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AUTOMATED DOCUMENTATION GENERATOR for ADVANCED PROTEIN CRYSTAL GROWTH (5-32809)

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PREFACE

This technical report was prepared by the staff of the Research Institute, The University of Alabama in Huntsville. The purpose of this report is to provide documentation of the work performed and results obtained under delivery order 17 of Marshall Space Flight Center (MSFC) Contract No. NAS8-38609. Mr. Gary A. Maddux was Principal Investigator for this fourteen month level of effort. Mr. David Jex of the Microgravity Experiment Projects Office provided technical coordination.

The views, opinions, and/or findings contained in this report are those of the author(s) and should not be construed as an official NASA position, policy, or decision unless so designated by other official documentation.

I have reviewed this report, dated 1-22-93 and the report contains no classified information.

Gary A. Maddux
Principal Investigator

Approval:

James R. Clark
Research Institute

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1.0 INTRODUCTION

The System Management and Production Laboratory at the Research Institute, the University of Alabama in Huntsville (UAH), was tasked by the Microgravity Experiment Projects (MEP) Office of the Payload Projects Office (PPO) at Marshall Space Flight Center (MSFC) to conduct research in the current methods of written documentation control and retrieval. The goals of this research were to determine the logical interrelationships within selected NASA documentation, and to expand on a previously developed prototype system to deliver a distributable, electronic knowledge-based system. This computer application would then be used to provide a "paperless" interface between the appropriate parties for the required NASA document.

2.0 BACKGROUND AND OBJECTIVES

The Microgravity Experiment Projects (MEP) Office of the Payload Projects Office (PPO) at MSFC is currently responsible for collecting and coordinating experiment/facility specifications and requirements between NASA and various colleges, universities, research centers, and other public- and private-sector organizations that are selected or are requesting to fly their respective microgravity experiments on designated flights. This coordination involves the communication of flight hardware requirements and the preparation and review of all documentation between NASA and the research groups. To reduce difficulties encountered by these customers of NASA, an effort was undertaken to research, analyze, and evaluate the current procedures involved in the information gathering activities.

The MEP Office identified a need to develop an Automated Payload Experiment Tool (APET) which would lead experiment developers through the development planning process, obtain necessary information, establish an electronic data exchange avenue and allow easy manipulation/reformatting of the collected information. In order to fulfill this need, the University of Alabama in Huntsville (UAH) was tasked to design and develop the APET software package to meet the increasing demands to lighten the burden of documentation preparation and maintenance for NASA and its customers.

The objective of this task was to expand on the results of the Automated Payload Experiment Tool (APET) Feasibility Study (previously performed by UAH) and provide procedures and software for the generation of experiment requirements and flight hardware requirements. The software would assist the scientist or engineer in generating the appropriate documentation to develop and perform flight qualified experiments for the manned microgravity environment.

3.0 CURRENT ENVIRONMENT

The current environment of manual data gathering and information dissemination is excessively reliant on paper as the primary medium of transfer. This reliance on a static media adds exponentially to the complexity of a process that by its nature is elaborate. Changes to a document stored on an information media that requires physical manipulation are costly and burden-some. With no method in place to ensure that changes are incorporated throughout follow-on documents, (other than manual verification), modifications to science, engineering, safety, and other documents are more susceptible to human error than necessary.

The design, development and preparation of an experiment to fly in space are time consuming tasks demanding a great deal of technical and disciplinary knowledge. Reducing the time required to prepare an experiment and its supporting documentation is of vital interest to the Microgravity Science Applications Division (MSAD). Methods of developing and utilizing state of the art information technologies are of prime concern in simplifying the critical Principal Investigator (PI)/Payload Element Developer (PED) interface.

4.0 ACTIVITIES

4.1 Form and Documentation Evaluation

UAH collected, analyzed, organized, and evaluated a number of forms and documents used in the current flight hardware development process. Documents were analyzed as to their content, and also evaluated regarding their relationships both within the same document and within other documents. The findings of this research were incorporated in the design of the computer software and its accompanying knowledge base.

4.2 Design Considerations

4.2.1 Hardware

The objective of APET is to provide an easy to use tool to the Principal Investigator team. To ensure ease of use, few computer hardware requirements are necessary to operate the APET software package.

APET is designed to run on any IBM-PC compatible personal computer. There have been four modules developed and distributed, and each module's requirements depend on its level of complexity. These four modules are the SRD, the SRD/ERD, the Project Plan, and the Science Requirements Envelope Document. All four packages will run on a 386 machine. However, while it is possible to use the SRD/ERD system on a 386 PC, it is recommended that the APET user install the software on a 486 PC or higher. The graphical displays, multiple screen windows, and the complexity of the system cause noticeable slowdowns on any machine less than the 486.

The software requires that the PC be equipped with a hard disk drive. For proper execution, the hard drive (or some partition of it) must be named C:. The SRD/ERD version of APET will require approximately 14M (megabytes) of space on the hard drive for the system, plus another 1M on the hard drive for the data files created by the user. However, for optimal performance, the hard drive should have a total of at least 17M free upon installation of the software. The Project Plan and the Science Requirements Envelope Document will each require from 1M - 3M of hard disk space.

For ease of use, the PC should be equipped with a mouse. This, however, is not mandatory. APET utilizes hypertext technology as the user interface. Hypertext software systems allow for the retrieval of related information at the point and click of a mouse or, if a mouse is not used, at the touch of one or two keystrokes. For information on a highlighted topic, the user should move the mouse to that word and click. A window will be opened, overlaying the current screen. Once the information is reviewed, the user can press the space bar and close the window, returning the user to the previous screen.

4.2.2 Software

One of the primary objectives in developing the APET was to reduce the confusion of the documentation process. This guiding principle was instrumental in the design of the software as well. The four APET software packages use a standardized format for the user interface. Screen design, menu selection, method of data entry, and user messages take the same form throughout the APET packages.

In developing the questions and knowledge base for the APET, it was assumed that all necessary instructions for successful completion of PI requirements were contained in the hardcopy documents. Therefore, to formulate user prompts, questions, explanations, etc., the questions and background information were taken directly from the applicable document. Definitions were taken from pertinent entries within the applicable document. When conflicting definitions were found to exist, the most logical definition was used in that software section.

4.3 Software Packages

4.3.1 Science Requirements Document

According to the Microgravity Science Applications Division (MSAD) Management Plan, "The Science Requirements Document (SRD) is the basic document which levies the science requirements on the hardware. As such, the document must first provide adequate justification for conducting the experiment in space and then delineate and justify the individual science requirements. The science requirements include the observational and environmental data requirements necessary to meet the science objectives".

The SRD is the first documentation requirement to be met by the Principal Investigator. It was also the logical beginning for the APET software. The SRD section of APET consists of a query of 52 questions concerning the description of the experiment, the limitations of non-space testing, and the potential benefits from the space environment. The answers to these questions are narrative in form (unlike other parts of APET, which are more fill-in-the-blank or choose from a list). User prompts for these questions were taken directly from the MSAD Management Plan. The user has the option of answering these questions sequentially or randomly (See Appendix A). An option also exists to answer only the unaddressed questions, so that at any time the user can see how many questions remain. There are a number of options available to the user to make the documentation process more efficient. For example, during the question/answer session, the user has the option of viewing/editing related answers on selected questions. This adds to the consistency of the material, and provides an easier data retrieval method for the user. For a full description of the SRD software package, see the SRD/ERD User Guide (Appendix B) and the APET Hierarchy of Menu Choices for SRD/ERD Package (Appendix C).

4.3.2 Experiment Requirements Document

The Experiment Requirements Document (ERD) is used by the payload element developer and/or the principal investigator to define experiment requirements to be accommodated by the Space Transportation System (STS) for a given mission. The ERD is the logical follow-on document to the SRD. While the SRD justifies the need for a space environment and generally describes experiment requirements, the ERD expands on these generalities and requires specific experiment specifications.

Because of the more exacting nature of the ERD, the user faces more demands to respond to questions with exact numbers rather than narrative descriptions. Therefore, the ERD user prompts will often ask for a number or word to be selected from a limited list of appropriate answers, or supply a short (one or two word) answer to the software query. Because of the more demanding requirements of the ERD, the software has a much deeper level of complexity. Questions with a limited number of answers or questions that require logical (YES/NO) responses can be checked against previous answers to ensure that conflicting or mutually exclusive responses are not accepted. This built-in "expertise" adds much to the integrity of the user supplied data, and thus makes the information contained in the ERD more consistent and useful.

The ERD section of APET is a great deal larger than the SRD. There are twelve sections of the ERD, several of which taken separately would be as large as the SRD in its entirety. However, based on the requirements of the experiment, complete sections of the ERD can be eliminated. The ERD is also more technically complex than the ERD, containing far more terminology, acronyms, etc. than the other APET modules. Therefore, the use of hypertext definitions, examples, graphics and hypertext reference sections are more widely used in the ERD.

The most critical of the ERD sections is the first, which deals with the experiment's functional objectives. Each experiment contains one or more functional objectives, which in turn are composed of one or more steps. Follow-on sections in the ERD refer back to and are based on the answers given in ERD Section One. The APET software helps the user by requiring that Section One be completed before these follow-on sections, and also aids by ensuring that if a functional objective is deleted, that the follow-on sections that refer to that deleted functional objective will also be deleted. Again, this adds to the consistency of the material, and provides an easier documentation method for the user. A full description of the ERD software package is contained in the SRD/ERD User Guide (Appendix B) and the APET Hierarchy of Menu Choices for SRD/ERD Package (Appendix C).

4.3.3 Project Plan

The Project Plan is the basic planning document that describes the overall plan for proceeding with the project. Project Plans are unique to each project and the format and level of detail vary with the size, complexity, sensitivity and other characteristics of the project. The Project Plan will cover the project to completion, including operational and data analysis periods. The Microgravity Science and Applications Division (MSAD) requires that a MSAD Project Plan be submitted and approved prior to making a major commitment of resources to an MSAD project. MSAD Project Plans are to be prepared in final draft form for the Requirements Definition Review.

Plans will be prepared and submitted for all flight experiments. Project plans will be reissued, modified, or amended for reflights depending on the complexity of the task. A plan's preparation is the responsibility of the designated Project Manager at the responsible NASA center. The Project Manager will sign the MSAD Project Plan as the preparer; the Project Scientist and the Principal Investigator will sign as concurring. The MSAD Project Plan will be signed off at the NASA center prior to submission to Headquarters by the appropriate center's authorities. When the Program Scientist and Program Manager sign to register their concurrence, the MSAD Project Plan will be submitted to the MSAD Director for approval.

The Project Manager is responsible for updating a MSAD Project Plan when significant changes occur (such as changes in scope, organization, or roles and responsibilities). This does not apply to resources, schedules or manpower, which are updated through normal budgeting and project monitoring activities. The Project Manager will establish a change control process for maintaining the MSAD Project Plan and other project documentation.

The Project Plan component of APET is similar to the SRD component, in that it is comprised primarily of text responses to a series of predefined questions. There are a number of options available to the user to make the documentation process more efficient. For a full description of the Project Plan software package, see the Project Plan User's Guide (Appendix D).

4.3.4 Science Requirements Envelope Document

The Science Requirements Envelope Document provides an envelope or volume of science requirements for a type of experimentation which is intended to encompass the science requirements generated by individual experiments of that type. The primary purpose of the document is to provide science requirements against which hardware can be conceptualized such that later, when specific PIs are chosen, their individual requirements will fall within the requirements originally stated in the Science Requirements Envelope Document.

The Science Requirements Envelope Document is very similar to the SRD. The primary difference is not the questions, but in the user responses, where a range of value is given for a capacity rather than a discreet measurement for an experiment. To complete the Science Requirements Envelope Document, questions were taken directly from the MSAD Management Plan. For a detailed description of the Science Requirements Envelope Document, see Appendix E.

4.3.5 Safety Requirements Document

The Safety Requirements Document designates the safety-related activities and documentation required of individual Payload Element Developers (PEDs). This document is applicable to all MSFC Payload Project Office managed STS attached payload missions and to all of the PEDs for those missions. STS attached payloads include Spacelab dedicated missions, middeck payloads, and partial-payload missions. A partial-payload mission is a flight that is not a Spacelab-dedicated (unique) mission and is shared with other payloads. Such missions are also referred to as mixed cargo missions. Partial payloads are defined as those payloads that do not require a Spacelab module or the Spacelab igloo.

After analysis of the Safety Requirements Document, it was determined that the UAH effort would concentrate on the preparation of the Materials Usage Agreement (MUA). The document addresses the materials to be used with the experiment, and specifies which are considered hazardous and require special safety concerns. Hazardous materials reside in a NASA-central database which is accessible via modem. At the time of this writing, software is being developed to incorporate this database into an APET module to be used in the generation of the MUA section of the Safety Requirements Document.

5.0 PRELIMINARY RESULTS OF SOFTWARE DISTRIBUTION

To solicit inputs about the APET software package, presentations and demonstrations were conducted to recently selected PIs at Marshall Space Flight Center, Huntsville, AL; Lewis Research Center in Cleveland, OH, and at NASA headquarters in Washington, D.C., where instruction manuals and system software were distributed. The primary emphasis was on the validation of the SRD package, and limited emphasis was on the ERD package. Emphasis was placed on the SRD because it is the first document to be completed by the PI and is due 12 - 36 months before the ERD. In addition, two packages for the generation of the Project Plan were distributed. No packages addressing the Science Requirements Envelope Document have been dispensed.

The preliminary results of these distributions have been favorable. The first SRD software package was distributed on diskette only, with no supporting documentation. Even so, the user was able to generate an acceptable SRD with minimal instruction from the UAH APET development staff. Comments from this and other early users of the system have found it user friendly, and an aid in meeting the documentation requirements. Users have been complimentary about the ease of data retrieval.

Although the ERD component of APET has been distributed, none of the early PI participants have completed any ERD sections. In addition, two packages for the generation of the Project Plan were distributed. Likewise, the software distribution addressing the Project Plan has not yielded any conclusive results. No packages addressing the Science Requirements Envelope Document have been dispensed. Recipients of the software have been impressed with the work NASA and MSFC have put into this effort, and all have agreed that the research completed is a valuable and needed first step in automating the documentation process.

6.0 LIMITATIONS OF DELIVERED SOFTWARE

The most valuable comments made about the APET software are not the compliments, but the criticisms. Without the customer inputs of what is still required in the system, it would be difficult to determine the improvements necessary to make it a valuable tool for the PI. The following paragraphs represent the most common suggestions on improving the APET tool.

The APET software was designed to run on any IBM-compatible personal computer (PC) using the DOS operating system. This requirement thus restricts users of the Macintosh line of computers and their associated operating system. The determination to build for the PC and not the Macintosh was made primarily because little application software existed for the Macintosh that would offer the same support as Knowledge Pro offered for the PC. However, because the NASA PI community's alliances seem to be evenly split between PC and Macintosh, it is a reoccurring suggestion that the Macintosh be supported. Efforts to convert the existing PC code to a form that can be executed on the Macintosh are currently being investigated, and will be implemented as appropriate.

The second common suggestion is that the APET editor be improved to include a spell checker function. This was realized to be a shortcoming of Knowledge Pro from the outset of the software development project. The exclusion of a spell checker function is primarily attributable to the lack of random access memory (RAM) of the current generation of personal computers. RAM is required for both APET, Knowledge Pro, and the Knowledge Pro editor. The addition of an internal spell checker would increase the requirements of RAM to the point of system failure. The proposed solution for the lack of a spell checker is to include an external spell checker that can be called by APET. In order to add this feature, a spell checker software package that is inexpensive and free to distribute must be found. Attempts are being made to find such a package at this time.

Most other suggestions about the APET software are not necessarily criticisms of the package but of the documentation process. For instance, PIs preparing to fill out the SRD commented that many of the questions asked did not pertain to the objective of the SRD. In those cases, it was explained that all questions came from the MSAD Management Plan. However, there has been enough commentary generated to justify that this is a valid concern with the PI community. The SRD should be examined for what information is needed to meet its objective, and eliminate any irrelevant questions that may exist.

7.0 CONCLUSIONS AND RECOMMENDATIONS

The APET package has been developed and distributed to PIs required to submit SRDs and ERDs to justify/define their experiments. Additionally, software has been developed and is currently being evaluated to fulfill the documentation requirements for Project Plans and Science Requirements Envelope Documents. Initial software efforts have begun on the Safety Requirements Document, with the prototype design being developed. Based on the preliminary comments of the PIs who have taken part in the distribution of the APET software, APET fills a need to automate the documentation process. However, more work needs to be done to enhance the APET system.

There should be a Macintosh version of APET available. There are a number of PIs who wish to use the software, but are unhappy with the PC-only restriction. The editor of the APET software should also be enhanced to include additional features, such as a spell checker. This recommendation may be delayed, however, until machines with a greater RAM are available on the market.

It is also recommended that the findings of this research be used to examine the documentation requirements placed on the PI. There are instructions in the NASA-supplied hardcopy documentation that are vague and have little or no relationship to the true objective of the master document. These instructions also offer little information as to the amount of detail required to adequately answer the question. These questions cause problems for the PI, and add unneeded complexity to the overall task.

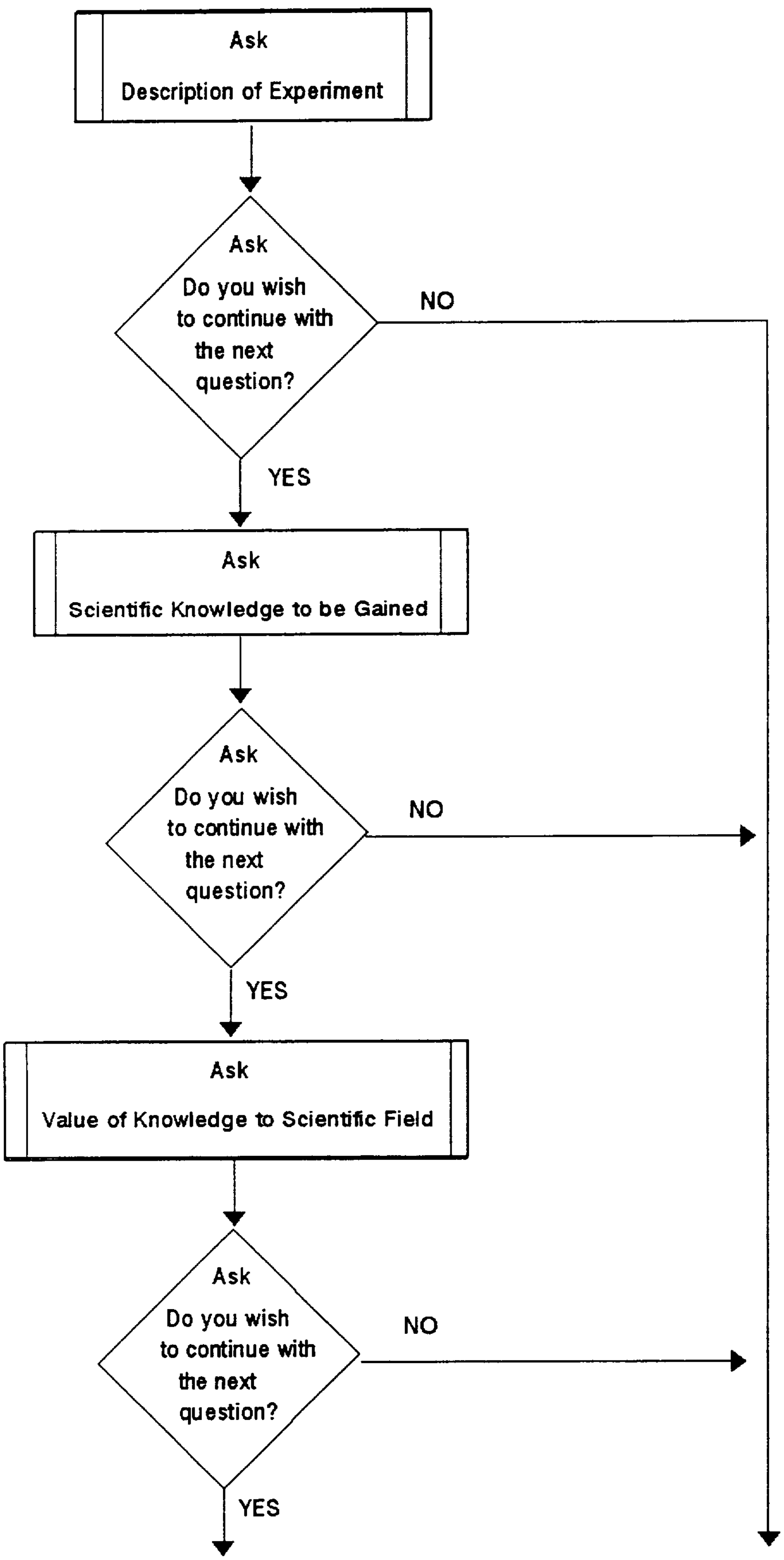
Once a number of SRDs have been created using APET, it is suggested that the software be modified to include examples of what is expected from the PI. This could further be developed to provide the PI a model that could be copied into his answer, then customized to his individual response.

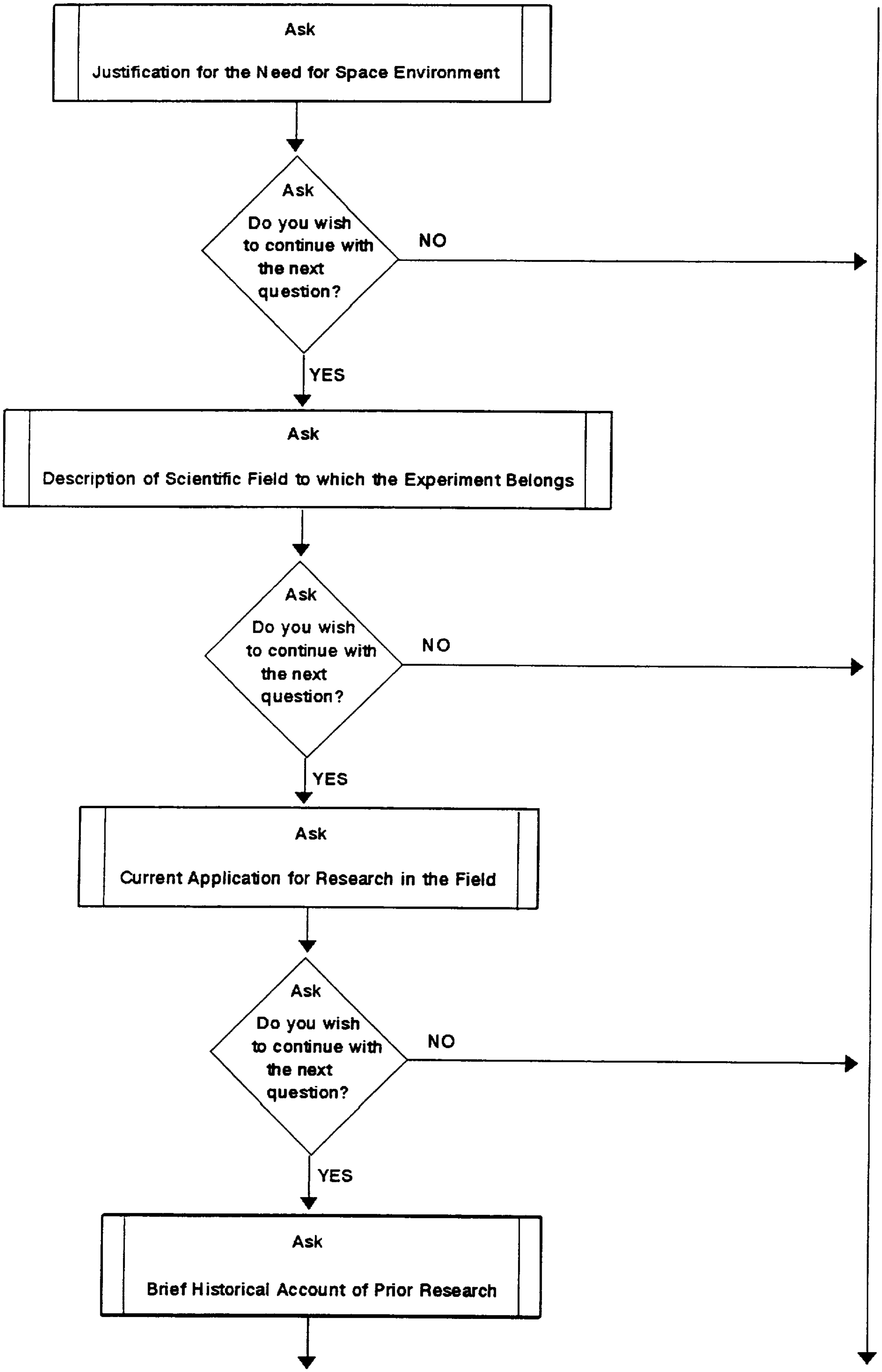
Further work should be conducted to complete the Safety Requirements Document's Material Usage Listing. This will be of great benefit to the PI, who is unlikely to be aware of the dynamic nature of the hazardous materials database. This work, along with the completed validation/distribution of the Project Plan and the Science Requirements Envelope Document, will provide a solid baseline from which NASA can move from a paper environment to an electronic environment.

APPENDIX A

SRD Logical Flow Chart

SRD Logical Flow Chart

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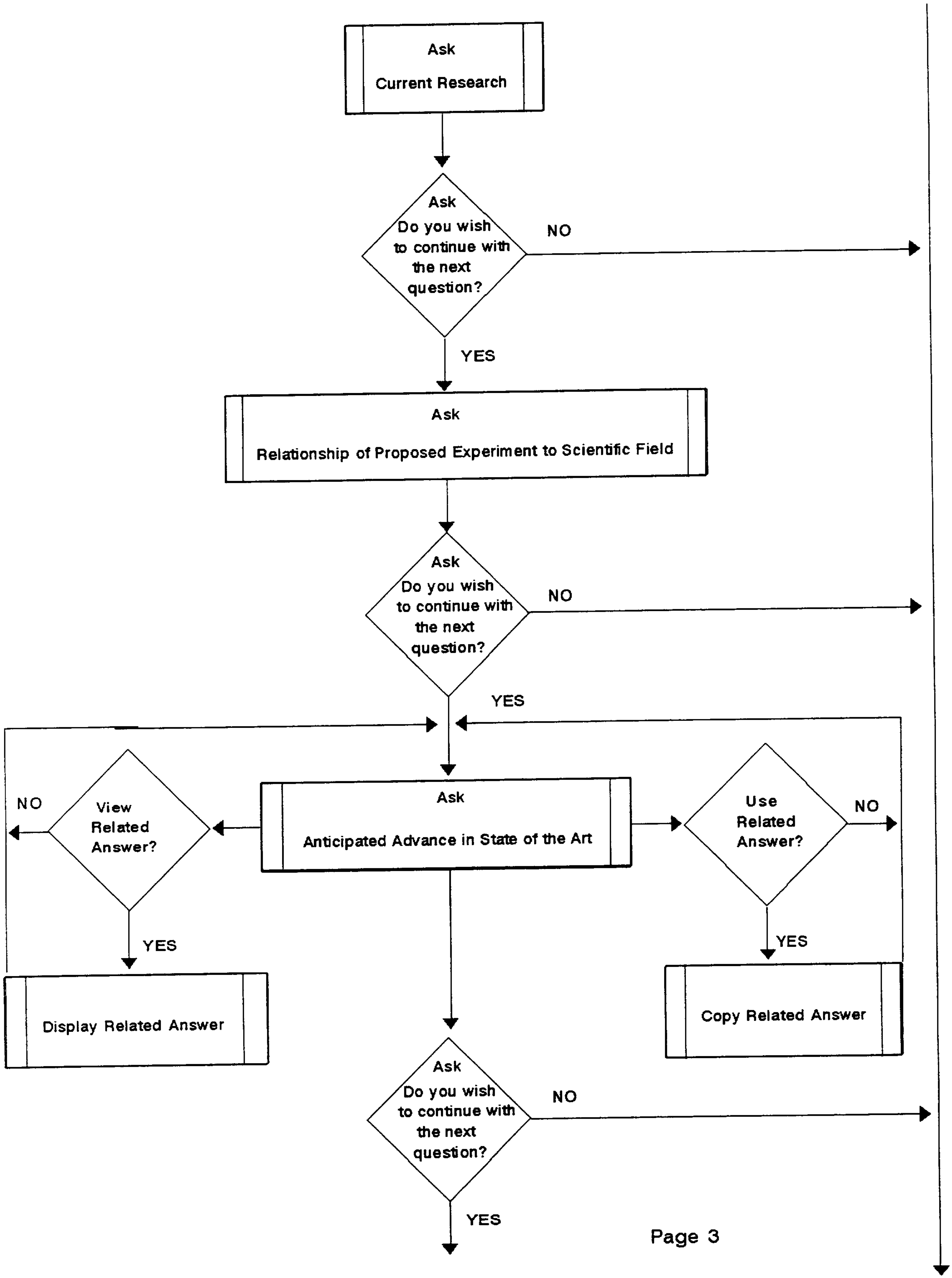
Justification for the Need for Space Environment
Ask
Do you wish to continue with the next question?
NO
YES
Ask
Description of Scientific Field to which the Experiment Belongs
Ask
Do you wish to continue with the next question?
NO
YES
Ask
Current Application for Research in the Field
Ask
Do you wish to continue with the next question?
NO
YES
Ask
Brief Historical Account of Prior Research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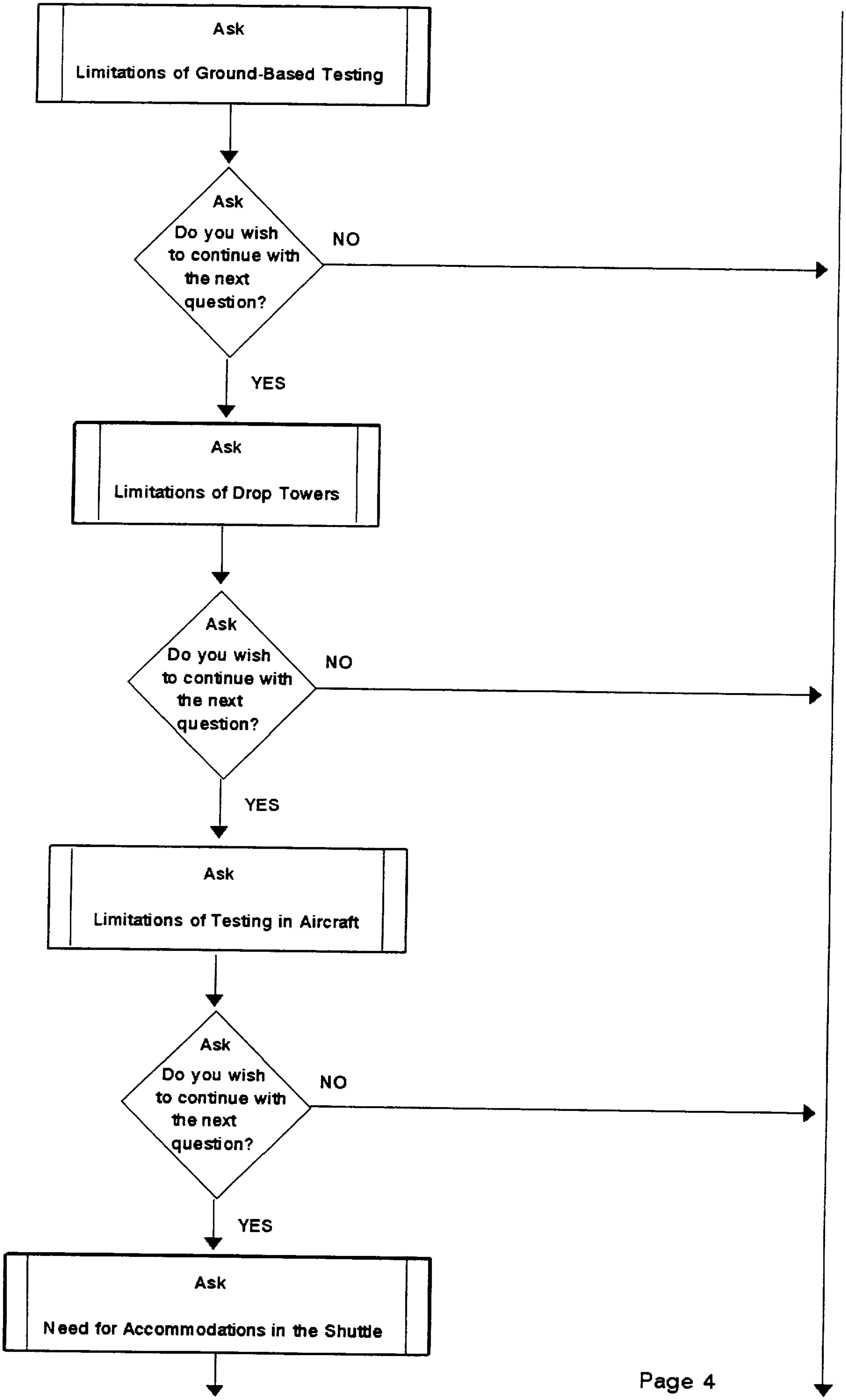
Current Research
Ask
Do you wish to continue with the next question?
NO
YES
Ask
Relationship of Proposed Experiment to Scientific Field
Ask
Do you wish to continue with the next question?
NO
YES
Ask
Anticipated Advance in State of the Art
View Related Answer?
NO
YES
Display Related Answer
Use Related Answer?
NO
YES
Copy Related Answer
Ask
Do you wish to continue with the next question?
NO
YES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YES
Ask
Limitations of Drop Towers
Ask
Do you wish to continue with the next question?
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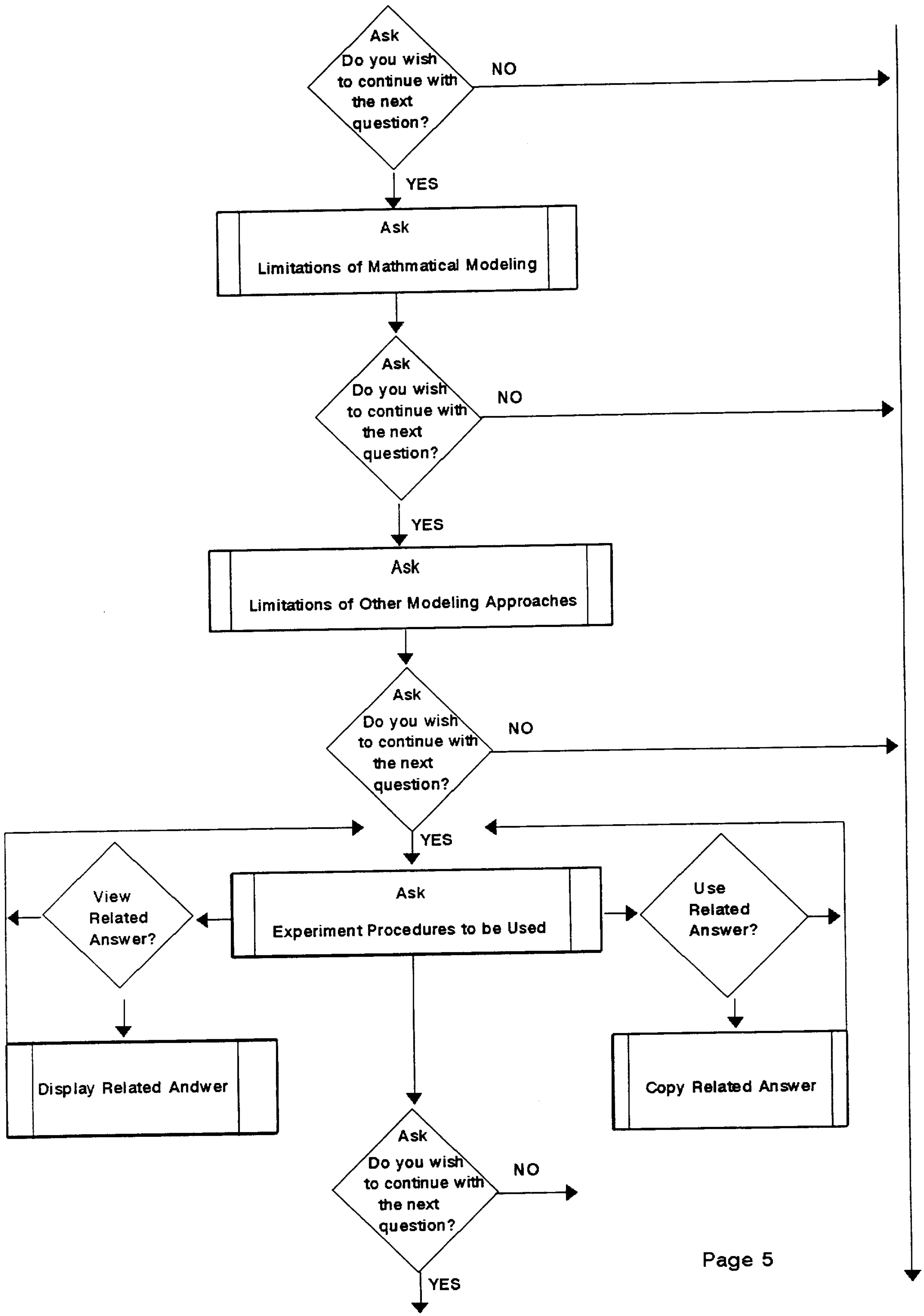
YES
Ask
Limitations of Testing in Aircraft
Ask
Do you wish to continue with the next question?
NO
YES
Ask
Need for Accommodations in the Shuttle



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Ask
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Do you wish to continue with the next question?
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YES
Ask
Limitations of Other Modeling Approaches
Ask
Do you wish to continue with the next question?
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View Related Answer?
Ask
Experiment Procedures to be Used
Use Related Answer?
Display Related Andwer
Copy Related Answer
Ask
Do you wish to continue with the next question?
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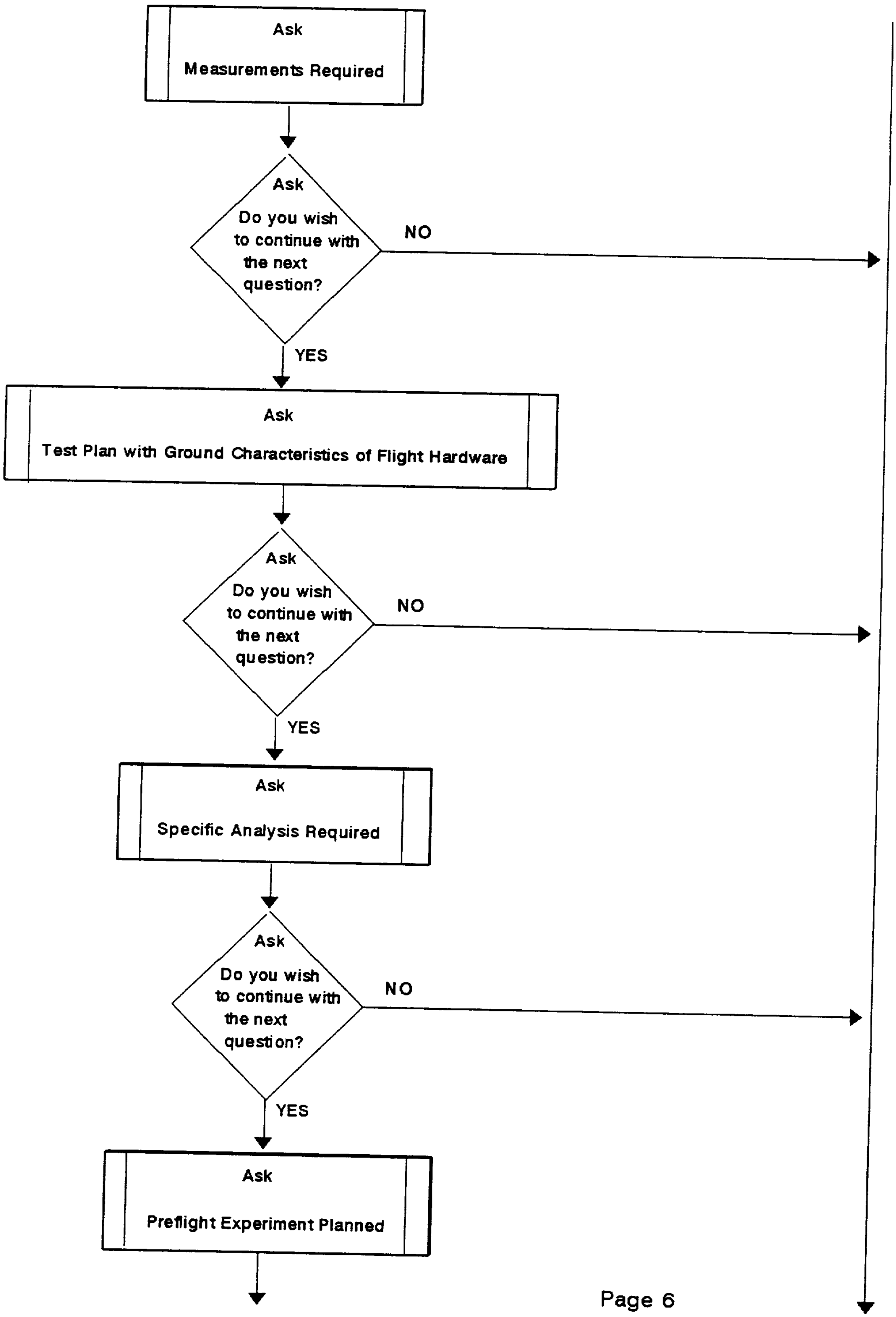
YES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Do you wish to continue with the next question?
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Ask
Test Plan with Ground Characteristics of Flight Hardware
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Do you wish to continue with the next question?
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Ask
Specific Analysis Required
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Do you wish to continue with the next question?
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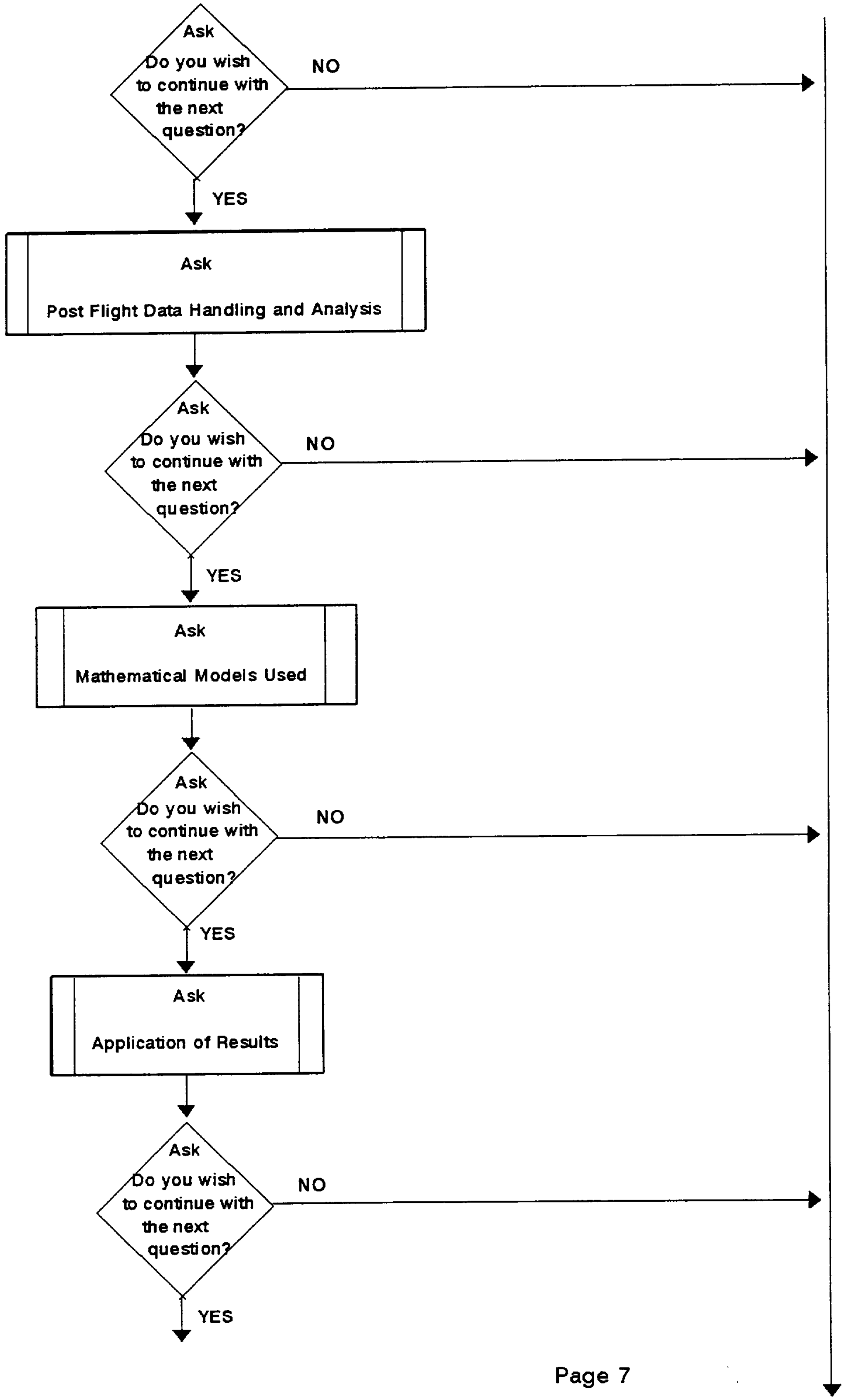
YES
Ask
Preflight Experiment Planned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YES
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Post Flight Data Handling and Analysis
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Do you wish to continue with the next question?
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YES
Ask
Mathematical Models Used
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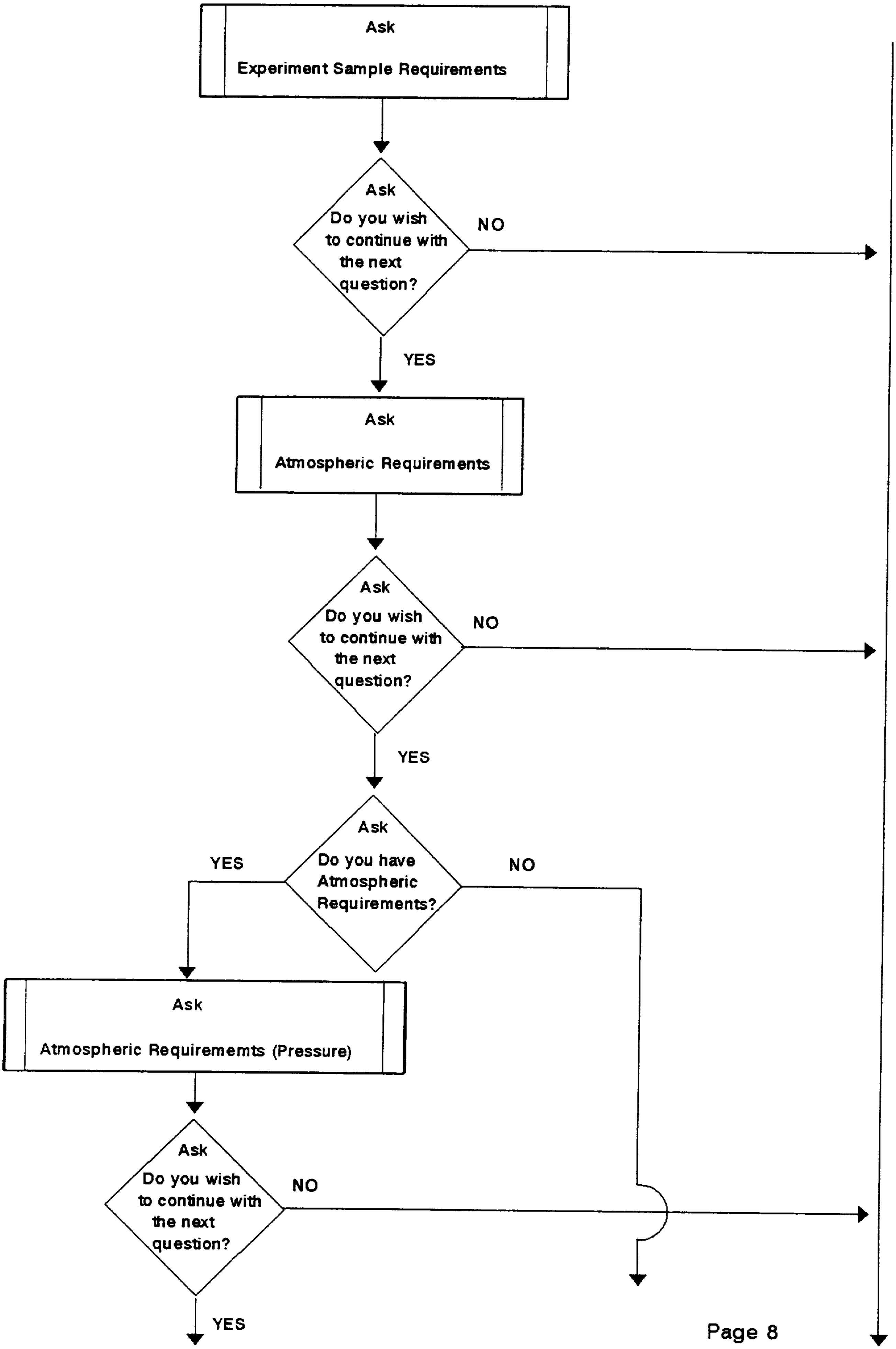
Do you wish to continue with the next question?
NO
YES
Ask
Application of Results
Ask
Do you wish to continue with the next question?
NO
YES


