Theater
6. European Arctic
7. Add new set

Screen 2.1 - Retrieve and present the selected default condition set to the user. This may be the either the "normal" conditions for the specified system type, or it may be the condition set which applies to the comparable mission which was selected in Step 1.

User Action: None

Input Files: "Conditions by System Type" Library

Output Files: None

Algorithms: None

Following Screen: Screen 2.2. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: None

Screen 2.2 - Ask the user to select a condition category. The user can elect to accept the default condition set, thereby skipping the process of assigning conditions.

User Action: The user will use the move the vertical arrow keys to indicate which condition category he/she wishes to examine.

Input Files: None

Output Files: If the user elects to accept the current condition set, then the conditions will be written to the working file.

Algorithms: None

Following Screen: If the user indicates that he/she wishes to accept the condition set which is presented, by pressing escape, then the following screen is 3.0. If the user indicated that he/she wishes to modify the condition set by choosing a category, then the following screen is 2.5. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a horizontal arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key"

PATH: SPREA>CONDITIONS>TYPICAL MODE: WORK

MISSION CONDITION SETS
Mission Area : Aviation System Type : Attack helicopter System Name : Apache IV Mission Name : Destoy Enemy Arm. Veh. Comparable Mission : Destroy Fixed Emplace. Condition Set : Typical
1. Define/modify the typical case condition set 2. Define/modify other condition sets
1. Environmental 2. Terrain 3. Target/threat related 4. Friendly force related

Screen 2.6 - As the user indicates that a condition must be changed, the condition library will present the possible options for the selected condition.

User Action: The user will use the vertical arrow keys to select the new condition setting. After the highlight bar has been positioned over the appropriate menu item, the user will use the carriage return to select the option.

Input Files: The "Conditions by System Type" Library will be used to identify the appropriate condition settings for a given condition subset (i.e., environmental, tactical).

Output Files: As the user selects new condition settings, they will be written to the working file. The condition settings will be filed under the new condition set name.

Algorithms: None

Following Screen: Screen 2.5. If the user presses escape, then 2.5. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a vertical arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key"

PATH: SPREA>CONDITIONS>TYPICAL>ENV MODE: WORK

BASIC ENVIRONMENTAL CONDITIONS	
1. Day/Night	: Day
2. Visibility Type	: Clear
3. Climate Type	: Basic/Cold
4. Electromagnetic Hazards (with/without)	: without
5. Flight rules	: visual
6. Altitude	: 200 feet
7. Additional conditions	

PATH: SPREA>CONDITIONS>TYPICAL>ENV MODE: WORK

Select Add Delete Copy Move

Select this item

BASIC ENVIRONMENTAL CONDITIONS		
1. Day/Night	: Day	
2. Visibility Type	: Clear	1. Clear
3. Climate Type	: Basic/C	2. Fog
4. Electromagnetic Hazards (with/without)	: without	3. Haze
5. Flight rules	: visual	4. Smoke
6. Altitude	: 200 fee	
7. Additional conditions		

PATH: SPREA>CONDITIONS>TYPICAL>ENV MODE: WORK

Select Add Delete Copy Move

Select this item

BASIC ENVIRONMENTAL CONDITIONS	
1. Day/Night	: Day
2. Visibility Type	: Clear
3. Climate Type	: Basic/Cold
4. Electromagnetic Hazards (with/without	
5. Flight rules	
6. Altitude	
7. Additional conditions	

1. Hot/Dry
2. Hot/Humid
3. Basic/High Humid
4. Basic/Hot
5. Basic/Cold
6. Cold
7. Severe Cold

PATH: SPREA>CONDITIONS>ENV>ADDITIONAL MODE: WORK

ADDITIONAL ENVIRONMENTAL CONDITIONS			
1. Special Environments	:	None	
2. Wind Direction - Type	:	No wind	
3. Wind Direction - Measured	:	0	mils from gun azimuth
4. Wind Velocity	:	0	miles/hour
5. Pressure	:	1013	millibars
6. Temperature	:	70	degrees Fahrenheit
8. Precipitation	:	Clear	
9. Visibility	:	10,000	meters

PATH: SPREA>CONDITIONS>ENV>ADDITIONAL MODE: WORK

Select Add Delete Copy Move

Select this item

ADDITIONAL ENVIRONMENTAL CONDITIONS		
1. Special Environments	: None	1. None
2. Wind Direction - Type	: No wind	2. Mountain
3. Wind Direction - Measured	: 0	3. Jungle
4. Wind Velocity	: 0	4. Desert
5. Pressure	: 1013	5. Winter
6. Temperature	: 70	6. Amphibious
8. Precipitation	: Clear	
9. Visibility	: 10,000	

PATH: SPREA>CONDITIONS>ENV>ADD MODE: WORK

Select Add Delete Copy Move

Select this item

ADDITIONAL ENVIRONMENTAL CONDITIONS		
1. Special Environments	: None	
2. Wind Direction - Type	: No wind	
3. Wind Direction - Measured	: 0	
4. Wind Velocity	: 0	
5. Pressure	: 1013	
6. Temperature	: 70	
8. Precipitation	: Clear	
9. Visibility	: 10,000	

1. No wind	muth
2. Headwind	
3. Tailwind	
4. Cross wind	t

PATH: SPREA>CONDITIONS>ENV>ADD MODE: WORK
Select Add Delete Copy Move
Select this item

ADDITIONAL ENVIRONMENTAL CONDITIONS		
1. Special Environments	: None	
2. Wind Direction - Type	: No wind	
3. Wind Direction - Measured	: 0	mils from ~~gun~~ acft azimuth
4. Wind Velocity	: 0	miles/hour
5. Pressure	: 1013	millibars
6. Temperature	: 70	degrees Fahrenheit
8. Precipitation	: Clear	
9. Visibility	: 10,000	

1. degrees Fahrenheit
2. degrees Celsius
3. degrees Kelvin

PATH: SPREA>CONDITIONS>ENV>ADD

MODE: WORK

ADDITIONAL ENVIRONMENTAL CONDITIONS		
1. Special Environments	: None	
2. Wind Direction - Type	: No wind	
3. Wind Direction - Measured	: 0	mils from aft azimuth
4. Wind Velocity	: 0	miles/hour
5. Pressure	: 1013	millibars
6. Temperature	: 70	degrees Fahrenheit
8. Precipitation	: Clear	
9. Visibility	: 10,000	

1. Clear
2. Snow
3. Ice
4. Rain

PATH: SPREA>CONDITIONS>TYPICAL MODE: WORK

MISSION CONDITION SETS
Mission Area : Aviation System Type : Attack helicopter System Name : Apache IV Mission Name : Destoy Enemy Arm. Veh. Comparable Mission : Destroy Fixed Emplace. Condition Set : Typical
1. Define/modify the typical case condition set 2. Define/modify other condition sets
1. Environmental 2. Terrain 3. Target/threat related 4. Friendly force related

ATH: SPREA>CONDITIONS>TYPICAL>TERRAIN MODE: WORK

Select Add Delete Copy Move

Select this item

BASIC TERRAIN CONDITIONS	
1. Type of Landing Area	: Confined Area
2. Additional conditions	

1. Confined Area
2. Slopes
3. Pinnacle/Ridge
4. Water
5. Normal Runway
6. Other

BASIC TARGET/THREAT RELATED CONDITIONS		
1. Protective Gear Level (MOPP level)	: 0	
2. Target Range	: 2000	meters
3. Electro Magnetic Pulse (EMP with/without)	: without	
4. Type of Electronic Warfare Present	: none	
5. General Target Type	: Armored vehicle	
5. Additional Conditions		

ATH: SPREA>CONDITIONS>TYPICAL>T&T MODE: WORK

Select Add Delete Copy Move

Select this item

BASIC TARGET/THREAT RELATED CONDITIONS		
1. Protective Gear Level (MOPP level)	:	0
2. Target Range	:	2000 meters
3. Electro Magnetic Pulse (EMP with/without)	:	without
4. Type of Electronic Warfare Present	:	none
5. General Target Type	:	Ar
5. Additional Conditions		

1. None
2. Meaconing
3. Jamming
4. Intercept
5. Direct Finding
6. All

PATH: SPREA>CONDITIONS>TYPICAL>TERRAIN MODE: WORK

BASIC TERRAIN CONDITIONS	
1. Type of Landing Area	: Confined Area
2. Additional conditions	

PATH: SPREA>CONDITIONS>TYPICAL>T&T>ADDITIONAL MODE: WORK

ADDITIONAL TARGET/THREAT CONDITIONS
1. General Target/Threat Types 2. Threats 3. Targets

PATH: SPREA>CONDITIONS>TYPICAL>T&T>ADDITIONAL MODE: WORK

Select Add Delete Copy Move Switch

Select this item

ADDITIONAL TARGET/THREAT CONDITIONS
1. General Target/Threat Types 2. Threats 3. Targets

Selected	Available
1. None	1. Small arms 2. Tank 3. Large caliber antiaircraft fire 4. High performance aircraft 5. Helicopter 6. Heat seeking missile 7. Air defense missiles

PATH: SPREA>CONDITIONS>TYPICAL>T&T>ADDITIONAL MODE: WORK

ADDITIONAL TARGET/THREAT CONDITIONS

1. General Target/Threat Types
2. Threats
3. Targets

1. Type of Threat Attack	: None
2. Directed Energy Weapon (present/absent)	: Absent
3. Threat Obstacles	: None

ATH: SPREA>CONDITIONS>TYPICAL>T&T>ADDITIONAL MODE: WORK

Select Add Delete Copy Move

Select this item

ADDITIONAL TARGET/THREAT CONDITIONS

1. General Target/Threat Types
2. Threats
3. Targets

1. Type of Threat Attack : None
2. Directed Energy Weapon (pr
3. Threat Obstacles

1. None
2. Small Arms
3. tank
4. lrg caliber antiaircraft fire
5. high performance aircraft
6. helicopter
7. Heat Seeking Missile
8. Antitank Guided Misl & Rckt Prop Grenade
9. Air Defense missiles

PATH: SPREA>CONDITIONS>TYPICAL>T&T>ADDITIONAL MODE: WORK

ADDITIONAL TARGET/THREAT CONDITIONS

1. General Target/Threat Types
2. Threats
3. Targets

1. Type of Threat Attack	:	None
2. Directed Energy Weapon (present/absent)	:	Absent
3. Threat Obstacles	:	None

1. Absent
2. Present

PATH: SPREA>CONDITIONS>TYPICAL>T&T>ADDITIONAL MODE: WORK

Select Add Delete Copy Move

Select this item

ADDITIONAL TARGET/THREAT CONDITIONS

1. General Target/Threat Types
2. Threats
3. Targets

1. Type of Threat Attack : None
2. Directed Energy Weapon (present/absent) : Absent
3. Threat Obstacles : None

1. None
2. Minefield
3. Other

PATH: SPREA>CONDITIONS>TYPICAL>T&T>ADDITIONAL MODE: WORK

ADDITIONAL TARGET/THREAT CONDITIONS

1. General Target/Threat Types
2. Threats
3. Targets

1. Target Exposure Time	:	0	seconds
2. Type of Target Aquisition	:	Visual	
3. Movement Status of Ground Targets (moving/stationary)	:	stationary	
4. Number of Targets	:	0	
5. Range of Ground Targets	:	0	meters
6. Aspect of Ground Targets	:	Frontal	
7. Ground Target Speed	:	0	miles/hour
8. Ground Target Class	:	Point	

PATH: SPREA>CONDITIONS>TYPICAL>T&T>ADDITIONAL MODE: WORK

Select Add Delete Copy Move

Select this item

ADDITIONAL TARGET/THREAT CONDITIONS

1. General Target/Threat Types
2. Threats
3. Targets

1.	Target Exposure Time	: 0 seconds
2.	Type of Target Aquisition	: Visual
3.	Movement Status of Ground Targets (moving/stationary)	:
4.	Number of Targets	:
5.	Range of Ground Targets	:
6.	Aspect of Ground Targets	:
7.	Ground Target Speed	:
8.	Ground Target Class	:

1. Visual
2. Infrared radar/sensor
3. Air defense radar
4. Radio direction finding system
5. Radar direction finding system
6. Others

```
ATH: SPREA>CONDITIONS>TYPICAL>T&T>ADDITIONAL                          MODE: WORK
Select  Add  Delete  Copy  Move
Select this item

 ADDITIONAL TARGET/THREAT CONDITIONS

    1. General Target/Threat Types
    2. Threats
    3. Targets

  1. Target Exposure Time                 : 0        seconds
  2. Type of Target Aquisition            : Visual

  3. Movement Status of Ground Targets : stationary
     (moving/stationary)
  4. Number of Targets                    : 0
  5. Range of Ground Targets              : 0        meters
  6. Aspect of Ground Targets             : Frontal
  7. Ground Target Speed                              /hour
                                            1. Frontal
  8. Ground Target Class                    2. Flanking
                                            3. Oblique
```

ATH: SPREA>CONDITIONS>TYPICAL>FFORCE MODE: WORK

FRIENDLY FORCE CONDITIONS	
1. Modes of Flight	: Regular
2. Navigation Technique	: Radio

FRIENDLY FORCE WEAPON/FIRE CONDITIONS	
1. Weapon Types	: 30-mm cannon, air-to-air stinger
2. Type of Sight	: Naked Eye
3. Flight Mode	: Moving
4. Weapon Mode	: Direct
5. AFT Pilot Status	: With
6. Type of Navigational Aid	: VOR
7. Takeoff Gross Weight	:
8. Maximum Weight of Load	:
9. Type of ECCM	: Jamming
10. Communication Medium	: Two way radio
11. Communication Mode	: Normal message traffic

PATH: SPREA>CONDITIONS>TYPICAL>FFROCE>WEAPONS MODE: WORK

Select Add Delete Copy Move

Select this item

FRIENDLY FORCE WEAPON/FIRE CONDITIONS

1.	Weapon Types	: 30-mm cannon, air-to-air stinger
2.	Type of Sight	: Naked Eye
3.	Flight Mode	: Movi
4.	Weapon Mode	: Dire
5.	AFT Pilot Status	: With
6.	Type of Navigational Aid	: VOR
7.	Takeoff Gross Weight	:
8.	Maximum Weight of Load	:
9.	Type of ECCM	: Jamming
10.	Communication Medium	: Two way radio
11.	Communication Mode	: Normal message traffic

1. Naked Eye
2. Night Vision Goggles
3. Night Hawk
4. Binoculars
5. Tgt Acq.& Design. Sight
6. Others

PATH: SPREA>CONDITIONS>TYPICAL>FFROCE>WEAPONS MODE: WORK
Select Add Delete Copy Move
Select this item

FRIENDLY FORCE WEAPON/FIRE CONDITIONS

1.	Weapon Types	: 30-mm cannon, air-to-air stinger
2.	Type of Sight	: Naked Eye
3.	Flight Mode	: Moving
4.	Weapon Mode	: Direct
5.	AFT Pilot Status	: With
6.	Type of Navigational Aid	: VOR
7.	Takeoff Gross Weight	:
8.	Maximum Weight of Load	:
9.	Type of ECCM	: Jamming
10.	Communication Medium	: Two ay
11.	Communication Mode	: Normal

1. Direct
2. TSU
3. HSS
4. Direct Laser
5. Indirect
6. Stadiametric
7. Indirect Stadiametric
8. Direct Stadiametric
9. Reflex Sight
10. Reflex Direct
11. Reflex Indirect
12. Flex
13. Fixed
14. Others

PATH: SPREA)CONDITIONS)TYPICAL)FFROCE)WEAPONS MODE: WORK

Select Add Delete Copy Move

Select this item

FRIENDLY FORCE WEAPON/FIRE CONDITIONS

1.	Weapon Types	: 30-mm cannon, air-to-air stinger
2.	Type of Sight	: Naked Eye
3.	Flight Mode	: Moving
4.	Weapon Mode	: Direct
5.	AFT Pilot Status	: With
6.	Type of Navigational Aid	: VOR
7.	Takeoff Gross Weight	:
8.	Maximum Weight of Load	:
9.	Type of ECCM	: Jammi
10.	Communication Medium	: Two w
11.	Communication Mode	: Norma

1. VOR
2. LOC
3. ASR
4. NDB
5. Others

PATH: SPREA>CONDITIONS>TYPICAL>FFROCE>WEAPONS MODE: WORK

Select Add Delete Copy Move

Select this item

FRIENDLY FORCE WEAPON/FIRE CONDITIONS

1.	Weapon Types	: 30-mm cannon, air-to-air stinger
2.	Type of Sight	: Naked Eye
3.	Flight Mode	: Moving
4.	Weapon Mode	: Direct
5.	AFT Pilot Status	: With
6.	Type of Navigational Aid	: VOR
7.	Takeoff Gross Weight	:
8.	Maximum Weight of Load	:
9.	Type of ECCM	: Jamming
10.	Communication Medium	: Two w
11.	Communication Mode	: Norma

1. Jamming
2. Chaff
3. Flares
4. Others

ATH: SPREA>CONDITIONS>TYPICAL>FFROCE>WEAPONS MODE: WORK
Select Add Delete Copy Move
Select this item

FRIENDLY FORCE WEAPON/FIRE CONDITIONS

1.	Weapon Types	: 30-mm cannon, air-to-air stinger
2.	Type of Sight	: Naked Eye
3.	Flight Mode	: Moving
4.	Weapon Mode	: Direct
5.	AFT Pilot Status	: With
6.	Type of Navigational Aid	: VOR
7.	Takeoff Gross Weight	:
8.	Maximum Weight of Load	:
9.	Type of ECCM	: Jamming
10.	Communication Medium	: Two way radio
11.	Communication Mode	

1. Two way radio
2. Intercom
3. Others

PATH: SPREA>CONDITIONS>TYPICAL>FFROCE>WEAPONS MODE: WORK

Select Add Delete Copy Move

Select this item

FRIENDLY FORCE WEAPON/FIRE CONDITIONS

1.	Weapon Types	: 30-mm cannon, air-to-air stinger
2.	Type of Sight	: Naked Eye
3.	Flight Mode	: Moving
4.	Weapon Mode	: Direct
5.	AFT Pilot Status	: With
6.	Type of Navigational Aid	: VOR
7.	Takeoff Gross Weight	:
8.	Maximum Weight of Load	:
9.	Type of ECCM	: Jamming
10.	Communication Medium	: Two way radio
11.	Communication Mode	: Normal message traffic

1. Normal Message Traffic
2. Messages Encoded and Decoded

PATH: SPREA>CONDITIONS>TYPICAL>FFORCE>ORG MODE: WORK

FRIENDLY FORCE ORGANIZATIONAL CONDITIONS	
1. Type of Higher Level Unit Operation Being Supported	: None
2. Type of Reconnaissance	: Zone
3. Types of Security Ops	: Screen
4. Techniques of Movement	: Traveling
5. Special Operations	: Command and Control

PATH: SPREA>CONDITIONS>TYPICAL>FFORCE>ORG MODE: WORK

Select Add Delete Copy Move

Select this item

FRIENDLY FORCE ORGANIZATIONAL CONDITIONS
1. Type of Higher Level Unit Operation Being Supported : None

OFFENSIVE	DEFENSIVE
1. None 2. Movement to contact 3. Hasty attack 4. Deliberate attack 5. Exploitation 6. Pursuit 7. Reconnaissance in Force 8. Raid 9. Feint 10. Demonstration	1. None 2. Covering force 3. Main battle 4. Deep attack 5. Rear area operations 6. Retrograde operations

PATH: SPREA>CONDITIONS>TYPICAL>FFORCE>ORG MODE: WORK

Select Add Delete Copy Move

Select this item

FRIENDLY FORCE ORGANIZATIONAL CONDITIONS		
1. Type of Higher Level Unit Operation Being Supported	: None	
2. Type of Reconnaissance	: Zone	
3. Types of Security Ops	: Scre	1. Zone 2. Route 3. River 4. Area
4. Techniques of Movement	: Trav	
5. Special Operations	: Comm	

PATH: SPREA>CONDITIONS>TYPICAL>FFORCE>ORG MODE: WORK

Select Add Delete Copy Move

Select this item

FRIENDLY FORCE ORGANIZATIONAL CONDITIONS

1. Type of Higher Level Unit Operation Being Supported : None
2. Type of Reconnaissance : Zone
3. Types of Security Ops : Screen
4. Techniques of Movement : Trav
5. Special Operations : Comm

1. Screen
2. Guard
3. Cover
4. Area

PATH: SPREA>CONDITIONS>TYPICAL>FFORCE>ORG MODE: WORK

Select Add Delete Copy Move

Select this item

FRIENDLY FORCE ORGANIZATIONAL CONDITIONS	
1. Type of Higher Level Unit Operation Being Supported	: None
2. Type of Reconnaissance	: Zone
3. Types of Security Ops	: Screen
4. Techniques of Movement	: Traveling
5. Special Operations	

1. Traveling
2. Traveling Overwatch
3. Bounding Overwatch

PATH: SPREA>CONDITIONS>TYPICAL>FFORCE>ORG MODE: WORK

Select Add Delete Copy Move

Select this item

FRIENDLY FORCE ORGANIZATIONAL CONDITIONS		
1.	Type of Higher Level Unit Operation Being Supported	: None
2.	Type of Reconnaissance	: Zone
3.	Types of Security Ops	: Screen
4.	Techniques of Movement	: Traveling
5.	Special Operations	: Command and Control

1. Command & Control
2. courier/messenger
3. aerial radio relay
4. aerial column control/traffic survey
5. aerial radiological survey

MORE

3.3 Step 3 - Identify Mission-Level Time and Accuracy Requirements

In this step, the user will enter the mission-level time and accuracy performance requirements for the new system. This is necessary so that the SPREA can allocate these performance requirements to the functions and tasks which comprise the mission.

Input

External. The external data for this step consist of the mission level minimally acceptable performance. The analyst will gather this information from a variety of sources.

Internal.

Process

In this step, the user will enter the minimally acceptable mission performance time and accuracy. The user will also enter the accuracy standards for the accuracy measure. In this context, accuracy refers to the probability of mission success.

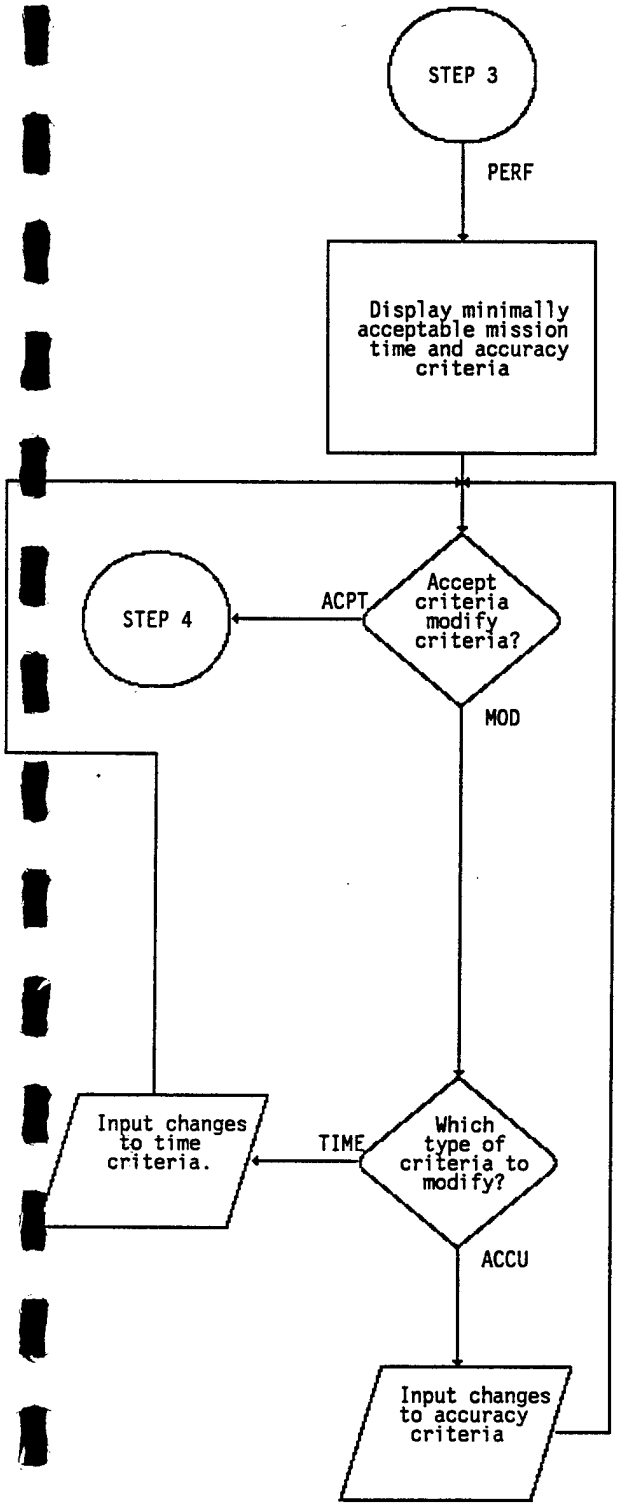
If the user identified a comparable mission in Step 1 of this process, then the minimally acceptable mission performance time and accuracy which are associated with the comparable mission will be presented as default input values.

This information will be used to allocate the mission performance across the functions and tasks which are elements of the mission. If the user does not enter a mission time and accuracy criteria, then the simulation model will simply predict the mission time and accuracy using the task and function performance estimates which will be entered in the succeeding

steps of this process. The SPREA Final Report will document the mission performance estimates which were predicted by the simulation, however the report will not compare those estimates to any mission level performance criteria.

User Interface

A detailed discussion of the user interface for this step is presented on the following pages.


STEP 3
PERF
Display minimally acceptable mission time and accuracy criteria
Accept criteria modify criteria?
ACPT
STEP 4
MOD
Which type of criteria to modify?
TIME
Input changes to time criteria.
ACCU
Input changes to accuracy criteria

Screen 3.1 - Display the minimally acceptable mission time and accuracy. The mission accuracy refers to the probability of mission success. In this screen, the user will change any of these fields. If a comparable mission was identified, this menu will contain data from the "Missions by System Type" Library. If a comparable mission was not identified, then the data areas on this menu will be blank.

User Action: Use the arrow keys to position the cursor in any field that needs to be edited.