Ask
Experiment Sample Requirements
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Do you wish to continue with the next question?
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YES
Ask
Atmospheric Requirements
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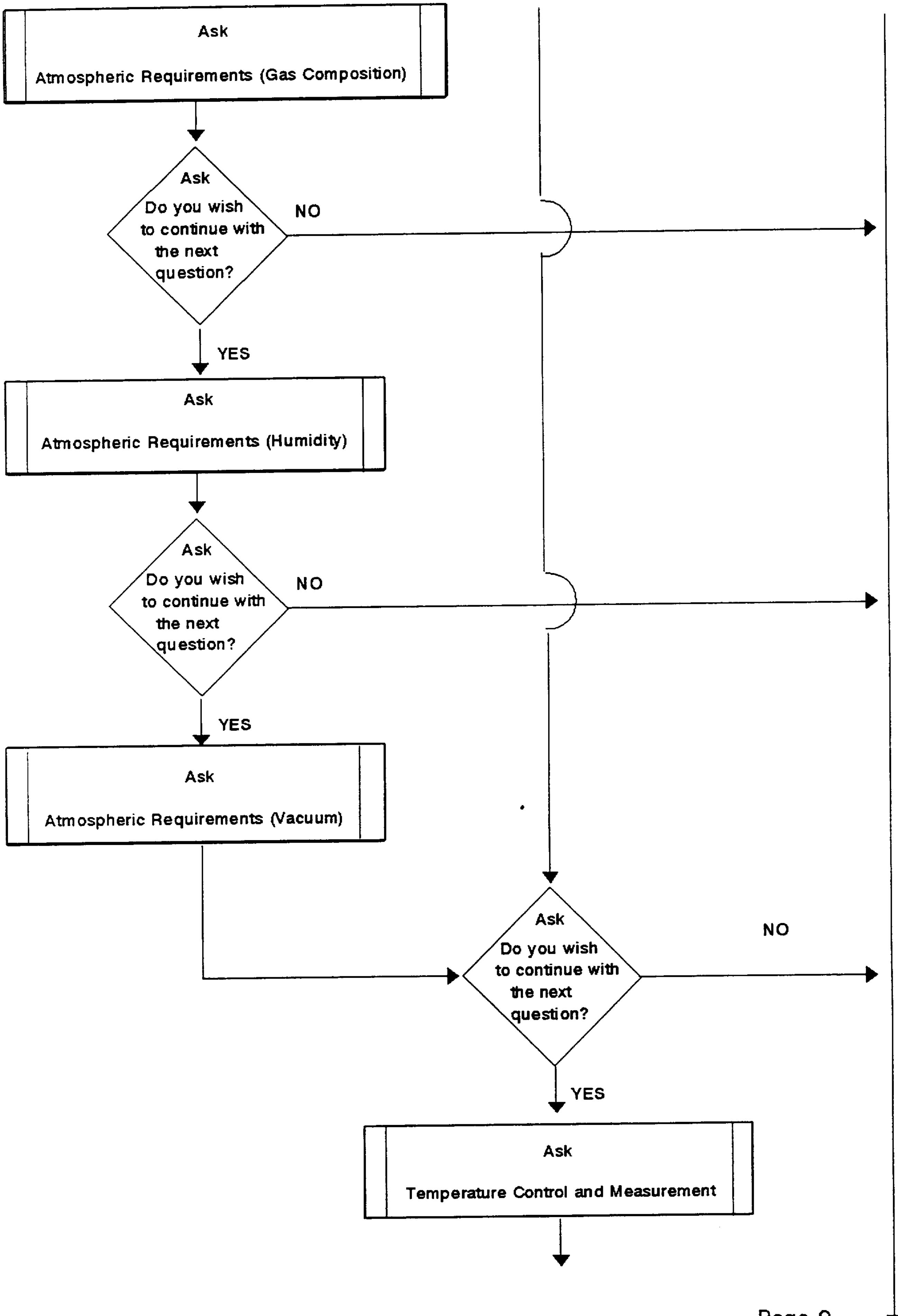
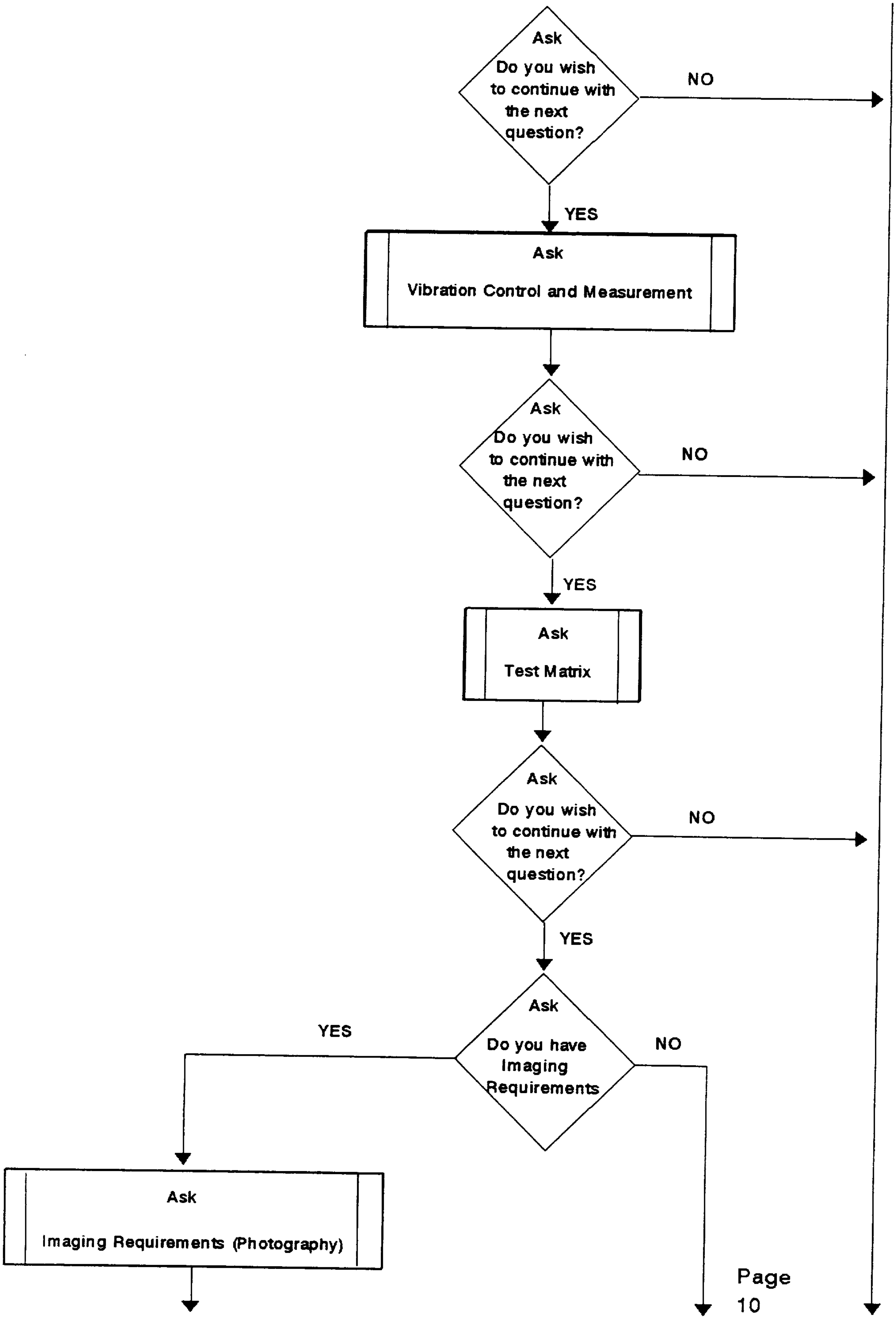
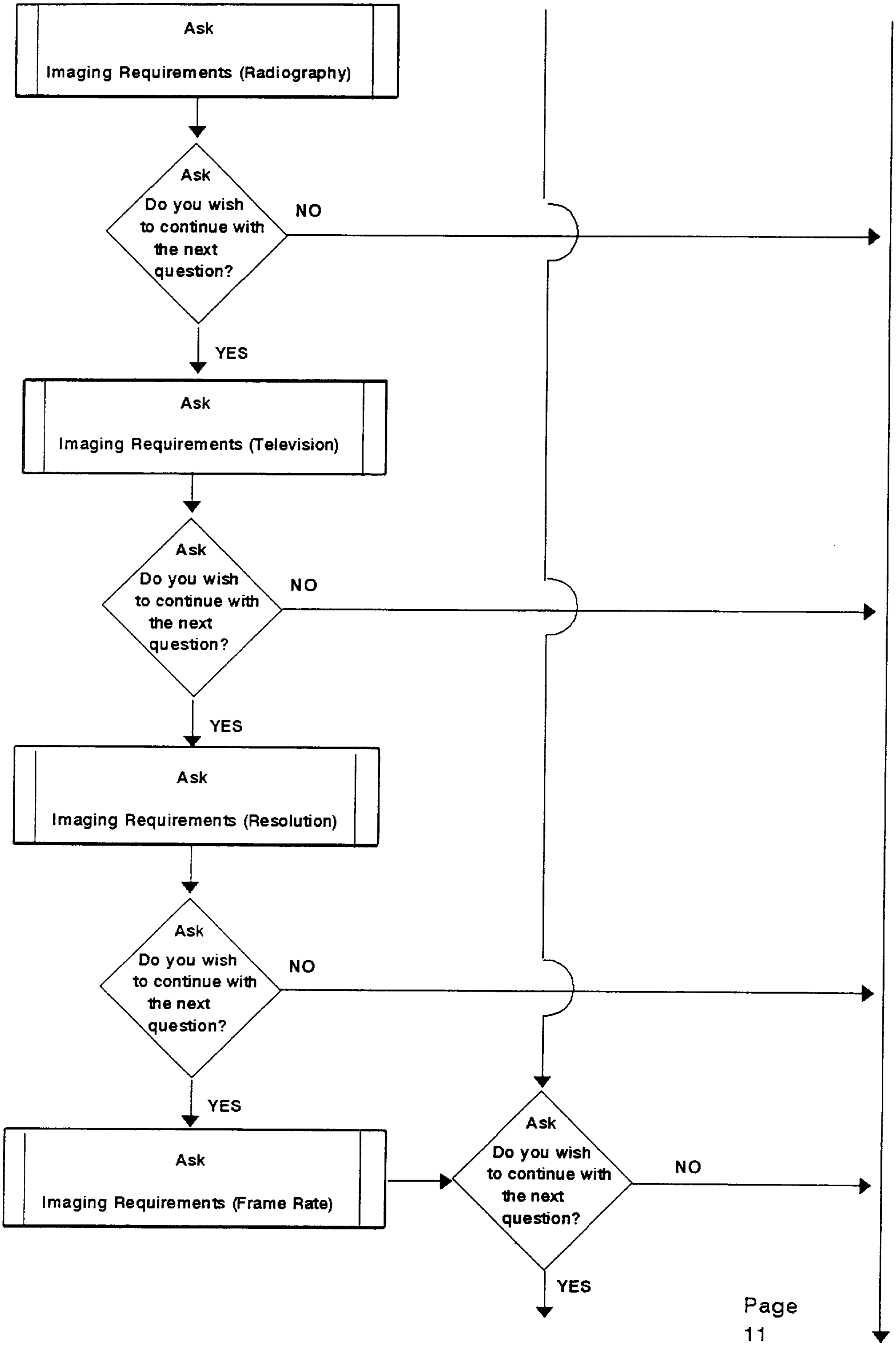
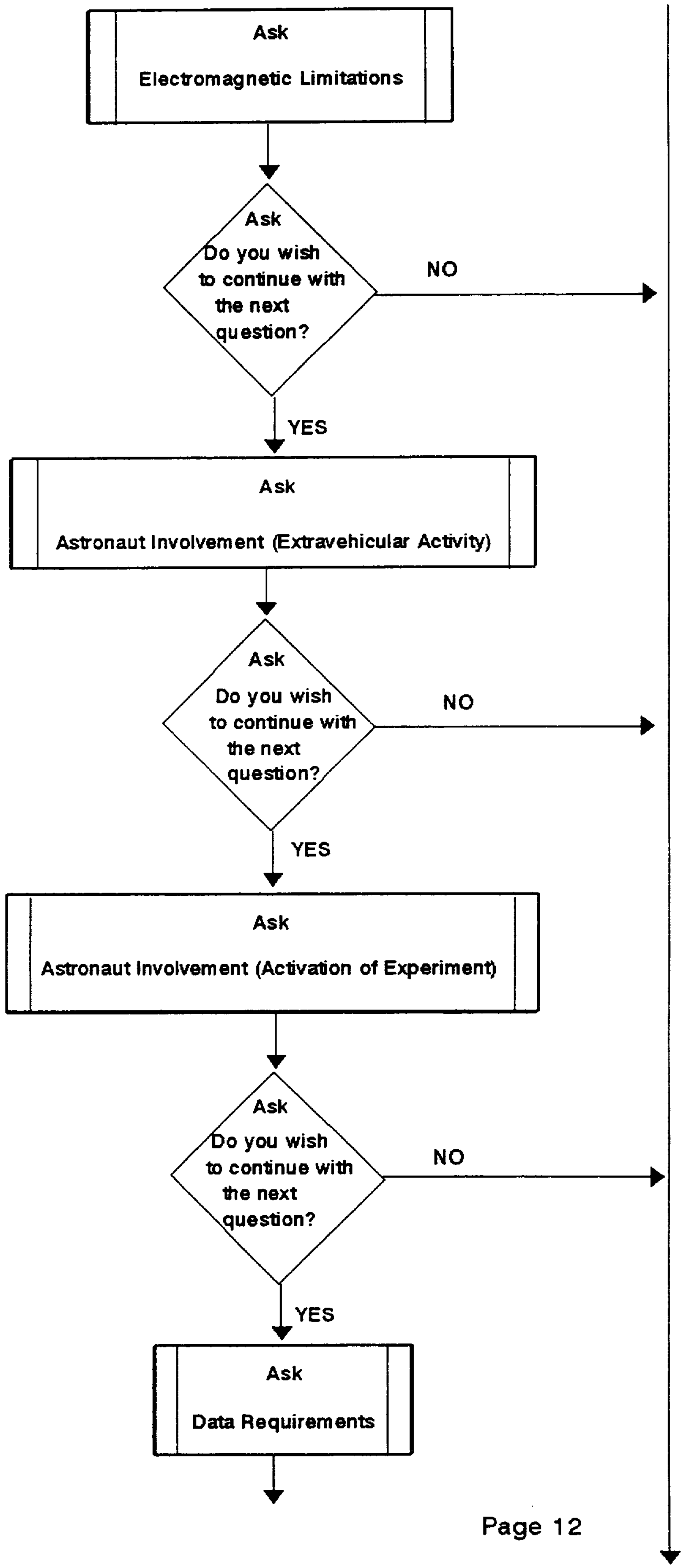
Do you wish to continue with the next question?
NO
YES
Ask
Do you have Atmospheric Requirements?
YES
NO
Ask
Atmospheric Requirememts (Pressure)
Ask
Do you wish to continue with the next question?
NO
YES

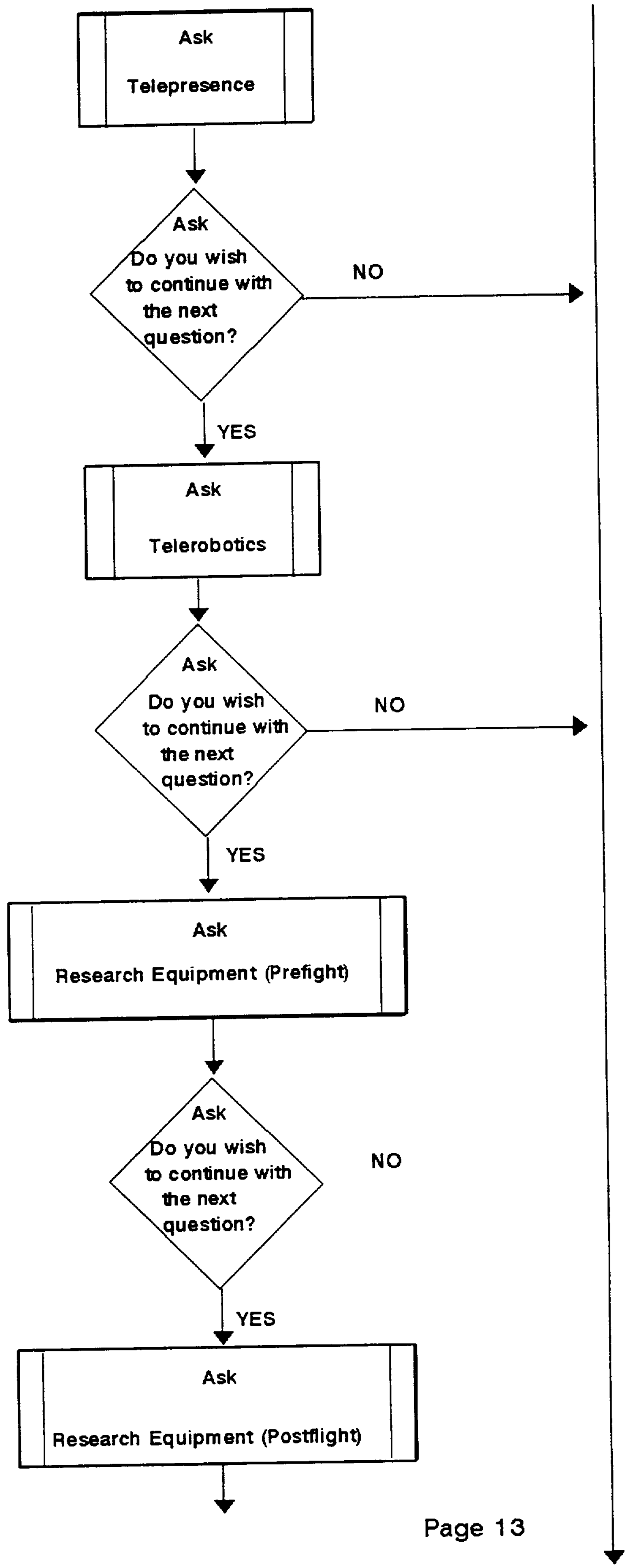

Ask
Atmospheric Requirements (Gas Composition)
Ask
Do you wish to continue with the next question?
NO
YES
Ask
Atmospheric Requirements (Humidity)
Ask
Do you wish to continue with the next question?
NO
YES
Ask
Atmospheric Requirements (Vacuum)
Ask
Do you wish to continue with the next question?
NO
YES
Ask
Temperature Control and Measurement


Ask
Do you wish to continue with the next question?
NO
YES
Ask
Vibration Control and Measurement
Ask
Do you wish to continue with the next question?
NO
YES
Ask
Test Matrix
Ask
Do you wish to continue with the next question?
NO
YES
Ask
Do you have Imaging Requirements
YES
NO
Ask
Imaging Requirements (Photography)

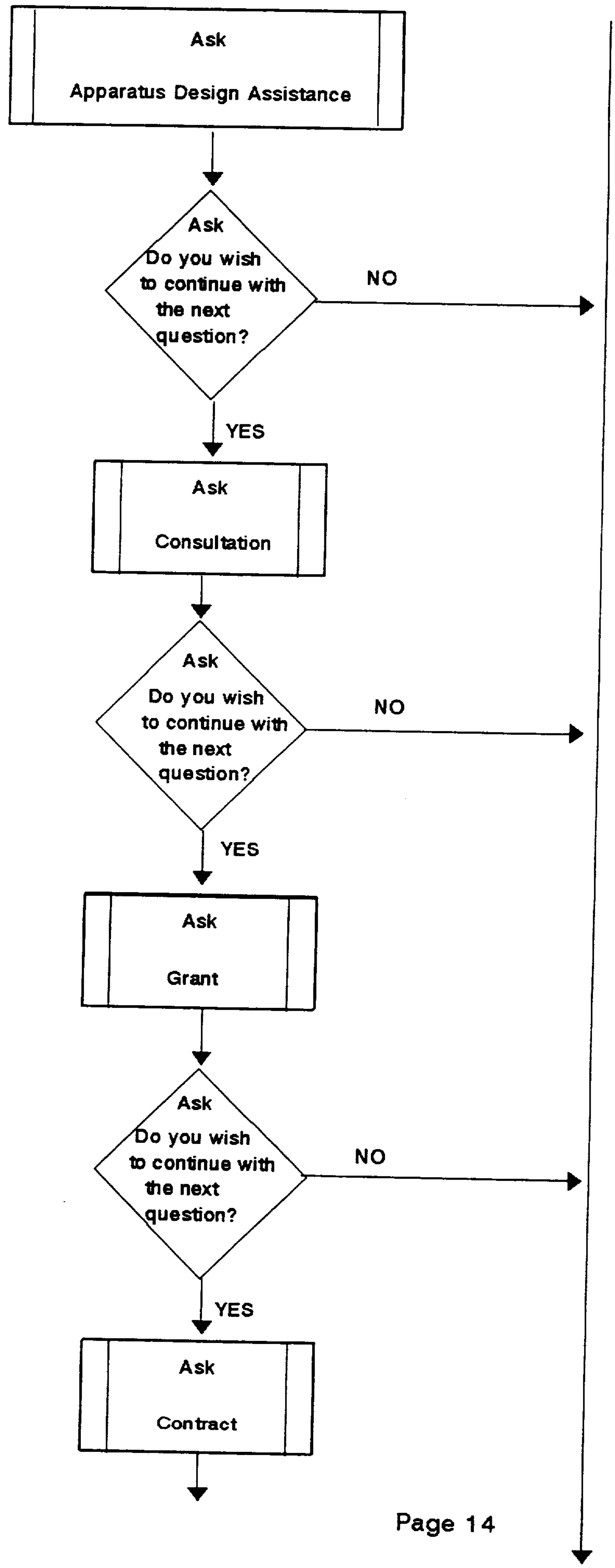


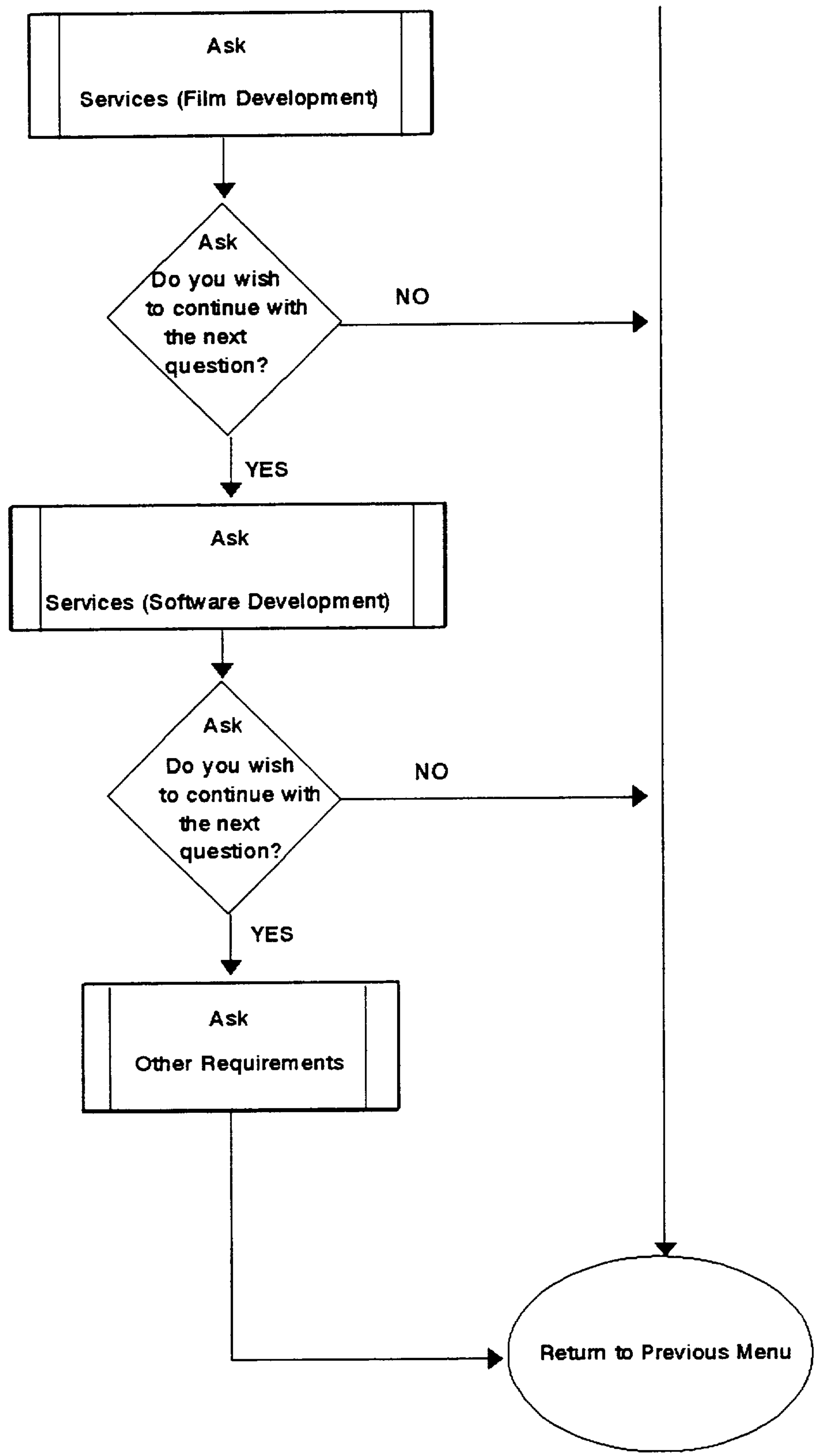
Ask
Imaging Requirements (Radiography)
Ask
Do you wish to continue with the next question?
NO
YES
Ask
Imaging Requirements (Television)
Ask
Do you wish to continue with the next question?
NO
YES
Ask
Imaging Requirements (Resolution)
Ask
Do you wish to continue with the next question?
NO
YES
Ask
Imaging Requirements (Frame Rate)
Ask
Do you wish to continue with the next question?
NO
YES


Ask
Electromagnetic Limitations
Ask
Do you wish to continue with the next question?
NO
YES
Ask
Astronaut Involvement (Extravehicular Activity)
Ask
Do you wish to continue with the next question?
NO
YES
Ask
Astronaut Involvement (Activation of Experiment)
Ask
Do you wish to continue with the next question?
NO
YES
Ask
Data Requirements



Ask
Telepresence
Ask
Do you wish
to continue with
the next
question?
NO
YES
Ask
Telerobotics
Ask
Do you wish
to continue with
the next
question?
NO
YES
Ask
Research Equipment (Prefight)
Ask
Do you wish
to continue with
the next
question?
NO
YES
Ask
Research Equipment (Postflight)


Ask
Apparatus Design Assistance
Ask
Do you wish to continue with the next question?
NO
YES
Ask
Consultation
Ask
Do you wish to continue with the next question?
NO
YES
Ask
Grant
Ask
Do you wish to continue with the next question?
NO
YES
Ask
Contract


Ask
Services (Film Development)
Ask
Do you wish
to continue with
the next
question?
NO
YES
Ask
Services (Software Development)
Ask
Do you wish
to continue with
the next
question?
NO
YES
Ask
Other Requirements
Return to Previous Menu

APPENDIX B

SRD/ERD User Guide

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Automated Payload Experiment Tool

SRD/ERD Users Manual

Prepared by:

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Microgravity Science and Applications Division
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September, 1992

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1.0 INTRODUCTION

So you want to fly an experiment on the Shuttle.

Well, to begin the process, we must get a little information about your experiment and its requirements.

If you have flown with us in the past, you may remember a substantial amount of paper documentation was required. This application, the Automated Payload Experiment Tool, is designed to alleviate much of the burden of the document preparation and maintenance process. This system can currently be used to prepare two support documents, the Science Requirements Document (SRD), which defines the science objectives, and the Engineering Requirements Document (ERD), which defines the engineering design/build requirements. The version that you have is for the creation of both documents.

2.0 DISCUSSION

2.1 Background

The Microgravity Experiment Projects (MEP) Office of the Payload Projects Office (PPO) at the Marshall Space Flight Center (MSFC) is currently responsible for collecting and coordinating experiment/facility specifications and requirements between NASA and various colleges, universities, research centers, and other public- and private-sector organizations that are selected or are requesting to fly their respective microgravity experiments on designated flights. This coordination involves the communication of flight hardware requirements and the preparation and review of all documentation between NASA and the research groups. To reduce difficulties encountered by these customers of NASA, an effort was undertaken to research, analyze, and evaluate the current procedures involved in the information gathering activities.

The MEP Office identified a need to develop an Automated Payload Experiment Tool (APET) which would lead experiment developers through the development planning process, obtain necessary information, establish an electronic data exchange avenue and allow easy manipulation/reformatting of the collected information. In order to fulfill this need, the University of Alabama in Huntsville (UAH) was tasked to design and develop the APET software package to meet the increasing demands to lighten the burden of documentation preparation and maintenance for NASA and its customers.

2.2 System Requirements

The objective of APET is to provide an easy to use tool to the Principal Investigator (PI) team. To ensure ease of use, few computer hardware requirements are necessary to operate the APET software package.

APET is designed to run on any IBM-PC compatible personal computer. While it is possible to use the system on a 386 PC, it is recommended that the APET user install the software on a 486 PC or higher. The graphical displays, multiple screen windows, and the complexity of the system cause noticeable slowdowns on any machine less than the 486.

The software requires that the PC be equipped with a hard disk drive. For proper execution, the hard drive (or some partition of it) must be named C:. The SRD/ERD version of APET will require approximately 14M (megabytes) of space on the hard drive for the system, plus another 1M on the hard drive for the data files created by the user. However, for optimal performance, the hard drive should have a total of at least 17M free upon installation of the software.

For ease of use, the PC should be equipped with a mouse. This, however, is not mandatory. APET utilizes the hypertext technology, which offers a point-and-click user interface. Instead of a mouse, the user does have the option of pressing selected function keys to achieve the same effect.

2.3 Installation

The APET software package is provided on four high density diskettes. The files stored on these diskettes have been compressed; therefore, it is required that the user follow several simple steps to ensure correct installation.

1) Insert the diskette marked as "APET SRD/ERD DISK 1" in the drive designated as A:. If the A: drive on your system is not the correct size, then use the DOS ASSIGN command to redesignate the drives appropriately. (For example, if you have 3 1/2" disks but your 3 1/2" drive is B:, then at the DOS prompt type **ASSIGN A: B:**.)

2) From this drive (A:) type:

INSTALL.

This will activate the installation routine. A series of instructions and informational text will be presented. Each screen will advise what is transpiring in the installation procedure. The installation routine will create a subdirectory on the C: drive called GARDEN. Once created, the files contained on the installation disks will be copied to the directory **C:\GARDEN**. Most of these files have been compressed to conserve disk space. An uncompress routine will be invoked to return these files to their normal (and usable) condition. As the installation routine is completed for each disk, the user will be advised to insert the next diskette. To cancel the installation at any time, press the CTRL (control) C keys.

3) Upon successful installation of the APET program files, the message **INSTALLATION ROUTINE COMPLETE** will be displayed. The APET application, running under the direction of Knowledge Pro software, will be entered and you will be presented the opening menu. All subsequent sessions using the APET software may be initiated by going to the C:\GARDEN subdirectory and typing **FLY**.

2.4 Getting Started

This application uses hypertext technology. Hypertext software systems allow for the retrieval of related information at the point and click of a mouse or, if a mouse is not used, at the touch of one or two keystrokes. For information on a highlighted topic, just move the mouse to that word and click. A window will be opened, overlaying the current window. In the new window, the information will immediately be displayed. Once this support information has been reviewed, press SPACE (or ESC) once to close the window and return to your original screen. If you are not using a mouse, please use the **F3** and **F4** function keys (marked Select and View) as indicated at the bottom of the screen. (See Figure 1). The **F3** key allows you to select the different hypertext topics. Once the desired topic is selected (i.e. highlighted), the **F4** key calls the background information for view.

Multiple page displays are indicated by the **Page 1 of 2** message at the lower right of the screen. To navigate through multiple screen displays, please use the **Page Up** and **Page Down** keys to scroll either forward or backward through the pages.

For help at anytime throughout the APET application, press the F1 key. This will retrieve location sensitive help information, and may be called from the system or system-called edit screens. This will be the method by which assistance information will be retrieved throughout this application.

APET has been designed as a menu-driven software package. This means that any function required of the user can be activated via a menu option. This includes exiting the system. It is strongly recommended that the user always "back out" of the application by using the appropriate menu options, i.e. "Return to Previous Menu". An option does exist to exit from any point in the application by selecting **F10**. It is not recommended that this be used from inside a question/answer section of the application. The **F10** command causes an immediate exit from the program, without checking to ensure that open files have been properly saved. Therefore, the user may experience data loss if the application is exited in this manner.

After the installation and initial use of the APET software, future systems will be initiated by going to the **C:\GARDEN** subdirectory and typing **FLY**. This will activate the software and present the opening menu. (See Figure 2).

Due to the hypertext capabilities of the APET software, a large amount of RAM (random access memory) is required. Because of the heavy RAM demand, proper execution of the software requires no other software package be running simultaneously with the APET software. Whenever the available RAM becomes too little for the application, an "Insufficient Memory" message will be shown at the bottom right of the screen. To alleviate this situation, simply get out of APET and reboot the system. This will usually free up all available RAM and ensure proper execution. (See Helpful Hints for further instruction.)

Automated Payload Experiment Tool

The primary purposes of the Science Requirements Document are:
(1) to provide adequate justification for conducting the experiment in space.
(2) to delineate and justify the science requirements that the experiment places on the hardware.

The Outline for the Science Requirements Document:

1.0 Introduction/Summary

2.0 Background

3.0 Justification for Conducting the Experiment in Space

4.0 Experiment Details

F1 Help	F3 Select		Pg 1 of 2
Space Cont.	F4 View	F8 DOS	F10 Quit

Figure 1
Sample Screen Layout Using Hypertext

Automated Payload Experiment Tool

Please select the activity of your choice, or choose Exit to leave the system.

How to use the System
Project Selection
SRD Overview and Explanation
SRD Documentation Cross-Reference
ERD Overview and Explanation
ERD Documentation Cross-Reference
Glossary/Acronyms
Print Glossary/Acronyms
Exit System

F1 Help

F8 DOS F10 Quit

Figure 2
Opening APET Main Menu

3.0 USING THE APET SYSTEM

3.1 How to Use the System

Because the use of a hypertext tool may be a new experience, a brief on line tutorial is provided with APET. To use this tool, please choose option one on the opening menu entitled "How to Use the System". To select this option, point with the mouse to the phrase and click. If not using a mouse, use the arrow keys to highlight the option and press **RETURN**. You can tell when an option has been selected because it (the phrase or word) will be highlighted differently from all other options. As the mouse is moved to other options, each in turn will be highlighted.

Once the "How to Use the System" option has been selected, a different screen will be presented with a brief overview of hypertext and the methods of selecting topics. (This overview is much the same as appears in Section 2.4 of this user's guide.) Practice selecting topics and moving from one screen to another using either the mouse or the appropriate keyboard function keys.

3.2 Project Selection

The APET software package will accommodate one or more experiments for the user. However, each experiment must be identified by a short (8 characters or less) name, which must conform to the naming convention used by the DOS computer operating system. Briefly, these rules state that a DOS name cannot be over 8 characters in length, and must contain a combination of either letters, numbers, or the underscore (_) character. Any other special keys, including the SPACE, are prohibited. The rationale behind this naming convention is to allow storage of data files for each experiment in a subdirectory for that specific experiment. For example, if a user is working on two experiments, identified as THINFILM and HIPROTEN, then there would be a subdirectory for each. The configuration of these files would be as follows:

Root Directory	Application Directory	Experiment Directory
C:\	GARDEN\....................	THINFILM
	....	HIPROTEN

Therefore, all data files containing answers for the APET questions for the experiment THINFILM would appear in the subdirectory THINFILM. If additional experiments are required, the user would identify the new experiment and an additional subdirectory would be added.

Figure 3 shows the menu for selecting, adding, or deleting an experiment project. In the example, the experiment AADSF_L has been previously defined by the user. If the user wants to work on this experiment, he simply points and clicks on this selection. (This would be the case in a majority of the cases, since most Principal Investigators will have only one active experiment at any given point). However, if another experiment is required, the user would click on "ENTER A NEW PROJECT". The user would be prompted to identify the new experiment, and would immediately be passed into the APET system, where information regarding that experiment would be addressed.

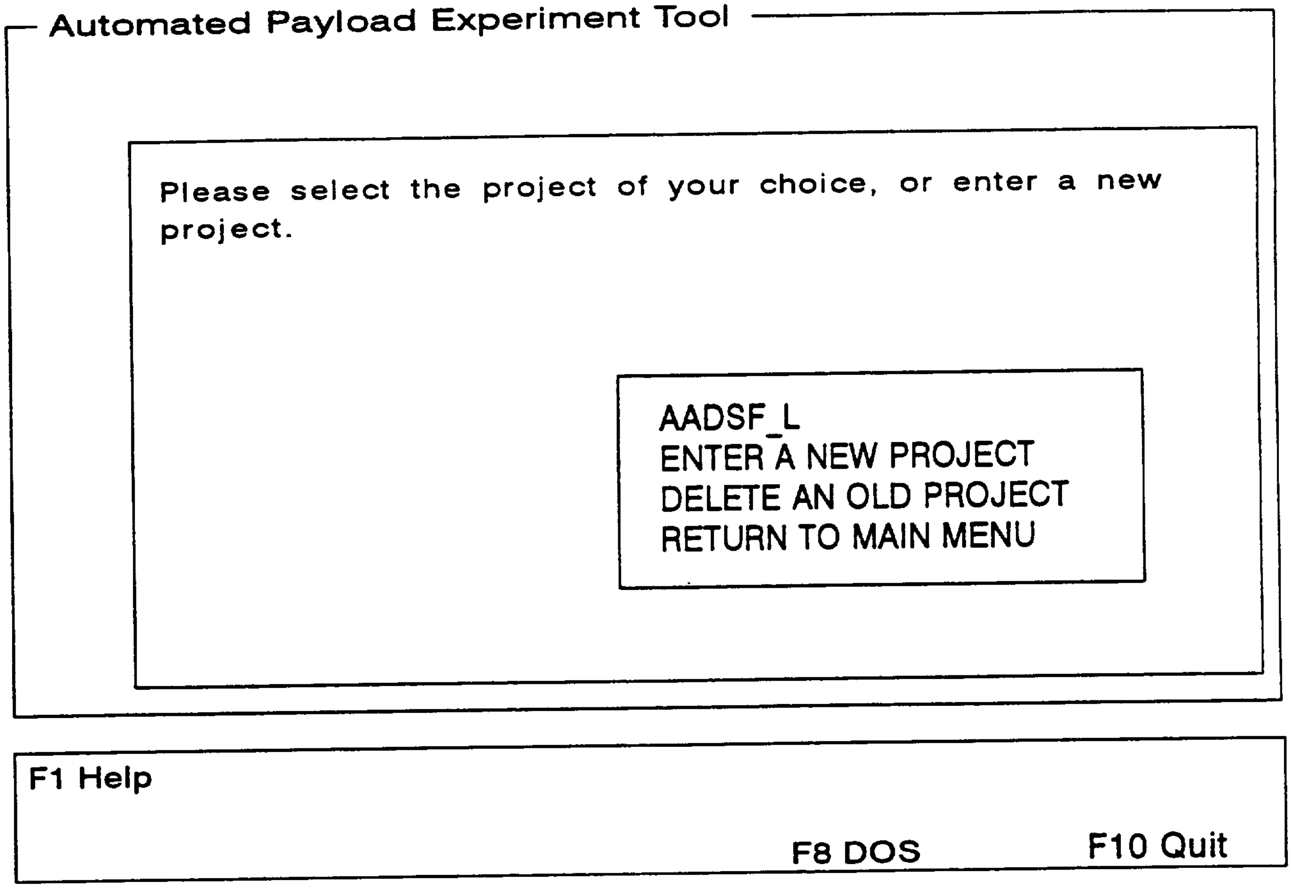


Figure 3
Project Selection/Identification Menu

If a user wishes to delete an experiment, along with all its associated data files, he may do so by selecting the "DELETE AN OLD PROJECT" option from the menu. However, there is no recoverable procedure to undelete a project. Therefore, the user is strongly advised to use this procedure with caution.

3.3 SRD Overview and Explanation

The third selection from the APET Main Menu is the "SRD Overview and Explanation". This option should be selected when the user wishes to see an overview of the SRD document, along with brief explanations of the information to be covered in each section/subsection of the document. For an additional overview of the topics to be addressed in the SRD, see Appendix A of this document.

3.4 ERD Overview and Explanation

The fourth selection from the APET Main Menu is the "ERD Overview and Explanation". This option should be selected when the user wishes to see an overview of the ERD, along with brief explanations of the information to be covered in each section/subsection of the document. For an overview of the topics to be addressed in the ERD, see Appendix B of this document.

3.5 SRD Documentation Cross-Reference

The fifth selection from the APET Main Menu is the "SRD Documentation Cross-Reference". Selection of this option allows the user to more fully understand the interrelationships between the Science Requirements Document (SRD) and the other documentation required by NASA. The SRD has sections that reference information contained in other sections of the SRD as well as other documents. Only the highlighted topics are further referenced.

3.6 ERD Documentation Cross-Reference

The sixth selection from the APET Main Menu is the "ERD Documentation Cross-Reference". Selection of this option allows the user to more fully understand the interrelationships between the Engineering Requirements Document (ERD) and the other documentation required by NASA. The ERD has sections that reference information contained in other sections of the ERD as well as other documents. Only the highlighted topics are further referenced.

3.7 Glossary/Acronyms

A number of NASA specific terms, definitions, and acronyms will appear as support material throughout the documentation process. One of the primary advantages of using a hypertext-based tool is to allow for easy and immediate retrieval of these terms.

Option number seven from the APET Main Menu allows the user to retrieve a listing of these terms, and presents them in a form analogous to a glossary in a book. To view a definition, highlight the desired term and click. A term can be highlighted by using the mouse to move the cursor to that word, or by using the F3 key for selection. To view the definition, the user should either click the mouse or press the F4 key. The definition of that word/term will be presented. Should the definition contain a term that requires further description, highlight that word and click. The new definition will overlay the previous definition. This method can be repeated as long as further definitions exist and the memory capacity of the machine is not exceeded.

Please note that the glossary consists of multiple pages. Remember to navigate through the multi-page displays by using either the Page Up/Page Down function keys.

3.8 Print Glossary/Acronyms

Option number eight from the APET Main Menu activates a routine for the printing of the glossary/acronym list, as discussed in 3.7. Because the output of this selection will be a multi-page document, the use of this option will be rare.

3.9 Filling Out the SRD

To fill out the SRD, the user must first select "Project Selection" from the APET Main Menu. Then the Project Selection/Identification Menu (Figure 3) will be presented for the user to identify either a new project or select an existing project. Once the selection/identification has been made, the SRD/ERD Activity Menu (Figure 4) will be presented. Please note that the selected project is shown on the upper right corner of the screen. Please be sure that the project shown is the one you wish to work.

The SRD/ERD Activity Menu presents eleven options for the user. The most significant of these is the first: "FILL OUT DOCUMENTATION". The selection of this option will present the Fill Out SRD/ERD Documentation Menu (Figure 5). This menu offers the user three options: "ENTER PROJECT INITIALIZATION INFORMATION", "COMPLETE SCIENCE REQUIREMENTS DOCUMENT (SRD)", and "COMPLETE ENGINEERING REQUIREMENTS DOCUMENT (ERD)".

3.10 Entering Project Initialization Information

Under most circumstances, the first information entered by the user into the APET system is the project initialization information. To enter this information, selection one from the Fill Out SRD/ERD Documentation Menu is chosen. This information is used to identify certain aspects of the experiment, and will be used throughout the documentation process. Entries include the PI name, his organization, address, city, state, zip, phone, and experiment title. This information will be provided in the form of type written responses to user prompts. For example, the user will be asked:

Please enter your first and last names, i.e. Dr. John Doe.

The user should respond with a one line response. (If there is a limitation on the length of this one line response, the screen display will provide an instruction, such as "Please limit your response to 16 characters.") This will be the format of user entries throughout the APET application. When the user is prompted to make an entry, the response should be on one line. When the user responds with a **RETURN**, the answer is stored and the next question, if one exists, is asked. Once all questions for that segment have been answered, the answers are written to a data file.

In the "Project Initialization Information" subsection, the only variation in the user prompt/one line response routine is with the experiment title. Because experiment titles can be several lines, the user is given a prompt and immediately sent to the APET editor. This editor is a small version of a word processor, with many of the functions of a common word processing package. The commands used in the APET editor are similar to those in the software package WORDSTAR. To see the commands available, press the F1 function key from inside the editor. A separate window will be opened and will overlay the current screen. From there, page down until the function you wish to perform is shown. The one-to-two keystroke command to accomplish the task will be shown. (Note: The symbol (^) represents the CONTROL key., i.e. ^KQ means to hold the CONTROL key down while pressing the letter K, then press the letter Q.) When the user is finished entering the answer into the editor, he may exit by pressing the ESC (escape) key. A message will then appear on the screen that tells the user what file name is being saved. Respond with a RETURN to accept this name and save the answer, or an ESC to cancel the answer.

Important: Do <u>not</u> change the file name when the APET software asks if the name is acceptable. Future sessions that allow the user to change, delete, print, or display the SRD answers require that these file names be used. Changing the file name will make the file either inaccessible or inappropriate. Therefore, <u>always</u> accept the file name as given.

Automated Payload Experiment Tool

The project you have selected is: AADSF_L
Please enter your choice of activities from the list.