Input Files: The DBMS retrieval routines were used in the previous screen to access the mission library and retrieve the performance time. Any other information (e.g., conditions and usages, system type, system name, date mission was entered) will also be retrieved and displayed in the comment field.

Output Files: None

Algorithms: None

Following Screen: Screen 3.2. If the user presses "escape" then Screen 3.0. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a horizontal arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key"

PATH: SPREA)MISSION REQUIREMENTS MODE: WORK

MISSION LEVEL TIME AND ACCURACY REQUIREMENTS

Mission Area	: Aviation
System Type	: Attack helicopter
System Name	: Apache IV
Mission Name	: Destroy Enemy Armored Vehicles
Comparable Mission	: Destroy Enemy Fixed Emplacements

1. Mission Time	:	15	minutes
2. Mission Accuracy	:	95	Probability of successful completion in percent
3. Mission Standards	:	1. 3 enemy vehicles destroyed 2. Remaining enemy force assessed	

Screen 3.2 - Edit minimally acceptable mission performance time, accuracy, or the accuracy standards.

User Action: Use the keyboard to input the data. An escape will signal that the entries are complete.

Input Files: None

Output Files: None

Algorithms: None

Following Screen: After the user presses the carriage return, Screen 3.3. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: Appropriate input values for the probability of mission success range from 0 to 100. If the value which the user enters is less than 1 and greater than 0 (to screen for the user entering a decimal point when none is necessary), the SPREA will respond "Warning! Mission accuracy can range from 0 to 100. (Return to Continue)". If the user enters a mission accuracy which is less than 0, then the SPREA will respond "Mission accuracy is less than 0. Please reenter. (Return to Continue)". If the user enters a mission accuracy which is greater than 100, then the SPREA will respond "Mission accuracy is greater then 100%. Please reenter. (Return to Continue)".

PATH: SPREA>MISSION REQUIREMENTS MODE: WORK

MISSION LEVEL TIME AND ACCURACY REQUIREMENTS

Mission Area : Aviation
System Type : Attack helicopter
System Name : Apache IV
Mission Name : Destroy Enemy Armored Vehicles
Comparable Mission : Destroy Enemy Fixed Emplacements

1. Mission Time : 15 minutes

1. minutes
2. hours
3. seconds

2. Mission Accuracy : 95 Probabili ul
completio

3. Mission Standards :
1. 3 enemy vehicles destroyed
2. Remaining enemy force assessed

3.4 Step 4 - Define System RAM Requirements

The user will be asked to enter three system-level RAM requirements. These include system reliability, system availability, and system maintainability. Each of these criteria are discussed in turn within the following three subsections.

3.4.1 Availability

Availability is an important piece of the performance measurement framework that guides the SPREA. There are many measures of availability; however, AR 702-3 states that operational availability (Ao) shall be used in all requirements documents. Appropriate combat models will produce an availability requirement and/or the composite pieces of the availability equation, and the user will be asked to supply these values as input into the SPREA.

The SPREA Report will document the input values that the user supplies, the source of the data, and any comments the user includes.

Input

The required operational availability of a new weapon system will be an output of an appropriate combat model. The SPREA will aid the user in identifying the specific combat model which should be accessed and the responsible organization. Operational availability is an input to Product 1.

Process

TRADOC/DARCOM PAM 70-11 defines Operational Availability (Ao) as follows:

$$A_o = \frac{OT + ST}{OT + ST + TCM + TPM + TALDT}$$

where:

OT = Operating time during a given calendar time period

ST = Standby time (not operating but assumed operable)

TCM = Total corrective maintenance downtime in clock hours during the given time period

TPM = Total preventative maintenance downtime in clockhours during the stated OT period

TALDT = Total administrative and logistics downtime spent waiting for parts, maintenance personnel, or transportation per given calendar time period

Therefore, an estimate for Ao can be established by:

1. Determining the mission length
2. Determining the standby time (the length of time between missions)
3. Determining the number of missions which will be executed per time unit
4. Determining the average maintenance downtime for the system (TCM + TPM)
5. Determining the average administrative and logistics downtime (TALDT)

The user will either obtain Ao or the necessary components. The help file for the availability screen will inform the user of the calculation listed above, so that if he/she only has the elements of the equation, operational availability can be calculated. The user will obtain the availability requirement from combat models, from available data on comparable fielded systems which will be provided by the SPREA, and/or from subject matter expert data.

Output

The definition of the required operational availability of the new weapon system is an output of this step. This value will be stored in the working file and will be included in the SPREA Final Report.

User Interface

The user interface for this step is presented at the end of the discussion on Maintainability in Subsection 3.4.3.

3.4.2 Reliability

Another performance criteria which will be associated with each system is reliability. In the SPREA, the measure of system reliability will consist of three subsets. First, the reliability of the armaments equipment group within the system will be measured using MRBF (mean rounds between failure). Second, the reliability of the mobility equipment group will be measured in MMBF (mean miles between failure). Finally, the reliability of the communication equipment group will be measured in MTBF (mean time between failure). All of these measurements will be based on the usage level which applies to the particular equipment group. The usage levels will be part of the system

Operational Mode Summary.

As an example, the usage levels for a system might be:

armaments = 411 rounds / day
communication = 14 hours / day
mobility = 200 miles / day

The reliability of each equipment group will vary as a function of the usage level. The SPREA Report will include the reliabilities and their associated usage values.

Input

External. The reliability of the weapon system is a function of the usage level of that system. For this reason, the weapon system Operational Mode Summary must be consulted prior to establishing weapon system reliability requirements.

Internal. The input to this step will consist of the usage levels for each of the three equipment groups, as well as the reliabilities (stated in percentages) that the user needs for each usage level.

The user will be presented with usage levels and percentage reliabilities for the appropriate system type. This will aid him/her in establishing appropriate criteria for the new weapon system.

Process

The reliability criteria for the system will be defined in three substeps. Each of these substeps is discussed in the following paragraphs.

Substep 1: The user will consult the Operational Mode Summary to identify the appropriate usages for the new weapon system

The Operational Mode Summary will include usage statements such as:

1) Firepower: 83 missions/tube/day
411 rounds/tube/day

2) Mobility: 28 moves/weapon/day
25 km/weapon/day

3) Communications:3 hours transmit, 6 hours receive

4) On-Board Electronics: 24 hours

5) Operating Time:24 hours

The user will be prompted to enter these usages into the SPREA.

Substep 2: The user will input reliability factors for each usage requirement.

The user will enter reliability factors for each usage level which is specified on the operational mode summary. For example, the user will specify that he wants to fire 411 rounds/day with a 90% reliability.

Substep 3: The SPREA will calculate the appropriate reliability measure.

The SPREA will assume an exponential distribution to calculate the appropriate reliability measure (i.e., mean time between failure, mean miles between failure, mean rounds between failure).

Example:

P(Rounds >= 411) = .90 (from step 1)

so

e ^(-m * 411) = .90

solving for m:

1/m = mean rounds between failure

These calculations will yield system reliabilities. These reliabilities will be in the form of:

1) Mean distance between failures for mobility equipment
2) Mean time between failures for communication equipment
3) Mean rounds between failures for armaments equipment

Note:

The system reliability and maintainability estimates which are yielded by the SPREA can be cross checked against the operational availability requirement (from the combat model) in the following manner:

Operational Availability <= (MTBF)/(MTBF + MTTR)

This calculation will be used by the SPREA to confirm that the required reliability and maintenance levels do yield a system availability that is at least as high as the availability from the combat model.

Output

The output of this step consists of values for mean time between failures (communications), mean rounds between failures (armament), and mean miles between failures (mobility). These values are displayed on the screen and also appear in the reports generated at the end of a SPREA session.

User Interface

The user is prompted to input usage and reliability estimates for the three types of equipment and then views the resultant MTBF, MMBF, and MRBF measures on screen. The interface allows the user to adjust the usage and reliability values as required to change the MTBF, MMBF, and MRBF measures if they are found to be unacceptable. The detailed discussion of the user interface is presented at the end of the next subsection which discusses Maintainability.

3.4.3 Maintainability

Maintainability of the system is a measure of the time it takes to restore the system to a specified operable condition. The SPREA will ask the user to input the either the MTTR (mean time to repair) or the MR (maintenance ratio i.e., maintenance manhours required per operational hour) for the system at each level (e.g., ORG, DS and GS). The SPREA will aid the user by displaying maintenance data from comparable systems.

This system level maintenance requirement will then be allocated to the generic equipment types for the system. From there, the requirements will be allocated to the specific corrective maintenance tasks for each equipment type. The SPREA Final Report will document the maintainability requirements estimates for each equipment type (i.e., Avionics) at the maintenance task level (i.e., troubleshoot, replace, inspect).

The reliability and maintainability estimates will be compared to the operational availability requirement to ensure that the three elements balance.

Input

The input for this step will consist of the system

maintenance ratio or mean time to repair for the system for each maintenance level (Unit, DS and GS). The user will be able to access this information for comparable system types, and will be able to modify these maintenance requirements, as appropriate.

Process

The process that the user will following in defining system maintainability requirements consists of three substeps. Each of these substeps is discussed in the following paragraphs.

Substep 1: The user will confirm the IOC Requirements at the system level.

The input to the Product 1 maintenance calculations will consist of maintenance manhours or maintenance ratios (maintenance hours per operational hour) at the ORG, DS and GS level. These data will be gathered from comparable systems using the Army Maintenance data bases, and will be input at the system level.

The user will be able to view the requirements which came from a comparable system type, and modify the requirements as he/she deems appropriate.

Substep 2: The SPREA will allocate the maintenance requirements to the generic equipment types of the system.

The system maintenance requirements for each level (i.e., ORG, DS, GS) will then be allocated across the generic equipment which pertain to the system type the user is studying. This will be done automatically by the SPREA using a percentage allocation chart. This chart will have been developed using comparable system maintenance data. The allocations will be presented to the user and he/she will be able to use knowledge about state-of-

the-art hardware developments to change these values, if appropriate.

Substep 3: The maintenance requirements for each generic equipment type will be allocated across corrective maintenance tasks.

Next, the maintenance ratios or manhours will be allocated to the corrective maintenance tasks. This will be accomplished using a percentage allocation chart, much like the one shown in Table 2. The five corrective maintenance tasks are troubleshoot, replace, inspect, adjust/repair, test/check. Again, the user will have the opportunity to modify the percentage allocation amounts across maintenance tasks.

Output

At the conclusion of this step, the user will have maintenance requirements at a task level, sorted by equipment type. For example, the user will have information that says:

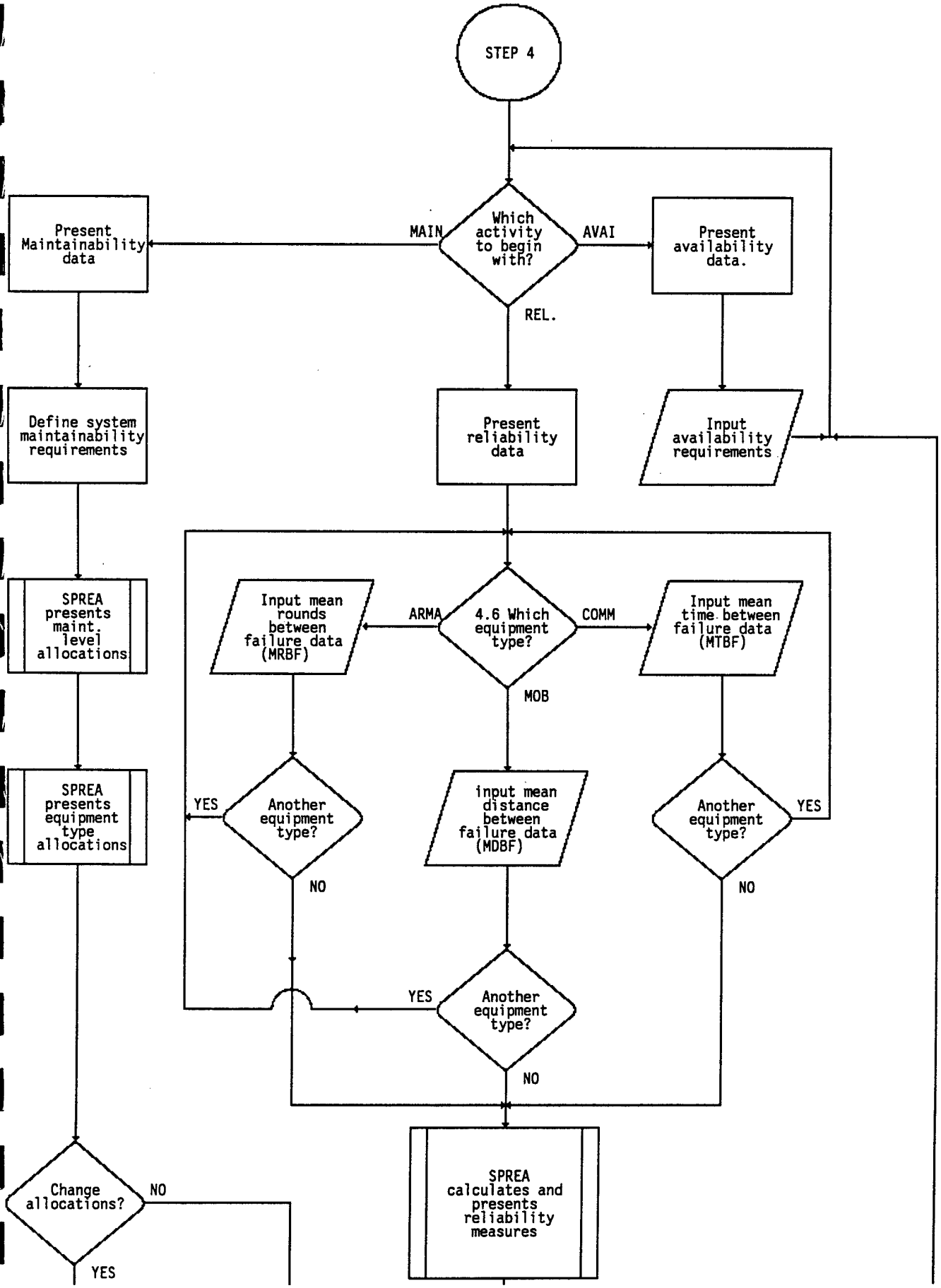
> "The engine can have no more than .06 maintenance manhours at the ORG level for each operational hour of the system. Fifty percent of that time will be spent on troubleshoot, 10% on replace, 10% on inspect, and 30% doing test/check."

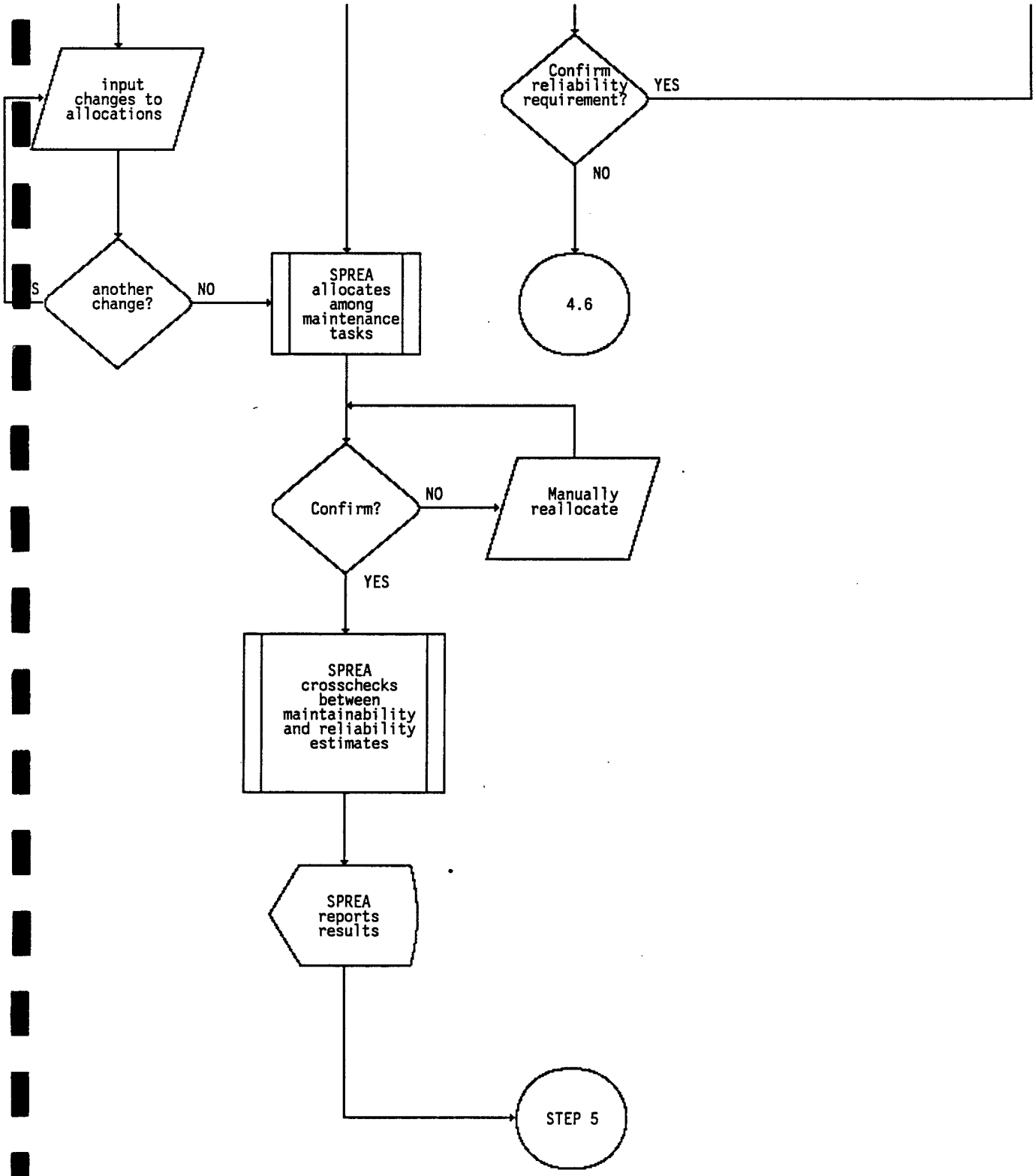
User Interface

The definition of maintainability requirements begins with the user specifying the system and the accompanying maintenance ratios for each level of maintenance (i.e., ORG, DS, GS). After inputing/editing these values, the next several screens require the user to input, for each level of maintenance, the percentage of maintenance allocated to each equipment type for that system. Once the user has completed this process for all three maintenance levels, the screen displays the maintenance ratios

for each equipment type by maintenance level. The user is directed to edit that screen by changing the percentage allocations on the previous screens.

The next activity the user performs is the allocation, by equipment type, of percentages of time spent on each of the five corrective maintenance tasks. The system presents a listing of representative percentage allocations and the user may either accept them or edit them as required. Once this procedure has been completed, the screen displays, by level of maintenance, the maintenance ratios for the equipment types by corrective maintenance tasks. The user may edit maintenance ratios by returning to the percentage allocation screen and redistributing the percentages.


STEP 4
Which activity to begin with?
MAIN
AVAI
REL.
Present Maintainability data
Present availability data.
Define system maintainability requirements
Present reliability data
Input availability requirements
SPREA presents maint. level allocations
Input mean rounds between failure data (MRBF)
4.6 Which equipment type?
ARMA
COMM
MOB
Input mean time between failure data (MTBF)
SPREA presents equipment type allocations
YES
Another equipment type?
NO
input mean distance between failure data (MDBF)
Another equipment type?
YES
NO
YES
Another equipment type?
NO
Change allocations?
NO
YES
SPREA calculates and presents reliability measures


input changes to allocations
another change?
S
NO
SPREA allocates among maintenance tasks
Confirm reliability requirement?
YES
NO
4.6
Confirm?
NO
Manually reallocate
YES
SPREA crosschecks between maintainability and reliability estimates
SPREA reports results
STEP 5

Screen 4.1 - The user will enter system RAM requirements.

User Action: Use the arrow keys to move the highlight bar, use the carriage return to select one of the listed options.

Input Files: None

Output Files: None

Algorithms: None

Following Screen: If the user selects "Input availability data" then Screen 4.2. If the user selects "Input maintainability data" then Screen 4.10. if the user selects "Input reliability data", then Screen 4.4. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed to select a menu option (i.e., not an arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key."

PATH: SPREA) RAM

MODE: WORK

SYSTEM RELIABILITY, AVAILABILITY
AND
MAINTAINABILITY REQUIREMENTS

Mission Area : Aviation
System Type : Attack helicopter
System Name : Apache IV

1. Availability
2. Reliability
3. Maintainability

Note: Default values are based on the system type

Screen 4.2 - Availability data for the appropriate system type will be retrieved and presented to the user for confirmation.

User Action: None

Input Files: The "Baseline RAM Values by System Type" Library

Output Files: None

Algorithms: None

Following Screen: Screen 4.3. Screen 4.1 if the user presses "escape".

Error Statements:

PATH: SPREA)RAM)AVAILABILITY MODE: WORK

SYSTEM AVAILABILITY
System Type : Attack helicopter System Name : Apache IV
Type in a new value for system availability or press the Enter key to accept the default 95 percent

Note: You may compute availability (Ao) as follows:

$$Ao = \frac{OT + ST}{OT + ST + TCM + TPM + TALDT}$$

where:
- OT = Operating time during a given calander time period
- ST = Standby time (not operating but assumed operable)
- TCM = Total corrective maintenance downtime in clock hours during the given time period
- TPM = Total preventive maintenance downtime in clock hours during the given time period
- TALDT = Total administrative and logistical downtime spent waiting for parts, maintenance personnel, or transportation during the given time period

Screen 4.3 - Define System Availability Requirements.

User Action: The user will use the keyboard to enter the availability requirement. He/she will press the carriage return to signal that the input is complete.

Input Files:

Output Files:

Algorithms:

Following Screen: Screen 4.1, unless an error is trapped. If the operation availability estimate is less than zero or greater than 100, then the following screen is Screen 4.3. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: The SPREA will error check the operational availability input to ensure that the value is within 0 and 100%. If the value is greater than 100, then "The operational availability requirement is greater than 100. (Return to Continue)". If the value is less than 0, then "The operational availability requirement is less than 0. (Return to Continue)".

Screen 4.4 - Reliability data for the appropriate system type will be retrieved and presented to the user for confirmation.

User Action: None

Input Files: "Baseline RAM Values by System Type" Library

Output Files: None

Algorithms: None

Following Screen: Screen 4.5. Screen 4.1 if the user presses "escape."

Error Statements:

PATH: SPREA>RAM>RELIABILITY MODE: WORK

SYSTEM RELIABILITY				
System Type : Attack helicopter System Name : Apache IV				
Parameter	Usage Rate	Usage Units	Confidence Level (%)	Min. Accept. Reliability (mean time/rounds/distance between failures)
general	10	hours/day	90	95 hours
armaments	20	rounds/day	90	189 rounds
mobility	0	flight hrs/day	0	0 flight hours

Screen 4.5 - Define System Reliability Requirements. The measure of system reliability will consist of three subsets. First, the reliability of the armaments equipment group within the system will be measured using MRBF (mean rounds between failure). Second, the reliability of the mobility equipment group will be measured in MMBF (mean miles between failure). Finally, the reliability of the communication equipment group will be measured in MTBF (mean time between failure). All of these measurements will be based on the usage level which applies to the particular equipment group.

User Action: The user will use the keyboard to enter the usage levels and confidence levels for each equipment group. The user will consult the Operational Mode Summary to identify the appropriate usages for the new weapon system. Valid confidence level entries range between 0 and 100. For example, the user will specify that he wants to fire 411 rounds/day with a 90% reliability.

Input Files: The input to this screen will consist of the usage levels and confidence levels for each of the three equipment groups. These usage levels are a part of the system Operational Mode Summary.

Output Files: None

Algorithms:

Following Screen: Screen 4.6. If an error is trapped, then Screen 4.5. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If the usages which are entered are less

than zero, then "The usage level for the XXXXXXXX equipment group is less than zero. (Return to Continue)". If the user inputs a reliability percentage that is less than 0 or greater than 100, then "The reliability value XXXXX is (less than zero, greater than 100). (Return to Continue)"

PATH: SPREA) RAM) RELIABILITY

MODE: WORK

SYSTEM RELIABILITY				
System Type : Attack helicopter System Name : Apache IV				
Parameter	Usage Rate	Usage Units	Confidence Level (%)	Min. Accept. Reliability (mean time/rounds/distance between failures)
general	10	hours/day	90	95 hours
armaments	20	rounds/day	90	189 rounds
mobility	0	flight hrs/ day	0	0 flight hours

Screen 4.7 - The SPREA will calculate the appropriate reliability measure. The output of this screen consists of values for mean time between failures (communications), mean rounds between failures (armament), and mean miles or flight hours between failures (mobility).

User Action: None

Input Files: None

Output Files: None

Algorithms: The SPREA will assume an exponential distribution to calculate the appropriate reliability measure (i.e., mean time between failure, mean miles between failure, mean rounds between failure).

Example:
P(Rounds >= 411) = .90 (from screen 4.6)
so
e ^(-m * 411) = .90
solving for m:
1/m = mean rounds between failure

These calculations will yield system reliabilities. These reliabilities will be in the form of:

1) Mean distance between failures for mobility equipment
2) Mean time between failures for communication equipment
3) Mean rounds between failures for armaments equipment

Following Screen: Screen 4.1. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: None

PATH: SPREA)RAM)RELIABILITY MODE: WAIT

SYSTEM RELIABILITY				
System Type : Attack helicopter System Name : Apache IV				
Parameter	Usage Rate	Usage Units	Confidence Level (%)	Min. Accept. Reliability (mean time/rounds/distance between failures)
general	10	hours/day	90	95 hours
armaments	10	rounds/day	90	189 rounds
mobility	0	flight hrs/ day	0	0 flight hours
Please wait while the reliabilities are computed				

SYSTEM RELIABILITY				
System Type : Attack helicopter System Name : Apache IV				
Parameter	Usage Rate	Usage Units	Confidence Level (%)	Min. Accept. Reliability (mean time/rounds/distance between failures)
general	10	hours/day	90	95 hours
armaments	10	rounds/day	90	95 rounds
mobility	0	flight hrs/ day	0	0 flight hours

Screen 4.10 - Maintainability data for the comparable system will be retrieved and presented to the user for confirmation.

User Action: None

Input Files: "Baseline RAM Values by System Type" Library

Output Files: None

Algorithms: None

Following Screen: Screen 4.12. Screen 4.1 if the user presses "escape."

Error Statements:

PATH: SPREA)RAM)MAINTENANCE)SYS MODE: WORK

SYSTEM LEVEL IOC REQUIREMENTS		
System Name: Apache IV	System Type: Attack helicopter	
Maintenance Level	Mean Time To Repair (hours)	Maintenance Ratio (maintenance hours per operational hour)
ORG	.68	2.39
DS	1.5	.322
GS	1.78	.221
1. Confirm 2. Change		

Screen 4.12 - Define system maintainability requirements. Maintainability of the system is a measure of the time it takes to restore the system to a specified operable condition.

This system level maintenance requirement will then be allocated to the generic equipment types for the system in Screen 4.13. From there, the requirements will be allocated to the specific corrective maintenance tasks for each equipment type.

User Action: The system will prompt the user to enter maintainability requirements at the ORG, DS and GS level.

Input Files: The SPREA will ask the user to input the MTTR (mean time to repair) and the MR (maintenance ratio i.e., maintenance manhours required per operational hour) for the system at each level (e.g., ORG, DS and GS).

Output Files:

Algorithms:

Following Screen: Screen 4.13. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements:

PATH: SPREA)RAM)MAINTENANCE)SYS MODE: WORK

SYSTEM LEVEL IOC REQUIREMENTS		
System Name: Apache IV	System Type: Attack helicopter	
Maintenance Level	Mean Time To Repair (hours)	Maintenance Ratio (maintenance hours per operational hour)
ORG	.68	2.39
DS	1.5	.322
GS	1.78	.221
1. Confirm 2. Change		

Screen 4.13 - The SPREA will allocate the maintenance requirements for each level (i.e., ORG, DS, GS) to the generic equipment types of the system type the user is analyzing.

User Action: The allocations will be presented to the user and he/she will be able to use knowledge about state-of-the-art hardware developments to change these values, if appropriate.

Input Files: This chart will have been developed using comparable system maintenance data. The "Generic Equipment by System Type" Library will be accessed to allocate the maintenance requirements. Also, the "Maintenance Hour Allocations by Generic Equipment Type" Library will also be accessed.

Output Files:

Algorithms: This will be done automatically by the SPREA using the percentage allocation chart from the "Maintenance Hour Allocations by Generic Equipment Type" Library.

Following Screen: Screen 4.14. If an error is trapped then Screen 4.13. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If any of the MR or MTTR data are less than zero, then "The (MR, MTTR) for XXXXXX equipment type is less than zero. (Return to Continue)"

PATH: SPREA>RAM>MAINTENANCE>SYS>EQUIP MODE: WORK

GENERIC EQUIPMENT TYPE MAINTENANCE REQUIREMENTS						
System Name: Apache IV			System Type: Attack helicopter			
Equipment Type	Allocation (%)			Maintenance Ratio		
	ORG	DS	GS	ORG	DS	GS
Airframe	22	65	65	.526	.209	.144
Landing Gear	2	.1	.1	.048	.000	.000
Hydraulic System	2	.5	.5	.048	.002	.001
Instruments	4	.5	.5	.096	.002	.001
Power Plant	14	7	7	.167	.023	.015
Fuel System	4	4	4	.096	.013	.009
Transmission & Rotor System	31	17	17	.741	.055	.038
Electrical System	4	2	2	.096	.006	.005
Flight Controls	8	.5	.5	.191	.002	.001
Utility System	5	1	1	.120	.003	.002
Avionics	4	2	2	.096	.006	.005
Armaments						

Screen 4.14 - The maintenance requirements for each generic equipment type will be allocated across corrective maintenance tasks.

User Action: This will be accomplished using a percentage allocation chart. The user will have the opportunity to modify the percentage allocation amounts across maintenance tasks.

Input Files: Input to this screen consists of the "Maintenance Hour Allocations by Maintenance Task" Library.

Output Files: At the conclusion of this screen, the user will have maintenance requirements at a task level, sorted by equipment type. For example, the user will have information that says:

> "The engine can have no more than .06 maintenance manhours at the ORG level for each operational hour of the system. Fifty percent of that time will be spent on troubleshoot, 10% on replace, 10% on inspect, and 30% doing test/check."

Algorithms:

Following Screen: If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements:

PATH: SPREA) RAM) MAINTENANCE) SYS) EQUIP) TASK MODE: WORK

GENERIC EQUIPMENT MAINTENANCE REQUIREMENTS ALLOCATED BY TASK					
System Name: Apache IV	System Type: Attack helicopter				
Maintenance Level: ORG	Maintenance Tasks Percent Allocation				
Equipment Type	trouble shoot	replace	inspect	adjust/ repair	test/ check
Airframe	6	22	10	62	.1
Landing Gear	6	22	10	62	.1
Hydraulic System	6	22	10	62	.1
Power Plant	6	22	10	62	.1
Fuel system	6	22	10	62	.1
Transmission and Rotor System	6	22	10	62	.1
Electrical System	6	22	10	62	.1
Flight Controls	6	22	10	62	.1
Utility System	6	22	10	62	.1
Avionics	6	22	10	62	.1
Armament	6	22	10	62	.1

PATH: SPREA)RAM)MAINTENANCE)SYS)EQUIP)TASK MODE: WORK

GENERIC EQUIPMENT MAINTENANCE REQUIREMENTS ALLOCATED BY TASK					
System Name: Apache IV	System Type: Attack helicopter				
Maintenance Level: DS	Maintenance Tasks Percent Allocation				
Equipment Type	trouble shoot	replace	inspect	adjust/ repair	test/ check
Airframe	1	7	9	83	.02
Landing Gear	1	7	9	83	.02
Hydraulic System	1	7	9	83	.02
Power Plant	1	7	9	83	.02
Fuel system	1	7	9	83	.02
Transmission and Rotor System	1	7	9	83	.02
Electrical System	1	7	9	83	.02
Flight Controls	1	7	9	83	.02
Utility System	1	7	9	83	.02
Avionics	1	7	9	83	.02
Armament	1	7	9	83	.02

Screen 4.16 - Cross check the maintainability and reliability estimates against the operation availability requirement.

User Action: None, this screen will be fully automated.

Input Files: The availability, reliability, and maintainability requirements will be retrieved from the working file.

Output Files: None

Algorithms: The system reliability and maintainability estimates which are yielded by the SPREA can be cross checked against the operational availability requirement (from the combat model) in the following manner:

Operational Availability <= (MTBF)/(MTBF + MTTR)

This calculation will be used by the SPREA to confirm that the required reliability and maintenance levels do yield a system availability that is at least as high as the availability from the combat model.

Following Screen: Screen 4.17. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: None

PATH: SPREA) RAM) CHECK

MODE: WORK

CROSS CHECK OF AVAILABILITY AGAINST RELIABILITY AND MAINTAINABILITY			
Check: Availability (= (Reliability)/(Reliability + Maintainability)			
Availability		Reliability (mean time between failures)	Maintainability (mean time to repair) (ORG)
Given	Calculated		
.95	.99	95 hours	.68 hours

1. Confirm
2. Make changes to availability
3. Make changes to reliability
4. Make changes to maintainability

Screen 4.17 - Report the results of the cross check to the user. The user will have the option of allowing the SPREA to automatically recompute a consistent solution for RAM if Screen 4.16 has determined that the results are inconsistent.

User Action: The SPREA will output the results of the consistency calculation to the screen. If the results are inconsistent, the user will be asked which one (if any) of the three requirements he/she wishes to bring into agreement with the other two. The user will use the arrow keys and to move the highlight bar, and the carriage return to select the requirement he/she wishes to correct. If the user wishes to accept the inconsistency, he/she will press "escape".

Input Files: None

Output Files: None

Algorithms: The SPREA will automatically recompute a value for the requirement which the user identifies. This computation will be based on the algorithm:

Operation Availability <= (MTBF)/(MTBF + MTTR)

Following Screen: If the user chooses either "reliability", "maintainability", or "availability" then Screen 4.1. If the user chooses "quit", then Screen 4.1. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements:

PATH: SPREA)RAM)CHECK

MODE: WORK

CROSS CHECK OF AVAILABILITY AGAINST RELIABILITY AND MAINTAINABILITY			
Check: Availability (= (Reliability)/(Reliability + Maintainability)			
Availability		Reliability (mean time between failures)	Maintainability (mean time to repair) (ORG)
Given	Calculated		
.95	.99	95 hours	.68 hours

1. Confirm
2. Make changes to availability
3. Make changes to reliability
4. Make changes to maintainability

3.5 Step 5 - Identify Functions and Their Minimally Acceptable Performance Criteria

Once the user has identified a mission for the system to accomplish, he or she will describe the functions which make up that mission. If the user identified a comparable mission in Step 1, then the functions for that comparable mission will serve as the starting point for the user in describing the composite functions of the new mission.

Where possible, the user will also enter the performance criteria for each function. These performance criteria are the function times and accuracies of the system for this mission. The user will be aided in setting performance criteria at the function level by either referring to functions which are listed in the "Functions and Tasks by System Type" Library that have baseline estimates, accessing subject matter experts, requirements documents, or combat model results. In Step ~~???~~ 10, the SPREA will combine the function times and accuracies in the context of the Monte Carlo Simulation to calculate a mission time and accuracy.

If the user indicated ~~in Step ???~~ 5 that the conditions he/she specified for the mission will vary from function to function, then as the user steps through each function in this step, he/she will be presented with the conditions which affect the operation of the specific function the user is currently considering. The user will be asked to indicate any condition of the current set which he/she wishes to change for this function.

Input

External. The "Functions and Tasks by System Type" Library will be used to limit the amount of information that the user must enter. Our team will gather function performance

requirements from combat models. The main disadvantage of this source is that the combat models do not adequately represent the human variable of the system (Van Nostrand, 1986); however, it is the best available source of system performance requirements data at this time. The data may also be available from either the analysis of comparable fielded systems, the user of acceptance test data, or from the subject matter experts who are familiar with the mission profile.

Internal. The initial "Functions and Tasks by System Type" Library will contain listings of functions, referenced by mission. The function taxonomy is included in Appendix A of this document. If the user is simulating a mission already in the library, a listing of composite functions will be available.

Process

If the user chooses a mission from the existing "Missions by System Type" Library, a list of the functions included in that mission will be presented in this step. The user will be able to selectively modify any of the functions which are listed. He/she will also be able to delete any of the functions. Finally, the user will have the capability to search through the "Functions and Tasks by System Type" Library to pull out additional functions for the mission and add them to the list.

Each of the functions (e.g., Navigation, Logistics, Information Routing, Prevention of Detection/Location of System) consists of a set of tasks (e.g., Select appropriate maps and/or navigation aids, Identify present location, Identify destination). Like the missions, the functions reside in their own library and are accessible to the user who wants to add to or modify them.

If the user has not identified a comparable mission in Step 1, then the task listing screen will be empty. The user will

enter the names of the functions that comprise the new mission. The user will be able to copy existing functions from the "Functions and Tasks by System Type" Library or, as with the missions, he or she will be able to develop new ones. If the user chooses to develop new functions, then he/she will be prompted for the function name, the conditions, and the function-level performance criteria.

Finally, the user will specify the sequence of the functions within the new mission. As with the other specifications of the mission, if the user has identified a comparable mission, the function sequence from that mission will be copied over into the new mission. If the user adds or deletes functions, then he/she will be prompted to make the necessary changes to the Function Sequence Table.

The performance measures of the functions will be time and accuracy. Every function will have a time and accuracy criteria. In Step 8, the accuracy and/or time requirements for each function will be allocated to the tasks which are members of that function.

The SPREA will aid the user in entering the minimally acceptable criteria for function performance time and accuracy. These data will be used to 1) allocate performance criteria to the task level, and to 2) compare these data with the output of the function models to determine whether the minimally acceptable system performance was attained.

Output

This step's output will be a list of functions and their associated performance criteria that make up the mission being simulated.

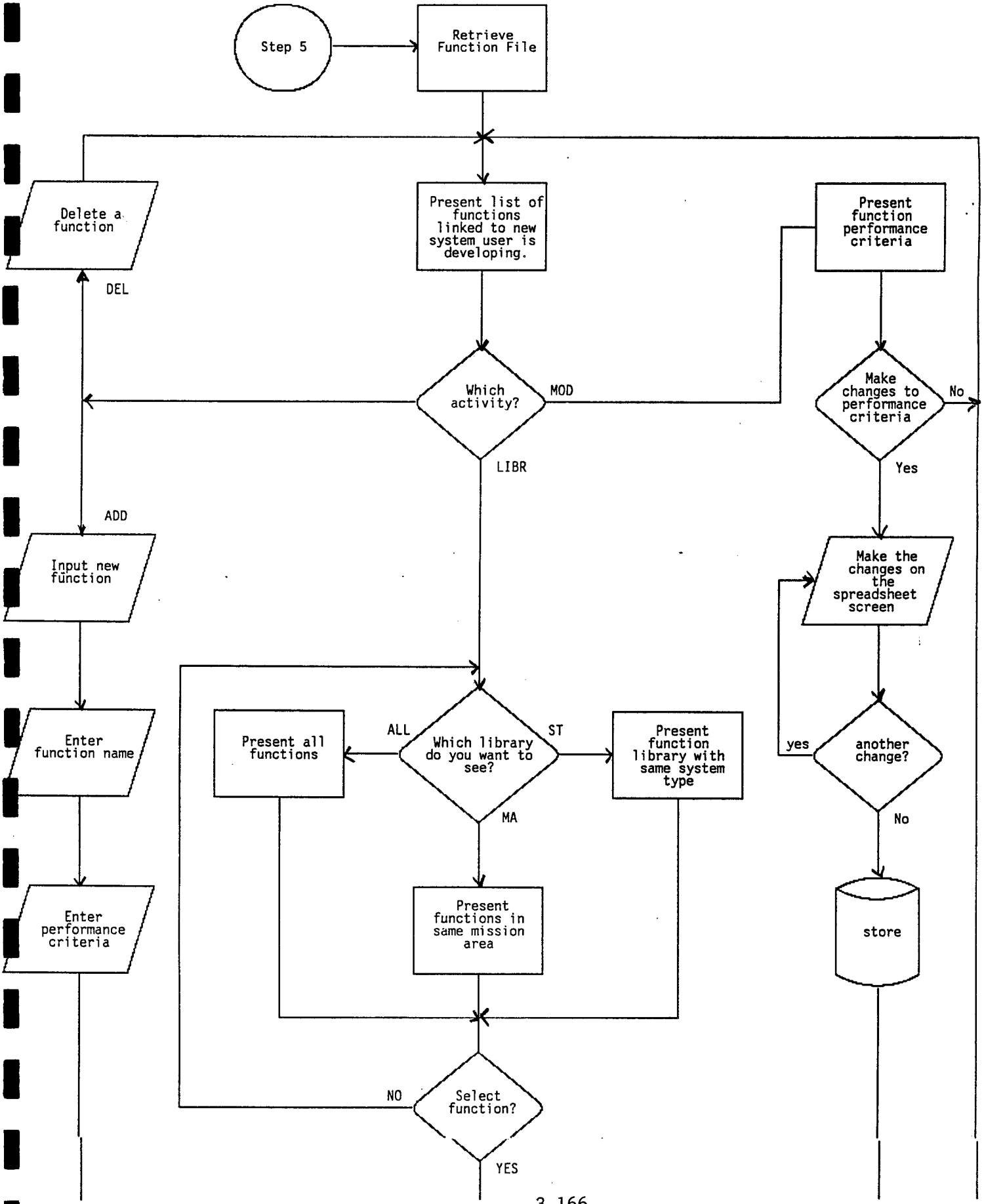
A list of the conditions which are associated with each

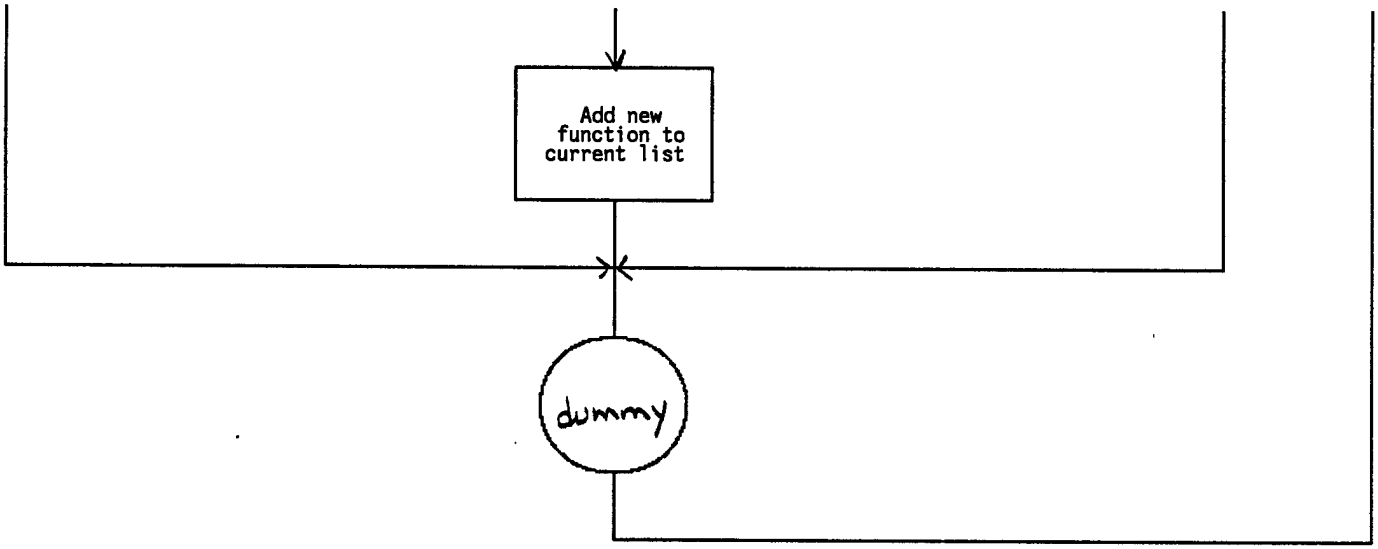
function will also be included in the output of this step.

User Interface

The user interfaces for this step consist of screens which allow the user to specify which functions comprise the mission to be analyzed. The user interface provides the user three approaches to function specification. The user may either 1) view/edit functions from a comparable mission, or 2) input functions individually from the function library, or 3) enter unique functions by entering the function name and then in Step 8, assigning individual tasks to the new function.

Once the user has determined the functions which apply to the mission under analysis, he may review and edit any system-provided data on function time, accuracy, conditions, and usages.


Step 5
Retrieve Function File
Present list of functions linked to new system user is developing.
Delete a function
DEL
Present function performance criteria
Which activity?
MOD
Make changes to performance criteria
No
Yes
LIBR
ADD
Input new function
Make the changes on the spreadsheet screen
Enter function name
Present all functions
ALL
Which library do you want to see?
ST
Present function library with same system type
yes
another change?
No
MA
Enter performance criteria
Present functions in same mission area
store
NO
Select function?
YES


Add new function to current list
dummy

Screen 5.0 - The user will choose whether he/she wishes to identify or modify the performance criteria for the functions, or whether he/she wishes to identify or modify the conditions which apply to each function.

User Action: The user will use the vertical arrow keys to position the cursor, and will press the carriage return to make the selection.

Input Files: None

Output Files: None

Algorithms: None

Following Screens: Screen 5.1 if the user wishes to identify or modify the performance criteria. If the user wishes to change the conditions for the functions, Screen 5.15.

Error Statements: None

PATH: SPREA>FUNCTIONS MODE: WORK

FUNCTION DEFINITION	
Mission Area	: Aviation
System Type	: Attack helicopter
System Name	: Apache IV
Mission Name	: Destroy Enemy Armored Vehicles
Comparable Mission	: Destroy Enemy Fixed Emplacements
Condition Set	: Typical

1. Identify/modify functions and performance criteria
2. Identify/modify conditions for functions

NOTE:
1. SPREA uses the functions and performance criteria from the comparable mission as defaults.

2. The conditions given in the specified condition set will be applied to all functions unless they are modifed by the user.

Screen 5.1 - Retrieve function information on the mission which was selected. If the mission the user is currently working on has a function file, then this screen will retrieve that file. If the user has identified a comparable mission, then the function information which is retrieved will be from the comparable mission.

User Action: None

Input Files: The DBMS retrieval routines will be used to access the function file for the new mission. The function performance times and accuracies, if any, will also be retrieved from the file.

Output Files: None

Algorithms: None

Following Screens: Screen 5.2.

Error Statements: None

Screen 5.2 - Present a list of functions that are attached to the new mission which the user is developing. If the user has identified a comparable mission, then this list will be the functions which are members of that mission.

User Action: Use the horizontal arrow keys to move the highlight bar to choose "Select", "Add", "Delete", "View Library", "Copy", or "Move". Select the option by pressing the carriage return.

Input Files: None

Output Files: None

Algorithms: None

Following Screen: Screen 5.3 if "Select". Screen 5.11 if "Add". Screen 5.12 if "Delete". Screen 5.4 if "View Library". If the user presses "escape" then Screen 3.1. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a horizontal arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key"

PATH: SPREA>FUNCTIONS>CRITERIA MODE: WORK
Select Add Delete Copy Move Libraries
Select this item

FUNCTION IDENTIFICATION AND PERFORMANCE CRITERIA	
System Name: Apache IV	Mission Name: Destroy Enemy Armored Vehicles
Functions	Performance Criteria
Plan and prepare for mission Taxi and takeoff Fly aircraft to destination Fly aircraft from destination Navigate Communicate Approach and land aircraft Perform after landing tasks Compensate for inflight equip. fail Acquire targets Attack targets Defend against attack Perform reconnaissance Call for direct support	Time in min : 1 (units are the same as for mission criteria) Accuracy : .90 (probability of success) Accuracy Standard : within 100 meters

Screen 5.3 - Present the function performance criteria to the user. This information includes the function performance time, function accuracy, and the standards for the accuracy measure.

User Action: The input on this screen is in spreadsheet format. The user can move around the spreadsheet with arrow keys. When the user reaches a cell that he/she wishes to make an entry in, the delete keys, as well as the other keys on the keyboard, can be used to enter numeric or alpha text. The Home key will place the cursor in the upper left-hand cell of the spreadsheet. The End key will place cursor at the end of the line on which the cursor currently is placed. The Page Down and Page Up keys will move the display downward and upward 25 rows, respectively. The Page Down and Page Up keys will only have an effect if the list of function information (in conjunction with the rest of the information on the screen) is longer than 25 rows. When the user presses "escape", the system will consider the editing on the screen complete. If the user does not believe that a function performance estimate is correct, however he/she does not wish to enter an estimate in the spreadsheet, then the user can enter "?" in the appropriate cell. This will signal the SPREA that this value is unknown. This value will then be assigned using backsolving techniques discussed in Screen ????.

Input Files: None

Output Files: When the user completes the editting session, the function and their editted performance time criteria will be written to temp.dat. This file will serve as the user's working file.

Algorithms: None

Following Screen: If no errors are trapped, Screen 5.2. If errors are detected, Screen 5.3. If the user presses F1, a context-specific help file will be displayed. After the help

file is displayed, the user will press the carriage return to return to this menu.

Error Statements: When the user indicates that the editting session is complete (by pressing "escape"), error trapping will commence. If any of the time values in the spreadsheet are < 0, then the user will receive the error "The performance time for function XXXXXXXX is less than zero. (Return to Continue)". All the errors which are encountered will be written to the file error.dat. If any of these errors are encountered, the user will be returned to the spreadsheet to make corrections.

PATH: SPREA)FUNCTIONS)CRITERIA MODE: WORK

FUNCTION IDENTIFICATION AND PERFORMANCE CRITERIA	
System Name: Apache IV	Mission Name: Destroy Enemy Armored Vehicles
Functions	Performance Criteria
Plan and prepare for mission Taxi and takeoff Fly aircraft to destination Fly aircraft from destination Navigate Communicate Approach and land aircraft Perform after landing tasks Compensate for inflight equip. fail Acquire targets Attack targets Defend against attack Perform reconnaissance Call for direct support	Time in min : 3 (units are the same as for mission criteria) Accuracy : .95 (probability of success) Accuracy Standard : completed correctly

PATH: SPREA>FUNCTIONS>CRITERIA MODE: WORK

FUNCTION IDENTIFICATION AND PERFORMANCE CRITERIA	
System Name: Apache IV	Mission Name: Destroy Enemy Armored Vehicles
Functions	Performance Criteria
Plan and prepare for mission Taxi and takeoff Fly aircraft to destination Fly aircraft from destination Navigate Communicate Approach and land aircraft Perform after landing tasks Compensate for inflight equip. fail Acquire targets Attack targets Defend against attack Perform reconnaissance Call for direct support	Time in min : 2 (units are the same as for mission criteria) Accuracy : .90 (probability of success) Accuracy Standard : completed w/o abort

PATH: SPREA>FUNCTIONS>CRITERIA>LIBRARIES MODE: WORK

FUNCTION IDENTIFICATION AND PERFORMANCE CRITERIA

e: Destroy Enemy Armored Vehicles

rmance Criteria

in min :
s are the same as
mission criteria)

acy :
(probability of success)

Accuracy Standard :

LIBRARIES

Access libraries containing functions associated with the same:

1. System type
2. Mission area
3. All functions

Approach and land aircraft
Perform after landing tasks
Compensate for inflight equip. fail
Acquire targets
Attack targets
Defend against attack
Perform reconnaissance
Call for direct support

Screen 5.4 - Ask the user which library he/she wishes to examine.

User Action: Use the vertical arrow keys to move the highlight bar to select "System Type" or "Misssion Area", or "All Functions". Select the option by pressing the carriage return.