FILL OUT DOCUMENTATION
PRINT SRD
DISPLAY SRD
CREATE AN ASCII FILE OF SRD
PRINT ERD
DISPLAY ERD
BASELINE DOCUMENT
COMPARE BASELINE TO CURRENT REVISION
COPY ANSWERS TO DISK
RETURN TO PREVIOUS MENU
RETURN TO MAIN MENU
QUIT

F1 Help

F8 DOS F10 Quit

Figure 4
SRD/ERD Activity Menu

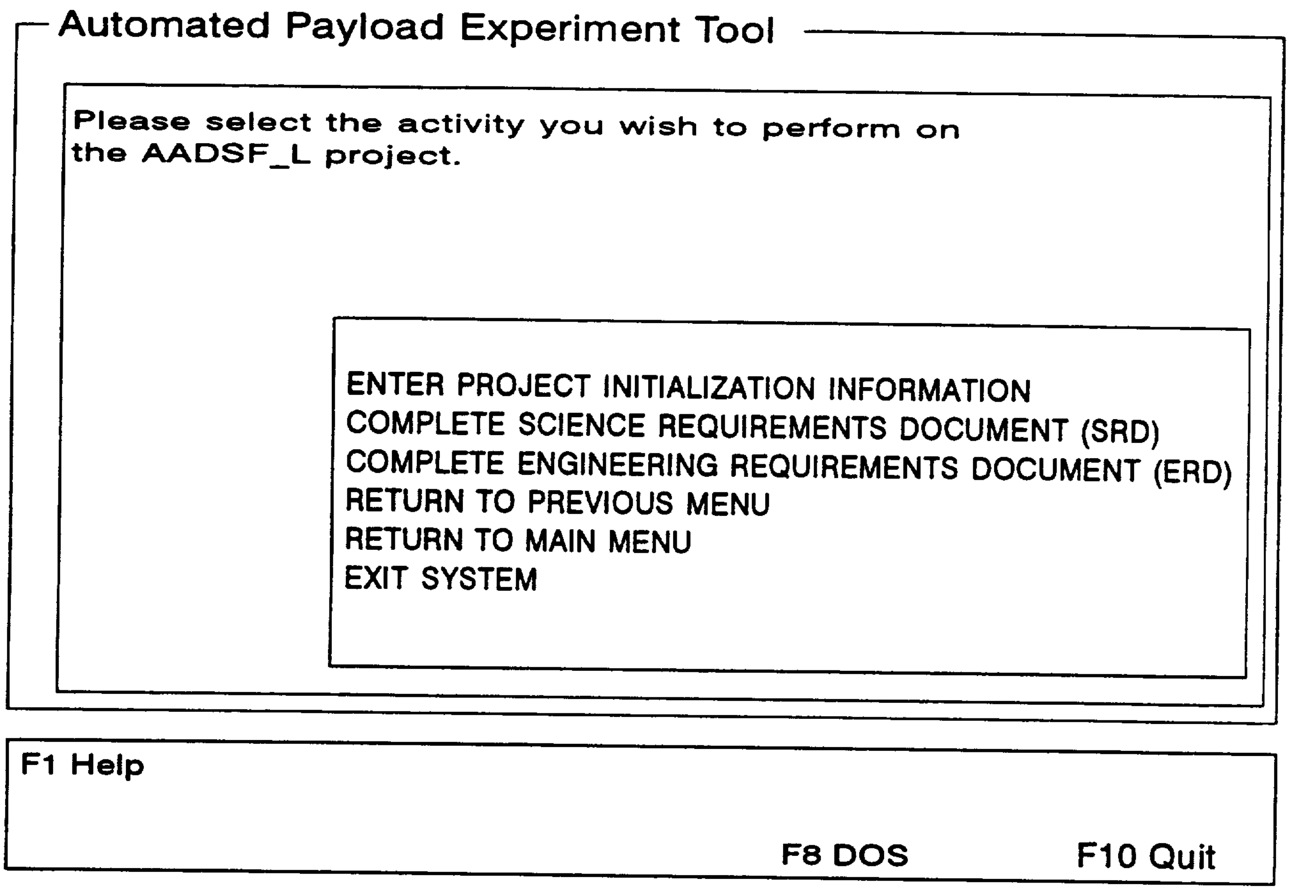


Figure 5
Fill Out SRD/ERD Documentation Menu

3.11 Complete Science Requirements Document

To complete the Science Requirements Document, there are usually between 50 - 60 questions that must be answered. These answers will be in the form of short narratives, consisting of one or more paragraphs of text. Each question or user prompt will invoke the APET editor and give the user sufficient space to write as much (or little) as required. (For an outline of the topics to be addressed, see Appendix A.) A sample question from the SRD is shown in Figure 6.

The Complete SRD session begins by asking the user if he has begun to fill out the SRD previously. A 'NO' response causes the questions to be asked in sequence. A 'YES' response results in the question topics to be displayed in a list. If questions are to be answered from a list, a list will appear as a window that overlays the question screen. The user is expected to point-and-click on the appropriate topic. (If not using a mouse, use the arrow keys to select and press RETURN.) The user should click on the appropriate answer with the left-side mouse button.

For the initial SRD session, the user would respond with a NO and proceed to the questions. These questions will be asked in the same sequence as is shown in the outline. After each response, the user will be asked if he wants to continue to the next question. This gives the user a chance to end the session when he desires, rather than advancing through all the remaining questions. The title of each question screen will include the number of the question (i.e., Number 1 of 52). This allows the user to see where he is in the process and act accordingly.

If the user responds with a 'YES', which means there has been a previous session, the following question will appear:

> Do you wish to change only one item, resume at a point and continue sequentially through the remainder of the SRD, or complete all topics previously unanswered?

This allows the user one of three options. 1) He may select the one answer that needs changing, go directly to that answer and change it, then record that answer to disk. 2) He can select the topic where he would like to resume his activities, answer that question, record the answer, and go to the next question in sequence. This gives the user the capability of selecting the 20th question, and proceed sequentially through the remaining 32 questions. 3) The user can complete all questions that have not yet been answered. This option will invoke a command to look at what answers (files) do not exist, and build a list of these topics. The user then selects the topic to answer, answers the question, records the answer, and goes to the next question of his choice. With each recorded answer, that topic is removed from the list.

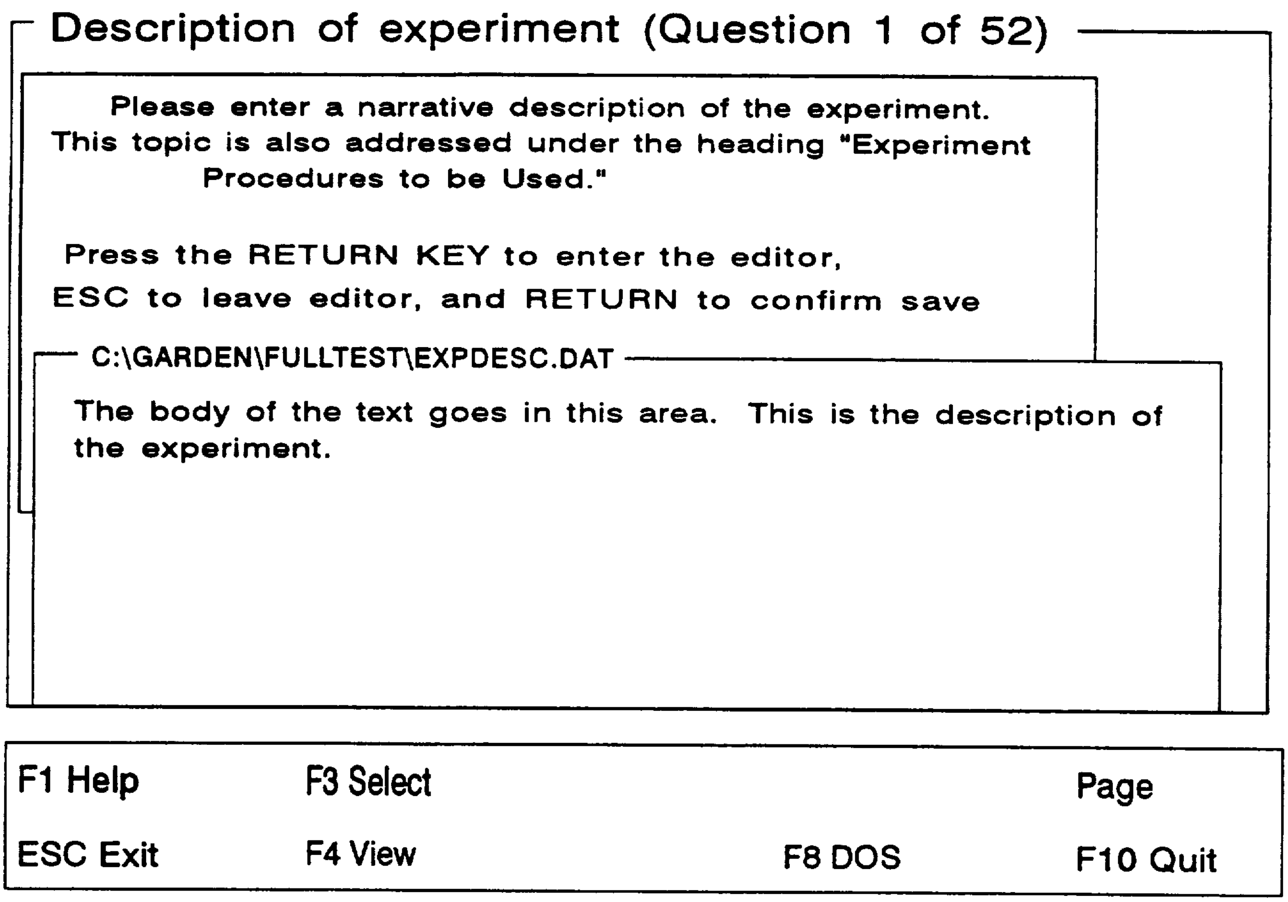


Figure 6
Sample SRD Question Screen

3.12 Printing the SRD

The user has three methods available to generate output from the APET software. These include printing the document, displaying the document, and creating an ASCII file of the document. The APET application was designed to be flexible enough to go to a variety of printers. As with most output, the best results will be with the use of a laser printer. If a laser printer is not available, the use of a dot-matrix printer will also be acceptable. A variety, although not nearly exhaustive, of dot-matrix printers have been tested with the APET software, and all have performed well.

If the document has previously been baselined (discussed later in section 3.19), then a menu will appear giving the user the option of printing the document from the baselined version, the current revision, or neither version. If the neither option is chosen, then it is assumed that the user does not want the document printed, and the program will automatically return to the previous menu. If the baseline option is chosen, then the document will be printed from the file which is in the project baseline subdirectory. If the current revision option is chosen, then the document will be printed from the version of the document which the user is currently revising. If the document has not been baselined, then the document will be printed from the current version.

The printing of the SRD will generate the document in its entirety. An initial page eject will normally (depending on printer type) advance a blank sheet of paper before the cover sheet is printed. This will be followed by a second page advance, then page one of the document will be printed, followed by two, three, etc. through the end of the document. Because there are often graphics, tables, etc. that must be inserted within the textual document, no table of contents is printed. Because of the limitation of graphics support, it is suggested that all externally generated graphic illustrations, tables, etc. be provided in an appendix, with appropriate references throughout the document.

While the print procedure is active, a message will appear in the lower left of the screen. No other activities may take place while the document is printing. In case the printer runs out of paper, an error message will appear. Reload paper in the printer and press the SPACE key to continue.

3.13 Displaying the SRD

The second method of generating output using APET is to display sections of the SRD to the screen. The SRD is divided into seven major sections, with each divided into one or more subsections (see Appendix A). The user has the capability of selecting a section and seeing the identical output as would appear if the document was printed. Displaying the SRD is recommended to quickly review answers, especially during the development phase of document preparation.

If the document has previously been baselined (discussed later in section 3.19), then a menu will appear giving the user the option of displaying the document from the baselined version, the current revision, or neither version. If the neither option is chosen, then it is assumed that the user does not want the document displayed, and the program will automatically return to the previous menu. If the baseline option is chosen, then the document will be displayed from the file which is in the project baseline subdirectory. If the current revision option is chosen, then the document will be displayed from the version of the document which the user is currently revising. If the document has not been baselined, then the document will be displayed from the current version.

Most SRD sections will require multiple page displays. Please note that to view the equivalent of an entire printed page, there will be at least three and usually four screen displays. Use the Page Up/Page Down method to move up or down in the document. Once a page is adequately reviewed, press the SPACE key to retrieve the next page in sequence. To abandon a display at any time, press the F10 key.

3.14 Create an ASCII File of SRD

The APET software does not have the ability to generate or insert graphics, charts, etc. that were created in some other application. This is primarily due to the memory size limitations of the computer. However, to alleviate this limitation, APET does have the ability to generate an ASCII file of its SRD output. After choosing this option, the user need only type in the full file name (includes drive, file name, and extension). The file will then be created as a replica of the printed output.

The benefit of creating an ASCII text file of the SRD is in providing the user with the capability of enhancing the final printing by inserting graphics, photos, tables, equations, or other difficult to create figures. In addition, different fonts, font sizes, and special effects can be used to dress up the final printed output.

3.15 Filling Out the ERD

To fill out the ERD, the user must first select "Project Selection" from the APET Main Menu. Upon this action, the Project Selection/Identification Menu (Figure 3) will be presented for the user to identify either a new project or select an existing project. Once the selection/identification has been made, the SRD/ERD Activity Menu (Figure 4) will be presented. Please note that the selected project is shown on the upper right corner of the screen. Please be sure that the project shown is the one you wish to work.

The SRD/ERD Activity Menu presents eleven options for the user. The most significant of these is the first: "FILL OUT DOCUMENTATION". The selection of this option will present the Fill Out SRD/ERD Documentation Menu (Figure 5). This menu offers the user three options: "ENTER PROJECT INITIALIZATION INFORMATION", "COMPLETE SCIENCE REQUIREMENTS DOCUMENT (SRD)" and "COMPLETE ENGINEERING REQUIREMENTS DOCUMENT (ERD)". Select "COMPLETE ENGINEERING REQUIREMENTS DOCUMENT (ERD)" if the project initialization information has already been entered. If this information has not already been entered, select it before generating the ERD.

3.16 Complete Engineering Requirements Document

To complete the Engineering Requirements Document, the user must answer a series of questions about the experiment. The questions are grouped into topics, a list of which is presented to the user. The user is asked to select the topic which is to be displayed. The chosen topic will be displayed along with the subtopics covered within that section. The user is prompted as to whether or not he wishes to begin or continue filling out the questions in that section. (For an outline of the topics to be addressed, see Appendix B.) If the user chooses to fill out the section, he will be prompted to select one of the subheadings. Upon subheading selection, a brief description of the topic will be given, along with any necessary instructions for answering the question.

If the question invokes the editor, the answers should be given in the form of short narratives, consisting of one or more paragraphs of text. Sufficient space will be given to write as much (or little) as required. If an answer requires a numeric response, enter the number just as you wish it to appear. A sample of this procedure is shown in Figures 7 thru 11.

Upon selection of a topic, if the questions within that chosen topic have already been answered, the user will be prompted with a message saying that the section has already been completed. The user then has the options of ADDING, EDITING, or DELETING answers, or RETURNING to the previous menu. The user should select an option and follow the instructions accordingly. If the chosen topic does not have any related subtopics, and the user wishes to complete that section, the program will give instructions for answering that question, and the APET editor will be invoked as needed.

Some of the topics have accompanying illustration(s) in order to give the user a better understanding of what information is needed. If you wish to view the illustration, simply click on, or select, the appropriate phrase. This will cause the screen to momentarily go blank, and the illustration will then be presented. After you have viewed the illustration, simply press SPACE and the program will return you to your original screen.

3.17 Printing the ERD

The user has two methods available to generate output from the APET software in regard to the ERD. These include printing the document, and displaying the document. The APET application was designed to be flexible enough to go to a variety of printers. As with most output, the best results will be with the use of a laser printer. If a laser printer is not available, the use of a dot-matrix printer will also be acceptable. A variety, although not nearly exhaustive, of dot-matrix printers have been tested with the APET software, and all have performed well.

If the document has previously been baselined (discussed later in section 3.19), then a menu will appear giving the user the option of printing the document from the baselined version, the current revision, or neither version. If the neither option is chosen, then it is assumed that the user does not want the document printed, and the program will automatically return to the previous menu. If the baseline option is chosen, then the document will be printed from the file which is in the project baseline subdirectory. If the current revision option is chosen, then the document will be printed from the version of the document which the user is currently revising. If the document has not been baselined, then the document will be printed from the current version.

The printing of the ERD must be accomplished by printing either selected sections or tables of the document. An initial page eject will normally (depending on printer type) advance a blank sheet of paper before the first sheet is printed. This will be followed by a second page advance, then page one of the document will be printed, followed by two, three, etc. through the end of the document. Because there are often graphics, tables, etc. that must be inserted within the textual document, no table of contents is printed. Because of the limitation of graphics support, it is suggested that all externally generated graphic illustrations, tables, etc. be provided in an appendix, with appropriate references throughout the document.

While the print procedure is active, a message will appear in the lower left of the screen. No other activities may take place while the document is printing. In case the printer runs out of paper, an error message will appear. Reload paper in the printer and press the SPACE key to continue.

3.18 Displaying the ERD

The second method of generating ERD output using APET is to display sections of the ERD to the screen. The ERD is divided into twelve major sections, some of which may be divided into more subsections (see Appendix B). The user has the capability of selecting a section and seeing the identical output as would appear if the document was printed. Displaying the ERD is recommended to quickly review answers, especially during the development phase of document preparation.

If the document has previously been baselined (discussed later in section 3.19), then a menu will appear giving the user the option of displaying the document from the baselined version, the current revision, or neither version. If the neither option is chosen, then it is assumed that the user does not want the document displayed, and the program will automatically return to the previous menu. If the baseline option is chosen, then the document will be displayed from the file which is in the project baseline subdirectory. If the current revision option is chosen, then the document will be displayed from the version of the document which the user is currently revising. If the document has not been baselined, then the document will be displayed from the current version.

Most ERD sections will require multiple page displays. Please note that to view the equivalent of an entire printed page, there will be at least three and usually four screen displays. Use the point-and-click (or Page Up/Page Down) method to move up or down in the document. Once a page is adequately reviewed, press the SPACE key to retrieve the next page in sequence. Displays will continue until all output has been presented.

Automated Payload Experiment Tool

The suggested outline for the Engineering Requirements Document (ERD) is as follows. Please choose the Section with which you would like to begin/resume:

1 Functional Objectives & Equipment Identification
2 Structural/Mechanical
3 Pointing/Stabilization and Alignment
4 Orbital Requirements and Constraints
5 Electrical Requirements
6 Thermal Control/Fluid Requirements
7 Data System Requirements
8 Flight Software Requirements
9 Physical Integration
10 Mission Operations Support
11 Training Objectives
12 Environmental Contamination Data Requirements
Return to Previous Menu

F1 Help	F3 Select		
	F4 View	F8 DOS	F10 Quit

Figure 7
ERD List of Sections

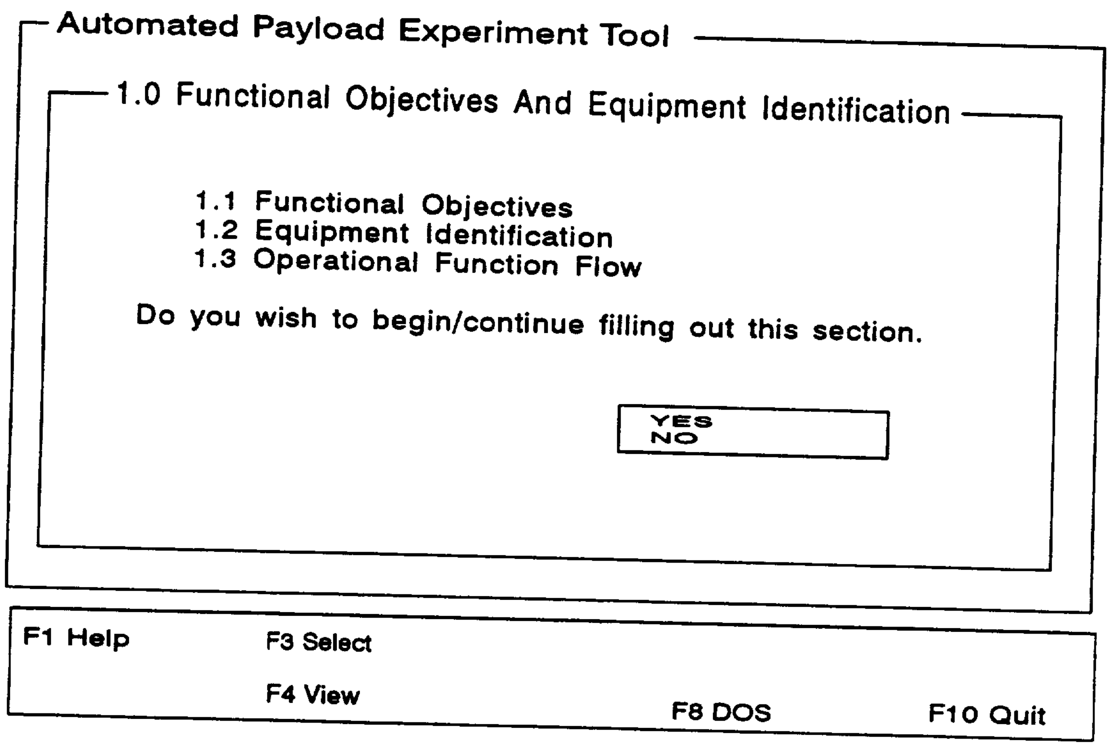


Figure 8
ERD Section Selection

Automated Payload Experiment Tool

With which subheading do you wish to begin?

1.1 Functional Objectives
1.2 Equipment Identification
1.3 Operational Function Flow
Quit

F1 Help	F3 Select		Pg 1 of 1
	F4 View	F8 DOS	

Figure 9
ERD Subtopic Selection

Automated Payload Experiment Tool

1.0 Functional Objectives and Equipment Identification

A definition of the experiment objectives and identification of the payload element equipment items needed to accomplish these objectives are necessary to define the support required from the STS or PMM by the instrument and the Principle Investigator.

Press SPACE to continue.

F1 Help	F3 Select		Pg 1 of 1
Space Cont.	F4 View	F8 DOS	F10 Quit

Figure 10
ERD Topic Narrative

Automated Payload Experiment Tool

Functional Objectives

Enter the number of Functional Objectives required for this experiment.

=> 0

F1 Help

Enter Accept F8 DOS F10 Quit

Figure 11
Sample ERD Question

3.19 Baselining a Document

At some point in the documentation procedure, the SRD/ERD will be considered complete and released to external offices, agencies, organizations, etc. When this occurs, that version of the document is considered the baseline, and should be easily identified as such.

To aid in the process of maintaining separate versions of the SRD and ERD, an option exists to baseline the current version of the document. (See Figure 12) The selection of this option will cause a replica of the current version's answers (or data files) to be copied to a new subdirectory for that experiment. This new subdirectory will be called **BASELINE**. From that point, all additional editing will transpire on a new version of the answers, while the baselined version of the answers will remain intact. The generation of output will require the user to identify which version (baseline or current revision) he wishes to access.

3.20 Comparing a Baseline to the Current Revision

Once the document has been baselined (See Section 3.19), the user may wish to compare this baseline with the current revision. APET provides a mechanism to accomplish this task. By selecting the option "Compare Baseline to Current Revision", a DOS routine will be invoked to compare all identical data files from the current revision to the baseline document. This comparison generates a file that can then be displayed or printed, so that a quick review will show which answers have been modified since the original baseline date.

3.21 Copying Answers to Disk

The final output option provided by APET is the creation of files that contain all data generated by the software. This can be used as either a backup mechanism during the creation of the files, or as a means of submission of the final document instead of a hard copy/printed document. By submitting the answers on diskette, the receiving party can have direct access to the answers in the same manner as would the sender. These files are not formatted as an ASCII file, and should not be confused with the final report output, which can be created using the "Create an ASCII File of SRD" (discussed in Section 3.12).

The user will have the option of selecting either the baseline document or the current revision. After this selection, the user is asked to select the drive to receive the backup (either A:,B:,C:, or D:). A DOS copy command will then be invoked to copy all files to the selected drive.

Automated Payload Experiment Tool

At some point in the documentation process, it is necessary to declare that all documents are complete, and that any changes to be made will be treated as revisions to the baseline document.

Do you want to baseline your answers at this time?

YES
NO

F1 Help

F8 DOS F10 Quit

Figure 12
Baseline Menu

4.0 HELPFUL HINTS

1) Avoid the use of the F10 key to exit from within the APET application. It is a better practice to back out of the APET system through the use of the menus. By doing so, the user ensures that all answers are properly recorded to the disk drive. Use of the F10 key from within the APET application will allow the user to exit but will not automatically save information generated during the session.

2) APET does not support the insertion of externally generated graphics, tables, equations, or other non-text material. To alleviate this problem without the added labor of using a secondary word processor, it is suggested that any such material be included in an Appendix, and referenced in the text generated in APET.

3) To insert an externally generated text file into the text area in the APET editor, use the command ^KR from within the editor. This is one of a variety of commands that can be used from the APET word processor. To see all available commands, press the F1 key from inside the editor and page through the instruction set.

4) The APET editor uses a word wrap routine that automatically wraps the line to the next line (a common word processing feature). It also maintains vertical alignment along the left margin. If you use indented paragraphs, please be sure that the line after the indented line begins in the column you desire. To do this, use the backspace key to move the first word in the line to the column desired. The recommended solution to this problem is not to indent paragraphs, but instead insert a blank line between each paragraph.

5) If your computer system is configured to automatically load WINDOWS or some other application package, it may be necessary to alter the AUTOEXEC.BAT file (located in the boot drive). Instructions for changing the automatic load of an application will vary by computer. One of the easier methods is to edit the AUTOEXEC.BAT file and remove the line that calls the package. For example, WINDOWS is called by the command WIN. By preventing these packages from loading, a significant amount of RAM is freed and allowed for use by APET.

APPENDIX A

SRD Topic Outline

1.0 INTRODUCTION/SUMMARY

1.1 Descripton of Experiment
(Question 1)

1.2 Scientific Knowledge to be Gained
(Question 2)

1.3 Value of Knowledge to Scientific Field
(Question 3)

1.4 Justification of the Need for Space Environment
(Question 4)

2.0 BACKGROUND

2.1 Descripton of Scientific Field
(Question 5)

2.2 Current Application for Research
(Question 6)

2.3 Brief Historical Account of Prior Research
(Question 7)

2.4 Current Research
(Question 8)

2.5 Relationship of Proposed Experiment
(Question 9)

2.6 Anticipated Advance in State of the Art
(Question 10)

3.0 JUSTIFICATION FOR CONDUCTING THE EXPERIMENT IN SPACE

3.1 Limitations of Ground-Based Testing
(Question 11)

3.2 Limitations of Drop Towers
(Question 12)

3.3 Limitations of Testing in Aircraft
(Question 13)

3.4 Need for Accommodations in the Shuttle
(Question 14)

3.5 Limitations of Mathematical Modeling
(Question 15)

3.6 Limitations of Other Modeling Approaches
(Question 16)

4.0 EXPERIMENT DETAILS

4.1 Experiment Procedures to be Used
(Question 17)

4.2 Measurements Required
(Question 18)

4.3 Test Plan Including Ground Characterization of Flight Hardwa
(Question 19)

4.4 Specific Analysis Required
(Question 20)

4.5 Preflight Experiment Planned
(Question 21)

4.6 Post Flight Data Handling and Analysis
(Question 22)

4.7 Mathematical Models Used
(Question 23)

4.8 Application of Results
(Question 24)

5.0 EXPERIMENT REQUIREMENTS

5.1 Experiment Sample Requirements
(Question 25)

5.2 Atmospheric Requirements

5.2.1 Pressure
(Question 26)

5.2.2 Gas Composition
(Question 27)

5.2.3 Humidity
(Question 28)

5.2.4 Vacuum
(Question 29)

5.3 Temperature Control and Measurement
(Question 30)

5.4 Vibration Control and Measurement
(Question 31)

5.5 Test Matrix
(Question 32)

5.6 Imaging Requirements

5.6.1 Photography
(Question 33)

5.6.2 Radiography
(Question 34)

5.6.3 Television
(Question 35)

5.6.4 Resolution
(Question 36)

5.6.5 Frame Rate
(Question 37)

5.7 Electromagnetic Limitations
(Question 38)

5.8 Astronaut Involvement

5.8.1 Extravehicular Activity
(Question 39)

5.8.2 Activation of Experiment
(Question 40)

5.9 Data Requirements
(Question 41)

5.10 Telepresence and Telerobotics

5.10.1 Telepresence
(Question 42)

5.10.2 Telerobotics
(Question 43)

6.0 PRINCIPAL INVESTIGATOR'S REQUIREMENTS

6.1 Research Equipment

6.1.1 Preflight
(Question 44)

6.1.2 Postflight
(Question 45)

6.2 Apparatus Design Assistance
(Question 46)

6.3 Consultation
(Question 47)

6.4 Grants and Contracts

6.4.1 Grants
(Question 48)

6.4.2 Contracts
(Question 49)

6.5 Services

6.5.1 Film Developing
(Question 50)

6.5.2 Software Development
(Question 51)

7.0 OTHER REQUIREMENTS
(Question 52)

APPENDIX B

ERD Topic Outline

For assistance in using this software,
or to offer suggestions or comments,
please contact the following:

Mr. Gary Maddux
Ms. Anna Provancha
Mr. David Chattam

at (205) 895-6343,
or write

Systems Management and Production Laboratory
Research Institute
RI E-47
The University of Alabama in Huntsville
Huntsville, AL 35899

1.0 FUNCTIONAL OBJECTIVES AND EQUIPMENT IDENTIFICATION

1.1 Functional Objective Requirements Sheet

Table 1-1. Experiment Functional Objectives

2.0 STRUCTURAL/MECHANICAL

3.0 POINTING/STABILIZATION AND ALIGNMENT

3.1 Pointing Requirements

3.2 Stabilization Requirements

3.3 Viewing Requirements

3.4 IPS Pointing Requirements

3.5 Experiment Pointing Capabilities

3.6 On-Orbit Acceleration and Vibration Limits

3.7 Alignment Requirements

3.8 Coalignment Requirements

4.0 ORBITAL REQUIREMENTS AND CONSTRAINTS

4.1 Desired Orbit Characteristics

4.2 Earth and Celestial Target List and Viewing Time Requirements

4.3 Viewing Requirements and Constraints (Earth and Solar Viewing)

4.4 Viewing Requirements and Constraints (Celestial Viewing)

4.5 Vehicle Motion and g-Level Limits

5.0 ELECTRICAL REQUIREMENTS

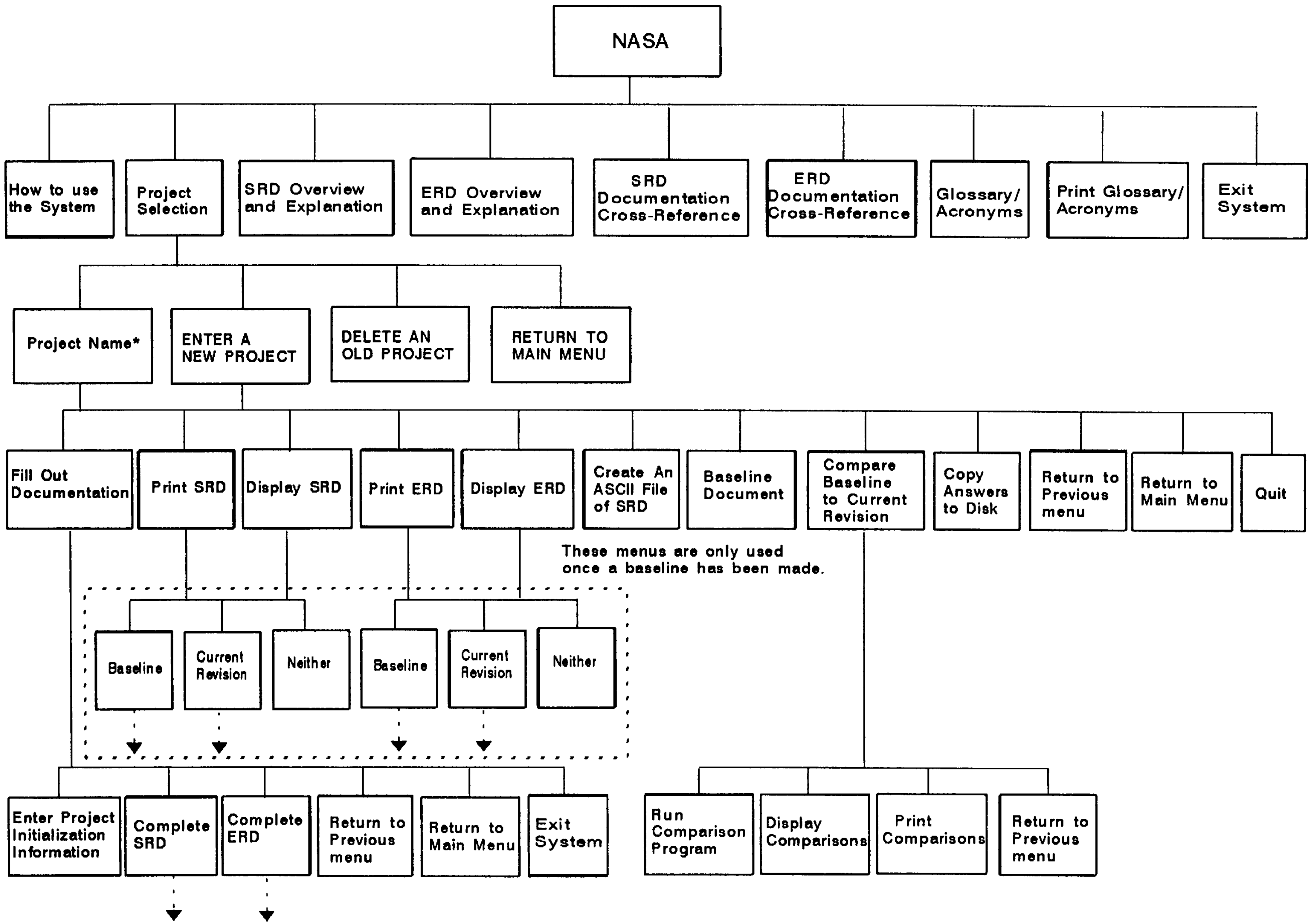
6.0 THERMAL CONTROL/FLUID REQUIREMENTS

7.0 DATA SYSTEM REQUIREMENTS

APPENDIX C

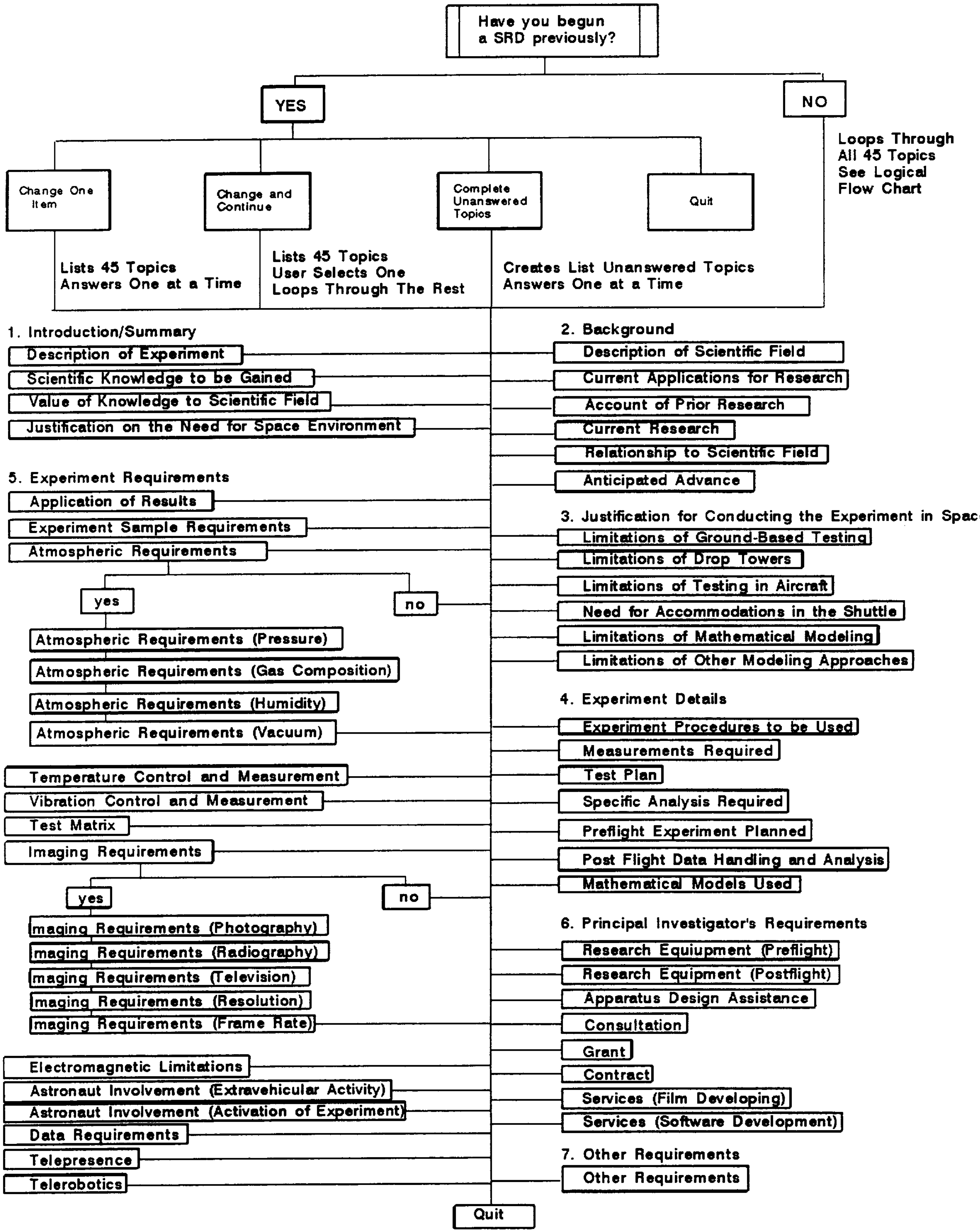
APET Hierarchy of Menu Choices for SRD/ERD Package

APET Hierarchy of Menu Choices for SRD/ERD Package



*The Project Name is entered by the user. The number of project names depends on the number of projects entered by the user.

Continuation of SRD Menu Choices



APPENDIX D

Project Plan User Guide

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Automated Payload Experiment Tool

Project Plan Users Manual

Prepared by:

Research Institute
The University of Alabama in Huntsville
Huntsville, AL 35899

Prepared for:

National Aeronautics and Space Administration
Microgravity Science and Applications Division
Marshall Space Flight Center, AL 35812

November, 1992

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LIST OF FIGURES

1.0 INTRODUCTION

So you want to fly an experiment on the Shuttle.

Well, to begin the process, we must get a little information about your experiment and its requirements.

If you have flown with us in the past, you may remember a substantial amount of paper documentation was required. This application, the Automated Payload Experiment Tool, is designed to alleviate much of the burden of the document preparation and maintenance process. This system can currently be used to prepare three support documents: the Science Requirements Document (SRD), which defines the science objectives, the Engineering Requirements Document (ERD), which defines the engineering design/build requirements, and the Project Plan. The version you have is for the creation of the Project Plan only.

2.0 DISCUSSION

2.1 Background

The Microgravity Experiment Projects (MEP) Office of the Payload Projects Office (PPO) at the Marshall Space Flight Center (MSFC) is currently responsible for collecting and coordinating experiment/facility specifications and requirements between NASA and various colleges, universities, research centers, and other public- and private-sector organizations that are selected or are requesting to fly their respective microgravity experiments on designated flights. This coordination involves the communication of flight hardware requirements and the preparation and review of all documentation between NASA and the research groups. To reduce difficulties encountered by these customers of NASA, an effort was undertaken to research, analyze, and evaluate the current procedures involved in the information gathering activities.

The MEP Office identified a need to develop an Automated Payload Experiment Tool (APET) which would lead experiment developers through the development planning process, obtain necessary information, establish an electronic data exchange avenue and allow easy manipulation/reformatting of the collected information. In order to fulfill this need, the University of Alabama in Huntsville (UAH) was tasked to design and develop the APET software package to meet the increasing demands to lighten the burden of documentation preparation and maintenance for NASA and its customers.

2.2 System Requirements

The objective of APET is to provide an easy to use tool to the Principal Investigator (PI) team. To ensure ease of use, few computer hardware requirements are necessary to operate the APET software package.

APET is designed to run on any IBM-PC compatible personal computer. While it is possible to use the system on a 386 PC, it is recommended that the

APET user install the software on a 486 PC or higher. The graphical displays, multiple screen windows, and the complexity of the system cause noticeable slowdowns on any machine less than the 486.

The software requires that the PC be equipped with a hard disk drive. For proper execution, the hard drive (or some partition of it) must be named C:. The Project Plan version of APET will require approximately 2M (megabytes) of space on the hard drive for the system, plus another 1M on the hard drive for the data files created by the user. However, for optimal performance, the hard drive should have a total of at least 4M free upon installation of the software.

For ease of use, the PC should be equipped with a mouse. This, however, is not mandatory. APET utilizes the hypertext technology, which offers a point-and-click user interface. Instead of a mouse, the user does have the option of pressing selected function keys to achieve the same effect.

2.3 Installation

The APET software package is provided on one high density diskette. The files stored on this diskette have been compressed; therefore, it is required that the user follow several simple steps to ensure correct installation.

1) Insert the diskette marked as "APET PROJECT PLAN" in the drive designated as A:. If the A: drive on your system is not the correct size, then use the DOS ASSIGN command to redesignate the drives appropriately. (For example, if you have a 3 1/2" disk but your 3 1/2" drive is B:, then at the DOS prompt type **ASSIGN A: B:**.)

2) From this drive (A:) type:

PINSTALL.

This will activate the installation routine. A series of instructions and informational text will be presented. Each screen will advise what is transpiring in the installation procedure. The installation routine will create a subdirectory on the C: drive called GARDEN. Once created, the files contained on the installation disk will be copied to the directory **C:\GARDEN**. Most of these files have been compressed to conserve disk space. An uncompress routine will be invoked to return these files to their normal (and usable) condition. To cancel the installation at any time, press the CNTL (control) C keys.

3) Upon successful installation of the APET program files, the message **INSTALLATION ROUTINE COMPLETE** will be displayed. The APET application, running under the direction of Knowledge Pro software, will be entered and you will be presented the opening menu. All subsequent sessions using the APET software may be initiated by going to the C:\GARDEN subdirectory and typing **PLAN**.

2.4 Getting Started

This application uses hypertext technology. Hypertext software systems allow for the retrieval of related information at the point and click of a mouse or, if a mouse is not used, at the touch of one or two keystrokes. For information on a highlighted topic, just move the mouse to that word and click. A window will be opened, overlaying the current window. In the new window, the information will immediately be displayed. Once this support information has been reviewed, press SPACE (or ESC) once to close the window and return to your original screen. If you are not using a mouse, please use the **F3** and **F4** function keys (marked Select and View) as indicated at the bottom of the screen. (See Figure 1). The **F3** key allows you to select the different hypertext topics. Once the desired topic is selected (i.e. highlighted), the **F4** key calls the background information for view.

Multiple page displays are indicated by the **Page 1 of 2** message at the lower right of the screen. To navigate through multiple screen displays, please use the **Page Up** and **Page Down** keys to scroll either forward or backward through the pages.

For help at anytime throughout the APET application, press the F1 key. This will retrieve location sensitive help information, and may be called from the system or system-called edit screens. This will be the method by which assistance information will be retrieved throughout this application.

APET has been designed as a menu-driven software package. This means that any function required of the user can be activated via a menu option. This includes exiting the system. It is strongly recommended that the user always "back out" of the application by using the appropriate menu options, i.e. "Return to Previous Menu". An option does exist to exit from any point in the application by selecting **F10**. It is not recommended that this be used from inside a question/answer section of the application. The **F10** command causes an immediate exit from the program, without checking to ensure that open files have been properly saved. Therefore, the user may experience data loss if the application is exited in this manner.

After the installation and initial use of the APET software, future systems will be initiated by going to the **C:\GARDEN** subdirectory and typing **PLAN**. This will activate the software and present the opening menu. (See Figure 2).

Due to the hypertext capabilities of the APET software, a large amount of RAM (random access memory) is required. Because of the heavy RAM demand, proper execution of the software requires no other software package be running simultaneously with the APET software. Whenever the available RAM becomes too little for the application, an "Insufficient Memory" message will be shown at the bottom right of the screen. To alleviate this situation, simply get out of APET and reboot the system. This will usually free up all available RAM and ensure proper execution. (See Helpful Hints for further instruction.)

"Automated_Payload_Experiment_Tool"

So you want to fly on the Shuttle.

Well before you can, we must get a little information about your experiment and its objectives.

If you have flown with us in the past, you may remember a substantial amount of paper documentation was required. This application, the [redacted] is designed to alleviate much of the burden on experiment preparation by utilizing a hypertext, knowlegde-based system. This system can be used to prepare one of our support documents, the Project Plan, which describes the overal plan for proceeding with a project.

Press SPACE to continue.

F1 HELP	F3 Select		Pg 1 of 1
Space Cont.	F4 View	F8 DOS	F10 Quit

Figure 1
Sample Screen Layout Using Hypertext

"Automated_Payload_Experiment_Tool"

Please select the activity or your choice, or choose Exit
to leave the system.

How to use the System
Project Selection
Project Plan (Overview)
Glossary/Acronyms
Print Glossary/Acronyms
Exit System

F1 HELP

F8 DOS F10 Quit

Figure 2
Opening APET Main Menu

3.0 USING THE APET SYSTEM

3.1 How to Use the System

Because the use of a hypertext tool may be a new experience, a brief on line tutorial is provided with APET. To use this tool, please choose option one on the opening menu entitled "How to Use the System". To select this option, point with the mouse to the phrase and click. If not using a mouse, use the arrow keys to highlight the option and press RETURN. You can tell when an option has been selected because it (the phrase or word) will be highlighted differently from all other options. As the mouse is moved to other options, each in turn will be highlighted.

Once the "How to Use the System" option has been selected, a different screen will be presented with a brief overview of hypertext and the methods of selecting topics. (This overview is much the same as appears in Section 2.4 of this user's guide.) Practice selecting topics and moving from one screen to another using either the mouse or the appropriate keyboard function keys.

3.2 Project Selection

The APET software package will accommodate one or more experiments for the user. However, each experiment must be identified by a short (8 characters or less) name, which must conform to the naming convention used by the DOS computer operating system. Briefly, these rules state that a DOS name cannot be over 8 characters in length, and must contain a combination of either letters, numbers, or the underscore (_) character. Any other special keys, including the SPACE, are prohibited. The rationale behind this naming convention is to allow storage of data files for each experiment in a subdirectory for that specific experiment. For example, if a user is working on two experiments, identified as THINFILM and HIPROTEN, then there would be a subdirectory for each. The configuration of these files would be as follows:

Root Directory	Application Directory	Experiment Directory
C:\	GARDEN\....................	THINFILM
	....	HIPROTEN

Therefore, all data files containing answers for the APET questions for the experiment THINFILM would appear in the subdirectory THINFILM. If additional experiments are required, the user would identify the new experiment and an additional subdirectory would be added.

Figure 3 shows the menu for selecting, adding, or deleting an experiment project. In the example, the experiment APCGF has been previously defined by the user. If the user wants to work on this experiment, he simply points and clicks on this selection. (This would be the condition in a majority of the cases, since most Principal Investigators will have only one active experiment at any given point). However, if another experiment is required, the user would click on "ENTER A NEW PROJECT". The user would be prompted to identify the new experiment, and would immediately be passed into the APET system, where information regarding that experiment would be addressed.

"Automated_Payload_Experiment_Tool"

Please select the project of your choice, or enter a new project.

APCGF
ENTER A NEW PROJECT
DELETE AN OLD PROJECT
RETURN TO MAIN MENU

F1 HELP

F8 DOS F10 Quit

Figure 3
Project Selection/Identification Menu

If a user wishes to delete an experiment, along with all its associated data files, he may do so by selecting the "DELETE AN OLD PROJECT" option from the menu. However, there is **no** recoverable procedure to undelete a project. Therefore, the user is strongly advised to use this procedure with caution.

3.3 Project Plan Overview

The third selection from the APET Main Menu is the "Project Plan Overview". This option should be selected when the user wishes to see an overview of the Project Plan document, along with brief explanations of the information to be covered in each section/subsection of the document. For an additional overview of the topics to be addressed in the Project Plan, see Appendix A of this document.

3.4 Glossary/Acronyms

A number of NASA specific terms, definitions, and acronyms will appear as support material throughout the documentation process. One of the primary advantages of using a hypertext-based tool is to allow for easy and immediate retrieval of these terms.

Option number four from the APET Main Menu allows the user to retrieve a listing of these terms, and presents them in a form analogous to a glossary in a book. To view a definition, highlight the desired term and click. A term can be highlighted by using the mouse to move the cursor to that word, or by using the F3 key for selection. To view the definition, the user should either click the mouse or press the F4 key. The definition of that word/term will be presented. Should the definition contain a term that requires further description, highlight that word and click. The new definition will overlay the previous definition. This method can be repeated as long as further definitions exist and the memory capacity of the machine is not exceeded.

Please note that the glossary consists of multiple pages. Remember to navigate through the multi-page displays by using either the Page Up/Page Down function keys.

3.5 Print Glossary/Acronyms

Option number five from the APET Main Menu activates a routine for the printing of the glossary/acronym list, as discussed in 3.4. Because the output of this selection will be a multi-page document, the use of this option will be rare.

3.6 Filling Out the Project Plan

To fill out the Project Plan, the user must first select "Project Selection" from the APET Main Menu. Then the Project Selection/Identification Menu (Figure 3) will be presented for the user to identify either a new project or select an existing project. Once the selection/identification has been made, the Project Plan Activity Menu (Figure 4) will be presented. Please note that the selected project is shown on the upper right corner of the screen. Please be sure that the project shown is the one you wish to work.

The Project Plan Activity Menu presents eleven options for the user. The most significant of these is the first: "FILL OUT DOCUMENTATION". The selection of this option will present the Fill Out Project Plan Documentation Menu (Figure 5). This menu offers the user two primary options: "ENTER PROJECT INITIALIZATION INFORMATION" and "COMPLETE PROJECT PLAN".