Input Files: None

Output Files: None

Algorithms: None

Following Screen: Screen 5.4.1 if "System Type". Screen 5.5 if "Mission Area". Screen 5.6 if "All Functions". If the user presses "escape" then Screen 5.2. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a vertical arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key"

Screen 5.4.1 - Present a list of functions that exist in the libraries under the same system type, (if any).

User Action: Use the horizontal arrow keys to move the highlight bar to select "Select". Select the option by pressing the carriage return.

Input Files: The DBMS retrieval routines will be used to access the "Functions and Tasks by System Type" Library and retrieve all the functions entered under the system type entered in Screen 1.11. The function performance time and accuracy will also be retrieved from the "Functions and Tasks by System Type" Library.

Output Files: None

Algorithms: None

Following Screen: Screen 5.7 if "Select". If the user presses "escape" then Screen 5.2. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a horizontal arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key"

PATH: SPREA>FUNCTIONS>CRITERIA>LIBRARIES>SYSTYP MODE: WORK
Select
Select this function

FUNCTION LIBRARY FOR SYSTEM TYPE : Attack helicopter	
Functions	Performance Criteria
Plan and prepare for mission Taxi and takeoff Fly aircraft to destination Fly aircraft from destination Navigate Communicate Approach and land aircraft Perform after landing tasks Compensate for inflight equip. fail Acquire targets Attack targets Defend against attack Perform reconnaissance Call for direct support	Time in min : 3 Accuracy (probability of success) : .95 Accuracy Standard : completed correctly

Screen 5.5 - Present a list of functions that exist in the libraries under the same mission area, (if any).

User Action: Use the horizontal arrow keys to move the highlight bar to select "Select" or "Switch". Select the option by pressing the carriage return. (The switch option allows the user to change the system type).

Input Files: The DBMS retrieval routines will be used to access the function library and retrieve all the functions entered under the mission area entered. The function performance time and accuracy will also be retrieved from the "Functions and Tasks by System Type" Library.

Output Files: None

Algorithms: None

Following Screen: Screen 5.7 if "Select". Screen 5.5.1 if "Switch". If the user presses "escape" then Screen 5.2. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a horizontal arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key"

PATH: SPREA>FUNCTIONS>CRITERIA>LIBRARIES>MISSION AREA MODE: WORK
Select Switch
Select this function

FUNCTION LIBRARY FOR MISSION AREA: Aviation	
Functions	Performance Criteria
Plan and prepare for mission Taxi and takeoff Fly aircraft to destination Fly aircraft from destination Navigate Communicate Approach and land aircraft Perform after landing tasks Compensate for inflight equip. fail Acquire targets Attack targets Defend against attack Perform reconnaissance Call for direct support	Time in min : 3 Accuracy (probability of success) : .95 Accuracy Standard : completed correctly
	SYSTEM TYPE : Attack helicopter
	1. attack helicopters 2. cargo helicopter 3. utility helicopter 4. scout helicopter 5. fixed wing

Screen 5.5.1 - Prompt the user to determine the system type (within the same mission area) for which the user wishes to view the library.

User Action: Use the vertical arrow keys to move the highlight bar to select a system type.

Input Files: The DBMS retrieval routines will be used to access the "Functions and Tasks by System Type" Library and retrieve all the functions entered under the system type entered. The function performance time and accuracy will also be retrieved from the "Functions and Tasks by System Type" Library.

Output Files: None

Algorithms: None

Following Screen: Screen 5.5. If the user presses "escape" then Screen 5.2. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a vertical arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key"

Screen 5.6 - Present the list of functions that exist in the "Functions and Tasks by System Type" Library.

User Action: Use the horizontal arrow keys to move the highlight bar to select "Select" or "Switch". Select the option by pressing the carriage return.

Input Files: The DBMS retrieval routines will be used to access the Function library and retrieve all the functions entered. The function performance time and accuracy will also be retrieved from the "Functions and Tasks by System Type" Library.

Output Files: None

Algorithms: None

Following Screen: Screen 5.7 if "Select". If the user presses "escape" or chooses "Quit" then Screen 5.2. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a horizontal arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key"

ATH: SPREA>FUNCTIONS>CRITERIA>LIBRARIES>ALL FUNCTIONS MODE: WORK
elect Switch
Select this function

FUNCTION LIBRARY FOR ALL FUNCTIONS	
Mission Area: Aviation	System Type: Attack helicopter
Functions	Performance Criteria
Plan and prepare for mission Taxi and takeoff Fly aircraft to destination Fly aircraft from destination Navigate Communicate Approach and land aircraft Perform after landing tasks Compensate for inflight equip. fail Acquire targets Attack targets Defend against attack Perform reconnaissance Call for direct support	Time in min : 3 Accuracy (probability of success) : .95 Accuracy Standard : completed correctly

PATH: SPREA>FUNCTIONS>CRITERIA>LIBRARIES>ALL FUNCTIONS MODE: WORK

Select Switch

Select this mission area

FUNCTION LIBRARY FOR ALL FUNCTIONS

Mission Area: Aviation	System Type: Attack helicopter

Functions	Mission Areas	ria
Plan and pr	1. Air defense	: 3
Taxi and ta	2. Aviation	
Fly aircraf	3. Close combat - heavy	: .95
Fly aircraf	4. Close combat - light	uccess)
Navigate	6. Combat service support	
Communicate	7. Combat support eng. and mine warfare	: completed correctly
Approach an	8. Command and control	
Perform aft	9. Fire support	
Compensate	10. IEW	
Acquire tar	11. NBC	
Attack targ	12. Special operations	
Defend agai		
Perform reconnaissance		
Call for direct support		

Screen 5.7 - Select function from the list that is presented

User Action: Use the vertical arrow keys to move the highlight bar to select the specific function of choice. The user will press the carriage return to complete the entry.

Input Files: None

Output Files: None

Algorithms: None

Following Screen: Predecessor screen unless the user presses "escape". If the user presses "escape" then Screen 5.2. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a vertical arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key"

Screen 5.11 - Add a function to the list that is presented

User Action: The last line of the function list is now vacant and the cursor is positioned at the left-hand side of the new row. Use the keyboard to enter the new function name, the performance time, the accuracy standard, and the accuracy. The user will press the carriage return to complete the entry.

Input Files: None

Output Files: None

Algorithms: None

Following Screen: Screen 5.2. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements:

Screen 5.12 - Delete a function from the list that is presented

User Action: Use the vertical arrow keys to move the highlight bar to select the specific function of choice. The user will press the carriage return to complete the entry. After the user presses the carriage return the selected function will disappear from the list and control will return to Screen 29.1.

Input Files: None

Output Files: None

Algorithms: None

Following Screen: Screen 5.2. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a vertical arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key"

Screen 5.15 - If the user indicated in Step 2 that the conditions vary from function to function, then the user will be asked in this step to enter the conditions for each function. The user will be presented with a subset of the condition set which applies at the mission level. This subset will contain the conditions which apply to the specific function. The user will be asked to indicate the conditions that must be changed, one-by-one.

User Action: The user will use the vertical arrow keys to select the condition subset which he/she wishes to examine more closely. After the highlight bar has been positioned over the appropriate menu item, the user will use the carriage return to select the option. The condition subsets consist of "environmental", "terrain", "tactical/threat", "friendly force", or "additional".

Input Files: The "Conditions by Function" Library will be used to identify the specific conditions which apply to a given function.

Output Files: None

Algorithms: None

Following Screen: Screen 5.16. If the user presses escape, then 5.2. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a vertical arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key"

Screen 5.16 - As the user indicates that a condition must be changed, the condition library will present the possible options for the selected condition.

User Action: The user will use the vertical arrow keys to select the new condition setting. After the highlight bar has been positioned over the appropriate menu item, the user will use the carriage return to select the option.

Input Files: The "Conditions by Function" Library will be used to identify the appropriate condition settings for a given condition subset (i.e., environmental, tactical).

Output Files: As the user selects new condition settings, they will be written to the working file. The condition settings will be filed under the new condition set name, specified in Step 2.

Algorithms: None

Following Screen: Screen 5.2. If the user presses escape, then 5.2. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a vertical arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key"

3.6 Step 6 - Identify Function Sequence

In order to build a mission network simulation from the function list, it is necessary to provide links between the functions. These links will be referred to as the "Function Sequence by Mission" Library. The "Function Sequence by Mission" Library is independent of the "Functions by Mission" Library. This enables the analyst to select functions for a particular mission from the "Function by Mission" Library before dealing with the sequencing of the functions.

Input

The primary input will be the "Function Sequence by Mission" Library. This library will contain the function sequences of all the missions which are included in the "Missions by System Type" Library. The analyst can use one of the available sequences, or he/she can modify an available sequence to reflect the unique features of the system mission being analyzed.

External. The analyst may want to modify the function sequences in the "Function Sequence by Mission" Library. In fact, this modification will be required to do so if any new functions were added to the mission.

Internal. The internal input source consists of the existing "Function Sequence by Mission" Library data that have been incorporated into the SPREA and will be available to the analyst. The initial data set that will be used to build this library will come from task analysis data of existing systems.

Process

Function sequence data will be provided for the missions which have been previously incorporated into the SPREA. As with the library data discussed in the preceding steps, these sequence data can be modified or the analyst can define a new function sequence from scratch.

The "Function Sequence by Mission" Library will be very simple. Each function will have a number and the analyst will be asked to identify the first function of the mission and the successor(s) for each function.

Note that accuracy is one of the performance criteria that will have been specified for the tasks in the "Functions by Mission" Library. Different successor functions may apply if the modeled function performance is inaccurate. Therefore, the analyst will have the option of specifying a "failure path" for each function. This failure path gives the analyst a vehicle for specifying functions whose failures would be catastrophic.

The software will ensure that the analyst has specified links for each function he or she wants to include. The software will also ensure that there are no dead-ends, illogical paths through the functions, or functions without paths that lead to them.

The "Function Sequence by Mission" Library supplies an easy method for the analyst to experiment with different function sequences. Since the sequence is independent of the function performance criteria, it will be possible for the analyst to see whether different function sequences will alter the system performance.

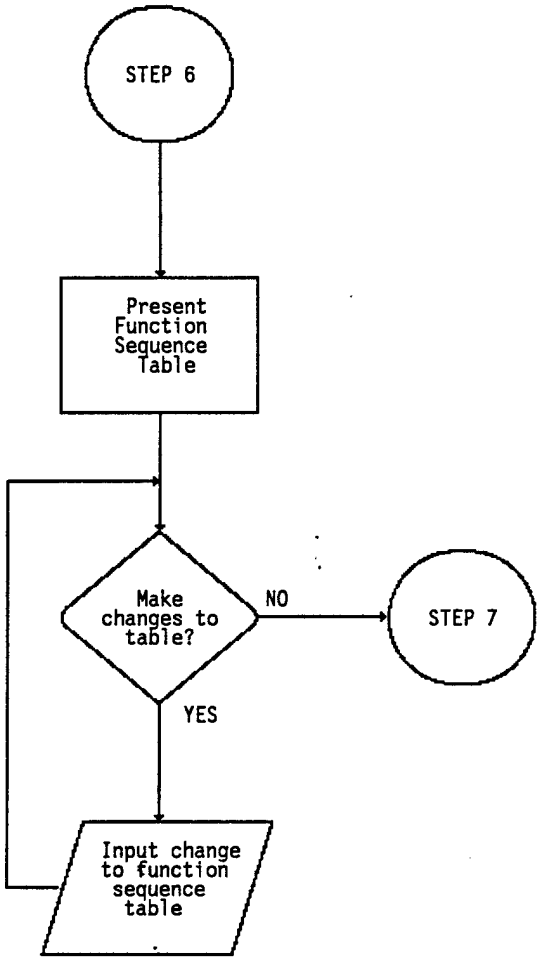
Output

The output from this step will consist of a complete function sequence for the mission that is being analyzed. This function sequence will contain the branching directions between the functions within the mission.

User Interface

The user interface for the "Function Sequence by Mission" Library will have a spreadsheet format. The data in this library will be filed by Mission Area and Mission, so if the analyst has specified a mission which already has a function sequence filed in the library, that sequence will be presented to the analyst automatically. The analyst will also be able to view the other library entries.

STEP 6: Identify Function Sequence



Screen 6.1 - Function Sequence. The user will be presented with the function sequence table. He/she will also be able to view the function network diagram.

User Action: The input on this screen will be in spreadsheet format. The user will move around the spreadsheet with arrow keys. When the user reaches a cell that he/she wishes to make an entry in, the delete keys, as well as the other keys on the keyboard, can be used to enter numeric or alpha text. The Home key will place the cursor in the upper left-hand cell of the spreadsheet. The End key will place cursor at the end of the line on which the cursor currently is placed. The Page Down and Page Up keys will move the display downward and upward 25 rows, respectively. The Page Down and Page Up keys will only have an effect if the list of functions (in conjunction with the rest of the information on the screen) is longer than 25 rows. When the user presses "escape", the system will consider the editing on the screen complete.

Input Files: The Mission and the System Name will be used to index into the "Function Sequence by Mission" Library. The DBMS Search routines will be used to locate the mission which is being analyzed. The DBMS Retrieval routines will be used to retrieve the function sequence from the "Functions by Mission" Library.

Output Files: When the user completes the editting session, the functions and their sequence will be written to temp.dat. This file will serve as the user's working file.

Algorithms: The SPREA will use the Micro SAINT routing algorithm to draw the function network diagram from the function sequence. The "loop" column on the sequence table is used to identify any looping constructs in the sequence of the mission. As an example, this screen shows that the function "Navigate" has a loop. The first time the function "Navigate" is encountered,

the following function is "Fly aircraft to mission area". The second time in the mission simulation that "Navigate" is encountered, the following function is "Fly aircraft from the mission area".

The probability column of the function sequence table indicates whether the following function is a probabilistic decision or a multiple decision. Any following function which has a probability value of "1" will always be a following function for the function. Any following function which has a probability value less than one will only be a following function for the indicated percentage of times. In this case, the following function will be determined be determined using the random number generator.

Following Screen: The escape key will signal that the user is finished with the editting of this information. If no errors are trapped, Screen 7.1. If errors are detected, Screen 6.1. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: When the user indicates that the editting session is complete (by pressing the escape key), error trapping will commence. If any of the preceding functions do not exist in the mission, then the user will receive the error "Function XXXXXXXX, listed as the preceding function for Function YYYYYYYY, does not exist. (Return to Continue)" If the user has not specified a beginning function for the mission, then the user will receive the error "A beginning function has not been specified. (Return to Continue)". If the user has specified probabilities for a probabilistic decision which do not add to 1.0, then "The probabilities for Function ZZZZZZZZ do not sum to one. (Return to Continue)". If the user has specified a single following function for a function with a multiple decision type, then "Function XXXXXXXX has a multiple decision type, but more

than one following function has not been specified. (Return to Continue)" All the errors which are encountered will be written to the file error.dat. If any of these errors are encountered, the user will be returned to the spreadsheet to make corrections.

PATH: SPREA>FUNCTION SEQUENCE MODE: WORK
Add Delete View
Add a new following function

FUNCTION SEQUENCE FOR MISSION : Destroy Enemy Armored Vehicles		
System Name : Apache IV Comparable Mission : Destroy Enemy Fix. Emplace.		
Functions (* - function for comparable mission only) Following Functions	Loop	Prob
Plan and prepare for mission		
Taxi and takeoff		1
Taxi and takeoff		
Navigate		1
Navigate		
Fly aircraft to mission area	1	1
Fly aircraft from mission area	2	1
Communicate		
Fly aircraft to mission area		
Perform reconnaissance		1
*Perform reconnaissance		
Navigate		.8
Defend against attack		.2
Acquire Targets		

PATH: SPREA)FUNCTION SEQUENCE MODE: WORK

Add Delete View

Add a new following function

FUNCTION SEQUENCE FOR MISSION : Destroy Enemy Armored Vehicles

System Name : Apache IV Comparable Mission : Destroy Enemy Fix. Emplace.

Functions (* - function for compar Following Functions	AVAILABLE FOLLOWING FUNCTIONS
Plan and prepare for mission Taxi and takeoff Taxi and takeoff Navigate Navigate Fly aircraft to mission area Fly aircraft from mission area Communicate Fly aircraft to mission area Perform reconnaissance *Perform reconnaissance Navigate Defend against attack Acquire Targets	Plan and prepare for mission Taxi and takeoff Fly aircraft to mission area Navigate Communicate Acquire targets Attack targets Defend against attack Fly aircraft from mission area Approach and land aircraft Perform after landing tasks

PATH: SPREA>FUNCTION SEQUENCE MODE: WORK

FUNCTION SEQUENCE FOR MISSION : Destroy Enemy Armored Vehicles		
System Name : Apache IV Comparable Mission : Destroy Enemy Fix. Emplace.		
Functions (* - function for comparable mission only) Following Functions	Loop	Prob
Plan and prepare for mission		
Taxi and takeoff		1
Taxi and takeoff		
Navigate		1
Communicate		1
Navigate		
Fly aircraft to mission area	1	1
Fly aircraft from mission area	2	1
Communicate		
Fly aircraft to mission area		
Perform reconnaissance		1
*Perform reconnaissance		
Navigate		.8
Defend against attack		.2

PATH: SPREA)FUNCTION SEQUENCE MODE: WORK

Add Delete View

Delete a current following function

FUNCTION SEQUENCE FOR MISSION : Destroy Enemy Armored Vehicles		
System Name : Apache IV Comparable Mission : Destroy Enemy Fix. Emplace.		
Functions (* - function for comparable mission only) Following Functions	Loop	Prob
Plan and prepare for mission		
Taxi and takeoff		1
Taxi and takeoff		
Navigate		1
Communicate		1
Navigate		
Fly aircraft to mission area	1	1
Fly aircraft from mission area	2	1
Communicate		
Fly aircraft to mission area		
Perform reconnaissance		1
*Perform reconnaissance		
Navigate		.8
Defend against attack		.2

PATH: SPREA>FUNCTION SEQUENCE MODE: WORK

Add Delete View

Delete a current following function

FUNCTION SEQUENCE FOR MISSION : Destroy Enemy Armored Vehicles		
System Name : Apache IV Comparable Mission : Destroy Enemy Fix. Emplace.		
Functions (* - function for comparable mission only) Following Functions	Loop	Prob
Plan and prepare for mission		
Taxi and takeoff		1
Taxi and takeoff		
Navigate		1
Communicate		1
Navigate		
Fly aircraft to mission area	1	1
Fly aircraft from mission area	2	1
Communicate		
Fly aircraft to mission area		
Acquire Targets		
Attack Targets		
Defend against attack		
Fly aircraft from mission area		

ATH: SPREA>FUNCTION SEQUENCE MODE: WORK

Add Delete View

View the function network diagram

FUNCTION SEQUENCE FOR MISSION : Destroy Enemy Armored Vehicles		
System Name : Apache IV Comparable Mission : Destroy Enemy Fix. Emplace.		
Functions (* - function for comparable mission only) Following Functions	Loop	Prob
Plan and prepare for mission		
Taxi and takeoff		1
Taxi and takeoff		
Navigate		1
Communicate		1
Navigate		
Fly aircraft to mission area	1	1
Fly aircraft from mission area	2	1
Communicate		
Fly aircraft to mission area		
Acquire Targets		
Attack Targets		
Defend against attack		
Fly aircraft from mission area		

THE NETWORK DIAGRAM WILL BE DISPLAYED HERE

ATH: SPREA>FUNCTION SEQUENCE MODE: WORK

FUNCTION SEQUENCE FOR MISSION : Destroy Enemy Armored Vehicles

System Name : Apache IV Comparable Mission : Destroy Enemy Fix. Emplace.

Functions (* - function for comparable mission only) Following Functions	Loop	Prob
Plan and prepare for mission		
Taxi and takeoff		1
Taxi and takeoff		
Navigate		1
Communicate		1
Navigate		
Communi		1
Fly air		1
Acquire		
Attack		
Defend		
Fly air		

ERROR : Functions from the comparable mission still exist in the as following tasks in the sequence list

PATH: SPREA>FUNCTION SEQUENCE MODE: WORK

FUNCTION SEQUENCE FOR MISSION : Destroy Enemy Armored Vehicles

System Name : Apache IV Comparable Mission : Destroy Enemy Fix. Emplace.

Functions (* - function for comparable mission only) Following Functions	Loop	Prob
Plan and prepare for mission		
Taxi and takeoff		1
Taxi and takeoff		
Navigate		1
Communicate		1
Navigate		
Communi		1
Fly air		1
Acquire		
Attack		
Defend		
Fly air		

ERROR : The probabilities for the highlighted functions do not add up to one

ATH: SPREA)FUNCTION SEQUENCE MODE: WORK

FUNCTION SEQUENCE FOR MISSION : Destroy Enemy Armored Vehicles

System Name : Apache IV Comparable Mission : Destroy Enemy Fix. Emplace.

Functions (* - function for comparable mission only) Following Functions	Loop	Prob
Plan and prepare for mission		
Taxi and takeoff		1
Taxi and takeoff		
Navigate		1
Communicate		1
Navigate		
Communi		1
Fly air		1
Acquire		
Attack		
Defend		
Fly air		

ERROR : The highlighted functions have loops which do not have cycle counts specified

3.7 Step 7 - Weight Function Accuracies

In this step, the function accuracies will be assigned weights which represent the effect that the accuracy of the specific function affects the probability of mission success.

Input

External. The user will enter weighting factors which apply to the accuracy measures for each function. If the user has identified a comparable mission in Step 1 of this process, then he/she will be presented with the weights assigned to that mission for modification or acceptance.

Internal.

Process

In this step, the user will assign weighting factors to the individual function accuracies. The weighting factors must add to 1.0. The user will have the ability to access the weights which were assigned to the comparable mission. He/she will be able to accept those estimates, or will be able to modify them, as appropriate.

The probability of mission success will be calculated by combining the individual function accuracies, and weighting those accuracies appropriately. The combination will be accomplished using a multiplicative model as shown below:

$$\text{Prob (Mission Success)} = (w_1 * A_1) * \ldots\ldots (w_n * A^n)$$

for n functions

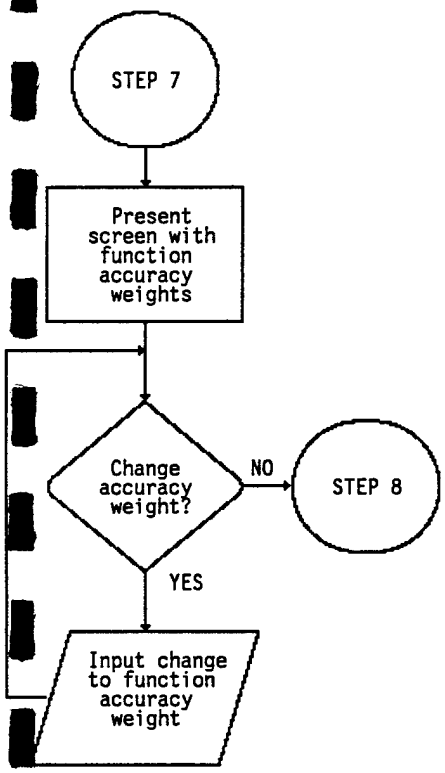
Output

The result of this step will be a weighted factor algorithm for calculating the probability of mission success as a function of the accuracy of each composite function.

User Interface

The user interface is described in detail in the remainder of this subsection.

STEP 7: Weight Function Accuracies



Screen 7.1 - Weight function accuracies towards the probability of mission success calculation. The user will be presented with the function accuracy weighting table.

User Action: The input on this screen will be in spreadsheet format. The user will move around the spreadsheet with arrow keys. When the user reaches a cell that he/she wishes to make an entry in, the delete keys, as well as the other keys on the keyboard, can be used to enter numeric or alpha text. The Home key will place the cursor in the upper left-hand cell of the spreadsheet. The End key will place cursor at the end of the line on which the cursor currently is placed. The Page Down and Page Up keys will move the display downward and upward 25 rows, respectively. The Page Down and Page Up keys will only have an effect if the list of functions (in conjunction with the rest of the information on the screen) is longer than 25 rows. When the user presses "escape", the system will consider the editing on the screen complete.

Input Files:

Output Files: When the user completes the editting session, the functions and their sequence will be written to temp.dat. This file will serve as the user's working file.

Algorithms: The SPREA will calculate the probability of mission success using:

Prob (Mission Success) = $(w_1 * A_1)$ * ..... $(w_n * A^n)$
for n functions

Following Screen: The escape key will signal that the user is finished with the editting of this information. If no errors are trapped, Screen 8.1. If errors are detected, Screen 7.1. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press

the carriage return to return to this menu.

Error Statements: When the user indicates that the editting session is complete (by pressing the escape key), error trapping will commence. If the weights do not sum to 1.0, then the user will receive the error "The weights of the functions do not sum to 1.0. (Return to Continue)". All the errors which are encountered will be written to the file error.dat. If any of these errors are encountered, the user will be returned to the spreadsheet to make corrections.

PATH: SPREA>FUNCTION WEIGHTINGS MODE: WORK

WEIGHTINGS FOR FUNCTION ACCURACIES			
System Name: Apache IV	Mission Name: Destroy Enemy Armored Vehicles		
Functions	Acc.	Wt.	Accuracy Standard
Plan and prepare for mission	.98	.02	completed correctly
Taxi and takeoff	.90	.1	completed w/o abort
Fly aircraft to destination	.95	.1	within 100 meters
Fly aircraft from destination	.95	.1	within 100 meters
Navigate	.95	.1	id destination correctly
Communicate	.90	.06	receive and send ok
Approach and land aircraft	.90	.1	without abort
Perform after landing tasks	.98	.02	completed correctly
Compensate for inflight equip. fail	.90	.1	w/o causing mission abort
Acquire targets	.95	.1	id & acq all w/i sector
Attack targets	.95	.1	disable enemy vehicle
Defend against attack	.90	.1	evade enemy attack
Total of weightings: 1			

PATH: SPREA>FUNCTION WEIGHTINGS MODE: WORK

WEIGHTINGS FOR FUNCTION ACCURACIES			
System Name: Apache IV		Mission Name: Destroy Enemy Armored Vehicles	
Functions	Acc.	Wt.	Accuracy Standard
Plan and prepare for mission	.98	.02	completed correctly
Taxi and takeoff	.90	.2	completed w/o abort
Fly aircraft to destination	.95	.1	within 100 meters
Fly aircraft from destination	.95	.1	within 100 meters
Navigate	.95	.1	id destination correctly
Communicate	.90	.06	receive and send ok
Approach and land aircraft	.90	.1	without abort
Perform after landing tasks	.98	.02	completed correctly
Compensate for inflight equip. fail	.90	.1	w/o causing mission abort
Acquire targets	.95	.1	id & acq all w/i sector
Attack targets	.95	.1	disable enemy vehicle
Defend against attack	.90	.1	evade enemy attack
Total of weightings: 1.1			

PATH: SPREA>FUNCTION WEIGHTINGS MODE: WORK

WEIGHTINGS FOR FUNCTION ACCURACIES

System Name: Apache IV Mission Name: Destroy Enemy Armored Vehicles

Functions	Acc.	Wt.	Accuracy Standard
Plan and prepare for mission	.98	.02	completed correctly
Taxi and takeoff	.90	.2	completed w/o abort
Fly aircraft to destination	.95	.1	within 100 meters
Fly aircraft from destination	.95	.1	within 100 meters
Navigate	.95	.1	id destination correctly
Communicate	.90	.06	receive and send ok
Approach and land aircraft	.90	.1	without abort
Perform after landing tasks	.98	.02	completed correctly
Compensate for inflight equip. fail	.90	.1	w/o causing mission abort
Acquire targets	.95	.1	id
Attack targets	.95	.1	di
Defend against attack	.90	.1	ev
Total of weightings:		1.1	

ERROR

Weightings do not add up to one

3.8 Step 8 - Identify Tasks that Compose Each Function and Assign Task Times and Accuracies

This step will be performed for each function in the system mission. In this step, the tasks for each function will be assigned times and accuracies. We expect that the task times will have some inherent variation. For this reason, we will apply Monte Carlo simulation at the function level. Each function will be modeled, task-by-task. These models will be created automatically using Micro SAINT simulation language, and will be run multiple times. The user will be presented with a frequency distribution of the function time and accuracy measures.

Input

The "Baseline Time and Accuracy Values by Function/Task" Library and the "Functions and Tasks by System Type" Library will be used to limit the amount of information that the user must enter.

Internal. The "Functions and Tasks by System Type" Library will contain listings of tasks, referenced by function. The task taxonomy is included in Appendix A of this document. If the user is simulating a function already in the "Functions and Tasks by System Type" Library, a listing of composite tasks and their baseline times and accuracies will be presented to him/her.

Process

The user will use the SPREA to identify the composite tasks of each function which is an element of the mission. The user will also use the SPREA to assign a performance time and accuracy to each of these tasks.

The Task Libraries will contain baseline estimates of task

performance for each of the existing tasks. These estimates will include the most likely time for the task, the amount of variation which the actual time might deviate from the most likely time, and the percentage accuracy.

These task performance baselines will have been derived from performance data on existing systems and will be associated with specific functions and conditions. The user, using the guidance of the SPREA, will be able to modify these baselines to produce a set of values that meets the overall function performance requirements, identified in Step 2 of this process.

We will access a number of data sources to obtain information on system tasks and task taxonomies for data needed to build the "Functions and Tasks by System Type" Library and the "Baseline Time and Accuracy Values by Function/Task" Library. These data sources include a MAA analysis effort, MAAXTAX, HCM, and an Army ARTEPs-based effort. We will also gather task performance criteria data from the National Training Center (NTC) and the ARTEPs efforts, which are supported by the proponent TRADOC schools.

If the user does not know what the performance criteria should be and is not sure whether the baseline performance criteria are correct, he or she will be able to instruct the system to assign this value by entering a "?". The SPREA will then use backsolving to assign performance criteria to that task which result in the minimally acceptable system performance.

The user will be provided with a method of altering the baseline task performance criteria to keep the library data current. This method will be entirely separate from the SPREA to ensure that the baselines are not changed frivolously.

Micro SAINT will be used to execute the function models. After the model has been executed, the results will be presented

to the user. This presentation will take the form of a frequency distribution. The number of times that the model realized the minimally acceptable functional performance which was identified in Step 2 will be clearly stated.

If the task performance criteria resulted in functional performance that failed to meet the minimally acceptable criteria, the SPREA will aid the user in reassigning task performance times and accuracies to improve the modeled function performance. This process will be repeated until all the functions in the mission have been modeled.

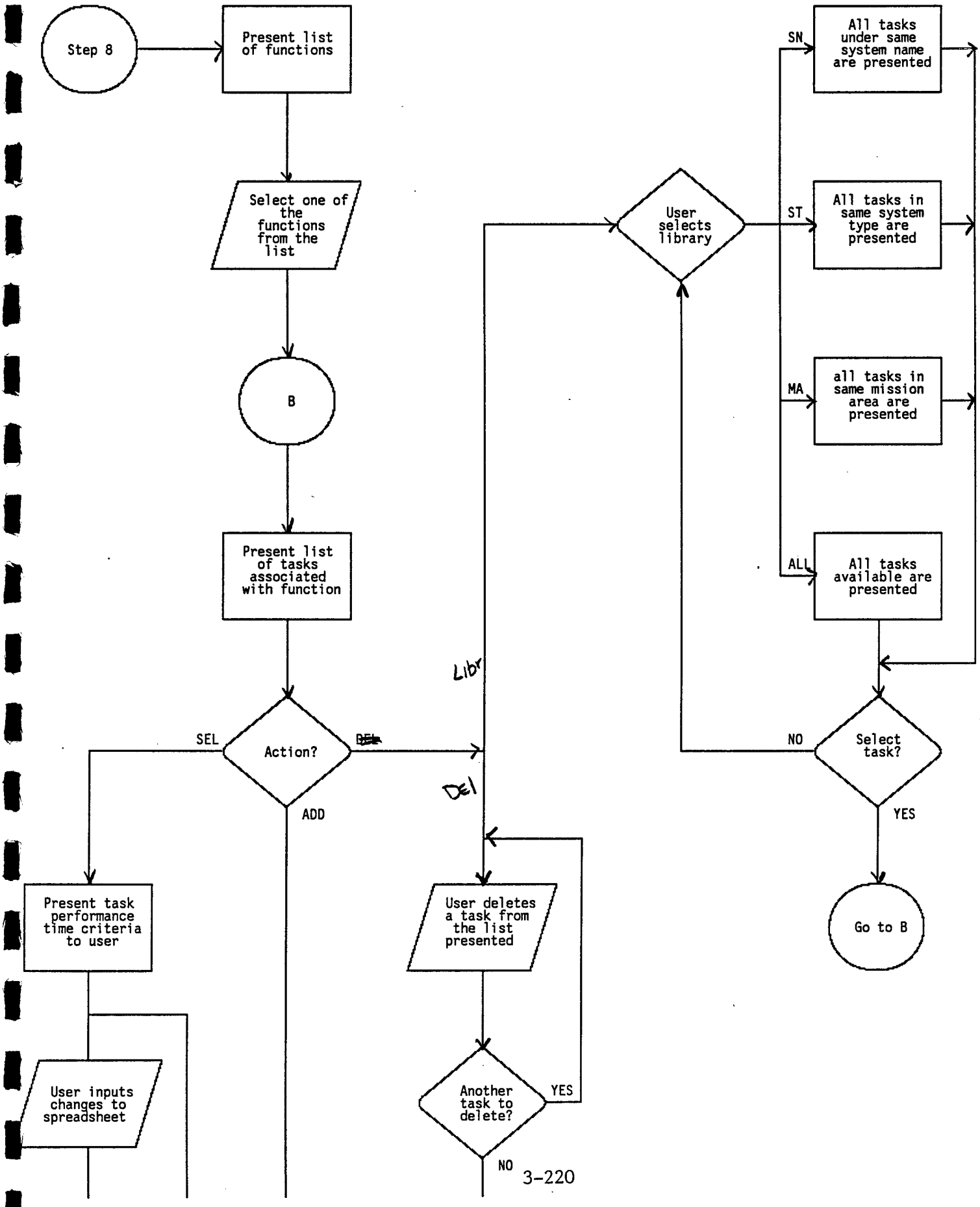
Output

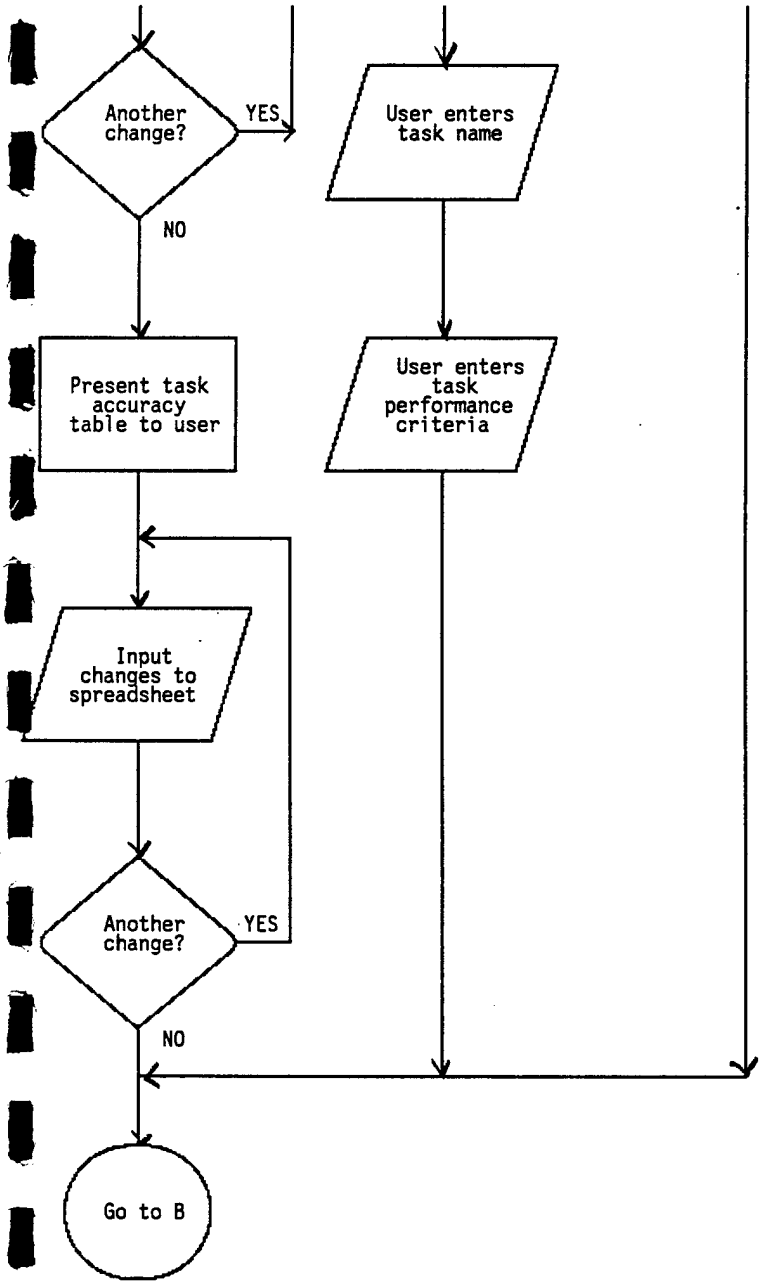
The output from this step will consist of a complete task model for each function in the mission that is being analyzed. This task list will contain the task performance times and accuracies which yielded the minimally acceptable function performance (originally an input from combat models).

User Interface

The user interfaces employed for this step are very similar to that used in Step 4. For this step, the screens display, one at a time, the functions linked to the mission in Step 4. As the functions are displayed, the constituent tasks are listed below, complete with SPREA-derived task-level estimates of time and accuracy. The user may edit the time and accuracy estimates preparatory to the execution of the Monte Carlo simulations. Once the user is satisfied with the time and accuracy values, the system executes the simulation model and presents the results on the screen. The screen display indicates the frequency distribution of task perfromance times and accuracies and then aggregates these values to arrive at function-level values. The

screen then prompts the user to ensure these values meet minimum acceptable criteria before proceding to the next function to analyze.


Step 8
Present list of functions
Select one of the functions from the list
B
Present list of tasks associated with function
Action?
SEL
DEL
ADD
Present task performance time criteria to user
User inputs changes to spreadsheet
User deletes a task from the list presented
Another task to delete?
YES
NO
Lib
User selects library
SN
ST
MA
ALL
All tasks under same system name are presented
All tasks in same system type are presented
all tasks in same mission area are presented
All tasks available are presented
Select task?
NO
YES
Go to B


Another change?
YES
NO
User enters task name
Present task accuracy table to user
User enters task performance criteria
Input changes to spreadsheet
Another change?
YES
NO
Go to B

Screen 8.1 - Present the list of functions that are included in the mission which the user selected.

User Action: Use the horizontal arrow keys to move the highlight bar to select "Select", "Add", "Delete", "Copy", "Move", or "Libraries". Select the option by pressing the carriage return.

Input Files: None

Output Files: None

Algorithms: None

Following Screen: Screen 8.2 if "Select". Screen 8.4 if "Add". Screen 8.5 if "Delete". Screen 8.7 if "View Library". If the user presses "escape" then Screen 8.1. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a horizontal arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key"

PATH: SPREA)TASKS MODE: WORK
Select Add Delete Copy Move Libraries
Select this item

TASK IDENTIFICATION AND PERFORMANCE CRITERIA	
System Name: Apache IV	Mission Name: Destroy Enemy Armored Vehicles
Functions	Tasks
Plan and prepare for mission	Plan flight Check load Calculate weight and balance bearing Prepare performance planning card Enter preflight data Conduct preflight inspection Perform engine start, run-up and check Prepare vehicle/personnel for NBC env.
Taxi and takeoff	Perform ground taxi (1015) Perform hover power check (1017) Perfrom hovering flight (1017) Perform takeoff
Fly aircraft to destination	Cruise (non-tactical flight)

Screen 8.2 - Select a function from the list that is presented

User Action: Use the vertical arrow keys to move the highlight bar to select the specific function of choice. The user will press the carriage return to complete the entry.

Input Files: None

Output Files: None

Algorithms: None

Following Screen: Screen 8.3 unless the user presses "escape". If the user presses "escape" then Screen 8.1. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a vertical arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key"

Screen 8.3 - Present the task performance time criteria to the user. This information includes the minimum, maximum and most likely task performance time, the conditions which the criteria were estimated under, and the usage levels the criteria apply to.

User Action: The input on this screen is in spreadsheet format. The user can move around the spreadsheet with arrow keys. When the user reaches a cell that he/she wishes to make an entry in, the delete keys, as well as the other keys on the keyboard, can be used to enter numeric or alpha text. The Home key will place the cursor in the upper left-hand cell of the spreadsheet. The End key will place cursor at the end of the line on which the cursor currently is placed. The Page Down and Page Up keys will move the display downward and upward 25 rows, respectively. The Page Down and Page Up keys will only have an effect if the list of functions (in conjunction with the rest of the information on the screen) is longer than 25 rows. When the user presses the carriage return, the system will consider the editing on the screen complete. The user can also move to the lower menu by using the "switch" command.

When the user moves to the lower menu, he/she will have the options of "Specify the impact on other functions", "Set criteria for next task", "Set task criteria for next function" or "Return to main task table".

Input Files: The Function, Mission and the System Name will be used to index into the "Functions and Tasks by System Type" Library. The DBMS Search routines will be used to locate the tasks which are included in the function. The DBMS Retrieval routines will be used to retrieve the tasks and their associated performance time criteria from the Library.

Output Files: When the user completes the editting session, the tasks and their editted performance time criteria

will be written to temp.dat. This file will serve as the user's working file.

Algorithms: None

Following Screen: If the user chooses "Specify the impact on other functions", then Screen 8.6. If "Set criteria for next task", then Screen 8.3 will be loaded with the next task. If the user chooses "Set task criteria for next function", then Screen 8.3 will be loaded with the first task of the next function. If he/she selects "Return to main task table", then Screen 8.1. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: When the user indicates that the editting session is complete (by pressing the "escape"), error trapping will commence. If any of the time values in the spreadsheet are < 0, then the user will receive the error "The (minimum, most likely, maximum) performance time for task XXXXXXXX is less than zero. (Return to Continue)" All the errors which are encountered will be written to the file error.dat. If any of these errors are encountered, the user will be returned to the spreadsheet to make corrections.

PATH: SPREA>TASKS>CRITERIA MODE: WORK
Switch
Switch menus

TASK CRITERIA

System Name : Apache IV
Mission Name : Destroy Enemy Armored Vehicles
Comparable Mission : Destroy Enemy Fixed Emplacements
Function : Plan and prepare for mission
Task : Plan flight

Task Time : 3 minutes

Accuracy Standard	Level	P(level)	P(redo)
All planning complete	0	.99	0
N/A	1	0	0
No planning complete	2	.01	1

1. Specify impact on other functions
2. Set criteria for next task
3. Set task criteria for next function
4. Return to main task table

Screen 8.4 - Add a task to the list that is presented

User Action: The last line of the task list is now vacant and the cursor is positioned at the left-hand side of the new row. Use the keyboard to enter the new task name. The user will press the carriage return to complete the entry.

Input Files: None

Output Files: None

Algorithms: None

Following Screen: Screen 8.1. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements:

PATH: SPREA)TASKS MODE: WORK
Select Add Delete Copy Move Libraries
Add a new item to the list

TASK IDENTIFICATION AND PERFORMANCE CRITERIA	
System Name: Apache IV	Mission Name: Destroy Enemy Armored Vehicles
Functions	Tasks
Plan and prepare for mission	Plan flight Check load Calculate weight and balance bearing Prepare performance planning card Enter preflight data Conduct preflight inspection Perform engine start, run-up and check Prepare vehicle/personnel for NBC env.
Taxi and takeoff	Perform ground taxi (1015) Perform hover power check (1017) Perfrom hovering flight (1017) Perform takeoff
Fly aircraft to destination	Cruise (non-tactical flight)

Screen 8.5 - Select a task from the list that is presented (Delete)

User Action: Use the vertical arrow keys to move the highlight bar to select the specific task of choice. The user will press the carriage return to complete the entry. After the user presses the carriage return the selected function will disappear from the list and control will return to Screen 8.1.

Input Files: None

Output Files: None

Algorithms: None

Following Screen: Screen 8.1. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a vertical arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key"

PATH: SPREA)TASKS MODE: WORK
Select Add Delete Copy Move Libraries
Delete this item

TASK IDENTIFICATION AND PERFORMANCE CRITERIA	
System Name: Apache IV	Mission Name: Destroy Enemy Armored Vehicles
Functions	Tasks
Plan and prepare for mission	Plan flight Check load Calculate weight and balance bearing Prepare performance planning card Enter preflight data Conduct preflight inspection Perform engine start, run-up and check Prepare vehicle/personnel for NBC env.
Taxi and takeoff	Perform ground taxi (1015) Perform hover power check (1017) Perfrom hovering flight (1017) Perform takeoff
Fly aircraft to destination	Cruise (non-tactical flight)

Screen 8.6 - Task Accuracy. The SPREA will present a Task Accuracy Table to the user.

User Action: The input on this screen is in spreadsheet format. The user can move around the spreadsheet with arrow keys. When the user reaches a cell that he/she wishes to make an entry in, the delete keys, as well as the other keys on the keyboard, can be used to enter numeric or alpha text. The Home key will place the cursor in the upper left-hand cell of the spreadsheet. The End key will place cursor at the end of the line on which the cursor currently is placed. The Page Down and Page Up keys will move the display downward and upward 25 rows, respectively. The Page Down and Page Up keys will only have an effect if the list of tasks (in conjunction with the rest of the information on the screen) is longer than 25 rows. When the user presses the carriage return, the system will consider the editing on the screen complete.

Input Files: The Mission, Function, and the System Name will be used to index into the "Functions and Tasks by System Type" Library. The DBMS Search routines will be used to locate the tasks which are included in the function. The DBMS Retrieval routines will be used to retrieve the tasks and their associated performance accuracy criteria from the "Baseline Time and Accuracy Values by Function/Task" Library.

Output Files: When the user completes the editting session, the tasks and their editted performance accuracy criteria will be written to temp.dat. This file will serve as the user's working file.

Algorithms: The leftmost column in the Task Accuracy Table lists the mission tasks. These tasks will be listed in roughly sequential order. The second column lists the degree of failure for each task. A failure degree of 0 corresponds to complete

success (i.e., complete accuracy). Likewise, a failure degree of 1 corresponds to partial success (partial accuracy), and a failure degree of 2 corresponds to total task failure. The third column in the table is the probability of redo. This is the probability that a task will repeat itself, given a specific degree of failure.

As an example, the prob(redo) for the "Detect Threat Warnings" Task is 5% for a failure degree of 1. This means that if the simulation leads to a partial failure for this task, then this task will repeat itself with a probability of 5%.

The degree of failure on any given task will affect each of the MOEs associated with the parent function differently. This is accounted for in the table. As an illustration, let's assume that MOE 1 is "Target Acquisition Time." The table shows that even if "Detect Threat Warnings" fails completely, target acquisition time will not degrade. On the other hand, if "Take Countermeasures" fails completely, target acquisition time will be degraded by 35%.

Following Screen: If no errors are trapped, Screen 8.2. If errors are detected, Screen 8.6. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: When the user indicates that the editting session is complete (by pressing the "escape"), error trapping will commence. If the accuracy for any task is less than 0 or greater than 100, then the user will receive the error "The percentage accuracy for task XXXXXXXX is (less than zero, greater than 100). (Return to Continue)". All the errors which are encountered will be written to the file error.dat. If any of these errors are encountered, the user will be returned to the spreadsheet to make corrections.

PATH: SPREA)TASKS)CRITERIA MODE: WORK

TASK CRITERIA

System Name : Apache IV
Mission Name : Destroy Enemy Armored Vehicles
Comparable Mission : Destroy Enemy Fixed Emplacements
Function : Plan and prepare for mission
Task : Check load

Task Time : 1 minutes

Accuracy Standard	Level	P(level)	P(redo)
Check complete	0	.95	0
Check incomplete or incorrect	1	.04	.3
No check performed	2	.01	.95

1. Specify impact on other functions
2. Set criteria for next task
3. Set task criteria for next function
4. Return to main task table

PATH: SPREA>TASKS>CRITERIA>IMPACT MODE: WORK

IMPACT OF TASK ON OTHER FUNCTIONS IN THE MISSION

Task : Plan flight Function : Plan and prepare for mission

Level	Accuracy Standard
1	N/A
2	No planning complete

Other functions	Level (current task)	Impact (% degradation)
Taxi and takeoff	1	0
	2	0
Fly aircraft to mission area	1	0
	2	20
Fly aircraft from mission area	1	0
	2	20
Navigate	1	0
	2	60

Screen 8.7 - Ask the user which library he/she wishes to examine.

User Action: Use the vertical arrow keys to move the highlight bar to select "System Type" or "Misssion Area", or "All Tasks". Select the option by pressing the carriage return.

Input Files: None

Output Files: None

Algorithms: None

Following Screen: Screen 8.8 if "System Type". Screen 8.9 if "Mission Area". Screen 8.10 if "All Tasks". If the user presses "escape" then Screen 8.1. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a vertical arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key"

PATH: SPREA)TASKS MODE: WORK
Select Add Delete Copy Move Libraries
Access libraries

TASK IDENTIFICATION AND PERFORMANCE CRITERIA	
System Name: Apache IV	Mission Name: Destroy Enemy Armored Vehicles
Functions	Tasks
Plan and prepare for mission	Plan flight Check load Calculate weight and balance bearing Prepare performance planning card Enter preflight data Conduct preflight inspection Perform engine start, run-up and check Prepare vehicle/personnel for NBC env.
Taxi and takeoff	Perform ground taxi (1015) Perform hover power check (1017) Perfrom hovering flight (1017) Perform takeoff
Fly aircraft to destination	Cruise (non-tactical flight)

PATH: SPREA)TASKS)LIBRARIES

MODE: WORK

TASK IDENTIFICATION AND PERFORMANCE CRITERIA

e: Destroy Enemy Armored Vehicles

LIBRARIES

Access libraries containing tasks associated with the same:

1. System type
2. Mission area
3. All tasks

	light load ate weight and balance bearing e performance planning card preflight data t preflight inspection
	Perform engine start, run-up and check Prepare vehicle/personnel for NBC env.
Taxi and takeoff	Perform ground taxi (1015) Perform hover power check (1017) Perfrom hovering flight (1017) Perform takeoff
Fly aircraft to destination	Cruise (non-tactical flight)

Screen 8.8 - Present a list of tasks that exist in the libraries under the same system type, (if any).

User Action: Use the horizontal arrow keys to move the highlight bar to select "Select". Select the option by pressing the carriage return.

Input Files: The DBMS retrieval routines will be used to access the "Functions and Tasks by System Type" Library and retrieve all the tasks entered under the system type entered in Screen 1.11. The task performance time and accuracy will also be retrieved from the "Functions and Tasks by System Type" Library.

Output Files: None

Algorithms: None

Following Screen: Screen 8.11 if "Select". If the user presses "escape" then Screen 8.1 If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a horizontal arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key"

PATH: SPREA>TASKS>LIBRARIES>SYSTYP MODE: WORK

Select

Select this task

TASK LIBRARY FOR SYSTEM TYPE : Attack helicopter	
Functions	Tasks
Plan and prepare for mission	Plan flight Check load Calculate weight and balance bearing Prepare performance planning card Enter preflight data Conduct preflight inspection Perform engine start, run-up and check Prepare vehicle/personnel for NBC env.
Taxi and takeoff	Perform ground taxi (1015) Perform hover power check (1017) Perfrom hovering flight (1017) Perform takeoff
Fly aircraft to destination	Cruise (non-tactical flight) Perform tactical flight Monitor isntruments

Screen 8.9 - Present a list of tasks that exist in the libraries under the same mission area, (if any).

User Action: Use the horizontal arrow keys to move the highlight bar to select "Select" or "Switch". Select the option by pressing the carriage return. (The switch option allows the user to change the system type).

Input Files: The DBMS retrieval routines will be used to access the task library and retrieve all the tasks entered under the mission area entered. The task performance time and accuracy will also be retrieved from the "Functions and Tasks by System Type" Library.