3.7 Entering Project Initialization Information

Under most circumstances, the first information entered by the user into the APET system is the project initialization information. To enter this information, selection one from the Fill Out Project Plan Documentation Menu is chosen. This information is used to identify certain aspects of the experiment, and will be used throughout the documentation process. Entries include the PI name, his organization, address, city, state, zip, phone, and experiment title. This information will be provided in the form of type written responses to user prompts. For example, the user will be asked:

Please enter your first and last names, i.e. Dr. John Doe.

The user should respond with a one line response. (If there is a limitation on the length of this one line response, the screen display will provide an instruction, such as "Please limit your response to 16 characters.") This will be the format of user entries throughout the APET application. When the user is prompted to make an entry, the response should be on one line. When the user responds with a RETURN, the answer is stored and the next question, if one exists, is asked. Once all questions for that section have been answered, the answers are written to a data file.

In the "Project Initialization Information" subsection, the only variation in the user prompt/one line response routine is with the experiment title. Because experiment titles can be several lines, the user is given a prompt and immediately sent to the APET editor. This editor is a small version of a word processor, with many of the functions of a common word processing package. The commands used in the APET editor are similar to those in the software package WORDSTAR. To see the commands available, press the F1 function key from inside the editor. A separate window will be opened and will overlay the current screen. From there, page down until the function you wish to perform is shown. The one-to-two keystroke command to accomplish the task will be shown. (Note: The symbol (^) represents the CONTROL key., i.e. ^KQ means to hold the CONTROL key down while pressing the letter K, then press the letter Q.) When the user is finished entering the answer into the editor, he may exit by pressing the ESC (escape) key. A message will then appear on the screen that tells the user what file name is being saved. Respond with a RETURN to accept this name and save the answer, or an ESC to cancel the answer.

Important: Do not change the file name when the APET software asks if the name is acceptable. Future sessions that allow the user to change, delete, print, or display the Project Plan answers require that these file names be used. Changing the file name will make the file either inaccessible or inappropriate. Therefore, always accept the file name as given.

"Automated_Payload_Experiment_Tool"

The project you have selected is: APCGF
Please enter your choice of activities from the list.

FILL OUT DOCUMENTATION
PRINT PROJECT PLAN
DISPLAY PROJECT PLAN
DETERMINE IF PROJECT PLAN IS COMPLETE
BASELINE DOCUMENT
COMPARE BASELINE TO CURRENT REVISION
COPY ASNWERS TO DISK
RETURN TO PREVIOUS MENU
RETURN TO MAIN MENU
EXIT SYSTEM

F1 HELP

F8 DOS F10 Quit

Figure 4
Project Plan Activity Menu

"Automated_Payload_Experiment_Tool"

Please select the activity you wish to perform on
the APCGF project.

Enter Project Initialization Information
Complete Project Plan
Return to Previous Menu
Return to Main Menu
Exit System

F1 HELP
F8 DOS
F10 Quit

Figure 5
Fill Out Project Plan Documentation Menu

3.8 Complete Project Plan

To complete the Project Plan document, the user must answer a series of questions about the experiment. (For an outline of the topics to be addressed, see Appendix A.) A sample question from the Project Plan is shown in Figure 6.

The questions are grouped into topics, a list of which is presented to the user. The user is asked to select the topic which is to be addressed. The chosen topic will be displayed, along with either its accompanying question or the subtopics covered within that section. If the user chooses to fill out one of the subsections, he will be prompted to select from a list. Upon subheading selection, a brief prompt, along with any necessary instructions for answering the question, will be displayed.

Each question in the Project Plan will invoke the editor. Answers should be given in the form of short narratives, consisting of one or more paragraphs of text. Sufficient space will be given to write as much (or little) as required. A sample of this procedure is shown in Figures 7 thru 10.

Some of the topics have accompanying illustration(s) in order to give the user a better understanding of what information is needed. If you wish to view the illustration, simply click on, or select, the appropriate phrase. This will cause the screen to momentarily go blank, and the illustration will then be presented. After you have viewed the illustration, press SPACE and the program will return you to your original screen.

3.9 Printing the Project Plan

The user has two methods available to generate output from the APET software. These include either printing the document or displaying the document to the screen. The APET application was designed to be flexible enough to go to a variety of printers. As with most output, the best results will be with the use of a laser printer. If a laser printer is not available, the use of a dot-matrix printer will also be acceptable. A variety, although not nearly exhaustive, of dot-matrix printers have been tested with the APET software, and all have performed well.

If the document has previously been baselined (discussed later in section 3.12), then a menu will appear giving the user the option of printing the document from the baselined version, the current revision, or neither version. If the neither option is chosen, then it is assumed that the user does not want the document printed, and the program will automatically return to the previous menu. If the baseline option is chosen, then the document will be printed from the version of the document which the user is currently revising. If the document has not been baselined, then the document will be printed from the current version.

The printing of the Project Plan can be accomplished in either of two methods. First, the user may choose the section to be printed. This is recommended for a document that is in process. Once the entire Project Plan

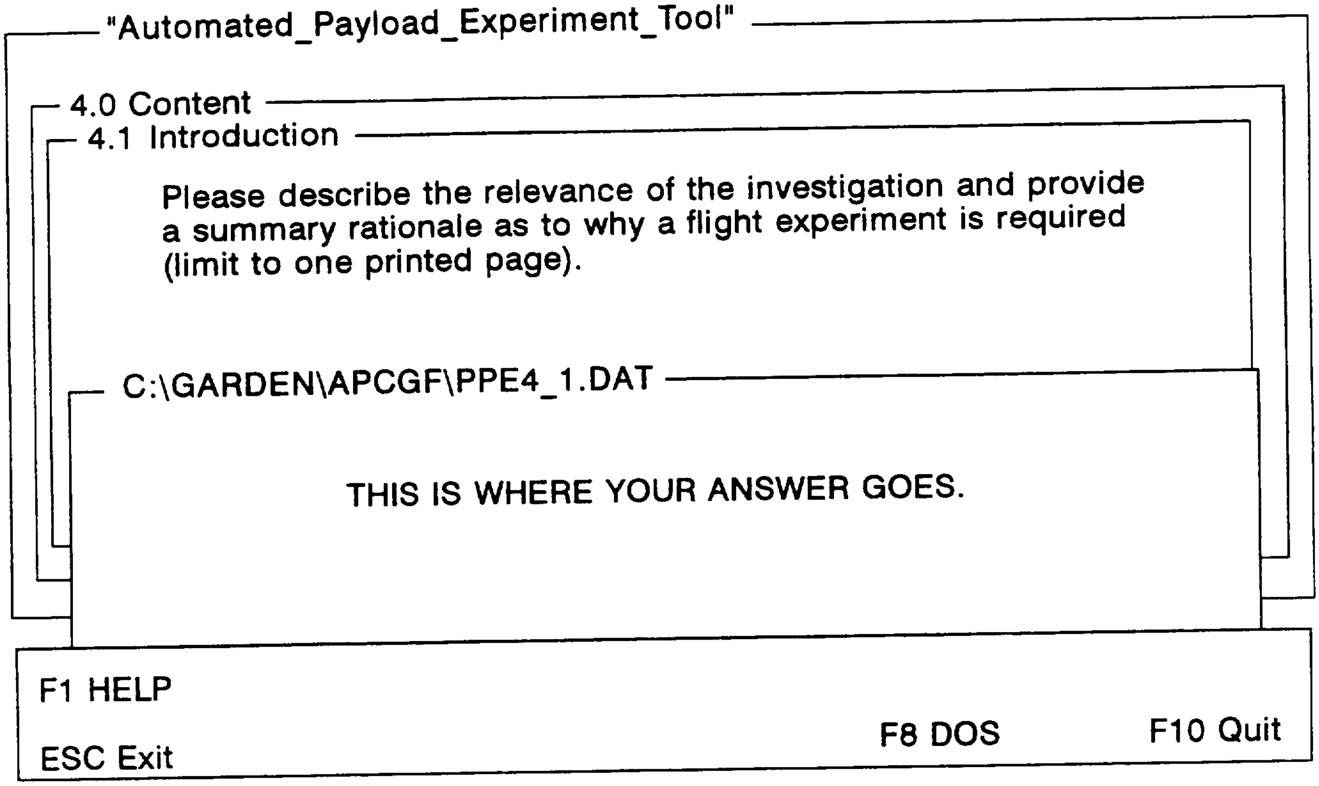

Figure 6
Sample Project Plan Question Screen

has been completed, the user can generate the document in its entirety. An initial page eject will normally (depending on printer type) advance a blank sheet of paper before the cover sheet is printed. This will be followed by a second page advance, then page one of the document will be printed, followed by two, three, etc. through the end of the document. Because there are often graphics, tables, etc. that must be inserted within the textual document, no table of contents is printed. Because of the limitation of graphics support, it is suggested that all externally generated graphic illustrations, tables, etc. be provided in an appendix, with appropriate references throughout the document.

While the print procedure is active, a message will appear in the lower left of the screen. No other activities may take place while the document is printing. In case the printer runs out of paper, an error message will appear. Reload paper in the printer and press the SPACE key to continue.

3.10 Displaying the Project Plan

The second method of generating output using APET is to display sections of the Project Plan to the screen. The Project Plan is divided into four major sections. Content (Section 4) is subdivided into nine subsections, with five of those subsections further divided. (see Appendix A). The user has the capability of selecting a section and seeing the identical output as would appear if the document was printed. Displaying the Project Plan is recommended to quickly review answers, especially during the development phase of document preparation.

If the document has previously been baselined (discussed later in section 3.12), then a menu will appear giving the user the option of displaying the document from the baselined version, the current revision, or neither version. If the neither option is chosen, then it is assumed that the user does not want the document displayed, and the program will automatically return to the previous menu. If the baseline option is chosen, then the document will be displayed from the version of the document which the user is currently revising. If the document has not been baselined, then the document will be displayed from the current version.

Most Project Plan sections will require multiple page displays. Please note that to view the equivalent of an entire printed page, there will be at least three and usually four screen displays. Use the Page Up/Page Down method to move up or down in the document. Once a page is adequately reviewed, press the SPACE key to retrieve the next page in sequence. To abandon a display at any time, press the F10 key.

3.11 Determining if Project Plan is Complete

To aid in the logical completion of the Project Plan, APET provides the user with the ability of "Determining if Project Plan is Complete". By selecting this option, the user activates a routine that checks for the existence of the data files created as answers to the Project Plan questions. The missing data files are analyzed to determine which sections have not been answered, and a listing is displayed to the screen.

3.12 Baselining a Document

At some point in the documentation procedure, the Project Plan will be considered complete and released to external offices, agencies, organizations, etc. When this occurs, that version of the document is considered the baseline, and should be easily identified as such.

To aid in the process of maintaining separate versions of the Project Plan, an option exists to baseline the current version of the document. (See Figure 11). The selection of this option will cause a replica of the current version's answers (or data files) to be copied to a new subdirectory for that experiment. This new subdirectory will be called **BASELINE**. From that point, all additional editing will transpire on a new version of the answers, while the baselined version of the answers will remain intact. The generation of output will require the user to identify which version (baseline or current revision) he wishes to access.

3.13 Comparing a Baseline to the Current Revision

Once the document has been baselined (See Section 3.12), the user may wish to compare this baseline with the current revision. APET provides a mechanism to accomplish this task. By selecting the option "Compare Baseline to Current Revision", a DOS routine will be invoked to compare all identical data files from the current revision to the baseline document. This comparison generates a file that can then be displayed or printed, so that a quick review will show which answers have been modified since the original baseline date.

3.14 Copying Answers to Disk

The final output option provided by APET is the creation of files that contain all data generated by the software. This can be used as either a backup mechanism during the creation of the files, or as a means of submission of the final document instead of a hard copy/printed document. By submitting the answers on diskette, the receiving party can have direct access to the answers in the same manner as would the sender. These files are not formatted as an ASCII file, and should not be confused with the final report output.

The user will have the option of selecting either the baseline document or the current revision. After this selection, the user is asked to select the drive to receive the backup (either A:,B:,C:, or D:). A DOS copy command will then be invoked to copy all files to the selected drive.

"Automated_Payload_Experiment_Tool"

Complete Project Plan

Which section do you wish to address?

1.0 General
2.0 Preparation and Approval
3.0 Changes
4.0 Content
Return to Previous Menu

F1 HELP

F8 DOS F10 Quit

Figure 7
Project Plan List of Sections

"Automated_Payload_Experiment_Tool"

4.0 Content

Which section would you like to complete?

Introduction
Objective
Science Requirements
Technical Plan
Implementation Plan
Management Plan
Schedule
Cost Control Plan
Project Reviews and Meetings
Return to Previous Menu

F1 HELP

F8 DOS F10 Quit

Figure 8
Project Plan Section Selection

"Automated_Payload_Experiment_Tool"

4.4 Technical Plan

The outline for the Technical Plan includes the following sections:

EXPERIMENT HARDWARE DESCRIPTION
PAYLOAD CLASSIFICATION
DEVELOPMENT APPROACH
TECHNOLOGY PLAN
LOGISTICS
MISSION OPERATIONS, TRAINING AND DATA MANAGEMENT
ANALYSIS OF MISSION RESULTS
FACILITIES
SAFETY
RETURN TO PREVIOUS MENU

F1 HELP

F8 DOS F10 Quit

Figure 9
Project Plan Subtopic Selection

"Automated_Payload_Experiment_Tool"

3.0 CONTENT

The Project Manager is responsible for updating a MSAD Project Plan when significant changes occur (such as changes in scope, organization, or roles and responsibilities). This does not apply to resources, schedules or manpower, which are updated through normal budgeting and project monitoring activities. The Project Manager will establish a change control process for maintaining the MSAD Project Plan and other project documentation.

Press SPACE to continue

F1 HELP		Pg 1 of 1
Space Cont.	F8 DOS	F10 Quit

Figure 10
Project Plan Topic Narrative

"Automated_Payload_Experiment_Tool"

At some point in the documentation process, it is necessary to declare that all documents are complete, and that any changes to be made will be treated as revisions to the baseline document.

Do you want to baseline your answers at this time?

YES
NO

F1 HELP

F8 DOS F10 Quit

Figure 11
Baseline Menu

4.0 HELPFUL HINTS

1) Avoid the use of the F10 key to exit from within the APET application. It is a better practice to back out of the APET system through the use of the menus. By doing so, the user ensures that all answers are properly recorded to the disk drive. Use of the F10 key from within the APET application will allow the user to exit but will not automatically save information generated during the session.

2) APET does not support the insertion of externally generated graphics, tables, equations, or other non-text material. To alleviate this problem without the added labor of using a secondary word processor, it is suggested that any such material be included in an Appendix, and referenced in the text generated in APET.

3) To insert an externally generated text file into the text area in the APET editor, use the command ^KR from within the editor. This is one of a variety of commands that can be used from the APET word processor. To see all available commands, press the F1 key from inside the editor and page through the instruction set.

4) The APET editor uses a word wrap routine that automatically wraps the text to the next line (a common word processing feature). It also maintains vertical alignment along the left margin. If you use indented paragraphs, please be sure that the line after the indented line begins in the column you desire. To do this, use the backspace key to move the first word in the line to the column desired. The recommended solution to this problem is not to indent paragraphs, but instead insert a blank line between each paragraph.

5) If your computer system is configured to automatically load WINDOWS or some other application package, it may be necessary to alter the AUTOEXEC.BAT file (located in the boot drive). Instructions for changing the automatic load of an application will vary by computer. One of the easier methods is to edit the AUTOEXEC.BAT file and remove the line that calls the package. For example, WINDOWS is called by the command WIN. By preventing these packages from loading, a significant amount of RAM is freed and allowed for use by APET.

APPENDIX A

Project Plan Topic Outline

1.0 INTRODUCTION

2.0 PREPARATION AND APPROVAL

3.0 CHANGES

4.0 CONTENT

- 4.1 Introduction
- 4.2 Objective
- 4.3 Science Requirements
- 4.4 Technical Plan
  - 4.4.1 Experiment Hardware Description
  - 4.4.2 Payload Classification
  - 4.4.3 Development Approach
  - 4.4.4 Technology Plan
  - 4.4.5 Logistics
  - 4.4.6 Mission Operations, Training and Data Management
  - 4.4.7 Analysis of Mission Results
  - 4.4.8 Facilities
  - 4.4.9 Safety
- 4.5 Implementation Plan
  - 4.5.1 Implementation Approach
  - 4.5.2 Summary Work Breakdown Structure
  - 4.5.3 Documentation
- 4.6 Management Plan
  - 4.6.1 Project Management Responsibilities and Organization
  - 4.6.2 Mission Management Responsibilities and Organization
  - 4.7 Schedule
  - 4.8 Cost Control Plan
  - 4.8.1 Resources

APPENDIX B

APET Editor Commands

MOVING THE CURSOR:

^D	Left One Character
^S	Right One Character
^A	Left One Word
^F	Right One Word
^I	Tab
^E	Up One Line
^X	Down One Line
^W	Scroll Up
^Z	Scroll Down
^R	Page Up
^C	Page Down
^QS	Beginning of a Line
^QD	End of a Line
^QE	Beginning of a Page
^QX	End of a Page
^QR	Beginning of the File
^QC	End of the File
^QB	Beginning of Marked Block
^QK	End of Marked Block

DELETING AND INSERTING TEXT:

^G	Delete Character Under Cursor
^H	Delete Character to Left of Cursor
^T	Delete Next Word
^Y	Delete a Line
^QY	Delete to the End of a Line
^KY	Delete a Marked Block
^V	Insert On/Off
^N	Insert a Line

BLOCK COMMANDS:

^KS	Save This File
^KB	Mark Beginning of Block
^KK	Mark End of Block
^KH	Hide/Display Block
^KC	Copy a Block
^KV	Move a Block
^KY	Delete a Block
^KR	Read a Block from a File
^KW	Write a Block to a File
^KP	Print a Block or Entire File if no Block is Marked

FORMATTING COMMANDS:

^B .... Reformat Paragraph
^OR .... Set Right Margin
^QI .... Toggle Autoindent Mode
^QW .... Toggle Word Wrap

FIND AND REPLACE COMMANDS:

^QA .... Find and Replace a String
^QF .... Find an Occurrance of a String
^L .... Find the Next Occurrence

For assistance in using this software,
or to offer suggestions or comments,
please contact the following:

Mr. Gary Maddux
Ms. Anna Provancha
Mr. David Chattam

at (205) 895-6343,
or write

Systems Management and Production Laboratory
Research Institute
RI E-47
The University of Alabama in Huntsville
Huntsville, AL 35899

APPENDIX E

Science Requirements Envelope Document User Guide

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Automated Payload Experiment Tool

Science Requirements Envelope Document

Users Manual

Prepared by:

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Prepared for:

National Aeronautics and Space Administration
Microgravity Science and Applications Division
Marshall Space Flight Center, AL 35812

December, 1992

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1.0 INTRODUCTION

So you want to fly an experiment on the Shuttle.

Well, to begin the process, we must get a little information about your experiment and its requirements.

If you have flown with us in the past, you may remember a substantial amount of paper documentation was required. This application, the Automated Payload Experiment Tool, is designed to alleviate much of the burden of the document preparation and maintenance process. This system can currently be used to prepare four of our support documents: the Science Requirements Document (SRD), which defines the science objectives, the Experiment Requirement Document (ERD), which defines the experiment design/build requirements, the Project Plan, which is the basic planning document that describes the overall plan for proceeding with the project, and the Science Requirements Envelope Document. The version you have is for the completion of the Science Requirements Envelope Document only.

2.0 DISCUSSION

2.1 Background

The Microgravity Experiment Projects (MEP) Office of the Payload Projects Office (PPO) at the Marshall Space Flight Center (MSFC) is currently responsible for collecting and coordinating experiment/facility specifications and requirements between NASA and various colleges, universities, research centers, and public- and private-sector organizations that are selected or are requesting to fly their respective experiments on NASA flights. This coordination involves the communication of flight hardware requirements and the preparation and review of all documentation between NASA and the research groups. To reduce difficulties encountered by these customers of NASA, an effort was undertaken to research, analyze, and evaluate the current procedures involved in the information gathering activities.

The MEP Office identified a need to develop an Automated Payload Experiment Tool (APET) which would lead experiment developers through the development planning process, obtain necessary information, establish an electronic data exchange avenue and allow easy manipulation/reformatting of the collected information. In order to fulfill this need, the University of Alabama in Huntsville (UAH) was tasked to design and develop the APET software package to meet the increasing demands to lighten the burden of documentation preparation and maintenance.

2.2 System Requirements

The objective of APET is to provide an easy to use tool to the Principal Investigator (PI) team. To ensure ease of use, few computer hardware requirements are necessary to operate the APET software package.

APET is designed to run on any IBM-PC compatible personal computer. It is recommended that the **APET** user install the software on a 386 PC or higher. The multiple screen windows, and the complexity of the system cause noticeable slowdowns on any machine less than the 386.

The software requires that the PC be equipped with a hard disk drive. For proper execution, the hard drive (or some partition of it) must be named C:. The Science Requirements Envelope version of APET will require approximately 1M of space on the hard drive for the system, plus another 1M on the hard drive for the data files created by the user. However, for optimal performance, the hard drive should have a total of at least 3M free upon installation of the software.

For ease of use, the PC should be equipped with a mouse. This, however, is not mandatory. **APET** utilizes the hypertext technology, which offers a point-and-click user interface. Instead of a mouse, the user does have the option of pressing selected function keys to achieve the same effect.

2.3 Installation

The **APET** software package is provided on one 3 1/2" diskette. The files stored on this diskette have been compressed; therefore, it is required that the user follow several simple steps to ensure correct installation.

1) Insert the 3 1/2" diskette in the drive designated as A:. If the A: drive on your system is not a 3 1/2" drive, then use the DOS ASSIGN command to redesignate the drives appropriately. (For example, if you have a 3 1/2" disk, but your 3 1/2" drive is B:, then at the DOS prompt type **ASSIGN A: B:**.)

2) From the A: drive type:

VINSTALL.

This will activate the installation routine. A series of instructions and informational text will be presented. Each screen will advise what is transpiring in the installation procedure. The installation routine will create a subdirectory on the C: drive called GARDEN. Once created, the files contained on the installation disk will be copied to the directory **C:\GARDEN**. Most of these files have been compressed to conserve disk space. An uncompress routine will be invoked to return these files to their normal (and usable) condition. To cancel the installation at any time, press the CTRL (control) C keys.

3) Upon successful installation of the APET program files, the message **INSTALLATION ROUTINE COMPLETE** will be displayed. The APET application, running under the direction of Knowledge Pro software, will be entered and you will be presented the opening menu. All subsequent sessions using the APET software may be initiated by going to the C:\GARDEN subdirectory and typing **ENVELOPE**

2.4 Getting Started

This application uses hypertext technology. Hypertext software systems allow for the retrieval of related information at the point and click of a mouse or, if a mouse is not used, at the touch of one or two keystrokes. For information on a highlighted topic, just move the mouse to that word and click. A window will be opened, overlaying the current window. In the new window, the information will immediately be displayed. Once this support information has been reviewed, press SPACE (or ESC) once to close the window and return to your original screen. If you are not using a mouse, please use the F3 and **F4** function keys (marked Select and View) as indicated at the bottom of the screen. (See Figure 1). The **F3** key allows you to select the different hypertext topics. Once the desired topic is selected (i.e. highlighted), the **F4** key calls the background information for view.

Multiple page displays are indicated by the **Page 1 of 2** message at the lower right of the screen. To navigate through multiple screen displays, please use the **Page Up** and **Page Down** keys to scroll either forward or backward through the pages.

For help at anytime throughout the APET application, select the F1 key. This will retrieve location sensitive help information, and may be called from the system or system-called edit screens. This will be the method by which assistance information will be retrieved throughout this application.

APET has been designed as a menu-driven software package. This means that any function required of the user can be activated via a menu option. This includes exiting the system. It is strongly recommended that the user always "back out" of the application by using the appropriate menu options, i.e. "Return to Previous Menu". An option does exist to exit from any point in the application by selecting **F10**. It is not recommended that this be used from inside a question/answer section of the application. The **F10** command causes an immediate exit from the program, without checking to ensure that open files have been properly saved. Therefore, the user may experience data loss if the application is exited in this manner.

After the installation and initial use of the APET software, future systems will be initiated by going to the **C:\GARDEN** subdirectory and typing **ENVELOPE**. This will activate the software and present the opening menu. (See Figure 2).

Due to the hypertext capabilities of the APET software, a large amount of RAM (random access memory) is required. Because of the heavy RAM demand, proper execution of the software requires no other software package be running simultaneously with the APET software. Whenever the available RAM becomes too little for the application, an "Insufficient Memory" message will be shown at the bottom right of the screen. To alleviate this situation, simply get out of APET and reboot the system. This will free up all available RAM and ensure proper execution. (See Helpful Hints for further instructions.)

"Automated_Payload_Experiment_Tool"

So you want to fly on the Shuttle.

Well before you can, we must get a little information about your experiment and its requirements.

If you have flown with us in the past, you may remember a substantial amount of paper documentation was required. This application, the **Automated Payload Experiment Tool**, is designed to alleviate much of the burden of the document preparation and maintenance process by utilizing a hypertext, knowledge-based system. This system can be used to prepare one of our support documents, the Science Requirements Envelope Document, which provides an envelope or volume of science requirements for a type of experimentation.

Press SPACE to continue.

F1 HELP	F3 Select		Pg 1 of 1
Space Cont.	F4 View	F8 DOS	F10 Quit

Figure 1
Sample Screen Layout Using Hypertext

"Automated_Payload_Experiment_Tool"

Please select the activity of your choice, or choose Exit
to leave the system.

HOW TO USE THE SYSTEM
PROJECT SELECTION
SCIENCE REQUIREMENTS ENVELOPE DOCUMENT (OVERVIEW)
GLOSSARY/ACRONYMS
PRINT GLOSSARY/ACRONYMS
EXIT SYSTEM

F1 HELP
F8 DOS F10 Quit

Figure 2
Opening APET Main Menu

3.0 USING THE APET SYSTEM

3.1 How to Use the System

Because the use of a hypertext tool may be a new experience, a brief on line tutorial is provided with APET. To use this tool, please choose option one on the opening menu entitled "How to Use the System". To select this option, point with the mouse to the phrase and click. If not using a mouse, use the arrow keys to highlight the option and press RETURN. You can tell when an option has been selected because it (the phrase or word) will be highlighted differently from all other options. As the mouse is moved to other options, each in turn will be highlighted.

Once the "How to Use the System" option has been selected, a different screen will be presented with a brief overview of hypertext and the methods of selecting topics. (This overview is much the same as appears in Section 2.4 of this user's guide.) Practice selecting topics and moving from one screen to another using either the mouse or the appropriate keyboard function keys.

3.2 Project Selection

The APET software package will accommodate one or more experiments for the user. However, each experiment must be identified by a short (8 characters or less) name, which must conform to the naming convention used by the DOS computer operating system. Briefly, these rules state that a DOS name cannot be over 8 characters in length, and must contain a combination of either letters, numbers, and the underscore (_) character. Any other special keys, including the SPACE, are prohibited. The rationale behind this naming convention is to allow storage of data files for each experiment in a subdirectory for that specific experiment. For example, if a user is working on two experiments, identified as THINFILM and HIPROTEN, then there would be a subdirectory for each. The configuration of these files would be as follows:

Root Directory	Application Directory	Experiment Directory
C:\	................GARDEN\	....................THINFILM
		....................HIPROTEN

Therefore, all data files containing answers for the APET questions for the experiment THINFILM would appear in the subdirectory THINFILM. If additional experiments are required, the user would identify the new experiment and an additional subdirectory would be added.

Figure 3 shows the menu for selecting, adding, or deleting an experiment project. In the example, the experiment APCGF has been previously defined by the user. If the user wants to work on this experiment, he simply points and clicks on this selection. (This would be the case in a majority of the cases, since most Principal Investigators will have only one active experiment

"Automated_Payload_Experiment_Tool"

Please select the project of your choice, or enter a new project.

APCGF
ENTER A NEW PROJECT
DELETE AN OLD PROJECT
RETURN TO MAIN MENU

F1 HELP

F8 DOS F10 Quit

Figure 3
Project Selection/Identification Menu

at any given point). However, if another experiment is required, the user would click on "ENTER A NEW PROJECT". The user would be prompted to identify the new experiment, and would immediately be passed into the APET system, where information regarding that experiment would be addressed.

If a user wishes to delete an experiment, along with all its associated data files, he may do so by selecting the "DELETE AN OLD PROJECT" option from the menu. However, there is no recoverable procedure to undelete a project. Therefore, the user is strongly advised to use this procedure with caution.

3.3 Science Requirements Envelope Document Overview

The third selection from the APET Main Menu is the "Science Requirements Envelope Document (Overview)". This option should be selected when the user wishes to see an overview of the Science Requirements Envelope Document, along with brief explanations of the information to be covered in each section/ subsection of the document. For an additional overview of the topics to be addressed in the Science Requirements Envelope, see Appendix A of this document.

3.4 Glossary/Acronyms

A number of NASA specific terms, definitions, and acronyms will appear as support material throughout the documentation process. One of the primary advantages of using a hypertext-based tool is to allow for easy and immediate retrieval of these terms.

Option number four from the APET Main Menu allows the user to retrieve a listing of these terms, and presents them in a form analogous to a glossary in a book. To view a definition, highlight the desired term and click. A term can be highlighted by using the mouse to move the cursor to that word, or by using the F3 key for selection. To view the definition, the user should either click the mouse or press the F4 key. The definition of that word/term will be presented. Should the definition contain a term that requires further description, highlight that word and click. The new definition will overlay the previous definition. This method can be repeated as long as further definitions exist and the memory capacity of the machine is not exceeded.

Please note that the glossary consists of multiple pages. Remember to navigate through the multi-page displays by using the Page Up/Page Down function keys.

3.5 Print Glossary/Acronyms

Option number five from the APET Main Menu activates a routine for the printing of the glossary/acronym list, as discussed in 3.4. Because the output of this selection will be a multi-page document, the use of this option will be rare.

3.6 Filling Out the Science Requirements Envelope Document

To fill out the Science Requirements Envelope, the user must first select "Project Selection" from the APET Main Menu. The Project Selection/Identification Menu (Figure 3) will then be presented for the user to identify either a new project or select an existing project. Once the selection/identification has been made, the Science Requirements Envelope Activity Menu (Figure 4) will be presented. Please note that the selected project is shown on the upper right corner of the screen. Please be sure that the project shown is the one you wish to work.

The Science Requirements Envelope Activity Menu presents seven options for the user. The most significant of these is the first: "FILL OUT DOCUMENTATION". The selection of this option will present the Fill Out Science Requirements Envelope Documentation Menu (Figure 5). This menu offers the user two options: "ENTER PROJECT INITIALIZATION INFORMATION" and "COMPLETE SCIENCE REQUIREMENTS ENVELOPE DOCUMENT".

3.7 Entering Project Initialization Information

Under most circumstances, the first information entered by the user into the APET system is the project initialization information. To enter this information, selection one from the Fill Out Envelope Documentation Menu is chosen. This information is used to identify certain aspects of the experiment, and will be used throughout the documentation process. Entries include the PI name, his organization, address, city, state, zip, phone, and experiment title. This information will be provided in the form of type written responses to user prompts. For example, the user will be asked:

Please enter your first and last names, i.e. Dr. John Doe.

The user should respond with a one line response. (If there is a limitation on the length of this one line response, the screen display will provide an instruction, such as "Please limit your response to 16 characters.") This will be the format of user entries throughout the APET application. When the user is prompted to make an entry, the response should be on one line. When the user responds with a RETURN, the answer is stored and the next question, if one exists, is asked. Once all questions for that segment have been answered, the answers are written to a data file.

In the "Project Initialization Information" subsection, the only variation in the user prompt/one line response routine is with the experiment title. Because experiment titles can be several lines, the user is given a prompt and immediately sent to the APET editor. This editor is a small version of a word processor, with many of the functions of a common word processing package. The commands used in the APET editor are similar to those in the software package WORDSTAR. To see the commands available, press the F1 function key from inside the editor. A separate window will be opened and will overlay the current screen. From there, page down until the function you wish to perform is shown. The one-to-two keystroke command to accomplish the task will be shown. (Note: The symbol (^) represents the CONTROL key., i.e. ^KQ

"Automated_Payload_Experiment_Tool"

The project you have selected is: APCGF
Please enter your choice of activities from the list.

FILL OUT DOCUMENTATION
PRINT SCIENCE REQUIREMENTS ENVELOPE DOCUMENT
DISPLAY ENVELOPE DOCUMENT
CREATE AN ASCII FILE OF ENVELOPE DOCUMENT
BASELINE DOCUMENT
COMPARE BASELINE TO CURRENT REVISION
COPY ANSWERS TO DISK
RETURN TO PREVIOUS MENU
RETURN TO MAIN MENU
QUIT

F1 HELP

F8 DOS F10 Quit

Figure 4
Science Requirements Envelope
Document Activity Menu

"Automated_Payload_Experiment_Tool"

Please select the activity you wish to perform on
the APCGF project.

Enter Project Initialization Information
Complete Science Requirements Envelope Document
Return to Previous Menu
Return to Main Menu
Exit System

F1 HELP

F8 DOS

F10 Quit

Figure 5
Fill Out Science Requirements
Envelope Document Menu

means to hold the CONTROL key down while pressing the letter K, then press the letter Q.) When the user is finished entering the answer into the editor, he may exit by pressing the ESC (escape) key. A message will then appear on the screen that tells the user what file name is being saved. Respond with a RETURN to accept this name and save the answer, or an ESC to cancel the answer.

Important: Do not change the file name when the APET software asks if the name is acceptable. Future sessions that allow the user to change, delete, print, or display the Science Requirements Envelope answers require that these file names be used. Changing the file name will make the file either inaccessible or inappropriate. Therefore, always accept the file name as given.

3.8 Complete Science Requirements Envelope Document

To complete the Science Requirements Envelope Document, there are usually between 30 - 39 questions that must be answered. These answers will be in the form of short narratives, consisting of one or more paragraphs of text. Each question or user prompt will invoke the APET editor and give the user sufficient space to write as much (or little) as required. (For an outline of the topics to be addressed, see Appendix A.) A sample question scenario from the Science Requirement Envelope is shown in Figures 6 - 9.

The Complete Science Requirement Envelope Document session begins by asking the user if he has begun to fill out the Science Requirements Envelope Document previously. A 'NO' response causes the questions to be asked in sequence. A 'YES' response displays the question topics in a list. If questions are to be answered from a list, a list will appear as a window that overlays the question screen. The user is expected to point-and-click on the appropriate topic. (If not using a mouse, use the arrow keys to select and press RETURN.) The user should click on the appropriate answer with the left-side mouse button.

For the initial Science Requirements Envelope session, the user would respond with a 'NO' and proceed to the questions. These questions will be asked in the same sequence as is shown in the outline. After each response, the user will be asked if he wants to continue to the next question. This gives the user a chance to end the session when he desires, rather than advancing through all the remaining questions. The title of each question screen will include the number of the question (i.e., Number 1 of 39). This allows the user to see where he is in the process and act accordingly.

If the user responds with a 'YES', which means there has been a previous session, the following question will appear:

> Do you wish to change only one item, resume at a point and continue sequentially through the remainder of the Envelope Document, or complete all topics previously unanswered?

This allows the user one of three options. 1) He may select the one answer that needs changing, go directly to that answer and change it, then

"Automated_Payload_Experiment_Tool"

Have you already begun to fill out the Science Requirements
Envelope Document in a previous session?

YES
NO

F1 HELP

F8 DOS

F10 Quit

Figure 6
Science Requirements Envelope Document
Previous Session Menu

"Automated_Payload_Experiment_Tool"

Do you wish to change only one item, resume at a point and continue sequentially through the remainder of the Envelope Document or complete all topics previously unanswered?

CHANGE ONE ITEM
CHANGE AND CONTINUE
COMPLETE UNANSWERED TOPICS
QUIT

F1 HELP

F8 DOS F10 Quit

Figure 7
Science Requirements Envelope Document
Question Completion Menu

"Automated_Payload_Experiment_Tool"

Change and Continue

With what subtopic do you wish to resume your activity?

Description of Experiment Type or Class
Scientific Knowledge to be Gained
Value of Knowledge to Scientific Field
Necessity for Space Environment
Description of Scientific Field
Current Applications for Research
Account of Prior Research
Current Research
Relationship to Scientific Field
Anticipated Advance
Limitations of Ground-Based Testing
Limitations of Drop Towers
Limitations of Testing in Aircraft
Need for Accommodations in the Shuttle
Limitations of Mathematical Modeling
Limitations of Other Modeling Approaches
<Page 1 of 3>

F1 HELP

Figure 8
Science Requirements Envelope Document
Topic Selection Menu

"Automated_Payload_Experiment_Tool"

Description of Experiment Type or Class (Question 1 of 39)

Please enter a narrative description of the type or class of the experiment. This topic is also addressed under the heading "Experiment Procedures to be Used" and "Description of Type of Experiments".

Press the RETURN key to enter the editor,

C:\GARDEN\APCGF\ENV1_1.DAT

ENTER TEXT HERE.

F1 HELP	F3 Select		Page
Space Cont.	F4 View	F8 DOS	F10 Quit

Figure 9
Sample Science Requirements Envelope Document Question

record that answer to disk. 2) He can select the topic where he would like to resume his activities, answer that question, record the answer, and go to the next question in sequence. This gives the user the capability of selecting the 20th question, and proceed sequentially through the remaining 19 questions. 3) The user can complete all questions that have not yet been answered. This option will invoke a command to look at what answers (files) do not exist, and build a list of these topics. The user then selects the topic to answer, answers the question, records the answer, and goes to the next question of his choice. With each recorded answer, that topic is removed from the list.

3.9 Printing the Science Requirements Envelope Document

The user has three methods available to generate output from the APET software. These include printing the document, displaying the document, and creating an ASCII file of the document. The APET application was designed to be flexible enough to go to a variety of printers. As with most output, the best results will be with the use of a laser printer. If a laser printer is not available, the use of a dot-matrix printer will also be acceptable. A variety, although not nearly exhaustive, of dot-matrix printers have been tested with the APET software, and all have performed well.

If the document has previously been baselined (discussed later in section 3.12), then a menu will appear giving the user the option of printing the document from the baselined version, the current revision, or neither version. If "Neither" is chosen, then it is assumed that the user does not want the document printed, and the program will automatically return to the previous menu. If "Baseline" is chosen, then the document will be printed from the file which is in the project's Baseline subdirectory. If the current revision option is chosen, then the document will be printed from the version of the document which the user is currently revising. If no baselined version of the document exists, then the document will be printed from the current revision.

The Science Requirements Envelope Document is divided into six sections. Each of these section can be printed individually if the user wishes, or the document can be printed in its entirety. If the option to print the entire document is chosen, an initial page eject will normally (depending on printer type) advance a blank sheet of paper before the cover sheet is printed. This will be followed by a second page advance, then page one of the document will be printed, followed by two, three, etc. through the end of the document. Because there are often graphics, tables, etc. that must be inserted within the textual document, no table of contents is printed. Because of the limitation of graphics support, it is suggested that all externally generated graphic illustrations, tables, etc. be provided in an appendix, with appropriate references throughout the document. If one of the document's sections is chosen to be printed individually, a blank page will be ejected, followed by the desired section.

While the print procedure is active, a message will appear in the lower left of the screen. No other activities may take place while the document is printing. In case the printer runs out of paper, an error message will appear. Reload paper in the printer and press the SPACE key to continue.

3.10 Displaying the Science Requirements Envelope Document

The second method of generating output using APET is to display sections of the Science Requirements Envelope to the screen. The Science Requirements Envelope is divided into six major sections, with each divided into one or more subsections (see Appendix A). The user has the capability of selecting a section and seeing the identical output as would appear if the document was printed. Displaying the Science Requirements Envelope is recommended to quickly review answers, especially during the development phase of document preparation.

As stated in Section 3.9, if the document has previously been baselined then a menu will appear giving the user the options for displaying the document from the baselined version, the current revision, or neither version. If "Neither" is chosen, then it is assumed that the user does not want the document displayed, and the program will automatically return to the previous menu. If "Baseline" is chosen, then the document will be displayed from the file which is in the project's Baseline subdirectory. If "Current Revision" is chosen, then the document will be displayed from the version of the document which the user is currently revising. If no baselined version of the document exists, then the document will be displayed from the current revision.

Most Science Requirements Envelope Document sections will require multiple page displays. Please note that to view the equivalent of an entire printed page, there will be at least three and usually four screen displays. Use the Page Up/Page Down method to move up or down in the document. Once a page is adequately reviewed, press the SPACE key to retrieve the next page in sequence.

3.11 Create an ASCII File of Science Requirements Envelope Document

The APET software does not have the ability to generate or insert graphics, charts, etc. that were created in some other application. This is primarily due to the memory size limitations of the computer. However, to alleviate this limitation, APET does have the ability to generate an ASCII file of the Science Requirements Envelope Document's output. After choosing this option, the user need only type in the full file name (includes drive, file name, and extension). The file will then be created as a replica of the printed output.

The benefit of creating an ASCII text file of the Science Requirements Envelope is in providing the user with the capability of enhancing the final printing by inserting graphics, photos, tables, equations, or other difficult to create figures. In addition, different fonts, font sizes, and special effects can be used to dress up the final printed output.

3.12 Baselining a Document

At some point in the documentation procedure, the Science Requirements Envelope will be considered complete and released to external offices, agencies, organizations, etc. When this occurs, that version of the document is considered the baseline, and should be easily identified as such.

To aid in the process of maintaining separate versions of the Science Requirements Envelope, an option exists to baseline the current version of the document. (See Figure 10) The selection of this option will cause a replica of the current version's answers (or data files) to be copied to a new subdirectory for that experiment. This new subdirectory will be called **BASELINE**. From that point, all additional editing will transpire on a new version of the answers, while the baselined version of the answers will remain intact. The generation of output will require the user to identify which version (baseline or current revision) he wishes to access.

3.13 Comparing a Baseline to the Current Revision

Once the document has been baselined (See Section 3.12), the user may wish to compare this baseline with the current revision. APET provides a mechanism to accomplish this task. By selecting the option "Compare Baseline to Current Revision", a DOS routine will be invoked to compare all identical data files from the current revision to the baseline document. This comparison generates a file that can then be displayed or printed, so that a quick review will show which answers have been modified since the original baseline date.

3.14 Copying Answers to Disk

The final output option provided by APET is the creation of files that contain all data generated by the software. This can be used as either a backup mechanism during the creation of the files, or as a means of submission of the final document instead of a hard copy/printed document. By submitting the answers on diskette, the receiving party can have direct access to the answers in the same manner as would the sender. These files are not formatted as an ASCII file, and should not be confused with the final report output, which can be created using the "Create ASCII File of the Science Requirements Document" (discussed in Section 3.11).

The user will have the option of selecting either the baseline document or the current revision. After this selection, the user is asked to select the drive to receive the backup (either A:,B:,C:, or D:). A DOS copy command will then be invoked to copy all files to the selected drive.

"Automated_Payload_Experiment_Tool"

At some point in the documentation process, it is necessary to declare that all documents are complete, and that any changes to be made will be treated as revisions to the baseline document.

Do you want to baseline your answers at this time?

YES
NO

F1 HELP

F8 DOS F10 Quit

Figure 10
Baseline Menu

4.0 HELPFUL HINTS

1) Avoid the use of the F10 key to exit the program. This key should only be used when the user wishes to exit completely out of the application. It is better practice to back out of the APET system through the use of the menus. By doing so, the user ensures that all answers are properly recorded to the disk drive. Use of the F10 Key will allow the user to exit but will not automatically save information generated during the session.

2) APET does not support the insertion of externally generated graphics, tables, equations, or other non-text material. To alleviate this problem without the added labor of using a secondary word processor, it is suggested that any such material be included in an Appendix, and referenced in the text generated in APET.

3) To insert an externally generated text file into the text area in the APET editor, use the command ^KR from within the editor. This is one of a variety of commands that can be used from the APET word processor. To see all the available commands, press the F1 Key from inside the editor. A list of all the available commands is also provided in Appendix B of this manual.

4) The APET editor uses a word wrap routine that automatically wraps the line to the next line (a common word processing feature). It also maintains vertical alignment along the left margin. If you use indented paragraphs, please be sure that the line after the indented line begins in the column you desire. To do this, use the backspace key to move the first word in the line to the column desired. The recommended solution to this problem is not to indent paragraphs, but to insert a blank line between each paragraph.

5) If your computer system is configured to automatically load WINDOWS or some other application package, it may be necessary to alter the AUTOEXEC.BAT file (located in the boot drive). Instructions for changing the automatic load of an application will vary by computer. One of the easier methods is to edit the AUTOEXEC.BAT file and remove the line that calls the package. For example, WINDOWS is called up by the command WIN. By preventing these packages from loading, a significant amount of RAM is freed and allowed for use by APET.