Output Files: None

Algorithms: None

Following Screen: Screen 8.11 if "Select". Screen 8.9.1 if "Switch". If the user presses "escape" then Screen 8.1. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a horizontal arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key"

PATH: SPREA>TASKS>LIBRARIES>MISSION AREA MODE: WORK
Select Switch
Select this task

TASK LIBRARY FOR MISSION AREA: Aviation	
SYSTEM TYPE : Attack helicopter	
Functions	Tasks
Plan and prepare for mission	Plan flight Check load Calculate weight and balance bearing Prepare performance planning card Enter preflight data Conduct preflight inspection Perform engine start, run-up and check Prepare vehicle/personnel for NBC env.
Taxi and takeoff	Perform ground taxi (1015) Perform hover power check (1017) Perfrom hovering flight (1017) Perform takeoff
Fly aircraft to destination	Cruise (non-tactical flight)

PATH: SPREA>TASKS>LIBRARIES>MISSION AREA MODE: WORK
Select Switch
Switch menus

TASK LIBRARY FOR MISSION AREA: Aviation	
SYSTEM TYPE : Attack helicopter	
Functions	Tasks
Plan and prepare for mission	Plan flight Check load Calculate weight and balance bearing Prepare performance planning card Enter preflight data Conduct preflight inspection Perform engine start, run-up and check Prepare vehicle/personnel for NBC env.
Taxi and takeoff	Perform ground taxi (1015) Perform hover power check (1017) Perfrom hovering flight (1017) Perform takeoff
Fly aircraft to destination	Cruise (non-tactical flight)

Screen 8.9.1 - Prompt the user to determine the system type (within the same mission area) for which the user wishes to view the library.

User Action: Use the vertical arrow keys to move the highlight bar to select a system type.

Input Files: The DBMS retrieval routines will be used to access the "Functions and Tasks by System Type" Library and retrieve all the tasks entered under the system type entered. The task performance time and accuracy will also be retrieved from the "Functions and Tasks by System Type" Library.

Output Files: None

Algorithms: None

Following Screen: Screen 8.8. If the user presses "escape" then Screen 8.1. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a vertical arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key"

PATH: SPREA>TASKS>LIBRARIES>MISSION AREA MODE: WORK
Select Switch
Select this system type

TASK LIBRARY FOR MISSION AREA: Aviation

SYSTEM TYPE : Attack helicopter

1. attack helicopters
2. cargo helicopter
3. utility helicopter
4. scout helicopter
5. fixed wing

Functions	
Plan and prepare for mission	lance bearing nning card
	Enter preflight data Conduct preflight inspection Perform engine start, run-up and check Prepare vehicle/personnel for NBC env.
Taxi and takeoff	Perform ground taxi (1015) Perform hover power check (1017) Perfrom hovering flight (1017) Perform takeoff
Fly aircraft to destination	Cruise (non-tactical flight)

Screen 8.10 - Present the list of tasks that exist in the "Functions and Tasks by System Type" Library.

User Action: Use the horizontal arrow keys to move the highlight bar to select "Select" or "Switch". Select the option by pressing the carriage return.

Input Files: The DBMS retrieval routines will be used to access the task library and retrieve all the tasks entered. The task performance time and accuracy will also be retrieved from the "Functions and Tasks by System Type" Library.

Output Files: None

Algorithms: None

Following Screen: Screen 8.11 if "Select". If the user presses "escape" or chooses "Quit" then Screen 8.1. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a horizontal arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key"

PATH: SPREA>TASKS>LIBRARIES>ALL TASKS MODE: WORK

Select Switch

Select this ~~function~~ task

LIBRARY FOR ALL TASKS	
Mission Area: Aviation	System Type: Attack helicopter
Functions	Tasks
Plan and prepare for mission	Plan flight Check load Calculate weight and balance bearing Prepare performance planning card Enter preflight data Conduct preflight inspection Perform engine start, run-up and check Prepare vehicle/personnel for NBC env.
Taxi and takeoff	Perform ground taxi (1015) Perform hover power check (1017) Perfrom hovering flight (1017) Perform takeoff
Fly aircraft to destination	Cruise (non-tactical flight)

Screen 8.11 - Select task from the list that is presented

User Action: Use the vertical arrow keys to move the highlight bar to select the specific task of choice. The user will press the carriage return to complete the entry.

Input Files: None

Output Files: None

Algorithms: None

Following Screen: Predecessor screen unless the user presses "escape". If the user presses "escape" then Screen 8.1. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a vertical arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key"

2.9 Step 9 - Identify Task Sequence

In order to build a mission network model from the Function and Task Libraries, it is necessary to provide links between the tasks. These links will be referred to as the "Task Sequence by Function" Library. The "Task Sequence by Function" Library is independent of the "Functions and Tasks by System Type" Library. This enables the analyst to select tasks for a particular function from the "Functions and Tasks by System Type" Library before dealing with the sequencing of the tasks.

Input

The primary input will be the "Task Sequence by Function" Library. This library will contain the task sequences of all the functions which are included in the "Functions by Mission" Library. The analyst can use one of the available sequences, or he/she can modify an available sequence to reflect the unique features of the system.

External. The analyst may want to modify the task sequences in the "Task Sequence by Function" Library. In fact, this modification will be required to do so if any new tasks were added to the function. Data sources that will be available to assist the analyst in making these modifications are discussed in Section 5.

Internal. The internal input source consists of the existing "Task Sequence by Function" Library data that have been incorporated into the SPREA and will be available to the analyst. The initial data set that will be used to build this library will come from task analysis data of existing systems.

Process

Task sequence data will be provided for the functions which have been previously incorporated into the SPREA. As with the library data discussed in the preceding steps, these sequence data can be modified or the analyst can define a new task sequence from scratch.

The "Task Sequence by Function" Library will be very simple. Each task will have a number and the analyst will be asked to identify the first task of the function and the successor(s) for each task.

The software will ensure that the analyst has specified links for each task he or she wants to include. The software will also ensure that there are no dead-ends, illogical paths through the tasks, or tasks without paths that lead to them.

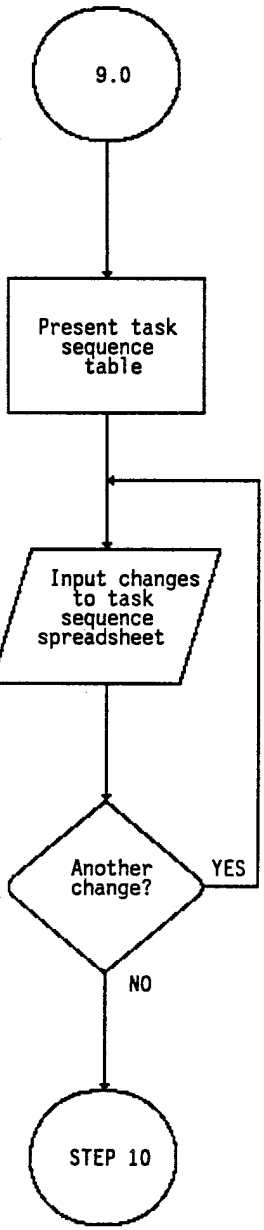
The "Task Sequence by Function" Library supplies an easy method for the analyst to experiment with different task sequences. Since the sequence is independent of the task performance criteria, it will be possible for the analyst to see whether different task sequences will alter the system performance.

Output

The output from this step will consist of a complete task sequence for the function that is being analyzed. This task sequence will contain the branching directions between the tasks within the function.

User Interface

The user interface for the "Task Sequence by Function" Library will have a spreadsheet format. The data in this library will be filed by System Type and Function, so if the analyst has specified a function which already has a task sequence filed in the library, that sequence will be presented to the analyst automatically. The analyst will also be able to view the other library entries.


9.0
Present task sequence table
Input changes to task sequence spreadsheet
Another change?
YES
NO
STEP 10

Screen 9.1 - Task Sequence. The user will be presented with the task sequence table. He/she will also be able to view the task network diagram.

User Action: The input on this screen will be in spreadsheet format. The user will move around the spreadsheet with arrow keys. When the user reaches a cell that he/she wishes to make an entry in, the delete keys, as well as the other keys on the keyboard, can be used to enter numeric or alpha text. The Home key will place the cursor in the upper left-hand cell of the spreadsheet. The End key will place cursor at the end of the line on which the cursor currently is placed. The Page Down and Page Up keys will move the display downward and upward 25 rows, respectively. The Page Down and Page Up keys will only have an effect if the list of tasks (in conjunction with the rest of the information on the screen) is longer than 25 rows. When the user presses the carriage return, the system will consider the editing on the screen complete.

Input Files: The Function and the System Type will be used to index into the "Task Sequence by Function" Library. The DBMS Search routines will be used to locate the function which is being analyzed. The DBMS Retrieval routines will be used to retrieve the task sequence from the "Task Sequence by Function" Library.

Output Files: When the user completes the editting session, the tasks and their sequence will be written to temp.dat. This file will serve as the user's working file.

Algorithms: The SPREA will use the Micro SAINT routing algorithm to draw the task network diagram from the task sequence. The "loop" column on the sequence table is used to identify any looping constructs in the sequence of the function. The probability column of the task sequence table indicates whether the following task is a probabilistic decision or a

multiple decision. Any following task which has a probability value of "1" will always be a following task for the task. Any following task which has a probability value less than one will only be a following task for the indicated percentage of times. In this case, the following task will be determined be determined using the random number generator.

Following Screen: If no errors are trapped, Screen 10.0 If errors are detected, Screen 9.1. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: When the user indicates that the editting session is complete (by pressing the "escape"), error trapping will commence. If any of the following tasks do not exist in the function, then the user will receive the error "Task XXXXXXXX, listed as the following task for Task YYYYYYYY, does not exist. (Return to Continue)" If the user has not specified a beginning task for the function, then the user will receive the error "A beginning task has not been specified. (Return to Continue)". if the user has specified multiple following tasks for a task with a 'single choice' decision type, then the user will receive the error "Multiple following tasks have been listed for a single choice decision for Task XXXXXXXX. (Return to Continue)". If a single following task has been listed for a task having either a 'multiple' or 'probabilistic' decision type, then the user will receive the error "A single following task has been listed for a (multiple, probabilistic) decision for Task XXXXXXXX. (Return to Continue)". If the probabilities for a set of probabilistic following tasks does not add to 1.0, then the user will receive the error "The probabilities for Task XXXXXXXX do not sum to 1.0. (Return to Continue)". All the errors which are encountered will be written to the file error.dat. If any of these errors are encountered, the user will be returned to the spreadsheet to make corrections.

PATH: SPREA)TASK SEQUENCE MODE: WORK

Add Delete View

Add a new following task

TASK SEQUENCE FOR MISSION : Destroy Enemy Armored Vehicles		
System Name : Apache IV Comparable Mission : Destroy Enemy Fix. Emplace. Function : Attack target		
Tasks (* - tasks for comparable mission only) Following Tasks	Loop	Prob
Maneuver for attack		
Select target(s)		1
Select weapon		1
Select target(s)		
Aim/sight weapon		1
Select weapon		
Aim/sight weapon		1
Aim/sight weapon		
Track target		1
Track target		
Fire weapon		.9
Aim/sight weapon		.1
Fire weapon		

PATH: SPREA)TASK SEQUENCE MODE: WORK

Add Delete View

Add a new following task

TASK SEQUENCE FOR MISSION : Destroy Enemy Armored Vehicles

System Name : Apache IV Comparable Mission : Destroy Enemy Fix. Emplace.
Function : Attack target

Tasks (* - tasks for comparabl Following Tasks	AVAILABLE FOLLOWING TASKS
Maneuver for attack Select target(s) Select weapon Select target(s) Aim/sight weapon Select weapon Aim/sight weapon Aim/sight weapon Track target Track target Fire weapon Aim/sight weapon Fire weapon	Maneuver for attack Select targets Select weapon Aim/sight weapon Track target Fire weapon Adjust fire Egress from attack position

PATH: SPREA)TASK SEQUENCE MODE: WORK

Add Delete View

Delete a current following task

TASK SEQUENCE FOR MISSION : Destroy Enemy Armored Vehicles		
System Name : Apache IV Comparable Mission : Destroy Enemy Fix. Emplace. Function : Attack target		
Tasks (* - tasks for comparable mission only) Following Tasks	Loop	Prob
Maneuver for attack		
Select target(s)		1
Select weapon		1
Select target(s)		
Aim/sight weapon		1
Select weapon		
Aim/sight weapon		1
Aim/sight weapon		
Track target		1
Track target		
Fire weapon		.9
Aim/sight weapon		.1
Fire weapon		

PATH: SPREA>TASK SEQUENCE MODE: WORK

Add Delete View

View the task network diagram

TASK SEQUENCE FOR MISSION : Destroy Enemy Armored Vehicles

System Name : Apache IV Comparable Mission : Destroy Enemy Fix. Emplace.

Function : Attack target

Tasks (* - tasks for comparable mission only) Following Tasks	Loop	Prob
Maneuver for attack		
Select target(s)		1
Select weapon		1
Select target(s)		
Aim/sight weapon		1
Select weapon		
Aim/sight weapon		1
Aim/sight weapon		
Track target		1
Track target		
Fire weapon		.9
Aim/sight weapon		.1
Fire weapon		

THE NETWORK DIAGRAM WILL BE DISPLAYED HERE

PATH: SPREA)TASK SEQUENCE MODE: WORK

TASK SEQUENCE FOR MISSION : Destroy Enemy Armored Vehicles

System Name : Apache IV Comparable Mission : Destroy Enemy Fix. Emplace.
Function : Attack target

Tasks (* - tasks for comparable mission only) Following Tasks	Loop	Prob
Maneuver for attack		
Select target(s)		1
Select weapon		1
Select target(s)		
Aim/sight weapon		1
Select w		1
Aim/sigh		1
Track ta		.9
		.1
Fire wea		

ERROR : Tasks from the comparable mission still exist as following tasks in the task sequence list

PATH: SPREA>TASK SEQUENCE MODE: WORK

TASK SEQUENCE FOR MISSION : Destroy Enemy Armored Vehicles

System Name : Apache IV Comparable Mission : Destroy Enemy Fix. Emplace.
Function : Attack target

Tasks (* - tasks for comparable mission only) Following Tasks	Loop	Prob
Maneuver for attack		
Select target(s)		1
Select weapon		1
Select target(s)		
Aim/sight weapon		1
Select w		1
Aim/sigh		1
Track ta		.9
Fire wea		.1

ERROR : The probabilities for the highlighted following tasks do not add up to one

PATH: SPREA)TASK SEQUENCE MODE: WORK

TASK SEQUENCE FOR MISSION : Destroy Enemy Armored Vehicles

System Name : Apache IV Comparable Mission : Destroy Enemy Fix. Emplace.
Function : Attack target

Tasks (* - tasks for comparable mission only) Following Tasks	Loop	Prob
Maneuver for attack		
Select target(s)		1
Select weapon		1
Select target(s)		
Aim/sight weapon		1
Select w		1
Aim/sigh		1
Track ta		.9
Fire wea		.1

ERROR : The highlighted following tasks have loops which do not have cycle counts specified

3.10 Step 10 - Simulate Mission

In this step, the simulation will be executed multiple times.

Input

Internal. The predicted system performance from the function models, which were a result of the task performance criteria will be automatically input to this step from Step 3.

Process

After the function simulation runs have been completed, the SPREA will compile a table of functions which are included in the mission, as well as their individual times and accuracies.

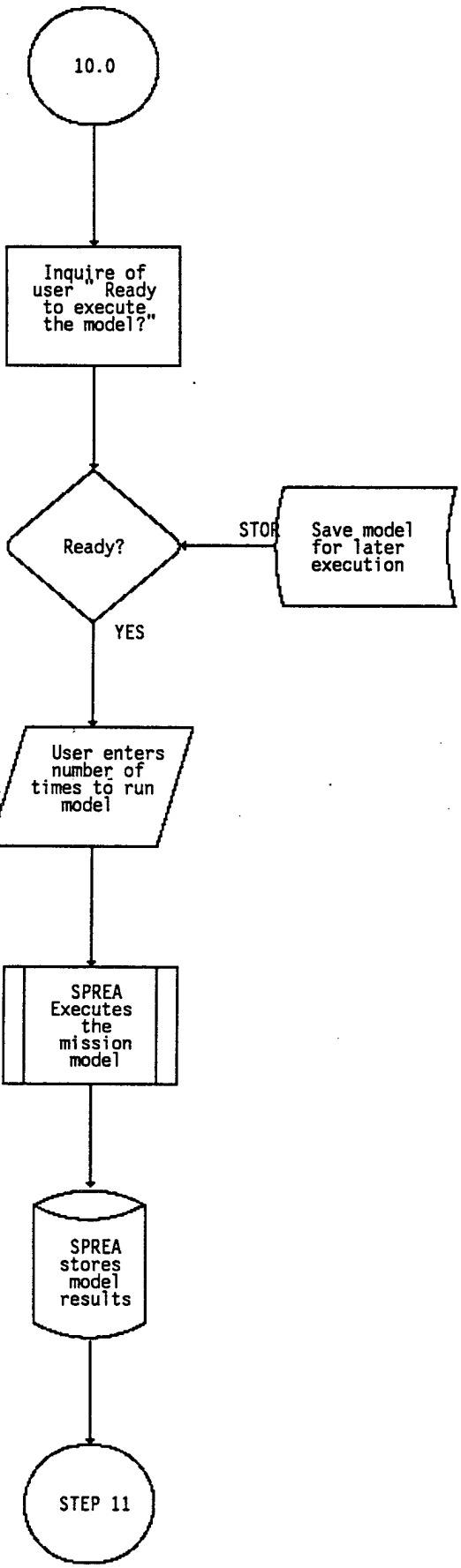
Output

The output of this step will include values for the mission time and accuracy. The frequency table which these values are based on will also be an output of this step.

User Interface

The user interface screens for this step present the mission and its constituent tasks in a tabular format. Displayed next to each function, are values for function time, and accuracy.

Step 10: Simulate Mission



Screen 10.1 - Execute the simulation model of the mission.

User Action: The user will be asked whether he/she is ready for the mission to execute. The user will be provided with an estimate (based upon the number of tasks in the mission model) of the execution time. The user will respond using the keyboard. The user will also enter the number of times he/she wishes to execute the model.

Input Files: If the user is ready to begin the simulation (i.e., chooses the first menu item), then the SPREA will compile the working file into an executable Micro SAINT-based simulation model. A detailed discussion of the simulation model itself is included in Section 6 of this design document.

Output Files: The results of this step consist of simulation model results. These will include predicted function performance times, predicted function performance accuracies, predicted mission performance time, predicted mission performance accuracy, reliability, availability and maintainability estimates. All of these outputs will be passed into Step 11, so that a complete output report can be compiled and presented. The results will also include a complete listing of the conditions (environmental, terrain, threat/target, and friendly forces).

Algorithms: The algorithms which pertain to this screen are discussed extensively in Section 6 of this design specification. This discussion includes a detailed explanation of the manner in which the working file will be used to compile an executable Micro SAINT simulation model of the system mission. Please refer to Section 6 for this information.

Following Screen: Screen 10.2 if the user indicates that he/she is ready to execute the model. Screen 2.0 if the user wants to change the conditions. Screen 3.0 if the user wants to

change the mission performance criteria. Screen 4.0 if the user wants to change the RAM criteria. Screen 5.0 if the user wants to reassign the function criteria. Screen 6.0 if the user wishes to change the function sequence. Screen 7.0 if the user wishes to change the function weights. Screen 8.0 if the user wants to change the task criteria and Screen 9.0 if the user wants to change the task sequence. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements:

PATH: SPREA>SIMULATE MODE: WORK

MISSION SIMULATION

Mission Area	:	Aviation
System Type	:	Attack helicopter
System Name	:	Apache IV
Mission Name	:	Destroy Enemy Armored Vehicles
Comparable Mission	:	Destroy Enemy Fixed Emplacements

1. Begin simulation
2. Change conditions
3. Change mission criteria
4. Change RAM criteria
5. Change function criteria
6. Change function sequence
7. Change function weights
8. Change task criteria
9. Change task sequence

The estimated time for simulation of this mission is : 0 hrs 25 min

Screen 10.2 - Execute the simulation. This step will be fully automated and will not require any user input.

User Action: None

Input Files: The working files which have been built throughout the SPREA process will feed the algorithms which build executable Micro SAINT models from the functions and tasks which have been described.

Output Files: After the simulation has completed, the results will be written to the mission results file. These files will be accessed when the user wishes to output the SPREA Final Reports.

Algorithms: The algorithms which are used to build an executable Micro SAINT model from the working files which contain the detailed mission description are discussed in detail in Section 6.0 of this design specification.

Following Screen: When the simulation execution completes, the following screen will be Screen 11.1. If the user presses "escape" then Screen 10.1. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: None

PATH: SPREA>SIMULATE

MODE: WAIT

MISSION SIMULATION

Mission Area	: Aviation
System Type	: Attack helicopter
System Name	: Apache IV
Mission Name	: Destroy Enemy Armored Vehicles
Comparable Mission	: Destroy Enemy Fixed Emplacements

1. Begin simulation
2. Change conditions
3. Change mission criteria
4. Change RAM criteria
5. Change function criteria
6. Change function sequence
7. Change function weights
8. Change task criteria
9. Change task sequence

The estimated time for simulation of this mission is : 0 hrs 25 min
Current elapsed time : 0 hrs 0 min

3.11 Step 11 - Generate Report

The most important output of this product is the SPREA Report which is generated after the simulation model has executed successfully.

Input

External. None.

Internal. The data that has been input by the user in the previous steps of this process and the data that is calculated during the mission simulation are inputs into the SPREA Report.

Process

Everything in the SPREA Report will be generated automatically, the user will simply have to request the printout. The user will have the opportunity to request different portions of the report. These portions can be selected such that they offer as much or as little detail as the user desires.

Output

The output of this step will be the SPREA Report that contains:

- an explicit statement of the mission that was modeled and its composite functions and tasks
- the conditions that apply to each function
- the required and estimated system performance parameters, which include:

- mission execution time (optional)
- mission accuracy (optional)
- system reliability estimates
- the operational availability requirement
- system maintainability estimates
- system performance measures by function

The mission which was modeled, as well as its composite functions and tasks, will be fully documented in the SPREA Report. This documentation will also include a spreadsheet listing of the tasks with their performance criteria. These performance criteria are:

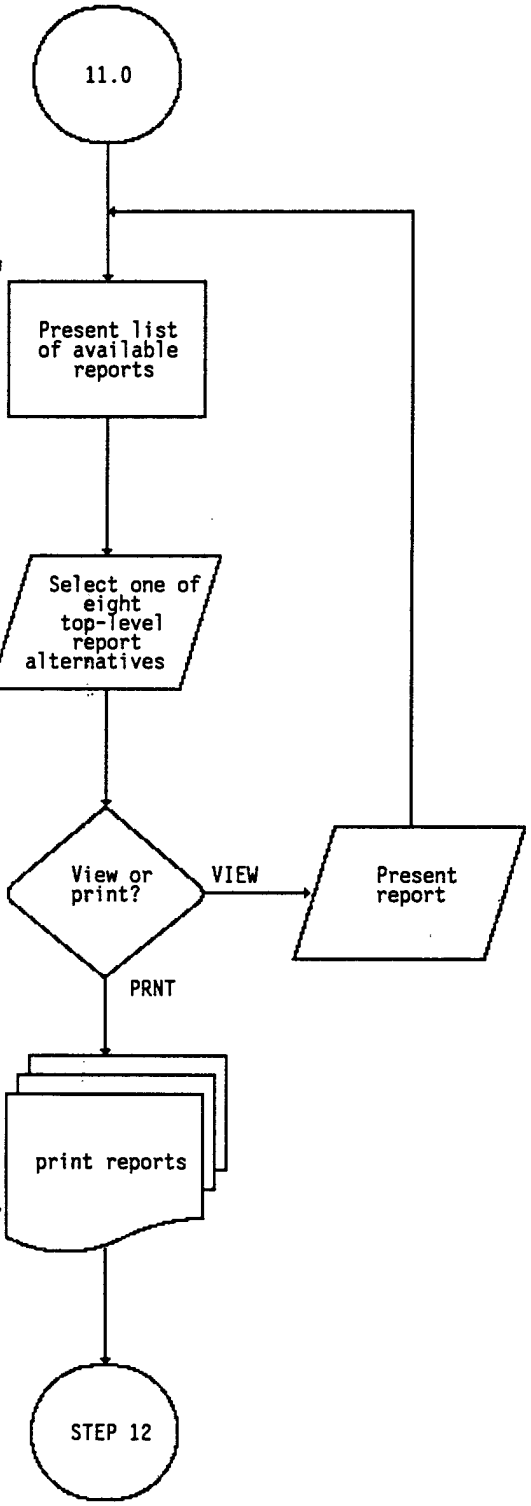
o most likely task performance time
o task accuracy

Finally, the documentation will supply a network drawing which indicates the predecessor/successor relationships between the tasks in each function.

User Interface

This user interface will be extremely simple. The user will be able to select portions of the system performance requirements estimations for printing, or he will be able to specify a complete system performance requirements report. The separate reports are discussed in detail in Section 7.3 of this document. They are also discussed in the remaining pages of this section.

Step 11: Generate Reports



Screen 11.1 - Generate Report. The most important outputs of this product are the SPREA Reports which are generated after the simulation model has executed. In this step, the user will specify which reports he/she wishes to see.

User Action: The user will use the vertical arrow keys to identify the report sections that he/she wishes to see.

Input Files: The input to this step consists of the results from the simulation execution, coupled with the data in the working file which includes a detailed description of all aspects of the mission.

Output Files: None

Algorithms: None

Following Screen: All of the reports which can be selected using this screen are included on the following pages, with the exception of the detailed condition listings. The condition listings have been excluded because they are identical to the information from Step 2 and are too voluminous to be repeated here. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements:

Report 1 - This is the system description report. It is a very short report that simply lists the system name, mission area, system type, mission name, and condition set.

Report 2 - This is the top-level mission description report. It includes a listing of the functions and tasks (listed by name in roughly sequential order).

Report 3 - Performance reports. The predicted mission performance time and accuracy are included in this report. The report also lists the minimally acceptable mission performance. Also includes the detailed function performance time and accuracy predictions and lists the task performance predictions, function by function. The report also includes the entire accuracy table for each task in each function.

Report 4 - System RAM. This includes the system reliability requirement report. In this report the system level reliability estimates for each of the three equipment groups are reported. These reliability estimates consist of three parts. The first part consists of the usage level for the equipment group. The second part consists of the confidence level for the usage level (i.e., the user wants to be able to fire 411 rounds per day without failure, 95% of the time). Finally, the reliability report includes the calculated MXBF for each of the three equipment groups.

It also includes the availability requirements report. This report will list the system name and the operational availability estimate for the system.

Finally, it includes the maintainability requirements report. In this report, the system level maintainability requirements will be listed, by the three maintenance levels (ORG, DS, and GS). The maintainability will be listed in MTTR and MR (Maintenance manhours per operation hour). The system maintainability requirement is allocated across the generic equipment of the system. The ORG, DS, and GS divisions are retained. This report also includes the maintainability requirements of the system, allocated to the maintainability tasks, by equipment type.

Report 5 - The function sequence report gives graphical and tabular information which identifies the sequence of functions within the mission.

Report 6 - The task sequence report gives graphical and tabular information which identifies the sequence of tasks within each function, for each function included in the mission.

Report 7 - Identifies and describes the mission condition set. This is the condition set that the user specified for the entire mission. The conditions in this set will be listed in two categories. Basic, and Additional. Within these two categories, the conditions are further divided into four types: Environmental, terrain, threat/target, and friendly force.

Report 8 - If the user indicated that the conditions could vary from function to function, then this report will be offered. This report will list the condition set which applies to each function, one-by-one.

PATH: SPREA)REPORTS MODE: WORK

View Print

View this report

SPREA REPORTS
The following reports are available for review and/or printing. 1. System description 2. Mission description 3. Performance reports 4. System RAM 5. Function sequence 6. Task sequence 7. Mission conditions 8. Function conditions

Report 1 - This is the system description report. It is a very short report that simply lists:

system name
mission area
system type
mission name
condition set

SYSTEM DESCRIPTION
System Name : Apache IV System Type : Attack helicopter Mission Area : Aviation Mission Name : Destroy Enemy Arm. Veh. Condition Set : Typical case

Report 2 - This is the top-level mission description report. It includes a listing of the functions and tasks (listed by name in roughly sequential order).

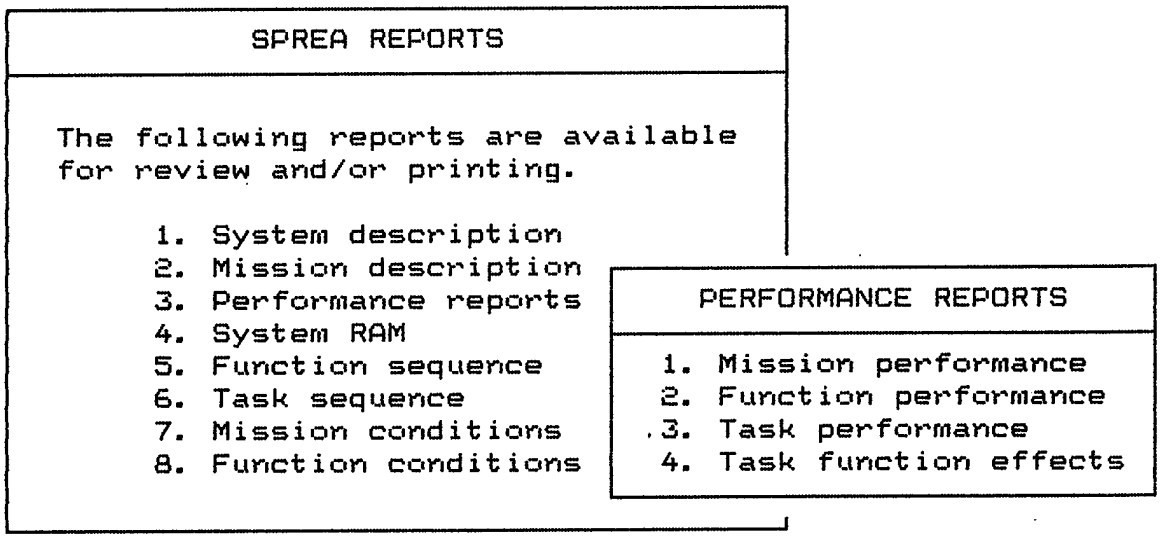
```
mission description
     system name
     mission name
     functions
     tasks
```

PATH: SPREA)REPORTS)MISSION DESCRIPTION MODE: WORK

MISSION DESCRIPTION	
System Name: Apache IV	Mission Name: Destroy Enemy Armored Vehicles
Functions	Tasks
Plan and prepare for mission	Plan flight Check load Calculate weight and balance bearing Prepare performance planning card Enter preflight data Conduct preflight inspection Perform engine start, run-up and check
Taxi and takeoff	Perform ground taxi (1015) Perform hover power check (1017) Perfrom hovering flight (1017) Perform takeoff
Fly aircraft to destination	Perform tactical flight Monitor instruments

PATH: SPREA> REPORTS> PERFORMANCE

MODE: WORK



PATH: SPREA) REPORTS) PERFORMANCE) MISSION MODE: WORK

View Print Graphs

View this report

MISSION PERFORMANCE TIME AND ACCURACY		
System Name : Apache IV Mission Name : Destroy Enemy Armored Vehicles		Condition Set : Typical
Measures	Time	Accuracy
Predicted	14.3	95
Minimally acceptable	15 minutes	95% prob. of success
Difference	- .7	0
Number of times minimally acceptable criteria met	48	49
Total number of times the mission was executed : 50		
Mission Accuracy Standards : 1. 3 enemy vehicles destroyed 2. Remaining enemy force assessed		

PATH: SPREA>REPORTS>PERFORMANCE>MISSION MODE: WORK
View Print Graphs

Freq. Dist. Histogram

N PERFORMANCE TIME AND ACCURACY

System Name : Apache IV Condition Set : Typical
Mission Name : Destroy Enemy Armored Vehicles

Measures	Time	Accuracy
Predicted	14.3	95
Minimally acceptable	15 minutes	95% prob. of success
Difference	- .7	0
Number of times minimally acceptable criteria met	48	49

Total number of times the mission was executed : 50

Mission Accuracy Standards : 1. 3 enemy vehicles destroyed
2. Remaining enemy force assessed

PATH: SPREA>REPORTS>PERFORMANCE>MISSION>FREQ DIST MODE: WORK

View Print

View this graph

THE FREQUENCY DISTRIBUTION WILL BE DISPLAYED HERE

PATH: SPREA>REPORTS>PERFORMANCE>MISSION>FREQ DIST MODE: WORK

View Print

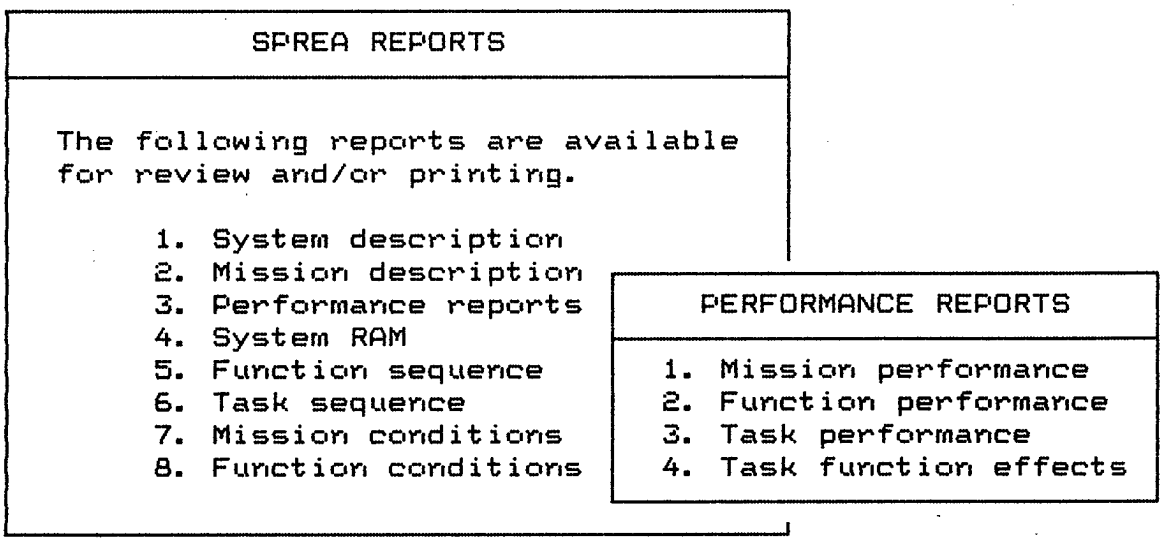
View this graph

THE HISTOGRAM WILL BE DISPLAYED HERE

PATH: SPREA) REPORTS) PERFORMANCE MODE: WORK

View Print

View this report



ATH: SPREA) REPORTS) PERFORMANCE) FUNCTION MODE: WORK
iew Print Graphs
View this report

FUNCTION PERFORMANCE REPORT

System Name: Apache IV Mission Name: Destroy Enemy Armored Vehicles

Function Name : Plan and prepare for mission

Measures	Criterion Values	Simulation Results				
		N	min	max	mean	SD
Time	5	100	3.8	6.2	4.8	.12
Accuracy	.98	100	.96	.99	.98	.014

Accuracy Standard : correctly completed

Accuracy Weight : .02

PATH: SPREA)REPORTS)PERFORMANCE)FUNCTION MODE: WORK

View Print Graphs

Time Freq. Dist.
Accuracy Freq. Dist.
Time Histogram
Accuracy Histogram

RFORMANCE REPORT

System Nam ission Name: Destroy Enemy Armored Vehicles

Function Name : Plan and prepare for mission

Measures	Criterion Values	Simulation Results				
		N	min	max	mean	SD
Time	5	100	3.8	6.2	4.8	.12
Accuracy	.98	100	.96	.99	.98	.014

Accuracy Standard : correctly completed

Accuracy Weight : .02

PATH: SPREA>REPORTS>PERFORMANCE>FUNCTION>TIME FREQ DIST MODE: WORK

View Print

View this graph

THE TIME FREQUENCY DISTRIBUTION WILL BE DISPLAYED HERE

PATH: SPREA>REPORTS>PERFORMANCE>FUNCTION>ACCURACY FREQ DIST MODE: WORK

View Print

View this graph

THE ACCURACY FREQUENCY DISTRIBUTION WILL BE DISPLAYED HERE

PATH: SPREA>REPORTS>PERFORMANCE>FUNCTION>TIME HISTOGRAM MODE: WORK

View Print

View this graph

THE TIME HISTOGRAM WILL BE DISPLAYED HERE

PATH: SPREA>REPORTS>PERFORMANCE>FUNCTION>ACCURACY HISTOGRAM MODE: WORK

View Print

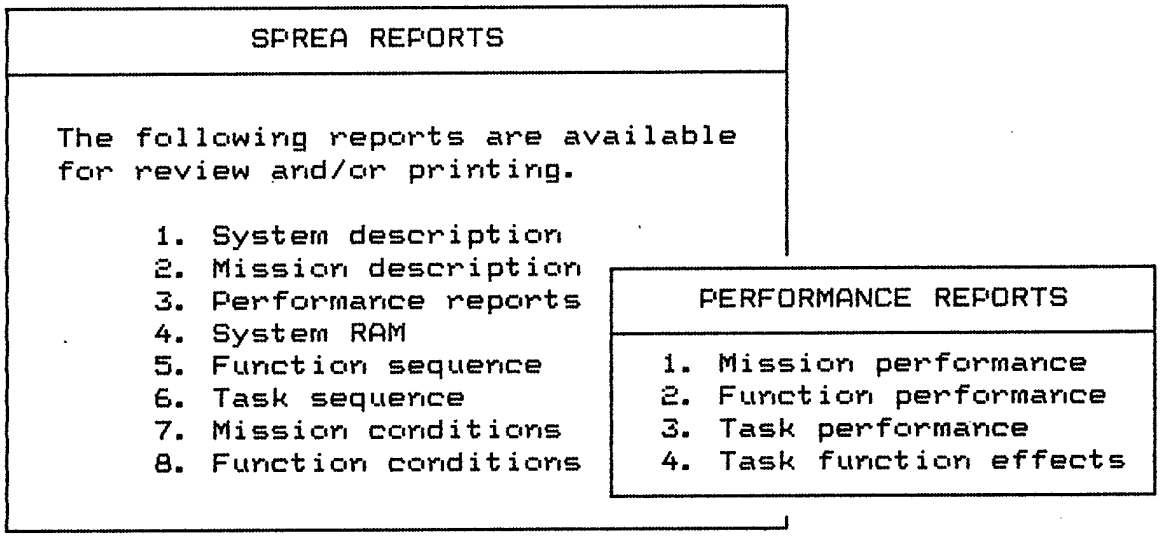
View this graph

THE ACCURACY HISTOGRAM WILL BE DISPLAYED HERE

PATH: SPREA> REPORTS> PERFORMANCE MODE: WORK

View Print

View this report



PATH: SPREA) REPORTS) PERFORMANCE) TASK MODE: WORK

View Print Graphs

View this report

TASK PERFORMANCE REPORT

System Name: Apache IV Mission Name: Destroy Enemy Armored Vehicles

Function Name : Plan and prepare for mission

Task : Check load

Level	P(Occurance)	P(Redo)	Accuracy Standard
0	.95	0	Check complete
1	.04	.3	Check incomplete or incorrect
2	.01	.95	No check performed

Event	Number of Times Run
Mission	100
Function	100
Task	113
Accuracy Level 0	94
Level 1	5
Level 2	1

Criterion Time		: 1
Simulation Time Data	N	: 113
	min	: .6
	max	: 1.4
	mean	: 1
	SD	: .07

PATH: SPREA>REPORTS>PERFORMANCE MODE: WORK

View Print

View this report

SPREA REPORTS

The following reports are available for review and/or printing.

1. System description
2. Mission description
3. Performance reports
4. System RAM
5. Function sequence
6. Task sequence
7. Mission conditions
8. Function conditions

PERFORMANCE REPORTS

1. Mission performance
2. Function performance
3. Task performance
4. Task function effects

PATH: SPREA>REPORTS>PERFORMANCE>TASK EFFECTS MODE: WORK
View Print
View this report

IMPACT OF TASK ON OTHER FUNCTIONS IN THE MISSION REPORT

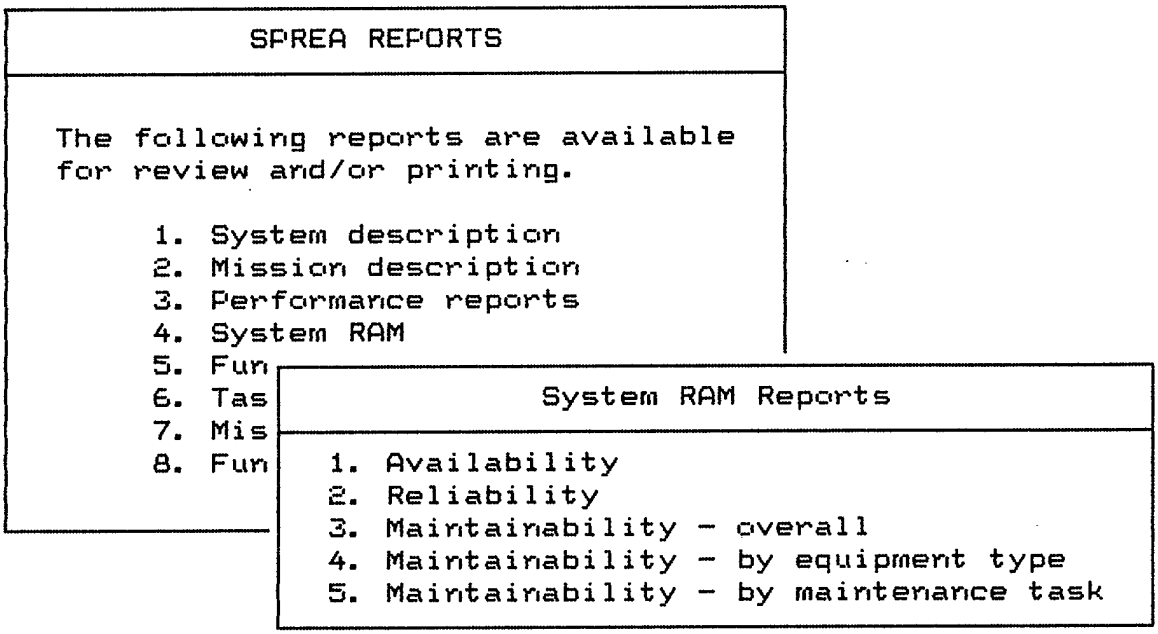
Task : Check load Function : Plan and prepare for mission

Level Accuracy Standard
1 Check incomplete or incorrect
2 No check performed

Other functions	Level	Impact (% degradation)
Taxi and takeoff	1	0
	2	0
Fly aircraft to mission area	1	0
	2	20
Fly aircraft from mission area	1	0
	2	20
Navigate	1	0
	2	60

PATH: SPREA>REPORTS
View Print
View this report

MODE: WORK



ATH: SPREA> REPORTS> RAM> AVAILABILITY

MODE: WORK

SYSTEM AVAILABILITY REPORT
System Name : Apache IV Mission Name : Destroy Enemy Armored Vehicles
Operational Availability : 95%

ATH: SPREA> REPORTS
iew Print
View this report

MODE: WORK

SPREA REPORTS

The following reports are available for review and/or printing.

1. System description
2. Mission description
3. Performance reports
4. System RAM
5. Fun
6. Tas
7. Mis
8. Fun

System RAM Reports

1. Availability
2. Reliability
3. Maintainability - overall
4. Maintainability - by equipment type
5. Maintainability - by maintenance task

PATH: SPREA>REPORTS>RAM>RELIABILITY MODE: WORK

SYSTEM RELIABILITY REPORT				
System Type : Attack helicopter System Name : Apache IV				
Parameter	Usage Rate	Usage Units	Confidence Level (%)	Min. Accept. Reliability (mean time/rounds/distance between failures)
general	10	hours/day	90	95 hours
armaments	20	rounds/day	90	189 rounds
mobility	0	flight hrs/day	0	0 flight hrs

PATH: SPREA) REPORTS
View Print
View this report

MODE: WORK

SPREA REPORTS

The following reports are available for review and/or printing.

1. System description
2. Mission description
3. Performance reports
4. System RAM
5. Fun
6. Tas
7. Mis
8. Fun

System RAM Reports

1. Availability
2. Reliability
3. Maintainability - overall
4. Maintainability - by equipment type
5. Maintainability - by maintenance task

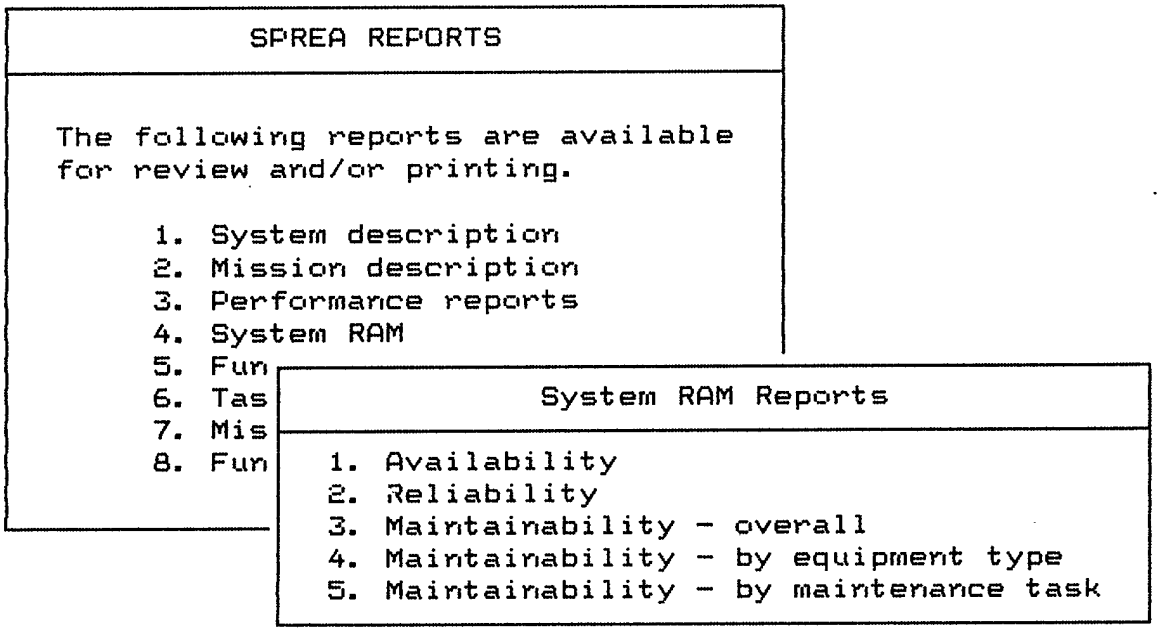
PATH: SPREA>REPORTS>RAM>IOC MODE: WORK

SYSTEM LEVEL IOC REQUIREMENTS REPORT		
System Name: Apache IV	System Type: Attack helicopter	
Maintenance Level	Mean Time To Repair (hours)	Maintenance Ratio (maintenance hours per operational hour)
ORG	1	.05
DS	1.5	.01
GS	3	.005

PATH: SPREA) REPORTS MODE: WORK

View Print

View this report



GENERIC EQUIPMENT TYPE MAINTENANCE REQUIREMENTS REPORT

System Name: Apache IV System Type: Attack helicopter

Equipment Type	Allocation (%)			Maintenance Ratio		
	ORG	DS	GS	ORG	DS	GS
Avionics system	5	5	5	.003	.02	.01
Communications system	3	5	1	.001	.02	.01
Electrical system	3	2	5	.02	.01	.03
Engine	5	3	8	.03	.02	.03
Fuel system	.05	.1	.1	.005	.005	.001
Fuselage	.01	.05	1	.001	.01	.005
Gunnery	3	.1	.05	.01	.03	.001
Hydraulic system	.5	2	1	.003	.01	.005
Landing gear	.05	1	2	.001	.001	.005
Main rotor	.1	.05	.5	.002	.003	.001
Radar system	1	2	1	.01	.02	.005
Tail rotor	.1	.05	.5	.002	.003	.001
Target acquisition system	2	2	1	.005	.005	.005

PATH: SPREA) REPORTS
View Print
View this report

MODE: WORK

SPREA REPORTS

The following reports are available for review and/or printing.

1. System description
2. Mission description
3. Performance reports
4. System RAM
5. Fun
6. Tas
7. Mis
8. Fun

System RAM Reports

1. Availability
2. Reliability
3. Maintainability - overall
4. Maintainability - by equipment type
5. Maintainability - by maintenance task

PATH: SPREA)REPORTS)RAM)EQUIP BY TASK MODE: WORK

GENERIC EQUIPMENT MAINTENANCE REQUIREMENTS ALLOCATED BY TASK REPORT					
System Name: Apache IV	System Type: Attack helicopter				
Maintenance Level: ORG	Maintenance Tasks Percent Allocation				
Equipment Type	trouble shoot	replace	inspect	adjust/ repair	test/ check
Avionics system	40	15	15	20	10
Communications system	35	20	10	25	10
Electrical system	40	20	15	15	10
Engine	20	15	15	35	15
Fuel system	10	15	10	50	15
Fuselage	5	0	30	55	10
Gunnery	25	20	10	30	15
Hydraulic system	10	15	10	50	15
Landing gear	5	15	15	50	15
Main rotor	5	20	15	45	15
Radar system	35	20	10	25	10
Tail rotor	5	20	15	45	15

PATH: SPREA>REPORTS>FUNCTION SEQUENCE MODE: WORK
View Print Diagram
View this report

FUNCTION SEQUENCE REPORT

System Name : Apache IV Mission Name : Destroy Enemy Armored Vehicles

Functions Following Functions	Loop	Prob
Plan and prepare for mission		
Taxi and takeoff		1
Taxi and Takeoff		
Navigate		1
Communicate		1
Navigate		
Fly aircraft to mission area	1	1
Fly aircraft from mission area	2	1
Communicate		
Fly aircraft to mission area		
Acquire targets		.9
Defend against attack		.1
Acquire Targets		
Attack targets	1-3	1

PATH: SPREA)REPORTS)FUNCTION SEQUENCE)DIAGRAM MODE: WORK
View Print
View this diagram

THE FUNCTION SEQUENCE DIAGRAM WILL GO HERE

PATH: SPREA>REPORTS>TASK SEQUENCE MODE: WORK
View Print Diagram
Print this report

TASK SEQUENCE REPORT

System Name : Apache IV Mission Name : Destroy Enemy Armored Vehicles
Function : Attack target

Tasks Following Tasks	Loop	Prob
Manuever for attack		
Select target(s)		1
Select weapon		1
Select target(s)		
Aim/sight weapon		1
Select weapon		
Aim/sight weapon		1
Aim/sight weapon		
Track target		1
Track target		
Fire weapon		.9
Aim/sight weapon		.1
Fire weapon		

PATH: SPREA) REPORTS) TASK SEQUENCE) DIAGRAM MODE: WORK

View Print

View this diagram

THE TASK SEQUENCE DIAGRAM WILL GO HERE

PATH: SPREA> REPORTS
View Print
View this report

MODE: WORK

SPREA REPORTS

The following reports are available for review and/or printing.

1. System descr
2. Mission desc
3. Performance
4. System RAM
5. Function seq
6. Task sequenc
7. Mission cond
8. Function con

MISSION CONDITIONS REPORTS

1. All reports
2. Environmental - standard
3. Environmental - additional
4. Terrain - standard
5. Terrain - additional
6. General target/threat
7. Target/threat types
8. Additional target
9. Additional threat
10. Friendly force organization
11. Friendly force weapon/fire
12. Friendly force miscellaneous

3.12 Step 12 - Correct if Necessary

In this step, the SPREA will aid the user in correcting any of the function or task performance criteria which are inconsistent with the minimally acceptable mission performance, as entered in Step 3. The inconsistencies will have been identified in the SPREA reports which are outputs of Step 11. This step will simply give the user guidance on correcting the inconsistencies.