APPENDIX A

Science Requirements Envelope Document
Topic Outline

OUTLINE FOR THE ENVELOPE DOCUMENT

KNOWLEDGE PRO
DATA FILE

1.0 PURPOSE

2.0 FUNCTION

3.0 PREPARATION, APPROVAL AND UPDATING

4.0 SUGGESTED CONTENTS

4.1 Introduction

4.1.1	Description of Experiment Type or Class	ENV1_1.DAT
4.1.2	Scientific Knowledge to be Gained from This Type of Experimentation	ENV1_2.DAT
4.1.3	Value of Knowledge of This Type of Experimentation to scientific field	ENV1_3.DAT
4.1.4	Necessity for Space Environment to Experiment	ENV1_4.DAT

4.2 BACKGROUND

4.2.1	Scientific Field to Which the Experiment Type belongs	ENV2_1.DAT
4.2.2	Current Applications for Research in the Field	ENV2_2.DAT
4.2.3	Brief Historical Account of Prior Research in the Field	ENV2_3.DAT
4.2.4	Current Research	ENV2_4.DAT
4.2.5	Relationship of Proposed Experiment Type to Scientific Field	ENV2_5.DAT
4.2.6	Anticipated Advance in State of the Art for This Type of Experimentation	ENV2_6.DAT

4.3 JUSTIFICATION FOR CONDUCTING THIS TYPE OF EXPERIMENT IN SPACE

4.3.1	Limitations of Ground-Based Testing	ENV3_1.DAT
4.3.2	Limitations of Drop-Towers	ENV3_2.DAT
4.3.3	Limitations of Testing in Aircraft	ENV3_3.DAT
4.3.4	Need for Accommodations in the Shuttle	ENV3_4.DAT
4.3.5	Limitations of Mathematical Modeling	ENV3_5.DAT
4.3.6	Limitations of Other Modeling Approaches ...	ENV3_6.DAT

4.4 DESCRIPTION OF EXPERIMENT TYPES

4.4.1	General Description of Type of Experiments..	ENV4_1.DAT
4.4.2	Types of Experiment Procedures to be Used ..	ENV4_2.DAT
4.4.3	Types of Measurements and Ranges of Values..	ENV4_3.DAT
	Required	ENV4_4.DAT

4.5 SCIENCE REQUIREMENTS ENVELOPE

4.6 OTHER REQUIREMENTS

APPENDIX B

Text Editor Commands

FORMATTING COMMANDS:

```
^B ........................... Reformat Paragraph
^OR .......................... Set Right Margin
^QI .......................... Toggle Autoindent Mode
^QW .......................... Toggle Word Wrap
```

FIND AND REPLACE COMMANDS:

```
^QA .......................... Find and Replace a String
^QF .......................... Find an Occurrance of a String
^L  .......................... Find the Next Occurrence
```

APPENDIX F

Project Plan Software Listing

```
(*NASAPLAN.KB     This is the Automated Paylaod Experiment Tool,      *)
(*                   a knowledge-based system to aid in the            *)
(*                   development of NASA documentation for             *)
(*                      pre-flight planning and control.               *)


no_edit_key ().
no_debug ().
column = 3.
row = 3.

action = '  '.
nasaloop = 1.
glossary_load = 0.
yn = [YES,NO].

while ?action <> 'Exit System'
  then do (mainmenu).

topic 'mainmenu'.
window (,,red,yellow,?column,?row,76,17).
choices = ['How to use the System','Project Selection',
           'Project Plan (Overview)','Glossary/Acronyms',
           'Print Glossary/Acronyms','Exit System'].

set_number_of_values (action,1).

  ask ('#e
  Please select the activity of your choice, or choose Exit
  to leave the system.',action,?choices).

close_window ().

if ?action = 'How to use the System'
  then new_kb ('ppintro.hkb').

if ?action = 'Project Selection'
  then new_kb ('pproject.hkb').

if ?action = 'Project Plan (Overview)'
  then new_kb ('ppout.hkb').

if ?action = 'Glossary/Acronyms'
  then
  glossary_load = (?glossary_load + 1)
  and
  do (glossary).

if ?action = 'Exit System'
  then exit ().

if ?action = 'Print Glossary/Acronyms'
  then
   ask ('#e

    The printing of the glossary/acronym list can require
    a significant amount of time (5-10 minutes depending
    on your system).  Are your sure you want to print the
    glossary at this time?',printok,?yn)
  and
```

```
   if ?printok = NO
    then new_kb ('NASAPLAN.CKB')
   else
    window (,white,red,yellow,1,16,27,4)
    and
    WRITE ('con:',
'  GLOSSARY is being
  printed.

  Please stand by.          ')
    and
    glossary_print is read ('PPTERMS.DAT',,'//KSC')
    and
    glossary_print is string_replace(?glossary_print,'//','         ')
    and
    glossary_print is string_replace(?glossary_print,'/end','')
    and
    print (?glossary_print)
    and
    glossary_print is read ('PPTERMS.DAT','//KSC')
    and
    glossary_print is string_replace(?glossary_print,'//','         ')
    and
    glossary_print is string_replace(?glossary_print,'/end','')
    and
    print (?glossary_print)
    and
    close_window ().
(* ***************************************************************** *)
topic glossary.
  window ('LISTING OF NASA GLOSSARY AND ACRONYMS',blue,white,white,1,1,80,20).


if ?glossary_load = 1
  then
  window (,white,red,yellow,1,16,27,4)
  and
  WRITE ('con:',
'  A slight delay will
  occur while the
  glossary is loaded.
  Please stand by.          ')
  and
  glossary_text is read ('PPINDEX.DAT')
  and
  close_window ()
  and
  close ('PPTERMS.DAT').

  say (?glossary_text).

  close_window ().

end. (* glossary *)

topic mark (find_string).
  text is read ('PPTERMS.DAT',concat('//',?find_string),'/end').
  window (?find_string,blue,white,white,,,72,).
  say (?text).
  close_window ().
```

```
end.

end. (* mainmenu *)
```

```
(*PPINTRO.KB       This is the introductory screen for the              *)
(*                  NASA Automated Payload Element Tool.                *)
(*                 It is used to give the novice user a                 *)
(*               brief tour of the functions of the system.             *)

no_edit_key ().
no_debug ().

yn is [YES,NO].
column = 3.
row = 3.

tried = 0.


do (so_you_want_to_fly).

new_kb ('nasaplan.ckb').

topic so_you_want_to_fly.
  say ('

                  #bmagenta So you want to fly on the Shuttle.#d

          Well, before you can, we must get a little information about
                    your experiment and its objectives.

     If you have flown with us in the past, you may remember a substantial
     amount of paper documentation was required.  This application, the
     #mAutomated Payload Experiment Tool#m, is designed to alleviate much
     of the burden of #mexperiment#m preparation by utilizing a #mhypertext#m,
     knowledge-based system.  This system can be used to prepare one of our
     support documents, the Project Plan, which describes the overall plan
     for proceeding with a project.


                              Press #fyellow SPACE#D to continue.').
if ?tried = 0
  then
       column = ?column + 1
       and
       row = ?row + 1
       and
       window (' ',white,red,white)
       and

       say ('#e
       For more information on a highlighted topic, just move
       the mouse to that word and click.  The information
       will immediately be displayed.  If you are not using a
       mouse, please use the function keys as indicated at the
       bottom of the screen.

       For multiple page definitions, please use the #fyellow Page Up#d
       and #fyellow Page Down#d keys to scroll back and forth through
       the pages.  Multiple page displays are indicated by the
       #fyellow Page x of x #d message at the lower right of the screen.

       For help at anytime throughout the application, select
       the #fyellow F1#d key.  This will retrieve location sensitive
```

```
      help information, and may be called from the system
      or system-called edit screens.

      This will be the method by which support documentation
      will be retrieved throughout this application.

                        Press #fyellow SPACE#D to continue.')
  and
    close_window ()
  and
    tried = 1
  and
    column = ?column - 1
  and
    row = ?row - 1
  and
    do (so_you_want_to_fly).


topic mark (find_string).
  column = ?column + 1.
  row    = ?row + 1.
  text is read ('PPTERMS.dat',concat('//',?find_string),'/end').
  window (?find_string,blue,white,white,?column,?row,72,).
  say (?text).
  column = ?column - 1.
  row = ?row - 1.
  close_window ().
end. (* mark *)


end. (* so_you_want_to_fly *)
```

```
(* PPOUT.KB  This is the outline for appendix E of the MSAD Project Plans *)

no_edit_key ().
no_debug ().

column = 3.
row = 3.
menu_choice = ' '.
menu_option = ['GENERAL','PREPARATION AND APPROVAL','CHANGES',
'CONTENT','RETURN TO PREVIOUS MENU'].

while ?menu_choice <> 'RETURN TO PREVIOUS MENU'
 then do (outline).

topic 'outline'.
ask('#e

                        OUTLINE FOR PREPARING
                         MSAD PROJECT PLANS


    Which section do you wish to display?',menu_choice,?menu_option).

if ?menu_choice = 'GENERAL'
  then do ('General').

if ?menu_choice = 'PREPARATION AND APPROVAL'
  then do ('Preparation and Approval').

if ?menu_choice = 'CHANGES'
  then do ('Changes').

if ?menu_choice = 'CONTENT'
  then new_kb ('dispcont.hkb').

if ?menu_choice = 'RETURN TO PREVIOUS MENU'
  then new_kb ('nasaplan.ckb').

end. (* outline *)


(*======================== THREADED TOPICS  ==============================*)

topic 'General'.
window ('1.0  General',blue,white,white,?column,?row,76,18).
say(['

             The Microgravity Science and Applications Division
        (MSAD) requires that a MSAD Project Plan be submitted and
        approved prior to making a major commitment of resources
        to an MSAD project. MSAD Project Plans are to be prepared
        in final draft form for the Requirements Definition Review
        #40RDR#41.


                       Press #fyellow SPACE#d to continue']).

close_window ().
end. (* General *)
```

```
topic 'Preparation and Approval'.
window ('2.0  Preparation and Approval',blue,white,white,?column,
?row,76,18).

say ('
          Plans will be prepared and submitted for all
     flight experiments.  Project plans will be reissued,
     modified, or ammended for reflights depending on the
     complexity of the task.  A plan#39s preparation is
     the responsibility of the designated Project Manager
     at the responsible NASA center.  The Project Manager
     will sign the MSAD Project Plan as the preparer; the
     Project Scientist and the Principal Investigator will
     sign as concurring.  The MSAD Project Plan will be signed
     off at the NASA center prior to submission to Headquarters
     by the appropriate center#39s authorities. When the Program
     Scientist and Program Manager sign to register their concur-
     rence, the MSAD Projet Plan will be submitted to the MSAD
     Director for approval.

                      Press #fyellow SPACE#d to continue').

close_window ().
end. (*Preparation and Approval *)

topic 'Changes'.
window ('3.0  Changes',blue,white,white,?column,?row,76,18).
say(['

            The Project Manager is responsible for updating
       a MSAD Project Plan when significant changes occur (such
       as changes in scope, organization, or roles and responsi-
       bilities).  This does not apply to resources, schedules
       or manpower, which are updated through normal budgeting
       and project monitoring activities.  The Projet Manager
       will establish a change control process for maintaining
       the MSAD Project Plan and other project documentation.

                      Press #fyellow SPACE#d to continue']).

close_window ().
end. (* Changes *)
```

```
(*PPROJECT.KB      This is the project menu to allow the              *)
(*                 user to define a new project or select             *)
(*                an existing project.  It then calls                 *)
(*                     the  appropriate submenu.                      *)

no_edit_key ().
no_debug ().
do_gloss = 1.
yn is [YES,NO].
projlist is ' '.
do (firstpass).

if ?project_want = 'RETURN TO MAIN MENU'
  then new_kb ('nasaplan.ckb').

topic 'firstpass'.
  eof = number_to_char (26).
  projtest is read_line ('pproj.dat').
  if ?projtest = ?eof
    then
     do (new_project)
    else
     projlist is read ('pproj.dat')
    and
     do (old_project).



topic 'new_project'.

window (,white,red,yellow,5,5,75,16).
read_response ('#e
     Please enter an identifier for your project.  This identifier
     should be eight (8) characters or less.  #n ',newproject).

newproject = string_replace(?newproject,' ','',8).

IF ?NEWPROJECT <> [ ] AND ?NEWPROJECT <> ' ' AND ?NEWPROJECT <> ''
  then
    projlist gets ?newproject
    and
    new_file ('pproj.dat')
    and
    write ('pproj.dat',#o,?projlist)
    and
    close ('pproj.dat')
    and
    project_want = ?newproject
    and
    cur_dir = string_replace(?project_want,' ','',10)
    and
    new_file ('CURDIR.DAT')
    and
    write ('CURDIR.DAT',?cur_dir)
    and
    close ('CURDIR.DAT')
    and
    DOSCOMMAND = CONCAT('MD ',?NEWPROJECT)
    and
    dos (?DOSCOMMAND,restore)
```

```
  else
    say ('#e

     Sorry, the identifier for your project must be a valid DOS
     name, i.e., eight (8) characters or less.

               Please press #fyellow SPACE#d and begin again. ')

     and
     new_kb ('pproject.hkb').
close_window ().

end. (* new_project *)

topic 'old_project'.

  window (,white, red, yellow, 5,5,75,16).
  choose_project = ?projlist.
  choose_project gets 'ENTER A NEW PROJECT'.
  choose_project gets 'DELETE AN OLD PROJECT'.
  choose_project gets 'RETURN TO MAIN MENU'.
  ask ('#e
  Please select the project of your choice, or enter a new
  project.',project_want,?choose_project).

 if ?project_want = ' ' or ?project_want = [ ] or ?project_want = ''
   then do (new_project).

 if ?project_want = 'DELETE AN OLD PROJECT'
   then do (kill_project).

 if ?project_want = 'RETURN TO MAIN MENU'
     then new_kb ('nasaplan.ckb').

   if ?project_want = 'ENTER A NEW PROJECT'
     then do (new_project)
   else
     cur_dir = string_replace(?project_want,' ','',10)
     and
     new_file ('CURDIR.DAT')
     and
     write ('CURDIR.DAT',?cur_dir)
     and
     close ('CURDIR.DAT').

 close_window ().

 end. (* old_project *)

 end. (* firstpass *)

 new_kb ('ppnasam.hkb').

 topic 'kill_project'.
   close ('pproj.dat').
   deletename = ' '.
   window (,white,red,yellow,5,5,75,16).
   ask ('#e

    You have chosen to delete a project.  This will erase all data
```

```
files for the project from your hard drive, plus will remove
the project from the list of available projects.  This deletion
is permanent and cannot be undone;  therefore, use this option
with CAUTION.

Do you wish to proceed with the project deletion?          ',
deleteok,?yn).

if ?deleteok = YES
  then
  read_response ('#e
  Please enter the project identifier exactly as it appears in
  the project selection list.  This identifier should be eight
  (8) characters or less.  #n',killproj).

oldlist is string_to_list (?projlist).

if ?deleteok = YES
  then
    deletename is intersect(?killproj,?oldlist).

deletefnl = NO.

if ?deleteok = YES
  then
    if ?deletename <> ' ' and ?deletename <> '' and ?deletename <> [ ]
      then
        ask (['#e
    This is your FINAL WARNING.
    #s
    Do you want to delete the project: ',?deletename,'?'],deletefnl,?yn)
      else
        say ('#e

     This project was not found.  Please be sure to type
     project title as it appears on the list, i.e. using
     appropriate upper- and lower-case letters.

                 Press #fyellow SPACE#d to continue.').

if ?deletefnl = YES
  then
  oldlist is remove (?oldlist,?deletename)
  and
  new_file ('PPROJ.DAT')
  and
  write ('PPROJ.DAT',?oldlist)
  and
  close ('PPROJ.DAT')
  and
  doscommand = concat ('ERASE C:\GARDEN\',?deletename,'\*.*')
  and
  dos (?doscommand,restore)
  and
  doscommand = concat ('RD ',?deletename)
  and
  dos (?doscommand,restore).
close_window ().
new_kb ('PPROJECT.HKB').
```

```
end. (* kill_project *)

(* ***************************************************************** *)

end.  (* nasamenu *)
```

```
(*PPNASAM.KB          This is the activity menu to allow the            *)
(*                 user to select an activity to perform on             *)
(*                          an existing project.                        *)

 no_edit_key ().
no_debug ().
do_gloss = 1.
today = date ().
month = element(?today,1).
day = element(?today,2).
year = element(?today,3).
today = concat(?month,'/',?day,'/',?year).
yn is [YES,NO].
curdir is read_line ('CURDIR.DAT').
close (concat('C:\GARDEN\',?CURDIR,'\BASELINE.DAT')).
curdir is string_replace (?curdir,' ','',8).
eof = number_to_char (26).

menu_option is ['FILL OUT DOCUMENTATION','PRINT PROJECT PLAN',
'DISPLAY PROJECT PLAN','DETERMINE IF PROJECT PLAN IS COMPLETE',
'BASELINE DOCUMENT','COMPARE BASELINE TO CURRENT REVISION',
'COPY ANSWERS TO DISK','RETURN TO PREVIOUS MENU',
'RETURN TO MAIN MENU',
'EXIT SYSTEM'].
menu_choice = ' '.

while ?menu_choice <> 'EXIT SYSTEM'
  then do (nasamenu).

topic nasamenu.

  ask (['#e #s
    The project you have selected is:  ',?curdir,'#d #n

    Please enter your choice of activities from the list.'],menu_choice,
         ?menu_option).

if ?menu_choice = 'FILL OUT DOCUMENTATION'
  then new_kb ('ppfillm.hkb').

if ?menu_choice = 'RETURN TO PREVIOUS MENU'
  then new_kb ('PPROJECT.HKB').

if ?menu_choice = 'RETURN TO MAIN MENU'
  then new_kb ('NASAPLAN.CKB').

if ?menu_choice = 'PRINT PROJECT PLAN'
  then new_kb('PPPRINT.HKB').

if ?menu_choice = 'BASELINE DOCUMENT'
  then do (baseline_rtn).

if ?menu_choice = 'DISPLAY PROJECT PLAN'
  then new_kb ('DISPPROJ.HKB').

if ?menu_choice = 'COPY ANSWERS TO DISK'
  then do (copyfiles).

if ?menu_choice = 'COMPARE BASELINE TO CURRENT REVISION'
  then do (compare_rtn).
```

```
if ?menu_choice = 'DETERMINE IF PROJECT PLAN IS COMPLETE'
  then new_kb ('ppsearch.hkb').

if ?menu_choice = 'EXIT SYSTEM'
  then stop ().

topic 'copyfiles'.

  ask ('Do you want to copy your answers to a different drive?',wantcopy,?yn).
  if ?wantcopy = YES
    then drivelist is [A:,B:,C:,D:,NONE]
  and
    ask
      ('Please choose the drive to which you wish to copy the files: ',
      drive_destination,?drivelist).

  if ?wantcopy = YES and ?drive_destination <> NONE
    then
      copy_command = concat ('COPY C:\GARDEN\',?curdir,'\*.DAT ',?DRIVE_DESTINAT
    and
      say ('
      Please insert diskette now if you are copying to a floppy drive.

                   Please press #fyellow SPACE#d when ready.    ')

    and
      move_cursor (1,10)
    and
      dos (?copy_command,restore)
    and
    say ('#e

             Answers have been moved to drive #s',?drive_destination,' #n #n


             Please press #fyellow SPACE#d to exit.    ').

    do (nasamenu).

 end. (* copyfiles *)

 topic 'baseline_rtn'.

   ask ('#e

   At some point in the documentation process, it is necessary to
   declare that all documents are complete, and that any changes
   to be made will be treated as revisions to the baseline document.

   Do you want to baseline your answers at this time?',baseline,?yn).

   curbase = ?eof.
   overwrite = YES.
   if ?baseline = YES
     then
       curbase is read_line (concat('C:\GARDEN\',?CURDIR,'\BASELINE.DAT'))
       and
       close (concat('C:\GARDEN\',?CURDIR,'\BASELINE.DAT'))
       and
```

```
        if ?curbase <> ?eof
          then
            ask
        ('#e

        You have already baselined this experiment in the past.  Do you
        want to take all revisions and overwrite your previous baseline
        to create a new baseline? ',overwrite,?yn).

    if ?curbase = ?eof and ?baseline = YES
      then
        md_command = concat ('MD C:\GARDEN\',?curdir,'\BASELINE')
      and
        dos (?md_command,restore)
      and
        copy_command = concat
         ('COPY C:\GARDEN\',?CURDIR,'\*.DAT C:\GARDEN\',?CURDIR,'\BASELINE\*.*')
      and
        dos (?copy_command,restore)
      and
        write (concat('C:\GARDEN\',?CURDIR,'\BASELINE.DAT'),?today)
      and
        say ('#e

          Baseline document has been created.  All changes to this
          document will be stored in the revision.  A new baseline
          must be created to incorporate any revisions into the
          final document.


                           Please press #fyellow SPACE#d to exit.    ').

    if ?curbase <> ?eof and ?baseline = YES and ?overwrite = YES
      then
        xcopy_command = concat
         ('XCOPY C:\GARDEN\',?CURDIR,'\*.DAT C:\GARDEN\',?CURDIR,
         '\BASELINE\*.* /D:',?CURBASE)
      and
        dos (?xcopy_command,restore)
      and
        new_file (concat('C:\GARDEN\',?CURDIR,'\BASELINE.DAT'))
      and
        write    (concat('C:\GARDEN\',?CURDIR,'\BASELINE.DAT'),?today)
      and
        say ('#e

          All revisions have been incorporated in the baseline
          document.  Addition changes to this document will be
          stored in a new revision.  A new baseline must be
          created to incorporate any new revisions into the
          final document.


                           Please press #fyellow SPACE#d to exit.    ').

     do (nasamenu).

end. (* baseline_rtn *)

topic 'compare_rtn'.
```

```
curbase is read_line (concat('C:\GARDEN\',?CURDIR,'\BASELINE.DAT'))
and
close (concat('C:\GARDEN\',?CURDIR,'\BASELINE.DAT'))
and
if ?curbase = ?eof
then
  say
    ('#e

    You have not yet baselined this experiment;  therefore,
    no comparison is necessary.


                  Press #fyellow SPACE#d to continue')

  and
  new_kb ('ppnasam.HKB').

 comp_choices = ['RUN COMPARISON PROGRAM','DISPLAY COMPARISONS',
                 'PRINT COMPARISONS','RETURN TO PREVIOUS MENU'].

 ask ('#e

   Do you wish to run the comparison program to generate a new
   listing of differences between the baseline and revision,
   print or display the results of the most recent comparison,
   or exit this menu?',comp_ans,?comp_choices).

 if ?comp_ans = 'RETURN TO PREVIOUS MENU'
   then new_kb ('NASAMENU.HKB').

 if ?comp_ans = 'RUN COMPARISON PROGRAM'
   then
     do (comp_pgm).

topic 'comp_pgm'.
  comp_command = concat
     ('FC /a C:\GARDEN\',?CURDIR,'\*.DAT C:\GARDEN\',?CURDIR,
     '\BASELINE\*.* > C:\GARDEN\',?CURDIR,'\DIFFER.DAT').
  dos (?comp_command,restore).
  close (concat('C:\GARDEN\',?CURDIR,'\DIFFER.DAT')).

  say ('#e

       Files have been compared.  Please use the display or
       print options to view the results of the comparison.

                      Press #fyellow SPACE#d to continue.').
end.  (* comp_pgm *)

  if ?comp_ans = 'DISPLAY COMPARISONS'
    then
      comp_file = read (concat(C:\GARDEN\,?CURDIR,'\DIFFER.DAT'))
      and
      say (?comp_file).

  if ?comp_ans = 'PRINT COMPARISONS'
    then
      comp_file = read (concat(C:\GARDEN\,?CURDIR,'\DIFFER.DAT'))
      and
```

```
      print (#p,?comp_file,#p).
  do (nasamenu).
end. (* compare_rtn *)
end.  (* nasamenu *)
```

```
(*PPSEARCH.KB     This program is used to search for the          *)
(*                 necessary data files to complete the            *)
(*               Project Plan, and notify the user of any          *)
(*                          missing sections.                      *)

yn = [YES,NO].
column = 3.
row = 3.
eof = number_to_char (26).
no_edit_key ().
no_debug ().

curdir is read_line ('CURDIR.DAT').
curdir = string_replace(?curdir,' ','',8).
incomplete_sections = [].
completed_sections = 0.
total_files = 25.

do (search).

close_window ().


if ?completed_sections = ?total_files
  then
    say  ('#e


       All questions have been answered.  The Project Plan is
       now ready to print.


                    Press #fyellow SPACE#d to continue')

  else
    say  ('#e


       The following topics have not been answered.  The Project
       Plan is not ready for final printing.

                                             #n',?incomplete_sections,

    '#n#n#n                        Press #fyellow SPACE#d to continue').

new_kb ('PPNASAM.HKB').

topic 'search'.
  window (,white,red,yellow,1,16,27,4).
    WRITE ('con:',
'  Database is being
  searched.

  Please stand by.          ').


  readfile = concat('C:\GARDEN\',?CURDIR,'\PPE4_1.DAT').
  testfile =  read_line(?readfile).
  do ('tally_rtn').
  if ?testfile = ?eof
```

```
    then incomplete_sections gets '4.1 Introduction'.
  close (?readfile).

  readfile = concat('C:\GARDEN\',?CURDIR,'\PPE4_2.DAT').
  testfile =  read_line(?readfile).
  do ('tally_rtn').
  if ?testfile = ?eof
    then incomplete_sections gets '4.2 Objectives'.
  close (?readfile).

  readfile = concat('C:\GARDEN\',?CURDIR,'\PPE4_3.DAT').
  testfile =  read_line(?readfile).
  do ('tally_rtn').
  if ?testfile = ?eof
    then incomplete_sections gets '4.3 Science Requirements'.
  close (?readfile).

  readfile = concat('C:\GARDEN\',?CURDIR,'\PPE4_4_1.DAT').
  testfile =  read_line(?readfile).
  do ('tally_rtn').
  if ?testfile = ?eof
    then incomplete_sections gets '4.4.1 Experiment Hardware Description'.
  close (?readfile).

  readfile = concat('C:\GARDEN\',?CURDIR,'\PPE4_4_2.DAT').
  testfile =  read_line(?readfile).
  do ('tally_rtn').
  if ?testfile = ?eof
    then incomplete_sections gets '4.4.2 Payload Classification'.
  close (?readfile).

  readfile = concat('C:\GARDEN\',?CURDIR,'\PPE4_4_3.DAT').
  testfile =  read_line(?readfile).
  do ('tally_rtn').
  if ?testfile = ?eof
    then incomplete_sections gets '4.4.3 Development Approach'.
  close (?readfile).

  readfile = concat('C:\GARDEN\',?CURDIR,'\PPE4_4_4.DAT').
  testfile =  read_line(?readfile).
  do ('tally_rtn').
  if ?testfile = ?eof
    then incomplete_sections gets '4.4.4 Technology Plan'.
  close (?readfile).

  readfile = concat('C:\GARDEN\',?CURDIR,'\PPE4_4_5.DAT').
  testfile =  read_line(?readfile).
  do ('tally_rtn').
  if ?testfile = ?eof
    then incomplete_sections gets '4.4.5 Logisitics'.
  close (?readfile).

  readfile = concat('C:\GARDEN\',?CURDIR,'\PPE4_4_6.DAT').
  testfile =  read_line(?readfile).
  do ('tally_rtn').
  if ?testfile = ?eof
    then incomplete_sections gets
    '4.4.6 Mission Operations Training & Data Management'.
  close (?readfile).
```

```
readfile = concat('C:\GARDEN\',?CURDIR,'\PPE4_4_7.DAT').
testfile =  read_line(?readfile).
do ('tally_rtn').
if ?testfile = ?eof
  then incomplete_sections gets
  '4.4.7 Analysis of Mission Results'.
close (?readfile).

readfile = concat('C:\GARDEN\',?CURDIR,'\PPE4_4_8.DAT').
testfile =  read_line(?readfile).
do ('tally_rtn').
if ?testfile = ?eof
  then incomplete_sections gets
  '4.4.8 Facilities'.
close (?readfile).

readfile = concat('C:\GARDEN\',?CURDIR,'\PPE4_4_9.DAT').
testfile =  read_line(?readfile).
do ('tally_rtn').
if ?testfile = ?eof
  then incomplete_sections gets
  '4.4.9 Safety'.
close (?readfile).

readfile = concat('C:\GARDEN\',?CURDIR,'\PPE4_5_1.DAT').
testfile =  read_line(?readfile).
do ('tally_rtn').
if ?testfile = ?eof
  then incomplete_sections gets
  '4.5.1 Implementation Approach'.
close (?readfile).

readfile = concat('C:\GARDEN\',?CURDIR,'\PPE4_5_2.DAT').
testfile =  read_line(?readfile).
do ('tally_rtn').
if ?testfile = ?eof
  then incomplete_sections gets
  '4.5.2 Summary Work Breakdown Structure'.
close (?readfile).

readfile = concat('C:\GARDEN\',?CURDIR,'\PPE4_5_3.DAT').
testfile =  read_line(?readfile).
do ('tally_rtn').
if ?testfile = ?eof
  then incomplete_sections gets
  '4.5.3 Documentation'.
close (?readfile).

readfile = concat('C:\GARDEN\',?CURDIR,'\PPE4_6_2.DAT').
testfile =  read_line(?readfile).
do ('tally_rtn').
if ?testfile = ?eof
  then incomplete_sections gets
  '4.6.2 Mission Management Responsibilities and Organization'.
close (?readfile).

readfile = concat('C:\GARDEN\',?CURDIR,'\PPE4_7.DAT').
testfile =  read_line(?readfile).
do ('tally_rtn').
if ?testfile = ?eof
```

```
   then incomplete_sections gets
   '4.7 Schedule'.
 close (?readfile).

 readfile = concat('C:\GARDEN\',?CURDIR,'\PPE4_8_1.DAT').
 testfile =  read_line(?readfile).
 do ('tally_rtn').
 if ?testfile = ?eof
   then incomplete_sections gets
   '4.8.1 Resources'.
 close (?readfile).

 readfile = concat('C:\GARDEN\',?CURDIR,'\PPE4_8_2.DAT').
 testfile =  read_line(?readfile).
 do ('tally_rtn').
 if ?testfile = ?eof
   then incomplete_sections gets
   '4.8.2 Cost Control Guidelines'.
 close (?readfile).

 readfile = concat('C:\GARDEN\',?CURDIR,'\E4_8_3_1.DAT').
 testfile =  read_line(?readfile).
 do ('tally_rtn').
 if ?testfile = ?eof
   then incomplete_sections gets
   '4.8.3.1 NASA Reports'.
 close (?readfile).

 readfile = concat('C:\GARDEN\',?CURDIR,'\E4_8_3_2.DAT').
 testfile =  read_line(?readfile).
 do ('tally_rtn').
 if ?testfile = ?eof
   then incomplete_sections gets
   '4.8.3.2 Contractor Reports'.
 close (?readfile).

 readfile = concat('C:\GARDEN\',?CURDIR,'\PPE4_8_4.DAT').
 testfile =  read_line(?readfile).
 do ('tally_rtn').
 if ?testfile = ?eof
   then incomplete_sections gets
   '4.8.4 Cost Control Strategy'.
 close (?readfile).

 readfile = concat('C:\GARDEN\',?CURDIR,'\E4_9_1_1.DAT').
 testfile =  read_line(?readfile).
 do ('tally_rtn').
 if ?testfile = ?eof
   then incomplete_sections gets
   '4.9.1.1 Internal Reviews'.
 close (?readfile).

 readfile = concat('C:\GARDEN\',?CURDIR,'\E4_9_1_2.DAT').
 testfile =  read_line(?readfile).
 do ('tally_rtn').
 if ?testfile = ?eof
   then incomplete_sections gets
   '4.9.1.2 External Reviews'.
 close (?readfile).
```

```
  readfile = concat('C:\GARDEN\',?CURDIR,'\E4_9_1_3.DAT').
  testfile =  read_line(?readfile).
  do ('tally_rtn').
  if ?testfile = ?eof
    then incomplete_sections gets
    '4.9.1.3 Design and Readiness Reviews'.
  close (?readfile).

topic 'tally_rtn'.
  if ?testfile <> ?eof
    then completed_sections = ?completed_sections + 1.
end.  (* tally_rtn *)

end. (* search *)
```

```
(* DISPPROJ.HKB is used to display all sections of the PROJECT PLAN.          *)

no_edit_key ().
no_debug ().
choice = [].
eof = number_to_char (26).
curdir is read_line ('CURDIR.DAT').
curdir is string_replace(?curdir,' ','',8).
blankline = '     '.
line_count = 0.

do (display_Routine).

new_kb ('PPNASAM.HKB').

topic 'display_Routine'.
  sections = ['1.0 INTRODUCTION',
              '2.0 OBJECTIVE',
              '3.0 SCIENCE REQUIREMENTS',
              '4.0 TECHNICAL PLAN',
              '5.0 IMPLEMENTATION PLAN',
              '6.0 MANAGEMENT PLAN',
              '7.0 SCHEDULE',
              '8.0 COST CONTROL PLAN',
              '9.0 PROJECT REVIEWS AND MEETINGS',
              'QUIT'].

  window ('Display Project Plan',white,blue,white,3,3,78,18).
  while ?choice <> QUIT
    then do (display_PPLAN).
  close_window ().
  close_all ().


topic 'display_PPLAN'.
  pplan_page = [].
  ask ('#e

      Which section do you want to display?',choice,?sections).

  if ?choice = '1.0 INTRODUCTION'
    then do ('1.0 INTRODUCTION').

  if ?choice = '2.0 OBJECTIVE'
    then do ('2.0 OBJECTIVE').

  if ?choice = '3.0 SCIENCE REQUIREMENTS'
    then do ('3.0 SCIENCE REQUIREMENTS').

  if ?choice = '4.0 TECHNICAL PLAN'
    then do ('4.0 TECHNICAL PLAN').

  if ?choice = '5.0 IMPLEMENTATION PLAN'
    then do ('5.0 IMPLEMENTATION PLAN').

  if ?choice = '6.0 MANAGEMENT PLAN'
    then do ('6.0 MANAGEMENT PLAN').

  if ?choice = '7.0 SCHEDULE'
    then do ('7.0 SCHEDULE').
```

```
  if ?choice = '8.0 COST CONTROL PLAN'
    then do ('8.0 COST CONTROL PLAN').

  if ?choice = '9.0 PROJECT REVIEWS AND MEETINGS'
    then do ('9.0 PROJECT REVIEWS AND MEETINGS').

  if ?choice = QUIT
    then new_kb ('PPNASAM.HKB').


topic '1.0 INTRODUCTION'.
  page_count = 0.
  pplan_page gets ?blankline.
  pplan_page gets ?blankline.
  filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_1.DAT').
  line is read_line (?filename).
  pplan_page gets '   1.0 INTRODUCTION'.
  pplan_page gets ?blankline.
  line_count = 4.
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  pplan_page gets ?blankline.
  line_count = ?line_count + 1.
  do (page_advance).


end.  (* 1.0 INTRODUCTION *)

topic '2.0 OBJECTIVE'.
  page_count = 0.
  filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_2.DAT').
  line is read_line (?filename).
  if ?line_count > 54
    then do (page_advance).

  pplan_page gets ?blankline.
  pplan_page gets ?blankline.
  pplan_page gets '   2.0 OBJECTIVE'.
  pplan_page gets ?blankline.
  line_count = ?line_count + 4.
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  pplan_page gets ?blankline.
  line_count = ?line_count + 1.
  do (page_advance).


end.  (* 2.0 OBJECTIVE *)

topic '3.0 SCIENCE REQUIREMENTS'.
  page_count = 0.
  filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_3.DAT').
  line is read_line (?filename).
  if ?line_count > 54
    then do (page_advance).

  pplan_page gets ?blankline.
```

```
  pplan_page gets ?blankline.
  pplan_page gets '   3.0 SCIENCE REQUIREMENTS'.
  pplan_page gets ?blankline.
  line_count = ?line_count + 4.
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  pplan_page gets ?blankline.
  line_count = ?line_count + 1.
  do (page_advance).


end.  (* 3.0 SCIENCE REQUIREMENTS *)

topic '4.0 TECHNICAL PLAN'.
  page_count = 0.
  filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_4_1.DAT').
  line is read_line (?filename).
  if ?line_count > 54
    then do (page_advance).

  pplan_page gets ?blankline.
  pplan_page gets ?blankline.
  pplan_page gets '   4.0 TECHNICAL PLAN'.
  pplan_page gets ?blankline.
  pplan_page gets '       4.1  Experiment Hardware Description'.
  pplan_page gets ?blankline.
  line_count = ?line_count + 6.
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  pplan_page gets ?blankline.
  line_count = ?line_count + 1.
  if ?line_count > 56
    then do (page_advance).

  pplan_page gets '       4.2  Payload Classification'.
  pplan_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_4_2.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
  pplan_page gets ?blankline.
  if ?line_count > 56
    then do (page_advance).

  pplan_page gets '       4.3  Development Approach'.
  pplan_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_4_3.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
  pplan_page gets ?blankline.
  if ?line_count > 56
```

```
  then do (page_advance).

pplan_page gets '       4.4  Technology Plan'.
pplan_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_4_4.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
pplan_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

pplan_page gets '       4.5  Logistics'.
pplan_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_4_5.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
pplan_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

pplan_page gets
'       4.6  Mission Operations Training and Data Management'.
pplan_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_4_6.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
pplan_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

pplan_page gets
'       4.7  Analysis of Mission Results'.
pplan_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_4_7.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
pplan_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

pplan_page gets
'       4.8  Facilities'.
pplan_page gets ?blankline.
line_count = ?line_count + 2.
```

```
  filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_4_8.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
  pplan_page gets ?blankline.
  do (page_advance).


  pplan_page gets
  '       4.9  Safety'.
  pplan_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_4_9.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
  pplan_page gets ?blankline.
  do (page_advance).

end.  (* 4.0 TECHNICAL PLAN *)

topic '5.0 IMPLEMENTATION PLAN'.
  page_count = 0.
  filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_5_1.DAT').
  line is read_line (?filename).
  if ?line_count > 54
    then do (page_advance).

  pplan_page gets ?blankline.
  pplan_page gets ?blankline.
  pplan_page gets '   5.0 IMPLEMENTATION PLAN'.
  pplan_page gets ?blankline.
  pplan_page gets '       5.1  Implementation Approach'.
  pplan_page gets ?blankline.
  line_count = ?line_count + 6.
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  pplan_page gets ?blankline.
  line_count = ?line_count + 1.
  if ?line_count > 54
    then do (page_advance).

  pplan_page gets
  '       5.2  Summary Work Breakdown Structure'.
  pplan_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_5_2.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
  pplan_page gets ?blankline.
  if ?line_count > 56
    then do (page_advance).
```

```
  pplan_page gets
  '        5.3  Documentation'.
  pplan_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_5_3.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
  pplan_page gets ?blankline.
  do (page_advance).


end.  (* 5.0 IMPLEMENTATION PLAN *)

topic '6.0 MANAGEMENT PLAN'.
  page_count = 0.
  filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_6_1.DAT').
  line is read_line (?filename).
  if ?line_count > 48
    then do (page_advance).

  pplan_page gets ?blankline.
  pplan_page gets ?blankline.
  pplan_page gets '   6.0 MANAGEMENT PLAN'.
  pplan_page gets ?blankline.
  pplan_page gets
  '       6.1  Project Management Responsibilities and Organization'.
  pplan_page gets ?blankline.
  line_count = ?line_count + 6.
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  pplan_page gets ?blankline.
  line_count = ?line_count + 1.
  if ?line_count > 56
    then do (page_advance).

  pplan_page gets
  '       6.2  Mission Management Responsibilities and Organization'.
  pplan_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_6_2.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
  pplan_page gets ?blankline.
  do (page_advance).


end.  (* 6.0 MANAGEMENT PLAN *)

topic '7.0 SCHEDULE'.
  page_count = 0.
  filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_7.DAT').
  line is read_line (?filename).
```

```
  if ?line_count > 56
    then do (page_advance).

  pplan_page gets ?blankline.
  pplan_page gets ?blankline.
  pplan_page gets '   7.0 SCHEDULE'.
  pplan_page gets ?blankline.
  line_count = ?line_count + 4.
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  pplan_page gets ?blankline.
  line_count = ?line_count + 1.
  do (page_advance).

end.  (* 7.0 SCHEDULE *)



topic '8.0 COST CONTROL PLAN'.
  page_count = 0.
  filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_8_1.DAT').
  line is read_line (?filename).
  if ?line_count > 54
    then do (page_advance).

  pplan_page gets ?blankline.
  pplan_page gets ?blankline.
  pplan_page gets '   8.0 IMPLEMENTATION PLAN'.
  pplan_page gets ?blankline.
  pplan_page gets '       8.1  Resources'.
  pplan_page gets ?blankline.
  line_count = ?line_count + 6.
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  pplan_page gets ?blankline.
  line_count = ?line_count + 1.
  if ?line_count > 56
    then do (page_advance).

  pplan_page gets
  '       8.2    Summary Work Breakdown Structure'.
  pplan_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_8_2.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  pplan_page gets ?blankline.
  line_count = ?line_count + 1.
  if ?line_count > 56
    then do (page_advance).

  pplan_page gets
  '       8.3    Cost Reporting and Control Structure'.
  pplan_page gets ?blankline.
  pplan_page gets '         8.3.1  Nasa Reports'.
```

```
  pplan_page gets ?blankline.
  line_count = ?line_count + 4.
  filename = concat(C:\GARDEN\,?CURDIR,'\E4_8_3_1.DAT').
  pplan_page gets ?blankline.
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
  pplan_page gets ?blankline.
  if ?line_count > 56
    then do (page_advance).

  pplan_page gets '       8.3.2  Contractor Reports'.
  pplan_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\E4_8_3_2.DAT').
  pplan_page gets ?blankline.
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
  pplan_page gets ?blankline.
  if ?line_count > 56
    then do (page_advance).

  pplan_page gets '       8.4     Cost Control Strategy'.
  pplan_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_8_4.DAT').
  pplan_page gets ?blankline.
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
  pplan_page gets ?blankline.
  do (page_advance).

end. (* 8.0 COST CONTROL PLAN *)


topic '9.0 PROJECT REVIEWS AND MEETINGS'.
 page_count = 0.
 filename = concat(C:\GARDEN\,?CURDIR,'\E4_9_1_1.DAT').
 line is read_line (?filename).
 if ?line_count > 56
   then do (page_advance).

   pplan_page gets ?blankline.
   pplan_page gets ?blankline.
   pplan_page gets '   9.0     PROJECT REVIEWS AND MEETINGS'.
   pplan_page gets ?blankline.
   pplan_page gets '       9.1  Management Reviews'.
   pplan_page gets ?blankline.
   pplan_page gets '       9.1.1  Internal Reviews'.
   pplan_page gets ?blankline.
   line_count = ?line_count + 8.
   while ?line <> ?eof
```

```
      then do (read_file).
    close (?filename).
    pplan_page gets ?blankline.
    line_count = ?line_count + 1.
    if ?line_count > 56
      then do (page_advance).

    pplan_page gets '      9.1.2     External Reviews'.
    pplan_page gets ?blankline.
    line_count = ?line_count + 2.
    filename = concat(C:\GARDEN\,?CURDIR,'\E4_9_1_2.DAT').
    line is read_line (?filename).
    while ?line <> ?eof
      then do (read_file).
    close (?filename).
    pplan_page gets ?blankline.
    line_count = ?line_count + 1.
    if ?line_count > 56
      then do (page_advance).

    pplan_page gets '      9.1.3     Design and Readiness Reviews'.
    pplan_page gets ?blankline.
    line_count = ?line_count + 2.
    filename = concat(C:\GARDEN\,?CURDIR,'\E4_9_1_3.DAT').
    line is read_line (?filename).
    while ?line <> ?eof
      then do (read_file).
    close (?filename).
    pplan_page gets ?blankline.
    line_count = ?line_count + 1.
    do (page_advance).

end. (* 9.0 PROJECT REVIEWS AND MEETINGS *)
end.  (* display_PPLAN *)

topic 'page_advance'.
  page_count = ?page_count + 1.
  window_name = concat(?choice,'  Page: ',?page_count).
  window (?window_name,white,blue,white,3,3,78,19).
  say (?pplan_page).
  pplan_page = [].
  pplan_page gets ?blankline.
  pplan_page gets ?blankline.
  line_count = 2.
  collect ().
  close_window ().
end.  (* page_advance *)

topic 'read_file'.
  if ?line_count > 58
    then do (page_advance).
  line = concat('        ',?line).
  pplan_page gets ?line.
  line is read_line (?filename).
  line_count = ?line_count + 1.
end.  (* read_file *)

end.  (* display_Routine *)
```

```
(* PPPRINT.KB is used to print all sections of the Project Plan.           *)

no_edit_key ().
no_debug ().

choice = ' '.
eof = number_to_char (26).
curdir is read_line ('CURDIR.DAT').
curdir is string_replace(?curdir,' ','',8).
blankline = '     '.
line_count = 0.
page_count = 0.

do (Print_Routine).

new_kb ('PPNASAM.HKB').

topic 'Print_Routine'.



sections = ['1.0 INTRODUCTION',
            '2.0 OBJECTIVE',
            '3.0 SCIENCE REQUIREMENTS',
            '4.0 TECHNICAL PLAN',
            '5.0 IMPLEMENTATION PLAN',
            '6.0 MANAGEMENT PLAN',
            '7.0 SCHEDULE',
            '8.0 COST CONTROL PLAN',
            '9.0 PROJECT REVIEWS AND MEETINGS',
            'PRINT ENTIRE DOCUMENT',
            'QUIT'].

window ('Print Project Plan',white,blue,white,3,3,78,18).
while ?choice <> QUIT
    then do (print_sections).
    close_window ().
    close_all ().

topic 'print_sections'.
pplan_page = [].
ask ('#e

        Which section do you wish to print?',choice,?sections).

if ?choice = '1.0 INTRODUCTION'
  then
  window (,white,red,yellow,1,16,27,4)
  and
  write ('con:','PRINT IN PROGRESS...')
  and
  do ('1.0 INTRODUCTION')
  and
  if line_count > 2
  then do (page_advance).
  close_window ().

if ?choice = '2.0 OBJECTIVE'
  then
  window (,white,red,yellow,1,16,27,4)
```

```
  and
  write ('con:','PRINT IN PROGRESS...')
  and
  do ('2.0 OBJECTIVE')
  and
  if line_count >2
  then do (page_advance).
  close_window ().

if ?choice = '3.0 SCIENCE REQUIREMENTS'
 then
 window (,white,red,yellow,1,16,27,4)
 and
 write ('con:','PRINT IN PROGRESS...')
 and
 do ('3.0 SCIENCE REQUIREMENTS')
 and
 if line_count > 2
 then do (page_advance).
 close_window ().

if ?choice = '4.0 TECHNICAL PLAN'
  then
  window (,white,red,yellow,1,16,27,4)
  and
  write ('con:','PRINT IN PROGRESS...')
  and
  do ('4.0 TECHNICAL PLAN')
  and
  if line_count > 2
  then do (page_advance).
  close_window ().

if ?choice = '5.0 IMPLEMENTATION PLAN'
  then
  window (,white,red,yellow,1,16,27,4)
  and
  write ('con:','PRINT IN PROGRESS...')
  and
  do ('5.0 IMPLEMENTATION PLAN')
  and
  if line_count > 2
  then
  do (page_advance).
  close_window ().

if ?choice = '6.0 MANAGEMENT PLAN'
  then
  window (,white,red,yellow,1,16,27,4)
  and
  write ('con:','PRINT IN PROGRESS...')
  and
  do ('6.0 MANAGEMENT PLAN')
  and
  if line_count > 2
  then
  do (page_advance).
  close_window ().

if ?choice = '7.0 SCHEDULE'
```

```
  then

  window (,white,red,yellow,1,16,27,4)
  and
  write ('con:','PRINT IN PROGRESS...')
  and
  do ('7.0 SCHEDULE')
  and
  if line_count > 2
  then
  do (page_advance).
  close_window ().

if ?choice = '8.0 COST CONTROL PLAN'
  then
  window (,white,red,yellow,1,16,27,4)
  and
  write ('con:','PRINT IN PROGRESS...')
  and
  do ('8.0 COST CONTROL PLAN')
  and
  if line_count > 2
  then
  do (page_advance).
  close_window ().

if ?choice = '9.0 PROJECT REVIEWS AND MEETINGS'
  then
  window (,white,red,yellow,1,16,27,4)
  and
  write ('con:','PRINT IN PROGRESS...')
  and
  do ('9.0 PROJECT REVIEWS AND MEETINGS')
  and
  if line_count > 2
  then
  do (page_advance).
  close_window ().


If ?choice = 'PRINT ENTIRE DOCUMENT'
then
  load ('pptitle.hkb')
  and
  do ('print_title_page')
  and
  remove_topic ('print_title_page')
  and
  page_count = 0
  and
  window (,white,red,yellow,1,16,27,4)
  and
  write ('con:','PRINT IN PROGRESS...')
  and
  do ('1.0 INTRODUCTION')
  and
  do ('2.0 OBJECTIVE')
  and
  do ('3.0 SCIENCE REQUIREMENTS')
  and
```

```
do ('4.0 TECHNICAL PLAN')
and
do ('5.0 IMPLEMENTATION PLAN')
and
do ('6.0 MANAGEMENT PLAN')
and
do ('7.0 SCHEDULE')
and
do ('8.0 COST CONTROL PLAN')
and
do ('9.0 PROJECT REVIEWS AND MEETINGS')
and
print (#p,' ').

if ?choice = 'QUIT'
 then new_kb ('PPNASAM.HKB').

close_window ().

end. (* print_sections *)

topic '1.0 INTRODUCTION'.
  pplan_page gets ?blankline.
  pplan_page gets ?blankline.
  filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_1.DAT').
  line is read_line (?filename).
  pplan_page gets '   1.0 INTRODUCTION'.
  pplan_page gets ?blankline.
  line_count = 4.
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  pplan_page gets ?blankline.
  line_count = ?line_count + 1.
  if ?line_count > 52
    then do (page_advance).
 end. (* INTRODUCTION *)

topic '2.0 OBJECTIVE'.
  pplan_page gets ?blankline.
  pplan_page gets ?blankline.
  pplan_page gets '   2.0 OBJECTIVE'.
  pplan_page gets ?blankline.
  line_count = ?line_count + 4.
  filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_2.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  pplan_page gets ?blankline.
  line_count = ?line_count + 1.
  if ?line_count > 52
    then do (page_advance).

end. (* OBJECTIVE *)

topic '3.0 SCIENCE REQUIREMENTS'.
  pplan_page gets ?blankline.
  pplan_page gets ?blankline.
  pplan_page gets '   3.0 SCIENCE REQUIREMENTS'.
```

```
  pplan_page gets ?blankline.
  line_count = ?line_count + 4.
  filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_3.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  pplan_page gets ?blankline.
  line_count = ?line_count + 1.
  if ?line_count > 52
    then do (page_advance).

end. (* SCIENCE REQUIREMENTS *)


topic '4.0 TECHNICAL PLAN'.
  pplan_page gets ?blankline.
  pplan_page gets ?blankline.
  pplan_page gets '   4.0  TECHNICAL PLAN'.
  pplan_page gets ?blankline.
  pplan_page gets '       4.1  Experiment Hardware Description'.
  pplan_page gets ?blankline.
  line_count = ?line_count + 6.
  filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_4_1.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  pplan_page gets ?blankline.
  line_count = ?line_count + 1.
  if ?line_count > 52
    then do (page_advance).

  pplan_page gets '       4.2  Payload Classification'.
  pplan_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_4_2.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  pplan_page gets ?blankline.
  line_count = ?line_count + 1.
  if ?line_count > 52
    then do (page_advance).

  pplan_page gets '       4.3  Development Approach'.
  pplan_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_4_3.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  pplan_page gets ?blankline.
  line_count = ?line_count + 1.
  if ?line_count > 52
    then do (page_advance).

  pplan_page gets '       4.4  Technology Plan'.
```

```
pplan_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_4_4.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
pplan_page gets ?blankline.
if ?line_count > 52
  then do (page_advance).

pplan_page gets '       4.5  Logistics'.
pplan_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_4_5.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
pplan_page gets ?blankline.
if ?line_count > 52
  then do (page_advance).

pplan_page gets '       4.6  Mission Operations, Training and Data Management
pplan_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_4_6.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
pplan_page gets ?blankline.
if ?line_count > 52
  then do (page_advance).

pplan_page gets '       4.7  Analysis of Mission Results'.
pplan_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_4_7.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
pplan_page gets ?blankline.
if ?line_count > 52
  then do (page_advance).

pplan_page gets '       4.8  Facilities'.
pplan_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_4_8.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
```

```
  pplan_page gets ?blankline.
  if ?line_count > 52
    then do (page_advance).


  pplan_page gets '        4.9  Safety'.
  pplan_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_4_9.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
  pplan_page gets ?blankline.
  if ?line_count > 52
    then do (page_advance).

end. (* TECHNICAL PLAN *)

topic '5.0 IMPLEMENTATION PLAN'.
  pplan_page gets ?blankline.
  pplan_page gets ?blankline.
  pplan_page gets '    5.0 IMPLEMENTATION PLAN'.
  pplan_page gets ?blankline.
  pplan_page gets '        5.1  Implementation Approach'.
  pplan_page gets ?blankline.
  line_count = ?line_count + 6.
  filename = concat (C:\GARDEN\,?CURDIR,'\PPE4_5_1.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  pplan_page gets ?blankline.
  line_count = ?line_count + 1.
  if ?line_count > 52
    then do (page_advance).

  pplan_page gets '        5.2  Summary Work Breakdown Structure'.
  pplan_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_5_2.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
  pplan_page gets ?blankline.
  if ?line_count > 52
    then do (page_advance).

  pplan_page gets '        5.3  Documentation'.
  pplan_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_5_3.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
```

```
  pplan_page gets ?blankline.
  if ?line_count > 52
    then do (page_advance).

end. (* IMPLEMENTATIN PLAN *)


topic '6.0 MANAGEMENT PLAN'.
  pplan_page gets ?blankline.
  pplan_page gets ?blankline.
  pplan_page gets '   6.0 MANAGEMENT PLAN'.
  pplan_page gets ?blankline.
  pplan_page gets '       6.1  Project Management Responsibilities and Organizat
  pplan_page gets ?blankline.
  line_count = ?line_count + 6.
  filename = concat (C:\GARDEN\,?CURDIR,'\PPE4_6_1.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  pplan_page gets ?blankline.
  line_count = ?line_count + 1.
  if ?line_count > 52
    then do (page_advance).

  pplan_page gets '       6.2  Mission Management Resopnsibilities and Organizat
  pplan_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_6_2.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
  pplan_page gets ?blankline.
  if ?line_count > 52
    then do (page_advance).

end. (* MANAGEMENT PLAN *)


topic '7.0 SCHEDULE'.
  pplan_page gets ?blankline.
  pplan_page gets ?blankline.
  pplan_page gets '   7.0 SCHEDULE'.
  pplan_page gets ?blankline.
  line_count = ?line_count + 4.
  filename = concat (C:\GARDEN\,?CURDIR,'\PPE4_7.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  pplan_page gets ?blankline.
  line_count = ?line_count + 1.
  if ?line_count > 52
    then do (page_advance).

end. (* SCHEDULE *)
```

```
topic '8.0 COST CONTROL PLAN'.
  pplan_page gets ?blankline.
  pplan_page gets ?blankline.
  pplan_page gets '   8.0 COST CONTROL PLAN'.
  pplan_page gets ?blankline.
  pplan_page gets '       8.1  Resources'.
  pplan_page gets ?blankline.
  line_count = ?line_count + 6.
  filename = concat (C:\GARDEN\,?CURDIR,'\PPE4_8_1.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  pplan_page gets ?blankline.
  line_count = ?line_count + 1.
  if ?line_count > 52
    then do (page_advance).

  pplan_page gets '       8.2  Cost Control Guidelines'.
  pplan_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_8_2.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
  pplan_page gets ?blankline.
  if ?line_count > 52
    then do (page_advance).

  pplan_page gets '       8.3  Cost Reporting and Control Structure'.
  pplan_page gets ?blankline.
  pplan_page gets '       8.3.1  Nasa Reports'.
  pplan_page gets ?blankline.
  line_count = ?line_count + 4.
  filename = concat(C:\GARDEN\,?CURDIR,'\E4_8_3_1.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
  pplan_page gets ?blankline.
  if ?line_count > 52
    then do (page_advance).

  pplan_page gets '       8.3.2  Contractor Reports'.
  pplan_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\E4_8_3_2.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
  pplan_page gets ?blankline.
  if ?line_count > 52
    then do (page_advance).

  pplan_page gets '       8.4  Cost Control Strategy'.
```

```
   pplan_page gets ?blankline.
   line_count = ?line_count + 2.
   filename = concat(C:\GARDEN\,?CURDIR,'\PPE4_8_4.DAT').
   line is read_line (?filename).
   while ?line <> ?eof
     then do (read_file).
   close (?filename).
   line_count = ?line_count + 1.
   pplan_page gets ?blankline.
   if ?line_count > 52
     then do (page_advance).

end. (* COST CONTROL PLAN *)

topic '9.0 PROJECT REVIEWS AND MEETINGS'.
  pplan_page gets ?blankline.
  pplan_page gets ?blankline.
  pplan_page gets '    9.0 PROJECT REVIEWS AND MEETINGS'.
  pplan_page gets ?blankline.
  pplan_page gets '        9.1  Management Reviews'.
  pplan_page gets ?blankline.
  pplan_page gets '        9.1.1  Internal Reviews'.
  pplan_page gets ?blankline.
  line_count = ?line_count + 8.
  filename = concat(C:\GARDEN\,?CURDIR,'\E4_9_1_1.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  pplan_page gets ?blankline.
  line_count = ?line_count + 1.
  if ?line_count > 52
    then do (page_advance).

  pplan_page gets '        9.1.2  External Reviews'.
  pplan_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\E4_9_1_2.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
  pplan_page gets ?blankline.
  if ?line_count > 52
    then do (page_advance).


  pplan_page gets '        9.1.3  Design and Rediness Reviews'.
  pplan_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\E4_9_1_3.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
  pplan_page gets ?blankline.
  do (page_advance).
```

```
end. (* PROJECT REVIEWS AND MEETINGS *)

end.  (* Print_PPLAN *)

topic 'page_advance'.
  page_count = ?page_count + 1.
  page_line = concat('                                        ',?page_count).
  while ?line_count < 58
    then
      pplan_page gets ?blankline
      and
      line_count = ?line_count + 1.
  if ?choice = 'PRINT ENTIRE DOCUMENT'
  then
  pplan_page gets ?page_line.
  print (#p,?pplan_page).
  pplan_page = [].
  pplan_page gets ?blankline.
  pplan_page gets ?blankline.
  line_count = 2.
  collect ().
end.  (* page_advance *)

topic 'read_file'.
  if ?line_count > 56
    then do (page_advance).
  line = concat('       ',?line).
  pplan_page gets ?line.
  line is read_line (?filename).
  line_count = ?line_count + 1.
end.  (* read_file *)

end.  (* Print_Routine *)
```

```
(* PPTITLE.KB prints the Title Page for the Project Plan *)

(* no_edit_key (). *)
(* no_debug (). *)

topic 'print_title_page'.
  no_edit_key ().
  filler = '                                                          '.
  eof = number_to_char (26).
  blankline = '                                                      '.

  expname is read(concat(C:\GARDEN\,?CURDIR,'\TITLE.DAT')).

  expname is string_replace(?expname,'    ','',600).
  expname is remove(?expname,'').
  lines = list_length(?expname).
  line_count = 1.
  title_length = 0.

  window (,white,red,yellow,1,16,27,4).
  write ('con:','REPORT BEING PRINTED...').

  while ?line_count <= ?lines
    then
      cur_line = element(?expname,?line_count)
      and
      cur_lngth = string_length(?cur_line)
      and
      line_count = ?line_count + 1
      and
      title_length = ?title_length + ?cur_lngth + 1
      and
      if ?cur_line = ''
        then
          expname = string_replace(?expname,?cur_line).
 expname = concat(element(?expname,1),'~',
                  element(?expname,2),'~',
                  element(?expname,3),'~',
                  element(?expname,4),'~',
                  element(?expname,5),'~',
                  element(?expname,6),'~',
                  element(?expname,7),'~',
                  element(?expname,8),'~',
                  element(?expname,9),'~',
                  element(?expname,10),'~',
                  element(?expname,11),'~',
                  element(?expname,12),'~',
                  element(?expname,13),'~',
                  element(?expname,14),'~',
                  element(?expname,15)).

title_length = ?title_length + 3.
counter = 1.
write_counter = 1.
line_one = ' '.
while ?counter < ?title_length
  then
    char = string_copy(?expname,?counter,1)
    and
    counter = ?counter + 1
```

```
    and
    write_counter = ?write_counter + 1
    and
    if ?write_counter > 40 and ?char = ' '
      then
        linelgth = string_length(?line_one)
        and
        linelgth = 80 - ?linelgth
        and
        linelgth = ?linelgth / 2
        and
        linefiller = string_copy (?blankline,1,?linelgth)
        and
        line_one = concat(?linefiller,?line_one,'#n',?char)
        and
        write_counter = 1
        and
        new_expname gets ?line_one
        and
        line_one = ''
      else
        line_one = concat(?line_one,?char).

linelgth = string_length(?line_one).
linelgth = 80 - ?linelgth.
linelgth = ?linelgth / 2.
linefiller = string_copy (?blankline,1,?linelgth).
line_one = concat(?linefiller,?line_one,'#n').

new_expname gets ?line_one.
new_expname = string_replace(?new_expname,'~',' ',600).

authorfile = concat(C:\GARDEN\,?CURDIR,'\AUTHOR.DAT').

titlepage = ('#n#n#n#n#n#n#n#n#n#n#n#n#n').
titlepage gets '                                   Project Plan'.
titlepage gets '                                       for:'.
titlepage gets ' '.
titlepage gets ?new_expname.
titlepage gets '#n#n'.
pagedate = ?date.
mo_num = element(?pagedate,1).
if ?mo_num = 1
  then month = January
  else
  if ?mo_num = 2
  then month = February
  else
  if ?mo_num = 3
  then month = March
  else
  if ?mo_num = 4
  then month = April
  else
  if ?mo_num = 5
  then month = May
  else
  if ?mo_num = 6
  then month = June
  else
```

```
    if ?mo_num = 7
    then month = July
    else
    if ?mo_num = 8
    then month = August
    else
    if ?mo_num = 9
    then month = September
    else
    if ?mo_num = 10
    then month = October
    else
    if ?mo_num = 11
    then month = November
    else
    if ?mo_num = 12
    then month = December
    else
    month = ' '.
  year = element(?pagedate,3).
  reportdate = concat(?month,' ',?year).

  datelgth = string_length(?reportdate).
  datelgth = 80 - ?datelgth.
  datelgth = ?datelgth / 2.
  datefiller = string_copy (?blankline,1,?datelgth).
  titlepage gets ' '.
  titlepage gets ' '.
  titlepage gets concat(?datefiller,?reportdate).

  basefile = concat('C:\GARDEN\',?CURDIR,'\BASELINE.DAT').
  baseline = read(?basefile).
  if ?baseline = ?eof
    then
      baseline = 'N/A'.

datelgth = string_length(?baseline).
datelgth = 80 -  ?datelgth.
datelgth = ?datelgth / 2.
datefiller = string_copy (?blaknline,1,?datelgth).
titlepage gets ' '.
titlepage gets '                                            Baselined: '.
titlepage gets concat(?datefiller,?baseline).

  name is read_line (?authorfile).
  name is string_replace(?name,'NAME:                  ','',1).
  name is string_replace(?name,'   ','',8).
  namelgth = string_length(?name).
  namelgth = 80 - ?namelgth.
  namelgth = ?namelgth / 2.
  namefiller = string_copy (?blankline,1,?namelgth).
  titlepage gets concat('#n#n#n#n#n#n#n#n#n#n#n#n',?namefiller,?name).

  organization is read_line (?authorfile).
  organization is string_replace(?organization,'ORGANIZATION:      ','',1).
  organization is string_replace(?organization,'   ','',8).
  organizationlgth = string_length(?organization).
  organizationlgth = 80 - ?organizationlgth.
  organizationlgth = ?organizationlgth / 2.
  organizationfiller = string_copy (?blankline,1,?organizationlgth).
```

```
  titlepage gets concat(?organizationfiller,?organization).

  mcode is read_line (?authorfile).
  mcode is string_replace(?mcode,'MAIL CODE:         ','',1).
  mcode is string_replace(?mcode,'    ','',8).
  mcodelgth = string_length(?mcode).
  mcodelgth = 80 - ?mcodelgth.
  mcodelgth = ?mcodelgth / 2.
  mcodefiller = string_copy (?blankline,1,?mcodelgth).
  titlepage gets concat(?mcodefiller,?mcode).

  street is read_line (?authorfile).
  street is string_replace(?street,'STREET:             ','',1).
  street is string_replace(?street,'    ','',8).
  streetlgth = string_length(?street).
  streetlgth = 80 - ?streetlgth.
  streetlgth = ?streetlgth / 2.
  streetfiller = string_copy (?blankline,1,?streetlgth).
  titlepage gets concat(?streetfiller,?street).

  city is read_line (?authorfile).
  city is string_replace(?city,'CITY, STATE, ZIP: ','',1).
  city is string_replace(?city,'    ',' ',8).
  city is string_replace(?city,'   ',' ',8).
  citylgth = string_length(?city).
  citylgth = 80 - ?citylgth.
  citylgth = ?citylgth / 2.
  cityfiller = string_copy (?blankline,1,?citylgth).
  titlepage gets concat(?cityfiller,?city).

  phone is read_line (?authorfile).
  phone is string_replace(?phone,'PHONE:              ','',1).
  phone is string_replace(?phone,'    ','',8).
  phonelgth = string_length(?phone).
  phonelgth = 80 - ?phonelgth.
  phonelgth = ?phonelgth / 2.
  phonefiller = string_copy (?blankline,1,?phonelgth).
  titlepage gets concat(?phonefiller,?phone).

  print (#p,?titlepage,#p).
  close_window ().
end.  (* print_title_page *)
```

```
(*PPFILLM.KB      This is the menu provided to the user to          *)
(*                  determine what he/she is to do on a              *)
(*                               project.                            *)


no_edit_key ().
no_debug ().
fdaction = '  '.

curdir is read_line ('CURDIR.DAT').
curdir is string_replace (?curdir,' ','',8).

while ?fdaction <> 'Exit System'
  then do (filldoc).

topic 'filldoc'.

fdchoices = ['Enter Project Initialization Information',
             'Complete Project Plan',
             'Return to Previous Menu',
             'Return to Main Menu',
             'Exit System'].

window (,white,red,yellow,5,5,75,16).
  set_number_of_values (fdaction,1).

  ask (['#e #s
    Please select the activity you wish to perform on #n
     the',?curdir,'#dproject.'],fdaction,?fdchoices).

close_window ().

if ?fdaction = 'Enter Project Initialization Information'
  then new_kb ('Pinitial.hkb').

if ?fdaction = 'Complete Project Plan'
  then new_kb ('ppquest2.hkb').

if ?fdaction = 'Return to Main Menu'
  then new_kb ('nasaplan.ckb').

if ?fdaction = 'Return to Previous Menu'
  then new_kb ('ppnasam.hkb').

if ?fdaction = 'Exit System'
  then exit ().
```

```
(*PINITIAL.KB        This program is used to allow the user            *)
(*                 to enter standard project initialization          *)
(*                 information, i.e. name, address, title, etc.      *)

no_edit_key ().
no_debug ().
curdir is read_line ('CURDIR.DAT').
curdir = string_replace(?curdir,' ','',8).

eof = number_to_char (26).
yn is [YES,NO].
chgwant = '  '.

do (personal_info).
new_kb ('PPFILLM.hkb').

topic 'personal_info'.

  blankline = '.'.
  close_window ().
  oldtext is read (concat (C:\GARDEN\,?CURDIR,'\AUTHOR.DAT')).
  if ?oldtext = ?eof
    then do (new_personal)
  else
    chgwant = '    '
    and
    while ?chgwant <> QUIT
      then do (edit_personal).

 (* ================= get new personal information ======================*)

 topic 'new_personal'.
  WRITE ('con:','#eIn the window below, please provide some general information
  about yourself and your experiment.                                        ').

  window (,white,red,yellow,5,5,75,16).

  read_response ('#e
     #fyellow Please enter your first and last names, i.e. Dr. John Doe.#d
                                                              #n ',name,?
                                                              blankline).

  name = concat ('NAME:                     ',?name).
  personal gets ?name.

  read_response ('#e
     #fyellow Please enter the name of your organization.#d
                                                      #n  ',organization,
                                                      ?blankline).

  organization = concat ('ORGANIZATION:     ',?organization).
  personal gets ?organization.

  read_response ('#e
     #fyellow Please enter the mail code, P.O Box, room number, or other needed
     address information of your organization.#d
                                                  #n',mail_code,?blankline).

  mail_code = concat ('MAIL CODE:          ',?mail_code).
  personal gets ?mail_code.
```

```
read_response ('#e
   #fyellow Please enter the street address of your organization.#d
                                                   #n',street,
                                                   ?blankline).

street = concat ('STREET:            ',?street).
personal gets ?street.

read_response ('#e
   #fyellow Please enter the city, state, and zip code of your organization.
   #d
                                              #n',city_st_zip,
                                                 ?blankline).

city_st_zip = concat ('CITY, STATE, ZIP: ',?city_st_zip).
city_st_zip = string_replace (?city_st_zip,'  ',' ',8).
personal gets city_st_zip.

read_response ('#e
   #fyellow Please enter your phone number.#d

                                                   #n',phone,
phone = concat ('PHONE:            ',?phone).          ?blankline).
personal gets ?phone.

say ('#e

  Please enter the title of your experiment.

  Press the #fyellow RETURN KEY#d to enter the editor,
  #fyellow ESC#d to leave the editor, and #fyellow RETURN#d to confirm save.

edit_file (concat (C:\GARDEN\,?CURDIR,'\TITLE.DAT'),yellow,black,red,9,11,70

author_info is [?name,#n,?organization,#n,?mail_code,#n,?street,#n,
?city_st_zip,#n,?phone,#n].
new_file (concat (C:\GARDEN\,?CURDIR,'\AUTHOR.DAT')).
write    (concat (C:\GARDEN\,?CURDIR,'\AUTHOR.DAT'),?author_info,#n).
close    (concat (C:\GARDEN\,?CURDIR,'\AUTHOR.DAT')).

if ?chgwant <> QUIT
  then
    ask
  ([?author_info, '#n #fyellow
  The information listed has been written to a file.
  Do you wish to change any of these entries?#d'],
  change_again,?yn,60,16)
    and
    if ?change_again = YES
      then
        oldtext is read (concat (C:\GARDEN\,?CURDIR,'\AUTHOR.DAT'))
        and
        change_again = NO
        and
        chgwant = '    '
        and
        while ?chgwant <> QUIT
          then
            do (edit_personal).

close_window ().
```

```
WRITE ('con:','#e      ').
end. (* new_personal *)

(* =============== get corrected personal information ===================*)

topic 'edit_personal'.

  change_info is [NAME,ORGANIZATION,'MAIL CODE',STREET,'CITY STATE ZIP',
  PHONE,TITLE,QUIT].

  ask ('Which entry in the below list do you wish to change?',chgwant,
    ?change_info).

  if ?chgwant = NAME
    then
      old_name = element(?oldtext,1)
      and
      old_value = string_replace (?old_name,'NAME:                    ','',1)
      and
      read_response (['#e
   #fyellow Your original entry for name was#s', ?old_value, '.#d #s #n#n
   Please enter the corrected name in its entirety.#n #o'],new_name,?old_value)


   if ?chgwant = NAME
     then
       new_name = concat ('NAME:                    ',?new_name)
       and
       oldtext is replace(?oldtext,?old_name,?new_name).


   if ?chgwant = ORGANIZATION
     then
       old_org = element(?oldtext,2)
       and
       old_value = string_replace (?old_org,'ORGANIZATION:      ','',1)
       and
       read_response (['#e
  #fyellow Your original entry for organization was#s #n', ?old_value,
 '.#d #s #n#n
  Please enter the corrected organization in its entirety.#n'],new_org,?old_valu

   if ?chgwant = ORGANIZATION
     then
       new_org = concat ('ORGANIZATION:      ',?new_org)
       and
       oldtext is replace(?oldtext,?old_org,?new_org).

   if ?chgwant = 'MAIL CODE'
     then
       old_mc = element(?oldtext,3)
       and
       old_value = string_replace (?old_mc,'MAIL CODE:         ','',1)
       and
       read_response (['#e
  #fyellow Your original entry for mail code was#s #n', ?
  old_value, '.#d #s #n#n
  Please enter the corrected mail code in its entirety.#n'],new_mc,?old_value).
```

```
if ?chgwant = 'MAIL CODE'
  then
    new_mc = concat ('MAIL CODE:         ',?new_mc)
    and
    oldtext is replace(?oldtext,?old_mc,?new_mc).

if ?chgwant = STREET
  then
    old_street = element(?oldtext,4)
    and
    old_value = string_replace (?old_street,'STREET:              ','',1)
    and
    read_response (['#e
#fyellow Your original entry for street was#s #n', ?
old_value,'.#d #s #n#n
Please enter the corrected street address in its entirety.#n'],new_street,
?old_value).

if ?chgwant = STREET
  then
    new_street = concat ('STREET:           ',?new_street)
    and
    oldtext is replace(?oldtext,?old_street,?new_street).

if ?chgwant = 'CITY STATE ZIP'
  then
  old_city = element(?oldtext,5)
  and
  old_value = string_replace (?old_city,'CITY, STATE, ZIP: ','',1)
  and
  read_response (['#e #fyellow Your original entry for city, state and zip was;
  old_value,'.#d #s #n#n
Please enter the corrected city, state, and zip address in its entirety.#n'],
new_city,?old_value).

if ?chgwant = 'CITY STATE ZIP'
  then
  new_city = concat ('CITY, STATE, ZIP: ',?new_city)
  and
  new_city = string_replace (?new_city,'    ',' ',8)
  and
  oldtext is replace(?oldtext,?old_city,?new_city).


if ?chgwant = PHONE
  then
  old_phone = element(?oldtext,6)
  and
  old_value = string_replace (?old_phone,'PHONE:              ','',1)
  and
  read_response (['#e #fyellow Your original entry for phone was#s #n', ?
  old_value,'.#d #s #n#n
Please enter the corrected phone number in its entirety.#n'],
new_phone,?old_value).

if ?chgwant = PHONE
  then
  new_phone = concat ('PHONE:           ',?new_phone)
  and
  oldtext is replace(?oldtext,?old_phone,?new_phone).
```

```
if ?chgwant = 'TITLE'
  then
  say ('#e

    Please enter the corrected title of your experiment.

    Press the #fyellow RETURN KEY#d to enter the editor,
    #fyellow ESC#d to leave the editor, and #fyellow RETURN#d to confirm save.')
  and
    edit_file (concat (C:\GARDEN\,?CURDIR,'\TITLE.DAT'),yellow,black,red,5,9,70,


 if ?chgwant = QUIT
   then
      new_file     (concat (C:\GARDEN\,?CURDIR,'\AUTHOR.DAT'))
     and
      write        (concat (C:\GARDEN\,?CURDIR,'\AUTHOR.DAT'),?oldtext,#n)
     and
      close        (concat (C:\GARDEN\,?CURDIR,'\AUTHOR.DAT')).

 if ?chgwant = QUIT
   then
   say
  ([?oldtext,'#fyellow      The information listed has been written to a file.
              Please press #flightgreen SPACE#d #fyellow to continue.
                                       ']).

 end. (* edit_personal *)


 end. (* personal_info *)
 (* =================== end personal information =======================*)
```

```
(* PPQUEST2.KB *)
(* These are the question to be asked for the completion of the Project *)
(* Plan.                                                                 *)
column = 2.
row = 2.
no_edit_key ().
no_debug ().
curdir is read_line ('CURDIR.DAT').
curdir = string_replace(?curdir,' ','',8).

menu_choice = ' '.
menu_option is ['1.0 General','2.0 Preparation and Approval',
'3.0 Changes','4.0 Content','Return to Previous Menu'].
while menu_choice <> 'Return to Previous Menu'
  then
   do (outline).


topic 'outline'.
column = ?column +  1.
row = ?row + 1.
window ('Complete Project Plan',white,blue,white,?row,?column,76,17).
ask ('#e

      Which section do you wish to address?',menu_choice,?menu_option).

if ?menu_choice = '1.0 General'
  then do ('1.0 General').

if ?menu_choice = '2.0 Preparation and Approval'
  then do ('2.0 Preparation and Approval').

if ?menu_choice = '3.0 Changes'
  then do ('3.0 Changes').

if ?menu_choice = '4.0 Content'
  then do ('4.0 Content').

if ?menu_choice = 'Return to Previous Menu'
  then new_kb ('ppfillm.hkb').

column = ?column - 1.
row = ?row - 1.
close_window ().

end. (* outline *)

DO (OUTLINE).

(*====================== THREADED TOPICS  ==============================*)

topic '1.0 General'.
window ('1.0  General',white,red,yellow,?column,?row,76,17).
say (['#e


        The Microgravity Science and Applications Division
     (MSAD) requires that a MSAD Project Plan be submitted and
     approved prior to making a major commitment of resources
     to an MSAD project. MSAD Project Plans are to be prepared
```

```
       in final draft form for the Requirements Definition Review
       #40RDR#41.


                           Press #fyellow SPACE#d to continue']).

end. (* General *)


topic '2.0 Preparation and Approval'.
window ('2.0  Preparation and Approval',white,red,yellow,?column,?row,76,17).
say ('#e

          Plans will be prepared and submitted for all flight
     experiments.  Project plans will be reissued, modified, or
     amended for reflights depending on the complexity of the task.
     A plan#39s preparation is the responsibility of the designated
     Project Manager at the responsible NASA center.  The Project
     Manager will sign the MSAD Project Plan as the preparer; the
     Project Scientist and the Principal Investigator will sign as
     concurring.  The MSAD Project Plan will be signed off at the
     NASA center prior to submission to Headquarters by the appro-
     priate center#39s authorities. When the Program Scientist and
     Program Manager sign to register their concurrence, the MSAD
     Projet Plan will be submitted to the MSAD Director for approval.


                           Press #fyellow SPACE#d to continue').

close_window ().
end. (*Preparation and Approval *)

topic '3.0 Changes'.
window ('3.0  Changes',white,red,yellow,?column,?row,76,17).
say (['#e


          The Project Manager is responsible for updating a MSAD
     Project Plan when significant changes occur (such as changes
     in scope, organization, or roles and responsibilities).  This
     does not apply to resources, schedules or manpower, which
     are updated through normal budgeting and project monitoring
     activities.  The Projet Manager will establish a change control
     process for maintaining the MSAD Project Plan and other project
     documentation.


                           Press #fyellow SPACE#d to continue']).

close_window ().
end. (* Changes *)


topic '4.0 Content'.
new_kb ('content.hkb').
end. (* content *)
```

```
topic 'Return to Previous Menu'.
new_kb ('ppfillm.hkb').
end.(* Return to Previous Menu *)
```

```
(*  DISPCONT.KB *)
(*  This file displays the Content Section of the Project Plan *)

column = 3.
row = 3.
no_edit_key ().
no_debug ().

do (Content).


topic 'Content'.
menu_choice2 = ' '.
menu_option2 is ['INTRODUCTION','OBJECTIVE','SCIENCE REQUIREMENTS',
'TECHNICAL PLAN','IMPLEMENTATION PLAN','MANAGEMENT PLAN','SCHEDULE',
'COST CONTROL PLAN','PROJECT REVIEWS AND MEETINGS','RETURN'].

while ?menu_choice2 <> 'RETURN'
then do (outline2).

topic 'outline2'.

window ('4.0  Content',white,blue,white,?column,?row,76,18).
ask('
          The following outline provides guidelines on the
        content, organization and format of the MSAD Project
        Plan.',
                  menu_choice2,?menu_option2).

if ?menu_choice2 = 'INTRODUCTION'
  then do ('Introduction').

if ?menu_choice2 = 'OBJECTIVE'
  then do ('Objective').

if ?menu_choice2 = 'SCIENCE REQUIREMENTS'
  then do ('Science Requirements').

if ?menu_choice2 = 'TECHNICAL PLAN'
  then new_kb ('disptech.hkb').

if ?menu_choice2 = 'IMPLEMENTATION PLAN'
  then new_kb ('dispimp.hkb').

if ?menu_choice2 = 'MANAGEMENT PLAN'
  then new_kb ('dispmgt.hkb').

if ?menu_choice2 = 'SCHEDULE'
  then do ('Schedule').

if ?menu_choice2 = 'COST CONTROL PLAN'
  then new_kb ('dispcost.hkb').

if ?menu_choice2 = 'PROJECT REVIEWS AND MEETINGS'
  then new_kb ('disprrev.hkb').

if ?menu_choice2 = 'RETURN'
  then new_kb ('ppout.hkb').
```

```
close_window ().
end. (* Content *)

topic 'Introduction'.
column = ?column + 1.
row  =  ?row + 1.
window ('4.1  Introduction',blue,white,white,?column,?row,73,15).
say (['


            Describe the relevance of the investigation and
      provide a summary rationale as to why a flight experi-
      ment is  required (limit to one page).



                        Press #fyellow SPACE#d to continue']).

close_window ().
column = ?column - 1.
row = ?row - 1.
end. (* introduction *)


topic 'Objective'.
column = ?column + 1.
row = ?row + 1.
window ('4.2  Objective',blue,white,white,?column,?row,75,17).
say (['


            Define the overall objectives of the flight experi-
      ment(s); if more than one flight is requested, indicate
      the specific objectives of each flight.




                        Press #fyellow SPACE#d to continue']).

close_window ().
column = ?column - 1.
row = ?row - 1.
end. (* Objective *)


topic 'Science Requirements'.
column = ?column + 1.
row = ?row + 1.
window ('4.3  Science Requirements',blue,white,white,?column,?row,75,17).
say (['
```

```
        Summarize the science requirements against which the
    hardware will be buiit and reference the applicable Science
    Requirements Document(s).




                         Press #fyellow SPACE#d to continue']).

close_window ().
column = ?column - 1.
row = ?row - 1.
end. (* Science Requirements *)

topic 'Schedule'.
column = ?column + 1.
row = ?row + 1.
window ('4.7  Schedule',blue,white,white,?column,?row,72,17).
say ('

            Provide an overall project master schedule that
        includes  the flow of hardware and software into the
        system integration and test activity.  Identify the
        Headquarters and mission management center controlled
        milestones.  To the extent possible, tie the schedule
        to the WBS and overlay the procurement and NASA budget
        cycles.  Provide a narrative describing the schedule
        and overall project flow.

                         Press #fyellow SPACE#d to continue').

close_window ().
column = ?column - 1.
row = ?row - 1.
end. (* Schedule *)
```

```
(* DISPTECH.KB *)
(* This files displays the Technical Plan section of Content *)

column = 3.
row = 3.

no_edit_key ().
no_debug ().

do ('Technical Plan').


topic 'Technical Plan'.
menu_choice3 = ' '.
menu_option3 is ['EXPERIMENT HARDWARE DESCRIPTION','PAYLOAD CLASSIFICATION',
'DEVELOPMENT APPROACH','TECHNOLOGY PLAN','LOGISTICS',
'MISSION OPERATIONS, TRAINING AND DATA MANAGEMENT',
'ANALYSIS OF MISSION RESULTS','FACILITIES','SAFETY',
'RETURN'].

While ?menu_choice3 <> 'RETURN'
 then do (outline3).


topic 'outline3'.
window ('4.4  Technical Plan',,,,?column,?row,77,18).
ask ('#e
            The outline for the Technical Plan includes the
            following sections:',menu_choice3,?menu_option3).

if ?menu_choice3 = 'EXPERIMENT HARDWARE DESCRIPTION'
  then do ('Experiment Hardware Description').

if ?menu_choice3 = 'PAYLOAD CLASSIFICATION'
  then do ('Payload Classification').

if ?menu_choice3 = 'DEVELOPMENT APPROACH'
  then do ('Development Approach').

if ?menu_choice3 = 'TECHNOLOGY PLAN'
  then do ('Technology Plan').

if ?menu_choice3 = 'LOGISTICS'
  then do ('Logistics').

if ?menu_choice3 = 'MISSION OPERATIONS, TRAINING AND DATA MANAGEMENT'
  then
    do ('Mission Operations, Training and Data Management').

if ?menu_choice3 = 'ANALYSIS OF MISSION RESULTS'
  then do ('Analysis of Mission Results').

if ?menu_choice3 = 'FACILITIES'
  then do ('Facilities').

if ?menu_choice3 = 'SAFETY'
  then do ('Safety').

if ?menu_choice3 =  'RETURN'
  then new_kb ('dispcont.hkb').
```

```
close_window ().
end. (* outline3 *)


topic 'Experiment Hardware Description'.
column = ?column + 1.
row = ?row + 1.
window ('4.1.1  Experiment Hardware Description',blue,white,white,?column,
?row,74,15).
say('


            Provide an overall description of the experiment
       hardware and relate the hardware to the science require-
       ments shown in section 4.3.  Relate differing hardware con-
       figurations or upgrades to the relevant objectives shown in
       section 42.




                         Press #fyellow SPACE#d to continue').

close_window ().
column = ?column -  1.
row = ?row - 1.
end. (* Experiment Hardware Description *)


topic 'Payload Classification'.
column = ?column + 1.
row = ?row + 1.
window ('4.4.2 Payload Classification',blue,white,white,?column,?row,72,15).
say ('




       State and show the rationale for the payload classification.





                         Press #fyellow SPACE#d to continue').

close_window ().
column = ?column - 1.
row = ?row - 1.
end. (* Payload Classification *)


topic 'Development Approach'.
column = ?column + 1.
row = ?row + 1.
window ('4.4.3 Development Approach',blue,white,white,?column,?row,72,15).
say ('
```

```
        Describe the overall development approach, indicat-
      ing plans for breadboard, engineering model, and/or proto-
      flight hardware development.  Identify  the numbers  of
      flight units and test  articles, and define the fidelity
      of simulators required.  Identify any support hardware
      required.  Define the spares philosophy and the quantity
      of spares required by the approach to be used.


                      Press #fyellow SPACE#d to continue').

close_window ().
column = ?column - 1.
row = ?row - 1.
end. (* Development Approach *)

topic 'Technology Plan'.
column = ?column + 1.
row = ?row + 1.
window ('4.4.4  Technology Plan',blue,white,white,?column,?row,72,15).
say (['

          Indicate what feasibility issues or proof-of-
        concept issues have been identified via ground-based
        testing during the defeinition phase of the project.
        These should have been identified at the Conceptual
        Design Review (CoDR) and closed by the RDR. It is not
        necessary to repeat the discussion of the breadboard
        program defined in section 4.4.3. If there was no tech-
        nology development requirement, this fact should be
        noted.

                      Press #fyellow SPACE#d to continue']).

close_window ().
column = ?column - 1.
row = ?row - 1.
end. (* Technology Plan *)

topic 'Logistics'.
column = ?column + 1.
row = ?row + 1.
window ('4.4.5  Logistics',blue,white,white,?column,?row,72,15).
say ('

        Identify where the major project functions, such as
      hardware build, different levels of integration, etc.,
      will take place and describe the special services, vehicles,
      systems, and major equipment necessary to satisfy the logistic
      requirements of the project.


                      Press #fyellow SPACE#d to continue').
```

```
close_window ().
column = ?column - 1.
row = ?row - 1.
end. (* Logistics *)

topic 'Mission Operations, Training and Data Management'.
column = ?column + 1.
row = ?row + 1.
window ('4.4.6  Missions Operations, Training and Data Management',
blue,white,white,?row,?column,72,15).
say ('
          Describe the operations approach, starting with a
      summary of the experiment operations sequence, and relate
      the crew involvement with the operations.  Identify  the
      location of the integration and operations activities
      and the organization supplying the support and define the
      level of support required.  Identify where and how opera-
      tions training will be performed and how data will be made
      available to the principal investigator for analysis. All
      assumptions should be clearly stated.

                        Press #fyellow SPACE#d to continue').

close_window ().
column = ?column - 1.
row = ?row - 1.
end. (* Mission Operations, Training and Data Management *)


topic 'Analysis of Mission Results'.
column = ?column + 1.
row = ?row + 1.
window ('4.4.7  Analysis of Mission Results',blue,white,white,?column,
?row,72,15).
say ('

          Describe procedures, associated efforts, and primary
      locations for the postmission analysis of data and other
      mission results.  Define experiment records to be developed
      and how they will be archived.




                        Press #fyellow SPACE#d to continue').

close_window ().
column = ?column - 1.
row = ?row - 1.
end. (* Analysis of Mission Results *)

topic 'Facilities'.
column = ?column + 1.
row = ?row + 1.
window ('4.4.8  Facilities',blue,white,white,?column,?row,72,15).
say (['

          Describe and outline major in-house and contractor
      facilities (existing, modified and new) for fabrication,
```

```
        test, checkout, launch, flight and mission operations, and
        data acquisition and analysis.



                    Press #fyellow SPACE#d to continue']).

close_window ().
Column = ?column - 1.
row = ?row - 1.
end. (* Facilities *)


topic 'Safety'.
column = ?column + 1.
row = ?row + 1.
window ('4.4.9  Safety',blue,white,white,?column,?row,72,15).
say ('

          Define the ground and mission safety requirements for the
          project.




                    Press #fyellow SPACE#d to continue').

close_window ().
column = ?column - 1.
row = ?row - 1.
end. (* Safety *)
```

```
(* DISPIMP.KB *)
(* THIS FILE DISPLAYS THE IMPLEMENTTATION PLAN SECTION OF THE PROJECT PLAN *)

column = 3.
row = 3.
no_edit_key ().
no_debug ().
menu_choice = ' '.
menu_option is ['IMPLEMENTATION APPROACH','SUMMARY WORK BREAKDOWN STRUCTURE',
'DOCUMENTATION','RETURN'].

while ?menu_choice <> 'RETURN'
 then do ('Implementation Plan').

topic 'Implementation Plan'.
window ('4.5  Implementation Plan',white,red,yellow,?column,?row,76,17).
ask ('
     Implementation Plan includes these three sections:',menu_choice,
     ?menu_option).

if ?menu_choice = 'IMPLEMENTATION APPROACH'
  then do ('Implementation Approach').

if ?menu_choice = 'SUMMARY WORK BREAKDOWN STRUCTURE'
  then do ('Summary Work Breakdown Structure').

if ?menu_choice = 'DOCUMENTATION'
  then do ('Documentation').

if ?menu_choice = 'RETURN'
  then new_kb ('dispcont.hkb').


close_window ().
end. (* Implementation Plan *)


topic 'Implementation Approach'.
column = ?column + 1.
row = ?row + 1.
window ('4.5.1  Implementation Approach',blue,white,white,?column,?row,71,
15).
say ('
            Indicate whether the project is an in-house activity
       or a contracted activity.  Define the principal entities on
       the project team, including the contractor team and its re-
       sponsibilities.  If the contractor team has not yet been se-
       lected, include a description  of the contractor procurement
       approach and schedule.



                         Press #fyellow SPACE#d to continue').

 close_window ().
 column = ?column - 1.
 row = ?row - 1.
 end. (* Implementation Approach *)
```

```
topic 'Summary Work Breakdown Structure'.
column = ?column + 1.
row = ?row + 1.
window ('4.5.2  Summary Work Breakdown Structure',blue,white,white,
?column,?row,71,15).
say (['

            Provide a summary Work Breakdown Structure (WBS)
        down to the "appropriate level" (as agreed to between the
        Project Manager, and the Program Manager) and a brief de-
        scription of each WBS element. The WBS structure should be
        related to line items on the project master schedule and
        to the resources section, and should serve as the baseline
        WBS to be used in future budget reporting.


                      Press #fyellow SPACE#d to continue']).

close_window ().
column = ?column - 1.
row = ?row - 1.
end. (* Summary Work Breakdown Structure *)


topic 'Documentation'.
column = ?column + 1.
row = ?row + 1.
window ('4.5.3  Documentation',blue,white,white,?column,?row,71,15).
say ('

            Provide a project documentation tree that includes
        all governing, hardware development, mission integration,
        and safety documentation.




                      Press #fyellow SPACE#d to continue').

close_window ().
column = ?column - 1.
row = ?row - 1.
end. (* Documentation *)
```

```
(* DISPMGT.KB *)
(* THIS FILES DISPLAYS THE MANAGEMENT PLAN SECTION OF THE PROJECT PLAN. *)

column = 3.
row = 3.
no_edit_key ().
no_debug ().

do ('Management Plan').

topic 'Management Plan'.

menu_choice = ' '.
menu_option is ['PROJECT MANAGEMENT RESPONSIBILITIES AND ORGANIZATION',
'MISSION MANAGEMENT RESPONSIBILITIES AND ORGANIZATION','RETURN'].

while ?menu_choice <>  'RETURN'
  then do (Outline).


topic 'Outline'.

window ('4.6  Management Plan',white,red,yellow,?column,?row,76,17).
ask ('
     Management Plan includes these two sections:',menu_choice,
     ?menu_option).

if ?menu_choice = 'PROJECT MANAGEMENT RESPONSIBILITIES AND ORGANIZATION'
  then do ('Project Management Responsibilities and Organization').

if ?menu_choice = 'MISSION MANAGEMENT RESPONSIBILITIES AND ORGANIZATION'
  then do ('Mission Management Responsibilities and Organization').

if ?menu_choice = 'RETURN'
  then new_kb ('dispcont.hkb').

close_window ().
end. (* outline *)
end. (* Management Plan *)


topic 'Project Management Responsibilities and Organization'.
column = ?column + 1.
row = ?row + 1.
window ('4.6.1  Project Management Responsibilities and Organization',blue,
white,white,?column,?row,71,15).
say (['

             Provide an organization chart of the project,
      including the Center Director, Project Manager, Principal
      Investigator, Project Scientist, and other key positions
      on the project, and all external project interfaces. Relate
      the organization chart to the WBS (section 5.2).


                         Press #fyellow SPACE#d to continue']).

close_window ().
column = ?column - 1.
```

```
row = ?row - 1.
end. (* Project Management Responsibilities and Organization *)


topic 'Mission Management Responsibilities and Organization'.
column = ?column + 1.
row = ?row + 1.
window ('4.6.2  Mission Management Responsibilities and Organization',blue,
white,white,?column,?row,71,15).
say ('
              Identify the NASA center responsible for mission
         management and describe what process is to be used to
         define the management and technical interface agreement
         between the NASA center responsible for the project and
         the Mission Management Center.  Indicate the mission
         management responsibilities and interfaces on the organ-
         ization chart prepared for section 6.1.  Identify all
         assumptions that will affect project plans, schedules
         and costs.

                     Press #fyellow SPACE#d to continue').

close_window ().
column = ?column - 1.
row = ?row - 1.
end. (* Mission Management, Responsibilities and Organization *)
```

```
(* DISPCOST.KB *)
(* THIS FILES DISPLAYS THE COST CONTROL SECTION OF THE PROJECT PLAN *)

column = 3.
row = 3.
no_edit_key ().
no_debug ().


do ('Cost Control Plan').

topic 'Cost Control Plan'.

menu_choice = ' '.
menu_options is ['RESOURCES','COST CONTROL GUIDELINES',
'COST REPORTING AND CONTROL STRUCTURE',
'COST CONTROL STRATEGY','RETURN'].

while ?menu_choice <> 'RETURN'
 then do (Outline).

topic 'Outline'.
window ('4.8  Cost Control Plan',white,red,yellow,?column,?row,76,17).
ask ('

      Cost Control includes these four sections:',menu_choice,
      ?menu_options).

if ?menu_choice = 'RESOURCES'
 then do ('resources').

if ?menu_choice = 'COST CONTROL GUIDELINES'
  then do ('Cost Control Guidelines').

if ?menu_choice = 'COST REPORTING AND CONTROL STRUCTURE'
  then new_kb ('costrep.hkb').

if ?menu_choice = 'COST CONTROL STRATEGY'
  then do ('Cost Control Strategy').

if ?menu_choice = 'RETURN'
  then new_kb ('dispcont.hkb').

close_window ().
end. (*  Outline *)
end. (* Cost Control Plan *)


topic 'Resources'.
column = ?column + 1.
row = ?row + 1.
window ('4.8.1   Resources',blue,white,white,?column,?row,71,15).
say(['
          Specify the funding (including contingency) and
      manpower requirements needed for the life of the pro-
      ject against the WBS.  These resource requirements should
      be consistent with results from the Independent Cost
      Review held in conjunction with the RDR.  Identify any
      assumptions made in determining the cost. Select the appro-
      priate WBS level to be the Cost Reporting level. Identify
```

```
        any use to be made of other facilities for which another
        entity (other than the project) will be financially respon-
        sible. (This should be consistent with facilily usage de-
        scribed in section 4.8.)

                        Press #fyellow SPACE#d to continue']).


close_window ().
column = ?column - 1.
row = ?row - 1.
end.(* Resoruces *)


topic 'Cost Control Guidelines'.
column = ?column + 1.
row = ?row + 1.
window ('4.8.2  Cost Control Guidelines',blue,white,white,?column,?row,
71,15).
say (['
            Define the cost control guidelines to be used in
        coping with cost variations at the different project
        levels.

            The following are examples of guidelines that may
        be used and are not intended to be universally applied.
        Each project can develop its own guidelines according
        to the individual project needs.

        a.  MSAD Allowance for Program Adjustment (APA) is to
            be utilized for changes in program scope imposed
            by external circumstances, such as change in launch
            date or launch vehicle and internal changes in the
            science requirements.

        b.   Project Office Contingency is to be utilized to
             fix internal problems for the Pi#39s or hardware
             contractor, such as design changes, parts procure-
             ment, alternate approaches, and change of subcon-
               tractors.

        c.   Contingency reserves at the lower WBS levels (if
             they exist) will be used to solve problems in those
             WBS elements. Only when problems cannot be solved
             within the WBS element are they to be referred to
             the next higher cost control point.

                        Press #fyellow SPACE#d to continue']).

close_window ().
column = ?column - 1.
row = ?row - 1.
end. (* Cost Control Gudielines *)


topic 'Cost Control Strategy'.
column = ?column + 1.
row = ?row + 1.
window ('4.8.4   Cost Control Strategy',blue,white,white,?column,?row,71,
```

```
15).
say ('

        This section should contain a discussion of courses
      of the event of cost growths. The entire hardware develop-
      ment process should be considered, including the test plans,
      support equipment, and facility requirements, etc., as well
      as the mainline flight hardware development.

        This discussion should include the prioritization of
      science requirements science and hardware development descope
      options, and appropriate decision points.  Program stretch-
      out options should also be addressed if appropriate. Obviously,
      this section should be developed with a high degree of partici-
      pation by the Principle investigator and Project and Program
      Scientists. Overall discussions on cost management, such as
      how to deal with overruns and underruns at the lower WBS and
      project levels, should also be included.

                        Press #fyellow SPACE#d to continue').

close_window ().
column = ?column - 1.
row = ?row - 1.
end. (* Cost Control Strategy *)
```

```
(* COSTREP.KB *)
(* THIS FILE DISPLAYS THE COST REPORTING AND CONTROL STRUCTURE SECTION *)
(* OF THE PROJECT PLAN *)

column = 3.
row = 3.
no_edit_key ().
no_debug ().

do ('Cost Reporting and Control Structure').


topic  'Cost Reporting and Control Structure'.
menu_choice =  ' '.
menu_option is ['NASA REPORTS','CONTRACTOR REPORTS','RETURN'].

while ?menu_choice <> 'RETURN'
then do (outline).

topic 'outline'.
window ('4.8.3  Cost Reporting and Control Structure',white,red,yellow,
?column,?row,76,17).
ask ('
    Cost Reporting and Control Structure includes these two sections:',
    menu_choice,?menu_option).

if ?menu_choice = 'NASA REPORTS'
  then do ('Nasa Reports').

if ?menu_choice = 'CONTRACTOR REPORTS'
  then do ('Contractor Reports').

if ?menu_choice = 'RETURN'
  then new_kb ('dispcost.hkb').

close_window ().

end. (* Outline *)
end. (* Cost Reporting and Control Structure *)


topic 'NASA Reports'.
column = ?column + 1.
row = ?row + 1.
window ('4.8.3.1  NASA Reports',blue,white,white,?column,?row,72,15).
say (['
                Show the #mWBS#m structure to be used for cost report-
           ing and control, and identify the monthly Management
           Information Control System (MICS) (or equivalent) and
           Project Operating Plan (POP) reporting format to be used.
           These should result from negotiations between the Project
           and Program Managers and will vary in detail depending on
           project size and complexity.

                          Press #fyellow SPACE#d to continue']).
close_window ().
column = ?column - 1.
row = ?row - 1.
end. (* NASA Reports *)
```

```
topic 'Contractor Reports'.
column = ?column + 1.
row = ?row + 1.
window ('4.8.3.2   Contractor Reports',blue,white,white,?column,?row,72,
15).
say ('
          Where applicable, delineate the contractor reports to
        be provided to the NASA center.

                    Press #fyellow SPACE#d to continue').

close_window ().
column = ?column - 1.
row = ?row - 1.
end. (*  Contractor Reports *)

topic 'WBS'.
column = ?column + 1.
row = ?row + 1.
window ('WBS',blue,white,white,?row,?column,72,13).
say('#e


                    Work Breakdown Structure


                    Press #fyellow SPACE#d to continue.').

close_window ().
column = ?column - 1.
row = ?row -1.
end. (* WBS *)
```

```
(* DISPPRREV.KB *)
(* THIS FILE DISPLAYS THE PROJECT REVIEWS AND MEETINGS SECTION OF THE *)
(* PROJECT PLAN *)

column = 3.
row = 3.
no_edit_key ().
no_debug ().

do ('Project Reviews and Meetings').



topic 'Project Reviews and Meetings'.
menu_choice = ' '.
menu_option is ['INTERNAL REVIEWS','EXTERNAL REVIEWS',
'DESIGN AND READINESS REVIEWS','RETURN'].

while ?menu_option <> 'RETURN'
   then do (Outline).

topic 'outline'.
window ('4.9  Project Reviews and Meetings',white,blue,white,?column,?row,
77,18).
ask ('
        Project Reviews and Meetings (Section 4.9) is broken down
       into section 4.9.1, #fyellow Management Review#d.

         Section 4.9.1 is  divided  into these three sections:'
         ,menu_choice,?menu_option).


if ?menu_choice = 'INTERNAL REVIEWS'
  then do ('Internal Reviews').

if ?menu_choice = 'EXTERNAL REVIEWS'
  then do ('External Reviews').

if ?menu_choice =   'DESIGN AND READINESS REVIEWS'
  then do ('Design and Readiness Reviews').

if ?menu_choice = 'RETURN'
  then new_kb ('dispcont.hkb').

close_window ().
end. (* Management Reviews *)


topic 'Internal Reviews'.
column = ?column + 1.
row = ?row + 1.
window ('4.9.1.1   Internal Reviews',blue,white,white,?column,?row,72,16).
say ('




          Identify weekly or monthly project meetings and
      reviews with the NASA center#39s management as appro-
      priate.
```

```
                    Press #fyellow SPACE#d to continue').

close_window ().
column = ?column - 1.
row = ?row - 1.
end. (* Internal Reviews *)


topic 'External Reviews'.
column = ?column + 1.
row = ?row + 1.
window ('4.9.1.2  External Reviews',blue,white,white,?column,?row,72,16).
say ('


            Identify biweekly telecons, monthly reviews, or
        periodic program reviews with NASA Headquarters, Mission
        Management, etc., as appropriate.



                       Press #fyellow SPACE#d to continue').

close_window ().
column = ?column - 1.
row = ?row - 1.
end. (* External Reviews *)


topic 'Design and Readiness Reviews'.
window ('4.9.1.3  Design and Readiness Reviews',blue,white,white,?column,
?row,72,17).
say ('


             Make reference to the major project reviews, in-
         cluding those required by the MSAD management plan as
         well as integrated payload reviews, safety reviews, and
         flight readiness reviews.


                       Press #fyellow SPACE#d to continue').

close_window ().
end. (* Design and Readiness Reviews *)
```

```
(* Content.kb *)
(* This is the program for filling out the Content section of the Project *)
(* Plan.                                                                   *)
column = 3.
row = 3.
no_edit_key ().
no_debug ().
curdir is read_line ('CURDIR.DAT').
curdir = string_replace(?curdir,' ','',8).

menu_choice = ' '.

menu_option is ['Introduction','Objective','Science Requirements',
'Technical Plan','Implementation Plan','Management Plan','Schedule',
'Cost Control Plan','Project Reviews and Meetings',
'Return to Previous Menu'].

while ?menu_choice <> 'Return to Previous menu'
  then do (Coutline).


topic 'Coutline'.
window ('4.0  Content',white,red,yellow,?column,?row,76,17).
ask ('#e
     Which section would you like to complete?',menu_choice,?menu_option).

if ?menu_choice = 'Introduction'
  then do ('Introduction').

if ?menu_choice = 'Objective'
  then do ('Objective').

if ?menu_choice = 'Science Requirements'
  then do ('Science Requirements').

if ?menu_choice = 'Technical Plan'
  then do ('Technical Plan').

if ?menu_choice = 'Implementation Plan'
  then do ('Implementation Plan').

if ?menu_choice = 'Management Plan'
  then do ('Management Plan').

if ?menu_choice = 'Schedule'
  then do ('Schedule').

if ?menu_choice = 'Cost Control Plan'
  then do ('Cost Control Plan').

if ?menu_choice = 'Project Reviews and Meetings'
  then do ('Project Reviews and Meetings').

if ?menu_choice = 'Return to Previous Menu'
  then new_kb ('ppquest2.hkb').
close_window ().

end. (* Content *)

new_kb ('ppquest2.hkb').
```

```
(*========================== THREADED TOPICS ================================*)

topic 'Introduction'.
column = ?column + 1.
row  =  ?row + 1.
window ('4.1  Introduction',blue,white,white,?column,?row,72,14).
say (['#e

       Please describe the relevance of the investigation and provide
       a summary rationale as to why a flight experiment is required
       (limit to one printed page).



             Press #fyellow RETURN KEY#d to enter the editor, #fyellow ESC#d
             to leave editor, and #fyellow RETURN#d to confirm save.']).


edit_file (concat (C:\GARDEN\,?CURDIR,'\PPE4_1.DAT'),yellow,black,red,6,12,70,10
close_window ().
close     (concat (C:\GARDEN\,?CURDIR,'\PPE4_1.DAT')).
column = ?column - 1.
row = ?row - 1.
end. (* introduction *)


topic 'Objective'.
column = ?column + 1.
row = ?row + 1.
window ('4.2  Objective',blue,white,white,?column,?row,72,14).
say (['#e

          Please define the overall objective(s) of the flight
          experiment(s);  if more than one flight is requested,
          indicate the specific objectives of each flight.


             Press #fyellow RETURN KEY#d to enter the editor, #fyellow ESC#d
             to leave editor, and #fyellow RETURN#d to confirm save.']).

edit_file (concat (C:\GARDEN\,?CURDIR,'\PPE4_2.DAT'),yellow,black,red,6,12,70,1
close_window ().
close     (concat (C:\GARDEN\,?CURDIR,'\PPE4_2.DAT')).
column = ?column - 1.
row = ?row - 1.
end. (* Objective *)


topic 'Science Requirements'.
column = ?column + 1.
row = ?row + 1.
window ('4.3  Science Requirements',blue,white,white,?column,?row,72,14).
say (['#e
```

```
        Please summarize the science requirements against which the
        hardware will be built and reference the applicable Science
        Requirements Document(s).


                Press #fyellow RETURN KEY#d to enter the editor, #fyellow ESC#d
                to leave editor, and #fyellow RETURN#d to confirm save.']).

edit_file (concat (C:\GARDEN\,?CURDIR,'\PPE4_3.DAT'),yellow,black,red,6,12,70,1
close_window ().
close      (concat (C:\GARDEN\,?CURDIR,'\PPE4_3.DAT')).
column = ?column - 1.
row = ?row - 1.
end. (* Science Requirements *)


topic 'Technical Plan'.
new_kb ('techplan.hkb').
end. (* Technical Plan *)

topic 'Implementation Plan'.
new_kb ('impplan.hkb').
end. (* Implementation Plan *)


topic 'Implementation Approach'.
column = ?column + 1.
row = ?row + 1.
window ('4.5.1  Implementation Approach',blue,white,white,?column,?row,72,14).
say ('#e

    Please indicate whether the project is an in-house activity or
    a contracted activity.  Define the principle entities on the
    project team, including the contractor team and its responsibil-
    ities.  If the contractor team has not yet been selected, include
    a description of the contractor procurement approach and schedule.


            Press #fyellow RETURN KEY#d to enter the editor, #fyellow ESC#d
            to leave editor, and #fyellow RETURN#d to confirm save.').
edit_file (concat (C:\GARDEN\,?CURDIR,'\PPE4_5_1.DAT'),yellow,black,red,6,12,70
close_window ().
close      (concat (C:\GARDEN\,?CURDIR,'\PPE4_5_1.DAT')).
column = ?column - 1.
row = ?row - 1.
end. (* Implementation Approach *)


topic 'Summary Work Breakdown Structure'.
column = ?column + 1.
row = ?row + 1.
window ('4.5.2  Summary Work Breakdown Structure',blue,white,white,
?column,?row,72,14).
say (['#e
```

```
Please provide a summary Work Breakdown Structure (WBS) down
to the "appropriate level" (as agreed to between the Project
Manager, and the Program Manager) and a brief description of
each WBS element. The WBS structure should be related to line
items on the project master schedule and to the resources
section, and it should serve as the baseline WBS to be used
in future budget reporting.

        Press #fyellow RETURN KEY#d to enter the editor, #fyellow ESC#d
        to leave editor, and #fyellow RETURN#d to confirm save.']).

edit_file (concat (C:\GARDEN\,?CURDIR,'\PPE4_5_2.DAT'),yellow,black,red,6,12,70,
close_window ().
close     (concat (C:\GARDEN\,?CURDIR,'\PPE4_5_2.DAT')).
column = ?column - 1.
row = ?row - 1.
end. (* Summary Work Breakdown Structure *)


topic 'Documentation'.
column = ?column + 1.
row = ?row + 1.
window ('4.5.3  Documentation',blue,white,white,?column,?row,72,14).
say ('#e

    Please provide a #mproject documentation tree#m that includes
    all governing, hardware development, mission integration, and
    safety documentation.  If a narrative should accompany this
    chart, please provide it here.


        Press #fyellow RETURN KEY#d to enter the editor, #fyellow ESC#d
        to leave editor, and #fyellow RETURN#d to confirm save.').

edit_file (concat (C:\GARDEN\,?CURDIR,'\PPE4_5_3.DAT'),yellow,black,red,6,12,70,
close_window ().
close     (concat (C:\GARDEN\,?CURDIR,'\PPE4_5_3.DAT')).
column = ?column - 1.
row = ?row - 1.
end. (* Documentation *)

topic 'Management Plan'.
new_kb ('MGTPLAN.HKB').
end. (* Management Plan *)

topic 'Schedule'.
column = ?column + 1.
row = ?row + 1.
window ('4.7  Schedule',blue,white,white,?column,?row,72,14).
say ('#e

    Please provide an overall project master schedule that includes
    the flow of hardware and software into the system integration and
    test activity.  Identify the Headquarters and mission management
    center controlled milestones.  To the extent possible, tie the
    schedule to the #mWBS#m and overlay the procurement and NASA budget
```