Input

The input to this step consists of the results of the mission simulation as compared to the minimally acceptable mission performance criteria entered in Step 3.

External. None.

Internal. The minimally acceptable mission performance criteria from Step 3. The mission simulation results, compiled in Step 10 and reported in Step 11.

Process

The process that the user will go through to resolve any inconsistencies between the mission performance predicted by the simulation model versus the minimally acceptable mission performance criteria entered in Step 3 will be straightforward.

Case 1: The mission performance time is too long.

Causes: The predicted mission performance time can only be too long for either or both of two reasons. First, the function performance times may be too long. Since the task performance

times are allocated using a percentage allocation chart, the task performance times are results of, rather than drivers of, the function performance time. The second possibility is that the task accuracies may be too low. Each task has been assigned a probability of accurate, partially inaccurate, or completely inaccurate performance. Associated with each level of accuracy, there is a probability that the task will repeat itself. Therefore, a mission performance time which is very long may be a result of some tasks repeating themselves, and thereby increasing the total execution time for the task.

Resolution: So the user will be asked whether he/she wishes to pursue resolving the mission performance time through the task accuracy avenue, or whether he/she wishes to pursue resolution through examining and reassigning function performance times.

To aid the user in resolving the mission performance time in either event, the user will first be presented with the functions and tasks on the critical path. The SPREA will also give the user an indication of the magnitude of the overrun. This indication will be a percentage. For instance, the SPREA will output "The mission performance time exceeds the requirement by 10 minutes. This is a 4% overrun."

If the user indicates that he/she wishes to modify the task accuracy table, then the tasks which are on the critical path will be presented. The user will be able to edit the accuracy estimates of any or all of the paths.

If the user indicates that he/she wishes to modify the function and task performance times, then the SPREA will ask the user whether he/she wishes to decrease all the function times on the critical path by percentage difference (in our example, 4%). The SPREA will warn the user that this may result in a different critical path. If the user does not wish to make an "across the board" reduction, the SPREA will then identify any functions on

the critical path which the user did not specify performance times for (remember that the user could enter a "?" in the time cell for any function or task), and the SPREA assigned times from the baseline library. The SPREA will ask the user if he/she wishes to have the SPREA deduct the performance difference from those functions. (If there is more than one such function, then the SPREA will deduct the amount equally). If the user does not desire that solution, then the SPREA will ask him/her to edit the performance times manually.

Case 2: Mission performance accuracy (probability of mission success is too low)

Causes: If the mission performance accuracy is too low, then the only possible causes are: 1) the function accuracies are too low, or 2) the function accuracy weights have been misapplied.

Resolution: The SPREA will ask the user which path he/she wishes to pursue in order to correct the function accuaracy allocations. If the user indicates that he she wishes to examine the function accuracies, then the SPREA will present the entire set of predicted function accuracies. Now, the function accuracies can only be too low if the task accuracies are too low. Beginning with the lowest function accuracy, the user will be presented with each task which contributed to that function's accuracy measure. This will continue through the entire set of functions, or will continue until the user opts to discontinue the process.

If the user indicates that he/she wishes to re-examine the function accuracy weights, then the SPREA will present the entire function accuracy weighting table to the user for edits. The edits will be carried out, just as in Step 7 of the process.

Case 3: Mission performance time is too long and mission

accuracy is too low.

Causes: Any combination or permutation of the four causes listed in the two preceding cases apply.

Resolution: The SPREA will suggest to the user that the best plan will be to edit the task accuracy table. The values in this table influence both mission time and mission accuracy.

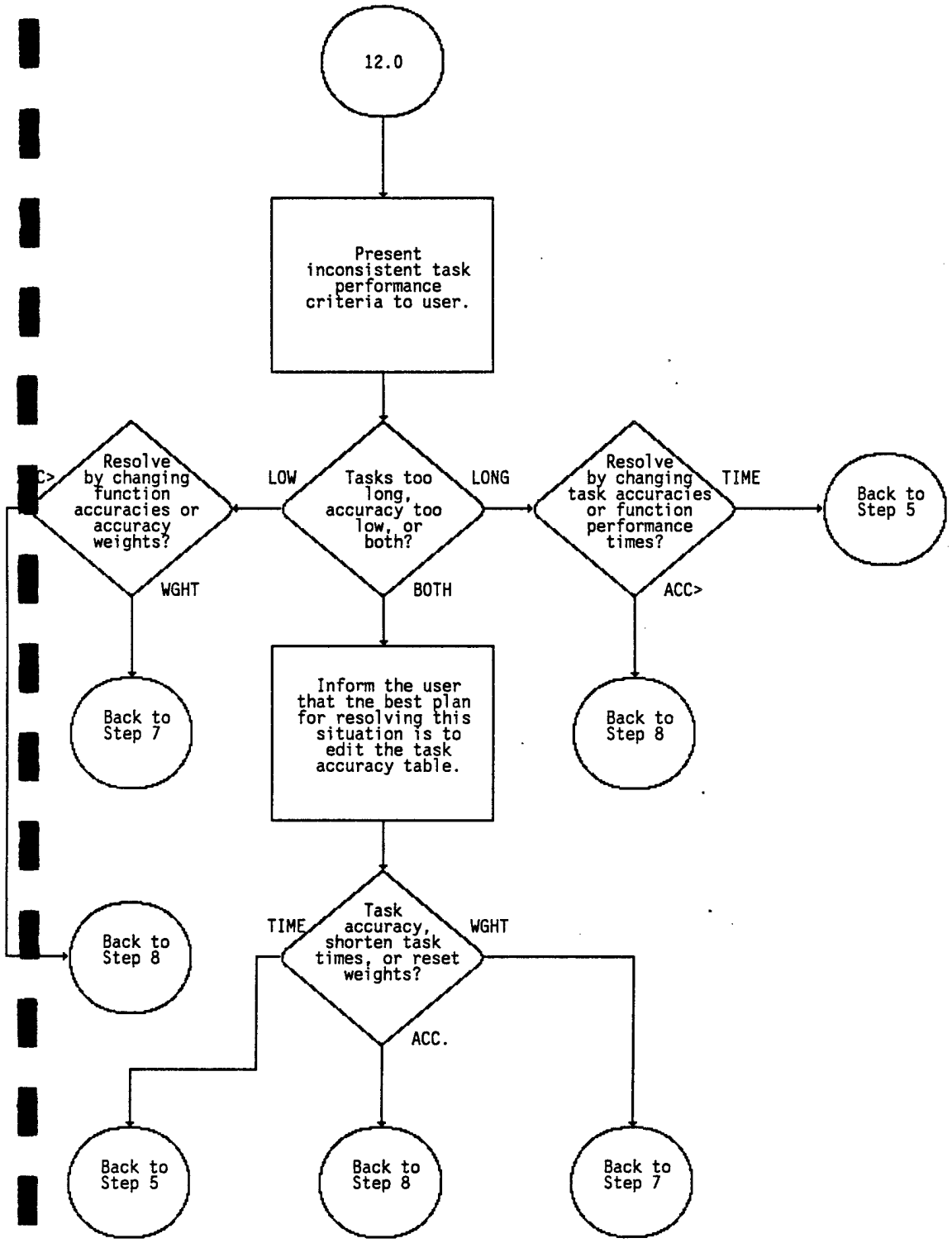
The user will also have the opportunity to resolve this case using any of the resolution methods discussed above.

Output

The output from this step consist of modified task and function performance criteria. The output of this step will be fed into Step 10, for another mission simulation. This sequence of steps (10 through 12) will iterate until the user is satified with the results.

User Interface

The user interface for this step is discussed in detail in the remainder of this subsection.


12.0
Present inconsistent task performance criteria to user.
Tasks too long, accuracy too low, or both?
LOW
LONG
BOTH
Resolve by changing function accuracies or accuracy weights?
WGHT
Back to Step 7
Resolve by changing task accuracies or function performance times?
TIME
Back to Step 5
ACC>
Back to Step 8
Inform the user that the best plan for resolving this situation is to edit the task accuracy table.
Task accuracy, shorten task times, or reset weights?
TIME
WGHT
ACC.
Back to Step 5
Back to Step 8
Back to Step 7

Screen 12.1 - Inform the user of the corrections (i.e., time, accuracy, or both) that must be made.

User Action: None. This is simply an informative screen.

Input Files: The simulation results files which were used to compile the reports in Step 11 are inputs to this screen.

Output Files: None

Algorithms: None

Following Screen: If Case 1, then 12.2. If Case 2, then 12.3. If Case 3, then 12.4. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: None

Screen 12.2 - The predicted mission performance time is too long. In this step, the user will be asked to indicate which method he wishes to pursue in order to correct the discrepancy between the predicted mission performance time and the minimally acceptable mission performance time. This screen will indicate the amount of the difference, both in relative percentage and absolute figures.

User Action: Use the vertical arrow keys to move the highlight bar to select the method which the user prefers for resolving the performance time prediction. The user will press the carriage return to complete the entry.

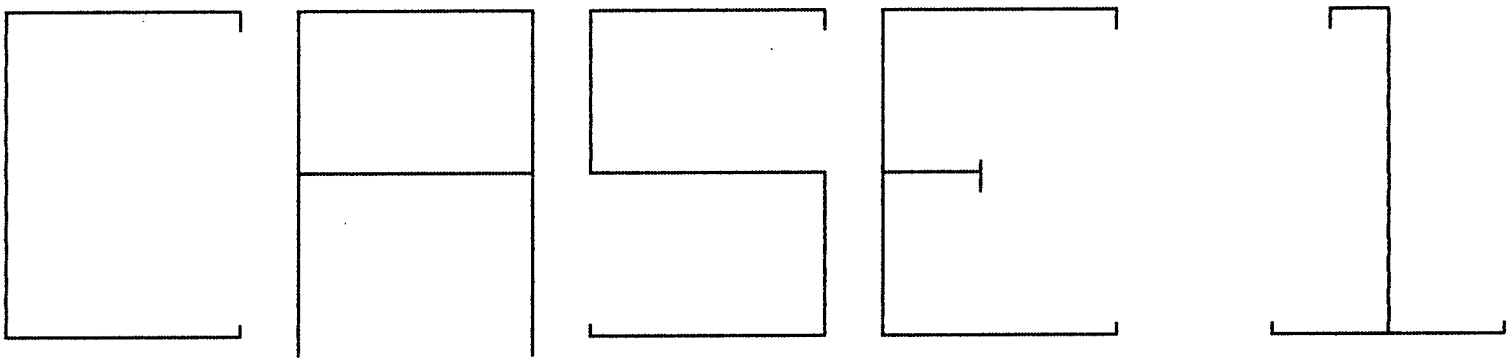
Input Files: None

Output Files: None

Algorithms: None

Following Screen: If the user chooses to shorten the function performance times, then control will be passed to Step 5. If the user chooses to review the task accuracy table, then control will be passed to Step 8. If the user presses "escape" then Screen 12.1. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a vertical arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key"



PATH: SPREA>CORRECT MODE: WORK

MISSION SIMULATION RESULTS AND CORRECTION		
Measure	Criterion Value	Simulation Value
Time	15	16.6
Accuracy	.95	.95

ERROR

The simulated mission time exceeds the criterion time.

This may be resolved by:

1. Reassigning function times
2. Reassigning task accuracies for degraded functions

PATH: SPREA)CORRECT)FUNCTION TIMES MODE: WORK

FUNCTION TIME TABLE

System Name: Apache IV Mission Name: Destroy Enemy Armored Vehicles

Functions (* - time set by SPREA)	Time
----ON CRITICAL PATH----	
Plan and prepare for mission	5
Taxi and takeoff	1
Navigate	1
Fly aircraft to destination	2
* Acquire targets	.5
* Attack targets	.5
Navigate	1
Fly aircraft from destination	2
Approach and land aircraft	1
Perform after landing tasks	2
----NOT ON CRITICAL PATH----	
Communicate	1
* Defend against attack	.5

1. Change all times by a specified percentage
2. Change individual function times
3. Recompute critical path time

Criterion Mission Time	Critical Path Total Time
15	16

PATH: SPREA)CORRECT)FUNCTION TIMES MODE: WORK

FUNCTION TIME TABLE

System Name: Apache IV Mission Name: Destroy Enemy Armored Vehicles

Functions (* - time set by SPREA)	Time
----ON CRITICAL PATH----	
Plan and prepare for mission	5
Taxi and takeoff	1
Navigate	1
Fly aircraft to destination	2
* Acquire targets	.5
* Attack targets	.5
Navigate	1
Fly aircraft from destination	2
Approach and land aircraft	1
Perform after landing tasks	2
----NOT ON CRITICAL PATH----	
Communicate	1
* Defend against attack	.5

1. Change all times by a specified percentage

2. Change individual function times

3. Recompute critical path time

Enter % change: + 0

Criterion Mission Time	Critical Path Total Time
15	16

ATH: SPREA)CORRECT)FUNCTION TIMES MODE: WORK
ave Cancel
Save changes

FUNCTION TIME TABLE

System Name: Apache IV Mission Name: Destroy Enemy Armored Vehicles

Functions (* - time set by SPREA)	Time
----ON CRITICAL PATH----	
Plan and prepare for mission	4.5
Taxi and takeoff	.9
Navigate	.9
Fly aircraft to destination	1.8
* Acquire targets	.45
* Attack targets	.45
Navigate	.9
Fly aircraft from destination	1.8
Approach and land aircraft	.9
Perform after landing tasks	1.8
----NOT ON CRITICAL PATH----	
Communicate	.9
* Defend against attack	.45

1. Change all times by a specified percentage
2. Change individual function times
3. Recompute critical path time

Criterion Mission Time	Critical Path Total Time
15	14.4

PATH: SPREA) CORRECT

MODE: WORK

MISSION SIMULATION RESULTS AND CORRECTION		
Measure	Criterion Value	Simulation Value
Time	15	16.6
Accuracy	.95	.95

ERROR

The simulated mission time exceeds the criterion time.

This may be resolved by:

1. Reassigning function times
2. Reassigning task accuracies for degraded functions

PATH: SPREA)CORRECT)DEGRADED FUNCTIONS MODE: WORK

Select

Select this function for changing task accuracies

DEGRADED FUNCTIONS

System Name: Apache IV Mission Name: Destroy Enemy Armored Vehicles

Degraded Functions	Required Accuracy	Simulated Accuracy
Fly aircraft to destination	.95	.93
Fly aircraft from destination	.95	.93
Acquire targets	.95	.92
Attack targets	.95	.94
Defend against attack	.90	.89

PATH: SPREA>CORRECT>DEGRADED FUNCTIONS MODE: WORK

Select

Select this function for changing task accuracies

DEGRADED FUNCTIONS

System Name: Apache IV Mission Name: Destroy Enemy Armored Vehicles

Degraded Functions	Required Accuracy	Simulated Accuracy
Fly aircraft to destination	.95	.93
Fly aircraft from destination	.95	.93
Acquire targets	.95	.92
Attack targets	.95	.94
Defend against attack	.90	.89

PATH: SPREA>CORRECT>DEGRADED FUNCTIONS>TASK ACCURACIES MODE: WORK

TASK ACCURACIES FOR DEGRADED FUNCTION				
Function : Fly aircraft to mission area				
Task	Level	P(lev)	P(redo)	Accuracy Standard
Perform tactical flight	0	.95	0	Completed
	1	.04	1	Completed incorrectly
	2	.01	1	Not completed
Monitor instruments	0	.90	0	Completed
	1	.08	.7	Completed incorrectly
	2	.02	1	Not completed

PATH: SPREA>CORRECT>DEGRADED FUNCTIONS>TASK ACCURACIES MODE: WORK

Save Cancel

Save changes

TASK ACCURACIES FOR DEGRADED FUNCTION				
Function : Fly aircraft to mission area				
Task	Level	P(lev)	P(redo)	Accuracy Standard
Perform tactical flight	0	.95	0	Completed
	1	.04	1	Completed incorrectly
	2	.01	1	Not completed
Monitor instruments	0	.90	0	Completed
	1	.08	.7	Completed incorrectly
	2	.02	1	Not completed

Screen 12.3 - The predicted mission performance accuracy (i.e., probability of mission success) is too low. In this step, the user will be asked to indicate which method he wishes to pursue in order to correct the discrepancy between the predicted mission performance accuracy and the minimally acceptable mission performance accuracy. This screen will indicate the amount of the difference, both in relative percentage and absolute figures.

User Action: Use the vertical arrow keys to move the highlight bar to select the method which the user prefers for resolving the performance accuracy prediction. The user will press the carriage return to complete the entry.

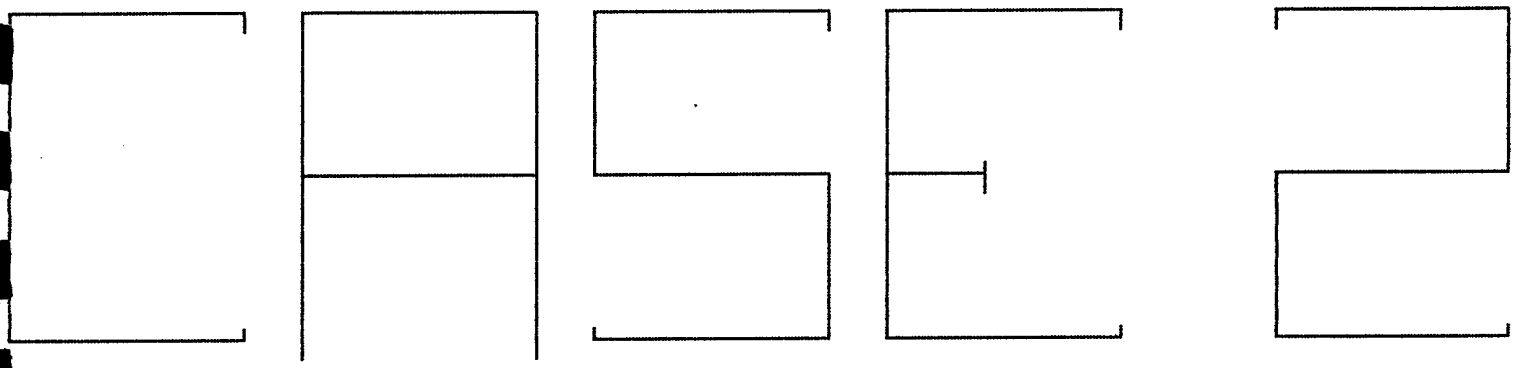
Input Files: None

Output Files: None

Algorithms: None

Following Screen: If the user chooses to reset the individual function accuracy weights, then control will be passed to Step 7. If the user chooses to review the task accuracy table, then control will be passed to Step 8. If the user presses "escape" then Screen 12.1. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a vertical arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key"



PATH: SPREA>CORRECT MODE: WORK

MISSION SIMULATION RESULTS AND CORRECTION		
Measure	Criterion Value	Simulation Value
Time	15	15
Accuracy	.95	.92

ERROR

The simulated mission accuracy is below the criterion accuracy.

This may be resolved by:

1. Reassigning function accuracies and/or accuracy weights
2. Reassigning task accuracies for degraded functions
3. Reassigning task effects from other functions on degraded functions

PATH: SPREA)CORRECT)FUNCTION ACCURACIES AND WEIGHTINGS MODE: WORK

FUNCTION ACCURACIES AND WEIGHTINGS			
System Name: Apache IV	Mission Name: Destroy Enemy Armored Vehicles		
Functions	Acc.	Wt.	Accuracy Standard
Plan and prepare for mission	.98	.02	completed correctly
Taxi and takeoff	.90	.1	completed w/o abort
Fly aircraft to destination	.95	.1	within 10 meters
Fly aircraft from destination	.95	.1	within 10 meters
Navigate	.95	.1	id destination correctly
Communicate	.90	.06	receive and send ok
Approach and land aircraft	.90	.1	without abort
Perform after landing tasks	.98	.02	completed correctly
Compensate for inflight equip. fail	.90	.1	w/o causing mission abort
Acquire targets	.95	.1	id & acquire all targets
Attack targets	.95	.1	disable enemy vehicle
Defend against attack	.90	.1	evade enemy attack
Total of weightings: 1			

PATH: SPREA)CORRECT)FUNCTION ACCURACIES AND WEIGHTINGS MODE: WORK
Save Cancel
Save changes

FUNCTION ACCURACIES AND WEIGHTINGS			
System Name: Apache IV		Mission Name: Destroy Enemy Armored Vehicles	
Functions	Acc.	Wt.	Accuracy Standard
Plan and prepare for mission	.98	.02	completed correctly
Taxi and takeoff	.90	.1	completed w/o abort
Fly aircraft to destination	.95	.1	within 10 meters
Fly aircraft from destination	.95	.1	within 10 meters
Navigate	.95	.1	id destination correctly
Communicate	.90	.06	receive and send ok
Approach and land aircraft	.90	.1	without abort
Perform after landing tasks	.98	.02	completed correctly
Compensate for inflight equip. fail	.90	.1	w/o causing mission abort
Acquire targets	.95	.1	id & acquire all targets
Attack targets	.95	.1	disable enemy vehicle
Defend against attack	.90	.1	evade enemy attack
Total of weightings: 1			

MISSION SIMULATION RESULTS AND CORRECTION		
Measure	Criterion Value	Simulation Value
Time	15	15
Accuracy	.95	.92

ERROR

The simulated mission accuracy is below the criterion accuracy.

This may be resolved by:

1. Reassigning function accuracies and/or accuracy weights
2. Reassigning task accuracies for degraded functions
3. Reassigning task effects from other functions on degraded functions

PATH: SPREA)CORRECT)TASK EFFECTS ON FUNCTIONS MODE: WORK

FUNCTIONS DEGRADED BY TASK EFFECTS		
System Name: Apache IV Mission Name: Destroy Enemy Armored Vehicles		
Degraded Function Source Function Task	Level	%Degradation
Fly aircraft to destination		
Plan and prepare for mission		
Plan flight	1	30
	2	50
Enter preflight data	1	20
	2	60
Navigate		
Identify present location	1	20
	2	20
Identify destination	1	30
	2	30
Select travel route	1	30
	2	30

PATH: SPREA)CORRECT)TASK EFFECTS ON FUNCTIONS MODE: WORK

Save Cancel

Save changes

FUNCTIONS DEGRADED BY TASK EFFECTS		
System Name: Apache IV Mission Name: Destroy Enemy Armored Vehicles		
Degraded Function Source Function Task	Level	%Degradation
Fly aircraft to destination		
Plan and prepare for mission		
Plan flight	1	30
	2	50
Enter preflight data	1	20
	2	60
Navigate		
Identify present location	1	20
	2	20
Identify destination	1	30
	2	30
Select travel route	1	30
	2	30

Screen 12.4 - The predicted mission performance accuracy (i.e., probability of mission success) is too low and the predicted mission performance time is to long. In this step, the user will be asked to indicate which method he wishes to pursue in order to correct the discrepancy between the predicted mission performance and the minimally acceptable mission performance. This screen will indicate the amount of the difference, both in relative percentage and absolute figures.

User Action: Use the vertical arrow keys to move the highlight bar to select the method which the user prefers for resolving the performance time prediction. The user will press the carriage return to complete the entry.

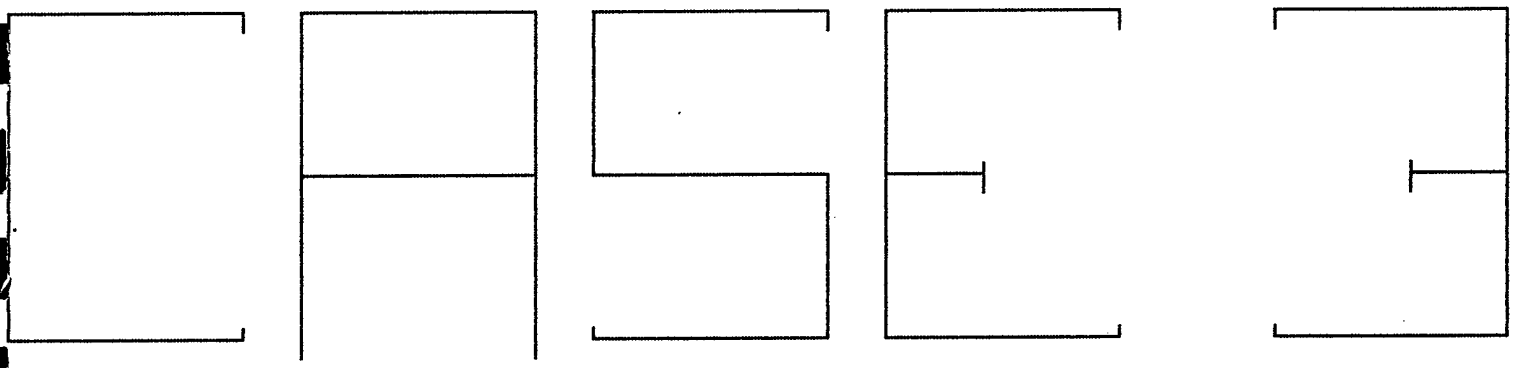
Input Files: None

Output Files: None

Algorithms: None

Following Screen: If the user chooses to shorten the function performance times, then control will be passed to Step 5. If the user chooses to review the task accuracy table, then control will be passed to Step 8. If the user wishes to reset the function accuracy weights, then control will be passed to Step 7. If the user presses "escape" then Screen 12.1. If the user presses F1, a context-specific help file will be displayed. After the help file is displayed, the user will press the carriage return to return to this menu.

Error Statements: If an inappropriate key is pressed (i.e., not a vertical arrow, carriage return, or F1), then "Please use the arrow keys to move the highlight bar, select an option by pressing the return key"



PATH: SPREA>CORRECT MODE: WORK

MISSION SIMULATION RESULTS AND CORRECTION		
Measure	Criterion Value	Simulation Value
Time	15	16.6
Accuracy	.95	.92

ERROR

The simulated mission time exceeds the criterion and the simulated mission accuracy is below the criterion accuracy. This may be resolved by:

1. Reassigning function times
2. Reassigning task accuracies for degraded functions
3. Reassigning function accuracies and/or accuracy weights
4. Reassigning task effects from other functions on degraded functions