cycles. Provide a narrative describing the schedule and overall project flow.

```
        Press #fyellow RETURN KEY#d to enter the editor, #fyellow ESC#d
        to leave editor, and #fyellow RETURN#d to confirm save.').
edit_file (concat (C:\GARDEN\,?CURDIR,'\PPE4_7.DAT'),yellow,black,red,6,12,70,
close_window ().
close      (concat (C:\GARDEN\,?CURDIR,'\PPE4_7.DAT')).
column = ?column - 1.
row = ?row - 1.
end. (* Schedule *)

topic 'Cost Control Plan'.
new_kb ('costcont.hkb').
end. (* Cost Control Plan *)

topic 'Project Reviews and Meetings'.
new_kb ('projrev.hkb').
end. (* Project Reviews and Meetings *)

topic 'WBS'.
column = ?column + 1.
row = ?row + 1.
window ('WBS',blue,white,white,?row,?column,72,14).
say('#e


                    Work Breakdown Structure


                    Press #fyellow SPACE#d to continue.').
close_window ().
column = ?column - 1.
row = ?row -1.
end. (* WBS *)
```

```
(* TECHPLAN.KB *)
(* This is the program for completing the Technical Plan Section of the *)
(* Project Plan *)
column = 2.
row = 2.
no_edit_key ().
no_debug ().
curdir is read_line ('CURDIR.DAT').
curdir = string_replace (?curdir,' ','',8).

menu_choice = ' '.
menu_option is ['EXPERIMENT HARDWARE DESCRIPTION','PAYLOAD CLASSIFICATION',
'DEVELOPMENT APPROACH','TECHNOLOGY PLAN','LOGISTICS',
'MISSION OPERATIONS, TRAINING AND DATA MANAGEMENT',
'ANALYSIS OF MISSION RESULTS','FACILITIES','SAFETY',
'RETURN TO PREVIOUS MENU'].

While ?menu_choice <> 'RETRUN TO PREVIOUS MENU'
 then do (Toutline).


topic 'Toutline'.
column = ?column + 1.
row = ?row + 1.
window ('4.4  Technical Plan',,,,?column,?row,77,17).
ask ('#e
            The outline for the Technical Plan includes the
            following sections:',menu_choice,?menu_option).

if ?menu_choice = 'EXPERIMENT HARDWARE DESCRIPTION'
  then do ('Experiment Hardware Description').

if ?menu_choice = 'PAYLOAD CLASSIFICATION'
  then do ('Payload Classification').

if ?menu_choice = 'DEVELOPMENT APPROACH'
  then do ('Development Approach').

if ?menu_choice = 'TECHNOLOGY PLAN'
  then do ('Technology Plan').

if ?menu_choice = 'LOGISTICS'
  then do ('Logistics').

if ?menu_choice = 'MISSION OPERATIONS, TRAINING AND DATA MANAGEMENT'
  then
    do ('Mission Operations, Training and Data Management').

if ?menu_choice = 'ANALYSIS OF MISSION RESULTS'
  then do ('Analysis of Mission Results').

if ?menu_choice = 'FACILITIES'
  then do ('Facilities').

if ?menu_choice = 'SAFETY'
  then do ('Safety').

if ?menu_choice =  'RETURN TO PREVIOUS MENU'
  then new_kb ('content.hkb').
```

```
close_window ().
column = ?column - 1.
row = ?row - 1.

end. (* Technical Plan *)
new_kb ('content.hkb').
(****************************** RELATED TOPICS ****************************)

topic 'Experiment Hardware Description'.
relatedfile1 = '\PPE4_3.dat'.
relatedfile2 = '\PPE4_2.dat'.
column = ?column + 1.
row = ?row + 1.
window ('4.4.1  Experiment Hardware Description',blue,white,white,?column,
?row,72,15).
say ('#e


   Please provide an overall description of the experiment hardware
   and relate the hardware to the science requirements shown in
   #mSection 4.3#m.  Relate differing hardware configurations or upgrades
   to the relevant objectives shown in #mSection 4.2#m.



              Press #fyellow RETURN KEY#d to enter the editor, #fyellow ESC#d
              to leave editor, and #fyellow RETURN#d to confirm save.').

edit_file (concat (C:\GARDEN\,?CURDIR,'\PPE4_4_1.DAT'),yellow,black,red,6,12,7
close_window ().
close     (concat (C:\GARDEN\,?CURDIR,'\PPE4_4_1.DAT')).
column = ?column - 1.
row = ?row - 1.
end. (* Experiment Hardware Description *)

topic 'Payload Classification'.
new_kb ('payclass.hkb').
end. (* payload classification *)

topic 'Development Approach'.
column = ?column + 1.
row = ?row + 1.
window ('4.4.3 Development Approach',blue,white,white,?column,?row,72,14).
say ('#e

    Please describe the overall development approach, indicating
    plans for breadboard, engineering model, and/or protoflight
    hardware development.  Identify the numbers of flight units and
    test articles, and define the fidelity of simulators required.
    Identify any support hardware required.  Define the spares
    philosophy and the quantity of spares required by the project.
    Use a #mdetailed flow diagram#m to clarify the development and test
    approach to be used.


            Press #fyellow RETURN KEY#d to enter the editor, #fyellow ESC#d
            to leave editor, and #fyellow RETURN#d to confirm save.').

edit_file (concat (C:\GARDEN\,?CURDIR,'\PPE4_4_3.DAT'),yellow,black,red,6,12,70
close_window ().
```

```
close     (concat (C:\GARDEN\,?CURDIR,'\PPE4_4_3.DAT')).
column = ?column - 1.
row = ?row - 1.
end. (* Development Approach *)

topic 'Technology Plan'.
relatedfile3 = '\PPE4_4_3.dat'.
column = ?column + 1.
row = ?row + 1.
window ('4.4.4  Technology Plan',blue,white,white,?column,?row,72,14).
say (['#e

    Please indicate what feasibility issues or proof-of-concept
    issues have been identified via ground-based testing during
    the definition phase of the project.  These should have been
    identified at the Conceptual Design Review (CoDR) and closed
    by the #mRDR#m. It is not necessary to repeat the discussion of
    the breadboard program defined in #mSection 4.4.3#m.  If there
    was no technology development requirement, this fact should
    be noted.


          Press #fyellow RETURN KEY#d to enter the editor, #fyellow ESC#d
          to leave editor, and #fyellow RETURN#d to confirm save.']).

edit_file (concat (C:\GARDEN\,?CURDIR,'\PPE4_4_4.DAT'),yellow,black,red,6,12,70,
close_window ().
close     (concat (C:\GARDEN\,?CURDIR,'\PPE4_4_4.DAT')).
column = ?column - 1.
row = ?row - 1.
end. (* Technology Plan *)

topic 'Logistics'.
column = ?column + 1.
row = ?row + 1.
window ('4.4.5  Logistics',blue,white,white,?column,?row,72,14).
say ('#e


     Please identify where the major project functions, such as
     hardware build, different levels of integration, etc., will
     take place and describe the special services, vehicles, systems,
     and major equipment necessary to satisfy the logistic require-
     ments of the project.



           Press #fyellow RETURN KEY#d to enter editor, #fyellow ESC#d
           to leave editor, and #fyellow RETURN#d to confirm save.').

edit_file (concat (C:\GARDEN\,?CURDIR,'\PPE4_4_5.DAT'),yellow,black,red,6,12,70,
close_window ().
close     (concat (C:\GARDEN\,?CURDIR,'\PPE4_4_5.DAT')).
column = ?column - 1.
row = ?row - 1.
end. (* Logistics *)


topic 'Mission Operations, Training and Data Management'.
column = ?column + 1.
```

```
row = ?row + 1.
window ('4.4.6  Missions Operations, Training and Data Management',
blue,white,white,?row,?column,72,14).
say ('#e

    Please describe the operations approach, starting with a
    summary of the experiment operations sequence, and relate the
    crew involvement with the operations.  Identify the location
    of the integration and operations activities and the organiz-
    ation supplying the support and define the level of support
    required.   Identify where and how operations training will be
    performed and how data will be made available to the principal
    investigator for analysis. All assumptions should be clearly
    stated.

           Press #fyellow RETURN KEY#d to enter the editor, #fyellow ESC#d
           to leave editor, and #fyellow RETURN#d to confirm save.').

edit_file (concat (C:\GARDEN\,?CURDIR,'\PPE4_4_6.DAT'),yellow,black,red,6,12,7
close_window ().
close     (concat (C:\GARDEN\,?CURDIR,'\PPE4_4_6.DAT')).
column = ?column - 1.
row = ?row - 1.
end. (* Mission Operations, Training and Data Management *)


topic 'Analysis of Mission Results'.
column = ?column + 1.
row = ?row + 1.
window ('4.4.7  Analysis of Mission Results',blue,white,white,?column,
?row,72,14).
say ('#e


     Please describe procedures, associated efforts, and primary
     locations for the postmission analysis of data and other
     mission results.  Define experiment records to be developed
     and how they will be archived.



          Press #fyellow RETURN KEY#d to enter the editor, #fyellow ESC#d
          to leave editor, and #fyellow RETURN#d to confirm save.').

edit_file (concat (C:\GARDEN\,?CURDIR,'\PPE4_4_7.DAT'),yellow,black,red,6,12,7
close_window ().
close     (concat (C:\GARDEN\,?CURDIR,'\PPE4_4_7.DAT')).
column = ?column - 1.
row = ?row - 1.
end. (* Analysis of Mission Results *)

topic 'Facilities'.
column = ?column + 1.
row = ?row + 1.
window ('4.4.8  Facilities',blue,white,white,?column,?row,72,14).
say (['#e


     Please describe and outline major in-house and contractor
     facilities (existing, modified and new) for fabrication,
```

```
     test, checkout, launch, flight and mission operations, and
     data acquisition and analysis.


           Press #fyellow RETURN KEY#d to enter the editor, #fyellow ESC#d
           to leave editor, and #fyellow RETURN#d to confirm save.']).

edit_file (concat (C:\GARDEN\,?CURDIR,'\PPE4_4_8.DAT'),yellow,black,red,6,12,70,
close_window ().
close     (concat (C:\GARDEN\,?CURDIR,'\PPE4_4_8.DAT')).
Column = ?column - 1.
row = ?row - 1.
end. (* Facilities *)


topic 'Safety'.
column = ?column + 1.
row = ?row + 1.
window ('4.4.9  Safety',blue,white,white,?column,?row,72,14).
say ('#e


       Please define the ground and mission safety requirements
       for the project.



            Press #fyellow RETURN KEY#d to enter the editor, #fyellow ESC#d
            to leave editor, and #fyellow RETURN#d to confirm save.').

edit_file (concat (C:\GARDEN\,?CURDIR,'\PPE4_4_9.DAT'),yellow,black,red,6,12,70,
close_window ().
close     (concat (C:\GARDEN\,?CURDIR,'\PPE4_4_9.DAT')).
column = ?column - 1.
row = ?row - 1.
end. (* Safety *)

topic 'detailed flow diagram'.
collect ()
and
dos ('SCHEDULE' ,restore).
end. (* detailed flow diagram *)

topic 'Section 4.3'.
column = ?column + 1.
row = ?row + 1.
related_answer is read(concat(C:\GARDEN\,?curdir,?relatedfile1)).
window ('4.3 Science Requirements',blue,white,white,?column,?row,73,15).
say ('
      This is your answer for Section 4.3: #t #n',
       ?related_answer, '#n #n #n #n #n
                       Press #fyellow SPACE#d to continue.').

column = ?column - 1.
row = ?row - 1.
close_window ().
end. (* Section 4.3 *)
```

```
topic 'Section 4.2'.
column = ?column + 1.
row = ?row + 1.
related_answer is read(concat(C:\GARDEN\,?curdir,?relatedfile2)).
window ('4.2 Objectives',blue,white,white,?column,?row,73,15).
say ('
      This is your answer for Section 4.2: #t #n',
       ?related_answer, '#n #n #n #n #n
                       Press #fyellow SPACE#d to continue.').

column = ?column - 1.
row = ?row - 1.
close_window ().
end. (* Section 4.2 *)

topic 'Section 4.4.3'.
column = ?column + 1.
row = ?row + 1.
related_answer is read(concat(C:\GARDEN\,?curdir,?relatedfile3)).
window ('4.4.3 Development Approach',blue,white,white,?column,?row,73,14).
say ('
      This is your answer for Section 4.4.3: #t #n',
       ?related_answer, '#n #n #n #n #n
                       Press #fyellow SPACE#d to continue.').

column = ?column - 1.
row = ?row - 1.
close_window ().
end. (* Section 4.4.3 *)

topic 'RDR'.
column = ?column + 1.
row = ?row + 1.
window ('RDR',blue,white,white,?row,?column,72,14).
say('#e


                  Requirements Definition Review



                     Press #fyellow SPACE#d to continue.').

close_window ().
column = ?column - 1.
row = ?row -1.
end. (* RDR *)
```

```
(* PAYCLASS.KB *)
(* THIS PROGRAM IS FOR COMPLETING THE PAYLOAD CLASSIFICATION SECTION     *)
(* OF THE PROJECT PLAN *)

column = 2.
row = 2.
no_edit_key ().
no_debug ().
curdir is read_line ('CURDIR.DAT').
curdir = string_replace (?curdir,' ','',8).
do (PCoutlne).


topic 'PCoutlne'.
column = ?column + 1.
row = ?row + 1.
window ('4.4.2 Payload Classification',blue,white,white,?column,?row,72,17).
say ('#e

  Please state and show the rationale for the payload classification
  as determined by #mNasa Management Instruction 8010.1A#m.  The payloads
  are classified as either class A, B, C, or D.  The guidelines for
  determining payload classification are as follows:


                                          #mClass A#m
                                          #mClass B#m
                                          #mClass C#m
                                          #mClass D#m


           Press #fyellow RETURN KEY#d to enter the editor, #fyellow ESC#d
           to leave editor, and #fyellow RETURN#d to confirm save.').

edit_file (concat (C:\GARDEN\,?CURDIR,'\PPE4_4_2.DAT'),yellow,black,red,6,12,70
close_window ().
close     (concat (C:\GARDEN\,?CURDIR,'\PPE4_4_2.DAT')).
column = ?column - 1.
row = ?row - 1.
new_kb ('techplan.hkb').

end. (* Payload Classification *)

topic 'Class A'.
column = ?column + 1.
row = ?row + 1.
window ('Class "A" Payload Characterization',blue,white,white,?column,?row,72,
17).
say ('#e

===== CHARACTERIZATION, MISSION SUCCESS, AND SRM&QA COST GUIDELINES ======
                              FOR CLASS A PAYLOADS

        CLASSIFICATION:                      CLASS A
                                          ===============

   Characterization:                  High Priority, Minimum Risk

   Typical Factors Used               High national prestiege;
   to Determine Payload               Long hardware life required;
```

Classifications:	High complexity; Highest cost; Long program duration; Critical launch constraints; Retrieval/reflight or in-flight maintenance to recover from problems is not feasible.
Achievement of Missioin Success Criteria:	All affordable programmatic and other measures are taken to achieve minimum risk. The highest practical product assurance standards are utilized.
Estimated Relative SRM&QA Cost Factors #m*1#m:	1.0

======== GUIDELINES FOR SRM&QA PROGRAM REQUIREMENTS FOR PAYLOADS ===========

SRM&QA ELEMENT:

Engineering Model, Prototype, Flight And Spare Hardware	Engineering Model Hardware For New Or Modified Designs. Separate Prototype And Flight Modes Hardware. Full Set Of Assembled And Tested "Flight Spare" Replacement Units.
Failure Investigation Board Requirements	Formal Board Required - Initiated And Conducted by Headquarters.
Treatement of Single Failure Points (SFPs)	Success Critical SFPs Are Not Permitted Except by Formal Project Waiver. Retention of Unavoidable SFPs Requires Justification Based On Risk Analysis And Implementation Of Measures To Mitigate Risk.
Qualification, Acceptance, And Protoflight Test Program	Full Formal Qualification And Acceptance Test Programs At All Hardware Levels. Extensive Design Margin And Development Testing For New or Modified Designs.
EEE Parts	Grade I (per Mil-Std-975).
Reviews #m*2#m	Full Formal Review Program Including Outside/Independent Reviews.
Safety	Per All Applicable NASA Safety Standards.
Materials	Verify Heritage of Previously

	Used Materials And Qualify All New Or Changed Materials. Utilize Source Controls On Procured Materials And Acceptance Test Each Lot/Batch.
Reliability	Failure Mode And Effects Analysis/Critical Items List (FEMA/CIL), Worst Case Performance And Parts Stress Analyses Required For All Parts And Circuits. Mechanical Reliability And Other Reliability Analyses Required Where Appropriate
Maintainability	Formal Maintainability Program For All Appropriate Flight And Critical Ground Support Elements.
Quality Assurance	Formal Quality Assurance Program Including Closed-Loop Problem Reporting And Alalysis of SRM&QA And Performance Trends.
Software #m*2#m	Formal Software Quality Assurance Program Including A Formal Review Program With Outside/Independent Reviews and Independent Verification And Validation.

```
                    Press  #fyellow SPACE#d to continue.').

topic '*1'.
Window (' Note *1 ',yellow,red,white,6,6,68,10,).
say ('#e
     There are wide variations in the methods for specifying
     and acccounting for "SRM&QA costs".  For Class A Programs,
     these costs are typically in the range of 10 t 15% of the
     total program cost.  The relative SRM&QA cost factors
     specified here are intended to require substantiative
     differences in the SRM&QA programs (and the associated costs)
     for the various program classifications in order to establish
     a meaningful ladder of cost/risk levels.

                    Press #fwhite SPACE#d to continue').

close_window ().
end. (* *1 *)

topic '*2'.
Window (' Note *2 ',yellow,red,white,6,6,68,7).
say ('#e
     Outside/Independent Review refers to reviews conducted by
     personnel who are not managing or directly associated with
     the program or the design effort (i.e., personnel who are
     not assigned to or in the management chain for the program
     and who are not preforming or managing the design effort).

                    Press #fwhite SPACE#d to continue').
```

```
close_window ().
end. (* *2 *)

close_window ().
column = ?column - 1.
row = ?row - 1.
end. (* Class A *)

topic 'Class B'.
column = ?column + 1.
row =  ?row + 1.
window ('Class "B" Payload Characterization',blue,white,white,?column,?row,
72,17).
say ('#e

===== CHARACTERIZATION, MISSION SUCCESS, AND SRM&QA COST GUIDELINES ======
                         FOR CLASS B PAYLOADS

       CLASSIFICATION:                       CLASS B
                                          ===============
    Characterization:                  High Priority, Medium Risk

    Typical Factors Used               High national prestiege;
    to Determine Payload               Medium hardware life required;
    Classifications:                   High to medium complexity;
                                       High cost;
                                       Medium program duration;
                                       Some launch constraints;
                                       Retrieval/reflight or in-flight
                                       maintenance to recover from
                                       problems is difficult or not
                                       feasible.

    Achievement of                     Compromises are used to permit
    Missioin Success                   somewhat reducec costs while
    Criteria:                          maintaining low risk to the
                                       overall mission success and a
                                       medium risk of achieving only
                                       partial sucess.  Stringent
                                       product assurance standrds are
                                       utilized.

    Estimated Relative
    SRM&QA Cost Factors #m*1#m:            0.7 x Class A

======== GUIDELINES FOR SRM&QA PROGRAM REQUIREMENTS FOR PAYLOADS ===========

    SRM&QA ELEMENT:

    Engineering Model,                  Engineering Model Hardware For
    Prototype, Flight                   New Or Modified Designs.
    And Spare Hardware                  Separate Prototype And Flight
                                        Modes Hardware.  Full Set Of
                                        Assembled And Tested #34Flight
                                        Spare#34 Replacement Units.

    Failure                             Formal Board Required - Initiated
    Investigation Board                 And Conducted by Headquarters.
    Requirements
```

Treatement of Single Failure Points (SFPs)	Success Critical SFPs Are Allowed W/O Formal Waiver But Are Minimized And Mitigated By Use Of High Reliability Parts And Additional Testing. Essential Spacecraft Functions And Key Instruments Are Typically Fully Redundant. Other Hardware Has Partial Redundancy And/Or Provisions For Graceful Degredation.
Qualification, Acceptance, And Protoflight Test Program	Formal Qualification And Acceptance Test Programs May Be Combined Using "Protoflight" Hardware Approach. Design Margin And Development Testing For New Designs.
EEE Parts	Combination Grade I and Grade II (per Mil-Std-975).
Reviews #m*2#m	Formal Review Program; may Include Outside/Independent Reviews.
Safety	Per All Applicable NASA Safety Standards.
Materials	Utilize Previously Tested/Flown Materials Or Qualify New Materials. Acceptance Test Each Lot of Procured Materials.
Reliability	FMEA/CIL Required At A Black Box (Or Circuit Block Diagram) Level. Worst Case Performance And Parts Stress Analysis Required For All Parts And Circuits.
Maintainability	Formal Maintainability Program For All Appropriate Flight And Critical Ground Support Elements.
Quality Assurance	Formal Quality Assurance Program Including Closed-Loop Problem Reporting And Alalysis of SRM&QA And Performance Trends.
Software #m*2#m	Formal Software Quality Assurance Program Including A Formal Review Program With Outside/Independent Reviews and Independent Verification And Validation.

Press #fyellow SPACE#d to continue.').

```
topic '*1'.
Window (' Note *1 ',yellow,red,white,6,6,68,10,).
say ('#e
```

```
     There are wide variations in the methods for specifying
     and acccounting for "SRM&QA costs".  For Class A Programs,
     these costs are typically in the range of 10 t 15% of the
     total program cost.  The relative SRM&QA cost factors
     specified here are intended to require substantiative
     differences in the SRM&QA programs (and the associated costs)
     for the various program classifications in order to establish
     a meaningful ladder of cost/risk levels.

                    Press #fwhite SPACE#d to continue').

close_window ().
end. (* *1 *)

topic '*2'.
Window (' Note *2 ',yellow,red,white,6,6,68,7).
say ('#e
     Outside/Independent Review refers to reviews conducted by
     personnel who are not managing or directly associated with
     the program or the design effort (i.e., personnel who are
     not assigned to or in the management chain for the program
     and who are not preforming or managing the design effort).

                    Press #fwhite SPACE#d to continue').

close_window ().
end. (* *2 *)

close_window ()
and
collect ().
column = ?column - 1.
row = ?row - 1.
end. (* Class B *)


topic 'Class C'.
column = ?column + 1.
row =  ?row + 1.
window ('Class "C" Payload Characterization',blue,white,white,?column,?row,
72,17).
say ('#e

===== CHARACTERIZATION, MISSION SUCCESS, AND SRM&QA COST GUIDELINES ======
                          FOR CLASS C PAYLOADS

       CLASSIFICATION:                    CLASS C
                                       ===============
   Characterization:                Medium Priiority, Medium/High  Risk

   Typical Factors Used             Moderate national prestiege;
   to Determine Payload             Short hardware life required;
   Classifications:                 Medium to low complexity;
                                    Medium cost;
                                    Short program duration;
                                    Few launch constraints;
                                    Retrieval/reflight or in-flight
                                    maintenance to recover from
                                    problems may befeasible.
```

Achievement of Missioin Success Criteria:	Moderate risks of not achieving mission success are accepted to permit significant cost savings. Reduced product assurance requirements are allowed.
Estimated Relative SRM&QA Cost Factors #m*1#m:	0.4 x Class A

======== GUIDELINES FOR SRM&QA PROGRAM REQUIREMENTS FOR PAYLOADS ===========

SRM&QA ELEMENT:	
Engineering Model, Prototype, Flight And Spare Hardware	Engineering Model Hardware For New Designs. "Protoflight" Hardware (In Lieu Of Separate Prototype And Flight Model(s). Limited Flight Spare Hardware (For Long Lead Or Difficult To Replace Flight Unit(s).
Failure Investigation Board Requirements	Formal Board Required - Initiated And Conducted by Cognizant Field Center.
Treatement of Single Failure Points (SFPs)	Success Critical SFPs Are Allowed W/O Formal Waiver. Single String And Partially Single Sting Design Approaches Are Commonplace.
Qualification, Acceptance, And Protoflight Test Program	Limited Qualification Testing For New Aspects Of The Design Plus Full Acceptance Test Program. Qualification Testing Required For Verification Of Safety Compliance And Interface Compatibility. Limited Development Testing.
EEE Parts	Grade II (per Mil-Std-975) or Upgraded Commerical.
Reviews #m*2#m	Limited Formal Reviews And Project Level Reviews.
Safety	Per All Applicable NASA Safety Standards.
Materials	Utilize Previously Tested/Flown Materials Or Characterize New Materials. Acceptance Test Sample Lots of Procured Materials.
Reliability	FMEA/CIL Requirements Determined At The Project Level. Analysis Of Interfaces Required. Parts Stress Analysis Required For All Parts And Circuits.

```
    Maintainability                  Maintainability Considered During
                                     Design, Sparing Provided Where
                                     Economical.

    Quality Assurance                Formal Inspection System
                                     Including Problem Reporting.

    Software #m*2#m                      Software Quality Assurance
                                     Program With Product Level
                                     Reviews.

                          Press  #fyellow SPACE#d to continue.').

 topic '*1'.
 Window (' Note *1 ',yellow,red,white,6,6,68,10,).
 say ('#e
      There are wide variations in the methods for specifying
      and acccounting for "SRM&QA costs".  For Class A Programs,
      these costs are typically in the range of 10 t 15% of the
      total program cost.  The relative SRM&QA cost factors
      specified here are intended to require substantiative
      differences in the SRM&QA programs (and the associated costs)
      for the various program classifications in order to establish
      a meaningful ladder of cost/risk levels.

                       Press #fwhite SPACE#d to continue').

 close_window ().
 end. (* *1 *)

 topic '*2'.
 Window (' Note *2 ',yellow,red,white,6,6,68,7).
 say ('#e
      Outside/Independent Review refers to reviews conducted by
      personnel who are not managing or directly associated with
      the program or the design effort (i.e., personnel who are
      not assigned to or in the management chain for the program
      and who are not preforming or managing the design effort).

                        Press #fwhite SPACE#d to continue').

 close_window ().
 end. (* *2 *)

 close_window ()
 and
 collect ().
 column = ?column - 1.
 row = ?row - 1.
 end. (* Class C *)

 topic 'Class D'.
 column = ?column + 1.
 row =  ?row + 1.
 window ('Class "D" Payload Characterization',blue,white,white,?column,?row,
 72,17).
 say ('#e

 ===== CHARACTERIZATION, MISSION SUCCESS, AND SRM&QA COST GUIDELINES ======
                              FOR CLASS D PAYLOADS
```

CLASSIFICATION:	CLASS D
Characterization:	High Risk, Minimum Cost
Typical Factors Used to Determine Payload Classifications:	Little national prestiege; Short hardware life required; Low complexity; Low cost; Short program duration; Non-critical launch time/orbit; Reflyable or econimicaly replaceable, in-flight maintenance may be feasible.
Achievement of Missioin Success Criteria:	Significant risks of not achieving mission success are accepted to permit minimum cost. Mimimal product assurance requirements are allowed.
Estimated Relative SRM&QA Cost Factors #m*1#m:	0.1 x Class A

======== GUIDELINES FOR SRM&QA PROGRAM REQUIREMENTS FOR PAYLOADS ===========

SRM&QA ELEMENT:	
Engineering Model, Prototype, Flight And Spare Hardware	Limited Engineering Model And Flight Spare Hardware Hardware.
Failure Investigation Board Requirements	Failure Investigation Initiated And Conducted by Cognizant Field Center - Formal Board Not Required.
Treatement of Single Failure Points (SFPs)	Success Critical SFPs Are Allowed W/O Formal Waiver. Single String And Partially Single Sting Design Approaches Are Commonplace.
Qualification, Acceptance, And Protoflight Test Program	Qualification Testing Required Only For Verification Of Safety Compliance And Interface Compatibility. Acceptance Test Program For Critical Performance Parameters.
EEE Parts	Commercial
Reviews #m*2#m	Project Level Reviews.
Safety	Per All Applicable NASA Safety Standards.

```
     Materials                               Requirements Based On Applicable
                                             Safety Standards.

     Reliability                             Analysis Requirements BAsed On
                                             Applicable Safety Requirements.
                                             Analysis Of Interfaces Required.

     Maintainability                         Requirements Based On Applicable
                                             Safety Standards.

     Quality Assurance                       Requirements Based On Applicable
                                             Safety Standards.

      Software #m*2#m                            Requirements Basded On
                                             Applicable Safety Guidelines.

                         Press  #fyellow SPACE#d to continue.').

  topic '*1'.
  Window (' Note *1 ',yellow,red,white,6,6,68,10,).
  say ('#e
       There are wide variations in the methods for specifying
       and acccounting for "SRM&QA costs".  For Class A Programs,
       these costs are typically in the range of 10 t 15% of the
       total program cost.  The relative SRM&QA cost factors
       specified here are intended to require substantiative
       differences in the SRM&QA programs (and the associated costs)
       for the various program classifications in order to establish
       a meaningful ladder of cost/risk levels.

                      Press #fwhite SPACE#d to continue').

 close_window ().
 end. (* *1 *)

 topic '*2'.
 Window (' Note *2 ',yellow,red,white,6,6,68,7).
 say ('#e
      Outside/Independent Review refers to reviews conducted by
      personnel who are not managing or directly associated with
      the program or the design effort (i.e., personnel who are
      not assigned to or in the management chain for the program
      and who are not preforming or managing the design effort).

                      Press #fwhite SPACE#d to continue').

close_window ().
end. (* *2 *)

close_window ()
and
collect ().
column = ?column - 1.
row = ?row - 1.
end. (* Class D *)

topic 'Nasa Management Instruction 8010.1A'.
new_kb ('NMI.hkb').
end. (* NMI *)
```

```
(* NMI.KB *)
(* This File Displays the Entire NMI 8010.1A Document Which Defines the *)
(* Classification of Payloads *)

no_edit_key ().
no_debug ().
do ('Display Document').

new_kb ('Payclass.hkb').


topic 'Display Document'.
window ('NMI 8010.1A',yellow,red,yellow,3,3,78,18).
say (['#e
                                                            NMI 8010.1A
     NASA
     Management                              Effective Date: November 21, 1990
     Instruction                            Expiration Date: November 21, 1990

     Responsible Office:   Q/Office of Safety and Mission Quality #49OSMQ#49

     Subject:              CLASSIFICATION OF NASA PAYLOADS

    1. PURPOSE

       This Instruction establishes policies and responsibilities
       associated with classification of airborne and space payloads for
       which NASA has Design, Development, Test, and Evaluation #40DDT&E#41
       responsibility.

    2. APPLICABILITY AND SCOPE

       a. This Instruction is applicable to NASA Headquarters and
          field installations.

       b. This Instruction should be implemented for all NASA payload
          flight equipment for which DDT&E responsibility is assigned
          to a field installation after release of the NMI.
          Applicability to equipment already assigned is at the
          discretion of the cognizant Headquarters Program Office.

    3. CLASSIFICATION PROVISIONS

       Classification provides a basis for:

       a. Mutual understanding among all involved organizations and
          individuals of the general approach that is to be taken
          relative to cost versus confidence trade decisions for
          specific equipment.

       b. Pre-selection of the official responsible for initiating
          and conducting investigations of in-flight, nonhazardous,
          nonpropagating failure of specific equipment.

       c. Structuring of field installation and Headquarters prepared
          guidelines, standards, or policies in such areas as
          environmental design and test; electrical, electronic, and
          electromechanical parts control; materials controls;
          configuration control; conduct of design reviews; and other
          elements that are amenable to tailoring for application to
          each class.
```

d. Structuring of experience data so that effectiveness of approaches associated with each class can be evaluated and adjustments made accordingly.

---

4. DEFINITIONS

For the purpose of this Instruction, the following definitions apply:

a. Payload - Any airborne or space equipment or material that is not an integral part of the carrier vehicle #40i.e., not part of the carrier aircraft, balloon, sounding rocket, expendable or recoverable launch vehicle#41. Included are items such as free-flying automated spacecraft, Spacelab payloads, Space Station payloads, flight hardware designed to conduct either coherent sets of experiments #40e.g., "Facility Class" instruments#41 or individual experiments, and payload support equipment. When used in this Instruction the term "payload" is intended to include only payloads for which NASA has DDT&E responsibility.

b. Payload Class - The NASA designation classifying each program/payload according to the criticality of the mission to NASA and national objectives, program cost, and the acceptable level of risk of a partial or complete failure.

5. LIMITATIONS

All payloads must conform with all applicable NASA safety requirements. In the event of any conflict with this Instruction, the safety requirements shall take precedence.

6. POLICIES

a. NASA will recognize the four classes of payloads which are defined and characterized in Attachment A to this Instruction. The characterizations for Classes A through D contained in Attachment A are intended to serve as guidelines to define a meaningful ladder of cost/risk combinations for NASA payloads.

b. Any equipment that constitutes a payload, or part of a payload, may be separately classified #40e.g., payload instrument, experiment, or support equipment#41. For example, a Class A free flyer may incorporate instruments from Classes A and B. A Class A Spacelab or Space Station payload may incorporate instruments from all four classes.

c. Guidelines for program Safety, Reliability, Maintainability, and Quality Assurance #40SRM&QA#41 and related requirements for Classes A through D are provided in Attachment B. Field installation and Headquarters organizations shall develop detailed policies, standards, and/or guidelines to adapt and expand upon the examples in Attachment B as necessary to establish a consistent set of requirements appropriate for the unique needs of their various payloads. Each subset of requirements described by the examples in Attachment B #40and in the corresponding detailed documents which are prepared#41 is intended to serve as an approved starting point for establishment of a complete set of DDT&E criteria and requirements tailored to the needs of a specific project.

d. In all cases, nothing in this Instruction is intended to limit or constrain the flexibility of a project to deviate from the guidelines in Attachment A or B, provided that the concurrence of cognizant field installation organizations and Headquarters Program Offices are obtained and documented.

e. Regardless of class designation, all payloads are to be developed and fabricated using sound management, engineering and manufacturing practices. Cost savings are to be achieved by taking steps to balance the use of resources to expected benefits appropriate for each class. Cost/risk tradeoffs shall be considered in determining requirements for NASA management visibility and day-to-day control, implementation of NASA-imposed "how-to" specifications and requirements, deliverable documentation, redundancy, spares, engineering and prototype model hardware, parts and material controls, inspection and audit controls and qualification/ acceptance test programs.

7 RESPONSIBILITIES

a. Headquarters Program Offices are responsible for:

(1) Assigning the class designation for each program/payload or payload element. The level of assembly selected for classification will usually consist of an integrated free flyer, or, in the case of Attached Payloads, an instrument. However, the Headquarters Program Office may establish the class designation at whatever level of assembly it considers appropriate for each project.

(2) Establishing a set of mission success criteria for each program/payload #40or payload element#41 which reflect the key objectives of the program. Such criteria will typically be easily measurable and expressed in terms of the science objectives to be achieved #40i.e., remote sensing of a planet for 2 years#41 or the service to be provided #40i.e., 95 percent availability of a single access link for 5 years#41.

(3) Defining acceptable risks for each program/payload or payload element and/or mission success criteria. Acceptable risks may be defined in terms of minimum

reliability requirements, critically of achieving the various mission success criteria, acceptable failures, or other appropriate criteria.

(4) Notifying the Office of Safety and Mission Quality #40OSMQ#41 in writing of the assigned payload classifications.

(5) Initiating and conducting investigations of in-flight, nonhazardous, nonpropagating failure of specific Class A and B equipment in accordance with Attachment B. For specific Class B equipment, the Headquarters Program Office may delegate this responsibility to the cognizant NASA field center.

b. Field installations are responsible for:

(1) Recommending a class designation for their proposed or assigned payload equipment.

(2) Recommending an appropriate classification breakdown into lower levels of assembly if payloads incorporate noncritical elements #40e.g., instruments or experiment hardware#41 for which lower class designations may be appropriate and cost effective.

(3) Planning and implementing a balanced development/acquisition effort that is consistent with paragraph 6e of this Instruction and incorporates the applicable subset of requirements shown in Attachment B. Where deviations from any of the guidelines in Attachment B are necessary, or where reclassifications are considered necessary, the Headquarters Program Office shall be coordinated with, and any changes documented and approved by the Headquarters Program Office, with a copy to the OSMQ.

(4) Maintaining documentation for each payload project showing current class designation together with a description of any deviations from the guidelines in Attachment B. This information should be documented in the Summary of Technical Plan section of the Project Plan and updated such that the current status is reflected by the latest Project Plan.

---

(5) Informing the cognizant Headquarters Program Office and the OSMQ, in writing, of all significant in-flight failures that occur during baseline or extended missions. Significant failures are those that result in failure to achieve payload objectives or degradation of payload performance, reliability, retrievability, or repairability to a level considered undesirable by the cognizant project office.

(6) Initiating and/or conducting investigations of in-flight, nonhazardous, nonpropagating failure of specific Class B-D

equipment in accordance with Attachment B.

c. The Office of Safety and Mission Quality is responsible for:

(1) Exercising general oversight and agencywide coordination of implementation of this Instruction.

(2) Serving as an agencywide focal point for collection and correlation of payload classification and in-flight failure information, and dissemination of lessons learned therefrom.

(3) Supporting Headquarters Program Offices in the development and review of payload class designations.

8. CANCELLATION

NMI 8010.1 dated September 26, 1979.

ATTACHMENTS:
A. Characterization, Mission Success and SRM&QA Cost Guidelines for Class A-D Payloads.
B. Guidelines for SRM&QA Program Requirements for Class A-D Payloads.

DISTRIBUTION:
SDL 1

ATTACHMENT A - CHARACTERIZATION, MISSION SUCCESS AND SRM&QA COST GUIDELINES FOR CLASS A-D PAYLOADS

CLASSIFICATION:	Class A
Characterization:	High Priority, Minimun Risk
Typical Factors Used to Determine Payload Classifications:	High national prestige; Long hardware life required; High complexity; Highest cost; Long program duration; Critical launch constraints; Retrieval/reflight or in-flight maintenance to recover from problems is not feasible.
Achievement of Mission Success Criteria:	All affordable programmatic and other measures are taken to achieve minimun risk. The highest practical product assurance standards are utilized.
Estimated Relative* SRM&QA Cost Factors:	1. 0

CLASSIFICATION:	Class B
Characterization:	High Priority, Medium Risk
Typical Factors Used to Determine Payload Classifications:	High national prestige; Medium hardware life required; High to medium complexity; High cost; Medium program duration; Retrieval/reflight or in-flight maintenance to recover from problems is difficult or not feasible.
Achievement of	Compromises are used to permit somewhat reduced costs

Mission Success Criteria:	while maintaining a low risk to the overall mission success and a medium risk of achieving only partial success. Stringent product assurance standards are utilized.
Estimated Relative* SRM&QA Cost Factors:	0.7 X Class A
CLASSIFICATION:	Class C
Characterization:	Medium Priority, Medium/High Risk
Typical Factors Used to Determine Payload Classifications:	Moderate national prestige; Short hardware life required; Medium to low complexity; Medium cost; Short program duration; Few launch constraints; Retrieval/reflight or in-flight maintenance to recover from problems may be feasible.
Achievement of Mission Success Criteria:	Moderate risks of not achieving mission success are accepted to permit significant cost savings. Reduced product assurance requirements are allowed.
Estimated Relative* SRM&QA Cost Factors:	0.4 X Class A
CLASSIFICATION:	Class D
Characterization:	High Risk, Minimum Cost
Typical Factors Used to Determine Payload Classifications:	Little national prestige; Short hardware life required; Low complexity; Low cost; Short program duration; Non-critical launch time/orbit; Reflyable or economically replaceable, in-flight maintenance may be feasible.
Achievement of Mission Success Criteria:	Significant risk of not achieving mission success is accepted to permit minimum costs. Minimal product assurance requirements are allowed.
Estimated Relative* SRM&QA Cost Factors:	0.1 X Class A

* There are wide variations in the methods for specifying and accounting for "SRM&QA costs". For Class A programs, these costs are typically in the range of 10 to 15% of the total program cost. The relative SRM&QA cost factors specified here are intended to require substantive differences in the SRM&QA programs #40and the associated costs#41 for the various program classifications in order to establish a meaningful ladder of cost/risk levels.

ATTACHMENT B - GUIDELINES FOR SRM&QA PROGRAM REQUIREMENTS FOR CLASS A-D PAYLOADS

CLASSIFICATION:	Class A
SRM&QA ELEMENTS:	
Engineering Model, Prototype, Flight	Engineering Model Hardware for new or modified designs. Separate Prototype and Flight Model Hardware. Full set

and Spare Hardware	of assembled and tested "Flight Spare" replacement units.
Failure Investigation Board Requirements	Formal Board Required - Initiated and Conducted by Headquarters.
Treatment of Single Failure Points #49SFPs#49	Success Critical SFP''s are not permitted except by Formal Project Waiver. Retention of Unavoidable SFP''s requires Justification based on Risk Analysis and Implementation of Measures to Mitigate Risk.
Qualification Acceptance, and Protoflight Test Program	Full Formal Qualification and Acceptance Test Programs at all hardware levels. Extensive Design Margin and Development Testing for New or Modified Designs.
EEE Parts	Grade I #40per MIL-STD-975#41.
Reviews*	Full Formal Review Program including Outside/Independent Reviews.
Safety	Per all applicable NASA Safety Standards.
Materials	Verify heritage of previously used materials and qualify all new or changed materials. Utilize source controls on procured materials and Acceptance Test each lot/batch.
Reliablilty	Failure Mode and Effects Analysis/Critical Items List #40FMEA/CIL#41, worst case performance and parts stress analyses required for all parts and circuits. Mechanical reliability and other reliability analyses required where appropriate.
Maintainability	Formal Maintainability Program for all appropriate flight and critical ground support elements.
Quality Assurance	Formal Quality Assurance Program including closed-loop problem reporting and analysis of SRM&QA and performance trends.
Software*	Formal Software Quality Assurance Program including a formal review program with Outside/Independent Reviews and independent verification and validation.

CLASSIFICATION: Class B

SRM&QA ELEMENTS:

Engineering Model, Prototype, Flight and Spare Hardware	Engineering Model Hardware for new or significantly modified designs. "Protoflight" hardware #40in lieu of seperate prototype and flight models#41 except where Extensive Qualification Testing is anticipated. Spare #40or refurbishable prototype#41 hardware as needed to avoid major program impact in flight units must be replaced.
Failure Investigation	Formal Board Required - Initiated by Headquarters; may be conducted by Congnizant Field Center #40see Par.7a#405#

Board Requirements	
Treatment of Single Failure Points #40SFPs#41	Success Critical SFP''s are allowed w/o formal waiver bu are minimized and mitigated by use of high reliability parts and additional testing. Essential spacecraft functions and key instruments are typically fully redundant. Other hardware has partial redundancy and/ or provisions for graceful degradation.
Qualification Acceptance, and Protoflight Test Program	Formal Qualification and Acceptance Test Programs may be combinded using "Protoflight" hardware approach. Design margin and development testing for new designs.
EEE Parts	Combination Grade I and Grade II #40per MIL-STD-975#41.
Reviews*	Formal Review Program; may include Outside/Independent Reviews.
Safety	Per all applicable NASA Safety Standards.
Materials	Utilize Previously Tested/Flown Materials or qualify new mateials. Acceptance test each lot of procured materials.
Reliablilty	FMEA/CIL required at a black box #40or circuit block diagram#41 level. Worst case performance and parts stre analyses required for all parts and circuits.
Maintainability	Formal Maintainability Program for selected flight and ground support elements.
Quality Assurance	Formal Quality Assurance Program including closed-loop problem reporting and analysis of SRM&QA and some performance trends.
Software*	Formal Software Quality Assurance Program including a formal review program and software verification and validation; may include Outside/Independent Reviews.
CLASSIFICATION:	Class C
SRM&QA ELEMENTS:	
Engineering Model, Prototype, Flight and Spare Hardware	Engineerig Model Hardware for New Designs. "Protoflight" Hardware #40in lieu of separate Prototype and flight models#41. Limited flight spare hardware #40for long leac or difficult to replace flight units#41.
Failure Investigation Board Requirements	Formal Board Required - Initiated and conducted by Cognizant Field Center.
Treatment of Single Failure Points #49SFPs#49	Success Critical SFP''s are allowed w/o formal waiver. Single string and partially single string design approaches are commonplace.
Qualification Acceptance, and Protoflight Test	Limited Qualification Testing for new aspects of the design plus full acceptance test program. Qualification testing required for verification of safety compliance

Program	and interface compatibility. Limited Development Testing.
EEE Parts	Grade II #40per MIL-STD-975#41 or upgraded commercial.
Reviews*	Limited Formal Reviews and Project Level Reviews.
Safety	Per all applicable NASA Safety Standards.
Materials	Utilize previously tested/flown materials or characterize new materials. Asseptance test sample lots of procured materials.
Reliablilty	FMEA/CIL Requirements determined at the project level. Analysis of interfaces required. Parts stress analysis required for all parts and circuits.
Maintainability	Maintainability considered during design. Sparing provided where economical.
Quality Assurance	Formal Inspection System including Problem Reporting.
Software*	Software Quality Assurance Program with Project Level Reviews.
CLASSIFICATION:	Class D
SRM&QA ELEMENTS:	
Engineering Model, Prototype, Flight and Spare Hardware	Limited Engineering Model and Flight Spare Hardware.
Failure Investigation Board Requirements	Failure Investigation initiated and conducted by Congnizant Field Center - Formal Board Not Required
Treatment of Single Failure Points #49SFPs#49	Success Critical SFP''s are allowed w/o Formal Waiver. Single string and partially single string design approaches are commonplace.
Qualification Acceptance, and Protoflight Test Program	Qualification Testing Required only for verification of safety compliance and interface compatibility. Acceptance test program for critical performance parameters.
EEE Parts	Commercial.
Reviews*	Project Level Reviews.
Safety	Per all applicable NASA Safety Standards.
Materials	Requirements based on applicable safety standards.
Reliablilty	Analysis Requirements based on applicable safety requirements. Analysis of interface required.
Maintainability	Requirements based on applicable safety standards.

```
Quality Assurance      Requirements based on applicable safety standards.

Software*              Requirements based on applicable safety standards.

* Outside/Independent Review refers to reviews conducted by personnel who
are not managing or directly associated with the program or the design effort
#49i.e., personnel who are not assigned to or in the management chain for the
program and who are not performing or managing the design effort#49.


                       Press #fwhite SPACE#d to Continue']).

close_window ().
end. (* Display Document *)
```

```
(* IMPPLAN.KB *)
(* THIS PROGRAM IS FOR FILLING OUT THE IMPLEMENTATION PLAN SECTION         *)
(* OF THE PROJECT PLAN.                                                    *)

column = 2.
row = 2.
no_edit_key ().
no_debug ().
curdir is read_line ('CURDIR.DAT').
curdir is string_replace (?curdir,' ','',8).
menu_choice = ' '.
menu_option is ['IMPLEMENTATION APPROACH',
'SUMMARY WORK BREAKDOWN STRUCTURE','DOCUMENTATION',
'RETURN TO PREVIOUS MENU'].

while ?menu_choice <>  'RETURN TO PREVIOUS MENU'
  then do (Ioutline).

topic 'Ioutline'.
column = ?column + 1.
row = ?row + 1.
window ('4.5  Implementation Plan',yellow,red,white,?column,?row,76,17).
ask ('#e

         The Implementation Plan includes these three sections',
         menu_choice,?menu_option).

if ?menu_choice = 'IMPLEMENTATION APPROACH'
  then do ('Implementation Approach').

if ?menu_choice = 'SUMMARY WORK BREAKDOWN STRUCTURE'
  then do ('Summary Work Breakdown Structure').

if ?menu_choice = 'DOCUMENTATION'
  then do ('Documentation').

if ?menu_choice = 'RETURN TO PREVIOUS MENU'
  then new_kb ('content.hkb').



close_window ().
column = ?column - 1.
row = ?row - 1.
end. (* Implementation Plan *)
new_kb ('content.hkb').

topic 'Implementation Approach'.
column = ?column + 1.
row = ?row + 1.
window ('4.5.1  Implementation Approach',blue,white,white,?column,?row,72,11).
say ('#e

    Please indicate whether the project is an in-house activity or
    a contracted activity.  Define the principle entities on the
    project team, including the contractor team and its responsibil-
    ities.  If the contractor team has not yet been selected, include
    a description of the contractor procurement approach and schedule.

          Press #fyellow RETURN KEY#d to enter the editor, #fyellow ESC#d
```

```
          to leave editor, and #fyellow RETURN#d to confirm save.').

edit_file (concat (C:\GARDEN\,?CURDIR,'\PPE4_5_1.DAT'),yellow,black,red,6,12,7
close_window ().
close      (concat (C:\GARDEN\,?CURDIR,'\PPE4_5_1.DAT')).
column = ?column - 1.
row = ?row - 1.
end. (* Implementation Approach *)


topic 'Summary Work Breakdown Structure'.
column = ?column + 1.
row = ?row + 1.
window ('4.5.2  Summary Work Breakdown Structure',blue,white,white,
?column,?row,72,12).
say (['#e

     Please provide a summary #mWork Breakdown Structure#m (WBS) down
     to the "appropriate level" (as agreed to between the Project
     Manager, and the Program Manager) and a brief description of
     each WBS element. The WBS structure should be related to line
     items on the project master schedule and to the resources
     section, and it should serve as the baseline WBS to be used
     in future budget reporting.

            Press #fyellow RETURN KEY#d to enter the editor, #fyellow ESC#d
            to leave editor, and #fyellow RETURN#d to confirm save.']).

edit_file (concat (C:\GARDEN\,?CURDIR,'\PPE4_5_2.DAT'),yellow,black,red,6,12,7(
close_window ().
close      (concat (C:\GARDEN\,?CURDIR,'\PPE4_5_2.DAT')).
column = ?column - 1.
row = ?row - 1.
end. (* Summary Work Breakdown Structure *)


topic 'Documentation'.
column = ?column + 1.
row = ?row + 1.
window ('4.5.3  Documentation',blue,white,white,?column,?row,72,11).
say ('#e

      Please provide a #mlist of documentation#m that includes
      all governing, hardware development, mission integration,
      and safety documentation.

          Press #fyellow RETURN KEY#d to enter the editor, #fyellow ESC#d
          to leave editor, and #fyellow RETURN#d to confirm save.').

edit_file (concat (C:\GARDEN\,?CURDIR,'\PPE4_5_3.DAT'),yellow,black,red,6,12,70
close_window ().
close      (concat (C:\GARDEN\,?CURDIR,'\PPE4_5_3.DAT')).
column = ?column - 1.
row = ?row - 1.
end. (* Documentation *)

topic 'Work Breakdown Structure'.
collect ()
and
dos ('WBS' ,restore).
```

```
end. (* Work Breakdown Structure *)

topic 'list of documentation'.
column =  ?column + 1.
row = ? row + 1.
window('List of Documentation',yellow,red,yellow,?column,?row,71,16).
say ('#e
   Documents Subject to Formal Baselining and Configuration Control
                              by APCGF
     ==============================================================


      Document                                       Responsibility
      --------                                       -------------
   o  Science Requirements                           PI
   o  Project Implementation Plan                    Project Office
   o  Instrument Interface Agreement                 Integrator
   o  Interface Control Document                     Developer and/or
                                                        Integrator
   o  Safety Plan                                    Developer and/or
                                                        Integrator
   o  Verification Plan                              Developer and/or
                                                        Integrator
   o  Experiment Requirement Document                Developer
   o  End Item Specification                         Project Office
   o  Drawings                                       Developer
   o  Test and Checkout Requirements and             Project Office
       Specifications Document
   o  Instrument Program and Component               Developer
       List
   o  Operations and Maintenance                     Developer
       Requirements/Manual
   o  Software Requirements/Manual                   Developer

       Any proposed change to items controlled above shall be
   approved by the Project Manager.  Changes to MSAD-controlled
   milestones, schedules and growth module specifications shall
   be submitted through the same channel.  All contracts and
   agreements are based on project requirements.  Technical re-
   quirements are set forth in specifications and technical docu-
   ments.  Other requirements concerning management and operating
   functions necessary for conduct of the project are specified in
   the appropriate requirements documents.

       For all apparatus in development or planning, contractual
   requirements will ensure that all applicable documentation
   necessary for flight qualification is produced.  At each level
   and at significant points in the APCGF Project, baselines will
   be established, and changes to these baselines will be tracked
   until a revised baseline is formally established.  The accom-
   panying #mtable#m provides a sample listing of those documents
   that shall be required for acceptance of flight hardware.

                    Press #fwhite SPACE#d to continue.').

column = ?column - 1.
row = ?row - 1.
close_window ().
end. (* documentation *)
```

```
topic 'table'.
column = ?column + 1.
row = ?row + 1.
window ('Sample Listing of Documents',blue,white,white,?column,?row,72,15).
say ('#e

        Documentation to Be Included in Accptance Data Package
        =====================================================

                 Log Book
                 Mass Properties Data
                 Waivers/Deviations
                 Test Procedure/Results
                 Operation and Maintenance Requirements/Manual
                 Drawing/Engineering Change Orders
                 Calibration Data
                 Materials Usage List/Maintenance Requirements/Manual
                 Safety Compliance Data
                 Verification Data
                 Special Handling Data
                 Cleanliness Certification
                 Pressure Vessel Log (If Applicable)
                 Discrepancy/Problem Reports
                 Acceptance/Preship Review Data (shortages,
                  open work, red tag items, shipping document,
                  certifications)


                     Press #fyellow SPACE#d to continue.').

close_window ().
column = ?column - 1.
row = ?row - 1.
end. (* table *)
```

```
(* MGTPLAN.KB *)
(* THIS PROGRAM IS FOR COMPLETING THE MANAGEMENT PLAN SECTION OF THE     *)
(* PROJECT PLAN *)

column = 2.
row = 2.
no_edit_key ().
no_debug ().
curdir is read_line ('CURDIR.DAT').
curdir = string_replace (?curdir,' ','',8).
menu_choice = ' '.
menu_option is ['PROJECT MANAGEMENT RESPONSIBILITIES AND ORGANIZATION',
'MISSION MANAGEMENT RESPONSIBILITIES AND ORGANIZATION',
'RETURN TO PREVIOUS MENU'].
while ?menu_choice <> 'RETURN TO PREVIOUS MENU'
then do (MPoutline).

topic 'MPoutline'.
column = ?column + 1.
row = ?row + 1.
window ('4.6  Management Plan',white,red,yellow,?column,?row,76,17).
ask ('#e

              The Management Plan Section includes these two parts:',
              menu_choice,?menu_option).

if ?menu_choice = 'PROJECT MANAGEMENT RESPONSIBILITIES AND ORGANIZATION'
  then do ('Project Management Responsibilities and Organization').

if ?menu_choice = 'MISSION MANAGEMENT RESPONSIBILITIES AND ORGANIZATION'
  then do  ('Mission Management Responsibilities and Organization').

if ?menu_choice = 'RETURN TO PREVIOUS MENU'
  then new_kb ('content.hkb').

close_window ().
column = ?column - 1.
row = ?row - 1.
end. (* Management Plan *)
new_kb ('content.hkb').

topic 'Project Management Responsibilities and Organization'.
relatedfile3 = '\PPE4_5_2.dat'.
column = ?column + 1.
row = ?row + 1.
window ('4.6.1  Project Management Responsibilities and Organization',blue,
white,white,?column,?row,72,12).
say ('#e

   Please provide an #morganization chart#m of the project, including
   the Center Director, Project Manager, Principle Investigator,
   Project Scientist, and other key positions on the project, and
   all external project interfaces.  Relate the organization chart
   to the WBS (#mSection 4.5.2#m).


                           Press #fyellow SPACE#d to continue.').
```

```
close_window ().
column = ?column - 1.
row = ?row - 1.
end. (* Project Management Responsibilities and Organization *)


topic 'Mission Management Responsibilities and Organization'.
column = ?column + 1.
row = ?row + 1.
window ('4.6.2  Mission Management Responsibilities and Organization',blue,
white,white,?column,?row,72,14).
say ('#e

    Please identify the NASA center responsible for mission man-
    agement and describe what process is to be used to define the
    management and technical interface agreements between the NASA
    center responsible for the project and the Mission Management
    Center.  Indicate the mission management responsibilities and
    interfaces on the #morganization chart#m prepared for Section 4.6.1.
    Identify all assumptions that will affect project plans,
    schedules and costs.

          Press #fyellow RETURN KEY#d to enter the editor, #fyellow ESC#d
          to leave editor, and #fyellow RETURN#d to confirm save.').

edit_file (concat (C:\GARDEN\,?CURDIR,'\PPE4_6_2.DAT'),yellow,black,red,6,12,70
close_window ().
close     (concat (C:\GARDEN\,?CURDIR,'\PPE4_6_2.DAT')).
column = ?column - 1.
row = ?row - 1.
end. (* Mission Management, Responsibilities and Organization *)

topic 'organization chart'.
collect () and
dos ('ORGEXPL' ,restore).
end. (* organization chart *)

topic 'Section 4.5.2'.
column = ?column + 1.
row = ?row + 1.
related_answer is read(concat(C:\GARDEN\,?curdir,?relatedfile3)).
window ('4.5.2 Summary Work Breakdown Structure',blue,white,white,
?column,?row,73,15).
say ('
      This is your answer for Section 4.5.2: #t #n',
       ?related_answer, '#n #n #n #n #n
                           Press #fyellow SPACE#d to continue.').

column = ?column - 1.
row = ?row - 1.
close_window ().
end. (* Section 5.2 *)
```

```
(* COSTCONT.KB *)
(* THIS PROGRAM IS FOR FILLING OUT THE COST CONTROL PLAN SECTION     *)
(* OF THE PROJECT PLAN.                                              *)

column = 2.
row = 2.
no_edit_key ().
no_debug ().
curdir is read_line ('CURDIR.DAT').
curdir = string_replace(?curdir,' ','',8).
menu_choice = ' '.
menu_options is ['RESOURCES','COST CONTROL GUIDELINES',
'COST REPORTING AND CONTROL STRUCTURE','COST CONTROL STRATEGY',
'RETURN TO PREVIOUS MENU'].
while ?menu_choice <> 'RETURN TO PREVIOUS MENU'
 then do (CCoutline).

topic 'CCoutline'.
column = ?column + 1.
row = ?row + 1.
window ('4.8 Cost Control',white,red,white,?row,?column,76,17).
ask ('#e

      The Cost Control Plan Includes these four sections:',
      menu_choice,?menu_options).

if ?menu_choice = 'RESOURCES'
  then do ('Resources').

if ?menu_choice = 'COST CONTROL GUIDELINES'
  then do ('Cost Control Guidelines').

if ?menu_choice = 'COST REPORTING AND CONTROL STRUCTURE'
  then do ('Cost Reporting and Control Structure').

if ?menu_choice = 'COST CONTROL STRATEGY'
  then do ('Cost Control Strategy').

if ?menu_choice = 'RETURN TO PREVIOUS MENU'
  then new_kb ('content.hkb').


close_window ().
column = ?column - 1.
row = ?row - 1.
end. (* Cost Control Plan *)
new_kb ('content.hkb').



topic 'Resources'.
relatedfile4 = '\PPE4_4_8.DAT'.
column = ?column + 1.
row = ?row + 1.
window ('4.8.1   Resources',blue,white,white,?column,?row,72,15).
say (['#e

    Please specify the funding (including contingency) and man-
    power requirements needed for the life of the project against
    the #mWBS#m.  These resource requirements should be consistent with
```

```
    results from the Independent Cost Review held in conjunction
    with the #mRDR#m.  Identify any assumptions made in determining the
    cost.  Select the appropriate WBS level to be the Cost Reporting
    level.  Identify any use to be made of other facilities for which
    another entity (other than the project) will be financially
    responsible.  (This should be consistent with facility usage
    described in #mSection 4.4.8#m.)

         Press #fyellow RETURN KEY#d to enter the editor, #fyellow ESC#d
         to leave editor, and #fyellow RETURN#d to confirm save.']).

edit_file (concat (C:\GARDEN\,?CURDIR,'\PPE4_8_1.DAT'),yellow,black,red,6,12,70
close_window ().
close     (concat (C:\GARDEN\,?CURDIR,'\PPE4_8_1.DAT')).
column = ?column - 1.
row = ?row - 1.
end.(* Resoruces *)

topic 'Cost Control Guidelines'.
column = ?column + 1.
row = ?row + 1.
window ('4.8.2  Cost Control Guidelines',blue,white,white,?column,?row,
72,13).
say (['#e#e

    Please define the cost control guidelines to be used in
    coping with cost variations at the different project levels.

    The following are #fyellow examples#d of guidelines that #fyellow may be use
    and are not intended to be universally applied.  Each project
    can develop its own guidelines according to the individual
    project needs.

    a.  MSAD Allowance for Program Adjustment (APA) is to be utilized
    for changes in program scope imposed by external circumstances,
    such as change in launch date or launch vehicle and internal
    changes in the science requirements.

    b.  Project Office Contingency is to be utilized to fix internal
    problems for the PI#39s or hardware contractor, such as design
    changes, parts procurement, alternate approaches, and change of
    subcontractors.

    c.  Contingency reserves at the lower #mWBS#m levels (if they exist)
    will be used to solve problems in those WBS elements. Only when
    problems cannot be solved within the WBS element are they to be
    referred to the next higher cost control point.

         Press #fyellow RETURN KEY#d to enter the editor, #fyellow ESC#d
         to leave editor, and #fyellow RETURN#d to confirm save.']).

edit_file (concat (C:\GARDEN\,?CURDIR,'\PPE4_8_2.DAT'),yellow,black,red,6,12,70,
close_window ().
close     (concat (C:\GARDEN\,?CURDIR,'\PPE4_8_2.DAT')).
column = ?column - 1.
row = ?row - 1.
end. (* Cost Control Gudielines *)

topic  'Cost Reporting and Control Structure'.
column = ?column + 1.
```

```
row = ?row + 1.
menu_option2 is ['NASA REPORTS','CONTRACTOR REPORTS','RETURN'].
menu_choice2 = ' '.
while ?menu_choice2 <> 'RETURN'
  then do ('cost reporting').
new_kb ('costcont.hkb').
topic 'cost reporting'.
window ('4.8.3  Cost Reporting and Control Structure',blue,white,white,
?column,?row,74,15).
ask ('#e

               This section includes these two parts:',menu_choice2,?
               menu_option2).

if ?menu_choice2 = 'NASA REPORTS'
  then do ('NASA REPORTS').

if ?menu_choice2 = 'CONTRACTOR REPORTS'
  then do ('CONTRACTOR REPORTS').

if ?menu_choice2 = 'RETURN'
  then new_kb ('costcont.hkb').

end. (* cost reporting *)


close_window ().
column = ?column - 1.
row = ?row - 1.
end. (* Cost Reporting and Control Structure *)

topic 'NASA Reports'.
column = ?column + 1.
row = ?row + 1.
window ('4.8.3.1  NASA Reports',blue,white,white,?column,?row,72,11).
say (['#e

    Please show the #mWBS#m structure to be used for cost reporting
    and control, and identify the monthly Management Information
    Control System (MICS) (or equivalent) and Project Operating
    Plan (POP) reporting format to be used.  These should result
    from negotiations between the Project and Program Managers and
    will vary in detail depending on project size and complexity.

          Press #fyellow RETURN KEY#d to enter the editor, #fyellow ESC#d
          to leave editor, and #fyellow RETURN#d to confirm save.']).

edit_file (concat (C:\GARDEN\,?CURDIR,'\E4_8_3_1.DAT'),yellow,black,red,6,12,70,
close_window ().
close     (concat (C:\GARDEN\,?CURDIR,'\E4_8_3_1.DAT')).
column = ?column - 1.
row = ?row - 1.
end. (* NASA Reports *)

topic 'Contractor Reports'.
column = ?column + 1.
row = ?row + 1.
window ('4.8.3.2   Contractor Reports',blue,white,white,?column,?row,72,11).
say ('#e
```

```
     Where applicable, please delineate the contractor reports to
     be provided to the NASA center.

          Press #fyellow RETURN KEY#d to enter the editor, #fyellow ESC#d
          to leave editor, and #fyellow RETURN#d to confirm save.').

edit_file (concat (C:\GARDEN\,?CURDIR,'\E4_8_3_2.DAT'),yellow,black,red,6,12,70
close_window ().
close     (concat (C:\GARDEN\,?CURDIR,'\E4_8_3_2.DAT')).
column = ?column - 1.
row = ?row - 1.
end. (*  Contractor Reports *)


topic 'Cost Control Strategy'.
column = ?column + 1.
row = ?row + 1.
window ('4.8.4   Cost Control Strategy',blue,white,white,?column,?row,72,13).
say ('#e

    Discuss the courses of action to be followed in the event
    of cost growths. The entire hardware development process should
    be considered, including the test plans, support equipment,
    and facility requirements, etc., as well as the mainline flight
    hardware development.

    Your discussion should include the prioritization of science
    requirements, science and hardware development descope options,
    and appropriate decision points.  Program stretch-out options
#n
    should also be addressed if appropriate. Obviously, this section
    should be developed with a high degree of participation by the
    Principle Investigator and Project and Program Scientists. Over-
    all discussions on cost management, such as how to deal with
    overruns and underruns at the lower #mWBS#m and project levels, should
    also be included.

          Press #fyellow RETURN KEY#d to enter the editor, #fyellow ESC#d
          to leave editor, and #fyellow RETURN#d to confirm save.').

edit_file (concat (C:\GARDEN\,?CURDIR,'\PPE4_8_4.DAT'),yellow,black,red,6,12,70
close_window ().
close     (concat (C:\GARDEN\,?CURDIR,'\PPE4_8_4.DAT')).
column = ?column - 1.
row = ?row - 1.
end. (* Cost Control Strategy *)

topic 'Section 4.4.8'.
column = ?column + 1.
row = ?row + 1.
related_answer is read(concat(C:\GARDEN\,?curdir,?relatedfile4)).
window ('4.4.8 Facilities',blue,white,white,?column,?row,73,15).
say ('
      This is your answer for Section 4.4.8: #t #n',
       ?related_answer, '#n #n #n #n #n
                       Press #fyellow SPACE#d to continue.').

column = ?column - 1.
row = ?row - 1.
close_window ().
```

```
end. (* Section 4.4.8 *)

topic 'RDR'.
column = ?column + 1.
row = ?row + 1.
window ('RDR',blue,white,white,?row,?column,72,14).
say('#e


                  Requirements Definition Review



                     Press #fyellow SPACE#d to continue.').

close_window ().
column = ?column - 1.
row = ?row -1.
end. (* RDR *)

topic 'WBS'.
column = ?column + 1.
row = ?row + 1.
window ('WBS',blue,white,white,?row,?column,70,10).
say('#e


                     Work Breakdown Structure



                     Press #fyellow SPACE#d to continue.').

close_window ().
column = ?column - 1.
row = ?row -1.
end. (* WBS *)
```

```
(* Projrev.kb *)
(*  This is the file for the completion of the Project Reviews and      *)
(*  Meetings section of the Project Plan.                               *)

column = 2.
row = 2.
no_edit_key ().
no_debug ().
curdir is read_line ('CURDIR.DAT').
curdir = string_replace (?curdir,' ','',8).
menu_choice = ' '.
menu_options is ['INTERNAL REVIEWS','EXTERNAL REVIEWS',
'DESIGN AND READINESS REVIEWS','RETURN TO PREVIOUS MENU'].

while ?menu_choice <> 'RETURN TO PREVIOUS MENU'
 then do (PRoutln).
topic 'PRoutln'.
column = ?column + 1.
row = ?row + 1.
window ('4.9  Project Reviews and Meetings',white,red,yellow,?column,?row,
76,17).
ask ('#e

       Project Reviews and Meetings includes the following topics:',
       menu_choice,?menu_options).


if ?menu_choice = 'EXTERNAL REVIEWS'
  then do ('External Reviews').

if ?menu_choice = 'INTERNAL REVIEWS'
  then do ('Internal Reviews').

if ?menu_choice =  'DESIGN AND READINESS REVIEWS'
  then do ('Design and Readiness Reviews').

if ?menu_choice = 'RETURN TO PREVIOUS MENU'
  then new_kb ('content.hkb').

close_window ().
column =  ?column - 1.
row = ?row - 1.

end. (* Project Reviews and Meetings *)
new_kb ('content.hkb').

topic 'Internal Reviews'.
column = ?column + 1.
row = ?row + 1.
window ('4.9.1.1   Internal Reviews',blue,white,white,?column,?row,72,11).
say ('#e

      Please identify weekly or monthly project meetings and
      reviews with the NASA center#39s management as appropriate.


           Press  #fyellow RETURN KEY#d to enter editor, #fyellow ESC#d
           to leave editor, and #fyellow RETURN#d to confirm save.').

edit_file (concat (C:\GARDEN\,?CURDIR,'\E4_9_1_1.DAT'),yellow,black,red,6,12,70,
```

```
close_window ().
close     (concat (C:\GARDEN\,?CURDIR,'\E4_9_1_1.DAT')).
column = ?column - 1.
row = ?row - 1.
end. (* Internal Reviews *)

topic 'External Reviews'.
column = ?column + 1.
row = ?row + 1.
window ('4.9.1.2  External Reviews',blue,white,white,?column,?row,72,11).
say ('#e

   Please identify biweekly telecons, monthly reviews, or peri-
   odic program reviews with NASA Headquarters, Mission Management,
   etc., as appropriate.


         Press #fyellow RETURN KEY#d to enter the editor, #fyellow ESC#d
         to leave editor, and #fyellow RETURN#d to confirm save.').

edit_file (concat (C:\GARDEN\,?CURDIR,'\E4_9_1_2.DAT'),yellow,black,red,6,12,70,
close_window ().
close     (concat (C:\GARDEN\,?CURDIR,'\E4_9_1_2.DAT')).
column = ?column - 1.
row = ?row - 1.
end. (* External Reviews *)

topic 'Design and Readiness Reviews'.
column = ?column + 1.
row = ?row + 1.
window ('4.9.1.3  Design and Readiness Reviews',blue,white,white,?column,
?row,72,11).
say ('#e

    Please make reference to the major project reviews, including
    those required by the MSAD management plan as well as integrated
    payload reviews, safety reviews, and flight readiness reviews.

          Press #fyellow RETURN KEY#d to enter the editor, #fyellow ESC#d
          to leave editor, and #fyellow RETURN#d to confirm save.').

edit_file (concat (C:\GARDEN\,?CURDIR,'\E4_9_1_3.DAT'),yellow,black,red,6,12,70,
close_window ().
close     (concat (C:\GARDEN\,?CURDIR,'\E4_9_1_3.DAT')).
column = ?column - 1.
row = ?row - 1.
```

APPENDIX G

Science Requirements Envelope Document Software Listing

```
(*ENVMMENU.KB        This is the main menu of the Science Requirements  *)
(*                              Envelope Document                         *)

no_edit_key ().
no_debug ().
action = '  '.
nasaloop = 1.
glossary_load = 0.
column = 3.
row = 3.
yn = [YES,NO].

menu_option is ['HOW TO USE THE SYSTEM',
'PROJECT SELECTION',
'SCIENCE REQUIREMENTS ENVELOPE DOCUMENT (OVERVIEW)',
'GLOSSARY/ACRONYMS',
'PRINT GLOSSARY/ACRONYMS','EXIT SYSTEM'].
menu_choice = ' '.

while ?menu_choice <> 'EXIT SYSTEM'
  then do (nasamenu).

topic 'nasamenu'.

window (' ',,,,3,3,77,18).

     ask (['#e #s

    Please enter your choice of activities from the list.'],menu_choice,
         ?menu_option).

if ?menu_choice = 'HOW TO USE THE SYSTEM'
  then new_kb  ('envintro.hkb').

if ?menu_choice = 'SCIENCE REQUIREMENTS ENVELOPE DOCUMENT (OVERVIEW)'
  then new_kb  ('envover.hkb').

if ?menu_choice = 'PROJECT SELECTION'
  then new_kb ('eproject.hkb').

if ?menu_choice = QUIT
  then stop ().

if ?menu_choice = 'GLOSSARY/ACRONYMS'
then glossary_load = (?glossary_load + 1)
and
do (glossary).


if ?menu_choice = 'PRINT GLOSSARY/ACRONYMS'
  then
    ask ('#e
     The printing of the glossary/acronym list can require
     a significant amount of time (5 - 10 minutes depending
     on your system).  Are you sure you want to print the
     glossary at this time?',printok,?yn)
   and
     if ?printok = NO
       then new_kb ('ENVMMENU.CKB')
     else
```

```
    window (,white,red,yellow,1,16,27,4)
    and
    WRITE ('con:',
'  GLOSSARY is being
  printed.

  Please stand by.          ')
    and
    glossary_print is read ('ENVTERMS.DAT',,'//KSC')
    and
    glossary_print is string_replace(?glossary_print,'//','        ')
    and
    glossary_print is string_replace(?glossary_print,'/end','')
    and
    print (?glossary_print)
    and
    glossary_print is read ('ENVTERMS.DAT','//KSC')
    and
    glossary_print is string_replace(?glossary_print,'//','        ')
    and
    glossary_print is string_replace(?glossary_print,'/end','')
    and
    print (?glossary_print)
    and
    close_window ().

(*    close_window ().  *)
(* ******************************************************************* *)
topic glossary.
  window ('LISTING OF NASA GLOSSARY AND ACRONYMS',blue,white,white,1,1,80,20).


if ?glossary_load = 1
  then
  window (,white,red,yellow,1,16,27,4)
  and
  WRITE ('con:',
'  A slight delay will
  occur while the
  glossary is loaded.
  Please stand by.          ')
  and
  glossary_text is read ('ENVINDEX.DAT')
  and
  close_window ()
  and
  close ('ENVTERMS.DAT').

  say (?glossary_text).

  close_window ().

end. (* glossary *)

topic mark (find_string).
column =  ?column + 1.
row =  ?row + 1.
  text is read ('ENVTERMS.dat',concat('//',?find_string),'/end').
  window (?find_string,blue,white,white,?column,?row,72,).
  say (?text).
```

```
  column = ?column - 1.
  row = ?row - 1.
  close_window ().
end. (* mark *)

end.  (* envmmenu *)
```

```
(*ENVINTRO.KB        This is the introductory screen for the              *)
(*                  Science Requirements Envelope Document                *)


yn is [YES,NO].
column = 3.
row = 3.
no_edit_key ().
no_debug ().
tried = 0.


do (so_you_want_to_fly).

new_kb ('envmmenu.ckb').

topic so_you_want_to_fly.
  say ('

                  #bmagenta So you want to fly on the Shuttle.#d

         Well, before you can, we must get a little information about
                 your experiment and its requirements.

       If you have flown with us in the past, you may remember a
       substantial amount of paper documentation was required.  This
       application, the #mAutomated Payload Experiment Tool#m, is designed
       to alleviate much of the burden of the document preparation and
       maintenance process, by utilizing a #mhypertext#m, knowledge-based
       system.  This system can be used to prepare one of our support
       documents, the #mScience Requirements Envelope Document#m, which
       provides an envelope or volume of science requirements for a type
       of experimentation.


                         Press #fyellow SPACE#D to continue.').
if ?tried = 0
  then
       column = ?column + 1
       and
       row = ?row + 1
       and
       window (' ',white,red,white)
       and

       say ('#e
       For more information on a highlighted topic, just move
       the mouse to that word and click.  The information
       will immediately be displayed.  If you are not using a
       mouse, please use the function keys as indicated at the
       bottom of the screen.

       For multiple page definitions, please use the #fyellow Page Up#d
       and #fyellow Page Down#d keys to scroll back and forth through
       the pages.  Multiple page displays are indicated by the
       #fyellow Page x of x #d message at the lower right of the screen.


       For help at anytime throughout the application, select
       the #fyellow F1#d key.  This will retrieve location sensitive
```

```
        help information, and may be called from the system
        or system-called edit screens.

        This will be the method by which support documentation
        will be retrieved throughout this application.

                                Press #fyellow SPACE#D to continue.')
  and
    close_window ()
  and
    tried = 1
  and
    column = ?column - 1
  and
    row = ?row - 1
  and
    do (so_you_want_to_fly).


topic mark (find_string).
  column = ?column + 1.
  row    = ?row + 1.
  text is read ('nasaterm.dat',concat('//',?find_string),'/end').
  window (?find_string,blue,white,white,?column,?row,72,).
  say (?text).
  column = ?column - 1.
  row = ?row - 1.
  close_window ().
end. (* mark *)


end. (* so_you_want_to_fly *)
```

```
(*ENVOVER.KB     This program lists the outline for                    *)
(*               the Science Requirements Envelope Document.           *)

no_edit_key ().
no_debug ().
row = 3.
column = 3.
(* show_outline = 0. *)
width = 72.
length = 12.

do (soutline).

new_kb ('eoutline.hkb').

(* Topic mark allows for the use of hypertext. *)

topic mark (find_string).
   row = ?row + 1.
   column = ?column + 1.
   text is read ('NASATERM.DAT',concat ('//',?find_string),'/end').
   window (?find_string, blue, white, white,?column,?row,
   76,17).
   say (?text).
   close_window ().
   row = ?row - 1.
   column = ?column -1.

end. (*topic mark*)


topic soutline.
(*if show_outline = 0
  then
show_outline = ?show_outline + 1. *)
window ('Overview and Explanation',blue,white,white,?column,?row,77,18).

   say ('#e

     #fyellow PURPOSE#d

       The Science Requirements Envelope Document provides an envelope
   or volume of science requirements for a type of experimentation which
   is intended to encompass the science requirements generated by individ-
   ual experiments of that type. The primary purpose of the document is to
   provide science requirements against which hardware can be conceptual-
   ized such that later, when specific PIs are chosen, their individual
   requirements will fall within the requirements originally stated in the
   Science Requirements Envelope Document.

     #fyellow FUNCTION#d

       The Science Requirements Envelope Document should provide:

        1.  A general description of the type of scientific
              investigations to be performed.

        2.  A formal establishment of the scientific rationale for
              conducting the type of scientific investigation defined.
```

3. A formal establishment of the science objectives of the type of experiments to be performed.

4. A general description of the observational measurement, environmental, and data requirements which accompany this type of experimentation.

#fyellow PREPARATION APPROVAL AND UPDATING#d

The Discipline Project Scientist, utilizing inputs from a Science Development Team, Discipline Working Groups or other sources, will prepare and submit the Science Requirements Envelope Document. The Discipline Program Scientist will concur with the document and the MSAD Chief Scientist will approve the intitial document and changes thereto. The document will be maintained under change control by the appropriate Center and will be used to drive conceptual hardware development until such time as the Hardware Capabilities Document has been developed and approved. At the appropriate time, to be determined by the MSAD Chief Scientist, the document will be abandoned and the individual Science Requirements Documents will be used to establish the requirements on the hardware.

Press #fyellow SPACE#d to continue.').

end. (* soutline *)

```
(* EOUTLINE.KB *)
(* THIS PROGRAM IS LETS THE USER VIEW THE QUESTIONS TO BE FILLED OUT *)
(* THAT ARE NECESSARY FOR THE COMPLETION OF THE ENVELOPE DOCUMENT *)
no_edit_key ().
no_debug ().
column = 3.
row = 3.
menu_choice  = ' '.
menu_option is ['INTRODUCTION/SUMMARY','BACKGROUND',
'JUSTIFICATION FOR CONDUCTING THIS EXPERIMENT IN SPACE',
'DESCRIPTION OF EXPERIMENT TYPES','SCIENCE REQUIREMENTS ENVELOPE',
'OTHER REQUIREMENTS','RETURN TO MAIN MENU'].

while ?menu_choice <> 'RETURN TO MAIN MENU'
  then do (view_outline).

new_kb ('envmmenu.hkb').

topic 'view_outline'.
window ('Overview and Explanation',blue,white,white,?row,?column,77,18).
ask ('#e

        The Outline for the Science Requirements Envelope Document:',
        menu_choice,?menu_option).

if ?menu_choice = 'INTRODUCTION/SUMMARY'
  then do ('Introduction/Summary').

if ?menu_choice = 'BACKGROUND'
  then do ('Background').

if ?menu_choice = 'JUSTIFICATION FOR CONDUCTING THIS EXPERIMENT IN SPACE'
  then
     do ('Justification for Conducting This Experiment In Space').

if ?menu_choice = 'DESCRIPTION OF EXPERIMENT TYPES'
  then do  ('Description of Experiment Types').

if ?menu_choice = 'SCIENCE REQUIREMENTS ENVELOPE'
  then new_kb ('SHOWSRE.HKB').

if ?menu_choice = 'OTHER REQUIREMENTS'
  then do ('Other Requirements').

if ?menu_choice = 'RETURN TO MAIN MENU'
  then new_kb ('envmmenu.ckb').

end. (* view outline *)
(*===============================Threaded topics===================*)

topic 'Introduction/Summary'.
      column = ?column + 1.
      row = ?row + 1.
      window ('1.0 Introduction/Summary',blue,white,white,
      ?column,?row,76,17).
      say ('#e

       Provide a brief discussion describing the following areas:

        1.1 Description of Experiment Type or Class
```

```
          1.2 Scientific Knowledge to be Gained From This Type
              of Experimentation

          1.3 Value of Knowledge of This Type of Experimentation
              to Scientific Field

          1.4 Necessity for Space Environment to Experiment Type


                            Press #fyellow SPACE#d to continue.').
      close_window ().

      row = ?row - 1.
      column = ?column -1.



end. (*Introduction/Summary*)

topic 'Background'.
      column = ?column + 1.
      row = ?row + 1.
      window ('2.0 Background',blue,white,white,?column,?row,
      76,17).
      say ('#e
     Provide a brief discussion describing the following areas:

           2.1 Scientific Field to which the Experiment Type Belongs

           2.2 Current Application for Research in the Field

           #m2.3 Brief Historical Account of Prior Research in the Field#m

           #m2.4 Current Research#m

           2.5 Relationship of Proposed Experiment type to
               Scientific Field

           2.6 Anticipated Advance in State of the Art for
               This Type of Experimentation.

                            Press #fyellow SPACE#d to continue.').
      close_window ().

      row = ?row - 1.
      column = ?column -1.

end. (*Background*)

topic 'Justification for Conducting This Experiment in Space'.
      column = ?column + 1.
      row = ?row + 1.
      window ('3.0 Justification for Conducting This Experiment in Space',
      blue,white,white,?column,?row,76,17).

      say ('#e

     Provide a brief discussion describing the following areas:
```

```
          3.1 Limitations of Ground-Based Testing

          3.2 Limitations of Drop Towers

          3.3 Limitations of Testing in Aircraft

          3.4 Need for Accommodations in the Shuttle

          3.5 Limitations of Mathematical Modeling

          3.6 Limitations of Other Modeling Approaches

                    Press #fyellow SPACE#d to continue.').
     close_window ().

     row = ?row - 1.
     column = ?column -1.

end. (*Justification for Conducting This Experiment in Space*)

topic 'Description of Experiment Types'.
     column = ?column + 1.
     row = ?row + 1.
     window ('4.0 Description of Experiment Types',blue,white,white,
     ?column,?row,76,17).
     say ('#e

     Provide a detailed description of the following areas:

          4.1 General Description of Type of Experiments

          4.2 Types of Experiment Procedures to be Used.

          4.3 Types of measurements and ranges of values required


                    Press #fyellow SPACE#d to continue.').
     close_window ().

     row = ?row - 1.
     column = ?column -1.

end. (*Description of Experiment Types*)




topic '2.3 Brief Historical Account of Prior Research in the Field'.
     row = ?row + 1.
     column = ?column + 1.
     window ('2.3 Brief Historical Account of Prior Research in the Field',blue
     white,?column,?row,76,16).
     say ('#e


     This section summarizes previously conducted studies
```

```
     not including current research and results.

                          Press #fyellow SPACE#d to continue.      ').
      close_window ().

      row = ?row - 1.
      column = ?column - 1.
end. (*2.3 Brief historical account of prior research*)

topic '2.4 Current research'.
      row = ?row + 1.
      column = ?column + 1.
      window ('2.4 Current research',blue,white,white,?column,?row,
      76,16).
      say ('#e

     This section summarizes the most recently conducted studies
     or related activities and their results.

                          Press #fyellow SPACE#d to continue.      ').
      close_window ().
      row = ?row - 1.
      column = ?column - 1.
end. (*2.4 Current research*)


topic 'Other Requirements'.
      row = ?row + 1.
      column = ?column + 1.
      window ('6.0 Other Requirements',blue,white,white,
      ?column,?row,76,17).
      say ('#e

          Be sure to describe any other applicable material which is
          not presently addressed in these requirements.


                          Press #fyellow SPACE#d to continue.').
      close_window ().

      row = ?row - 1.
      column = ?column - 1.
end. (*6.0 Other Requirements*)


(*========================= end subtopics===================*)
```

```
(* SHOWSRE.KB *)
(* THIS PROGRAM IS FOR DISPLAYING THE SCIENCE REQUIREMENTS ENVELOPE  *)
(* SECTION OF THE SCIENCE REQUIREMENTS ENVELOPE *)

column = 3.
row = 3.
no_edit_key ().
no_debug ().

curdir is read_line ('curdir.dat').
curdir = string_replace (?curdir,' ','',8).
menu_choice = ' '.
menu_option is ['EXPERIMENT SAMPLE REQUIREMENTS',
'RANGE OF ATMOSPHERIC REQUIREMENTS','TEMPERATURE CONTROL AND MEASUREMENT',
'VIBRATION CONTROL AND MEASUREMENT','TEST MATRICES',
'IMAGING REQUIREMENTS','ELECTROMAGNETIC LIMITATIONS','ASTRONAUT INVOLVEMENT',
'DATA REQUIREMENTS','TELEPRESENCE, TELEROBOTICS','RETURN TO PREVIOUS MENU'].

while ?menu_choice <> 'RETURN TO PREVIOUS MENU'
  then do (outline).


topic 'outline'.

      column = ?column + 1.
      row = ?row + 1.
      window ('Overview and Explanation',,white,white,3,3,77,18).
      window ('5.0 Science Requirements Envelope',blue,white,white,
      ?column,?row,76,17).
      ask ('#e

     Provide a brief discussion describing the following areas:',menu_choice,
     ?menu_option).

if ?menu_choice = 'EXPERIMENT SAMPLE REQUIREMENTS'
   then do ('Experiment Sample Requirements').

if ?menu_choice = 'RANGE OF ATMOSPHERIC REQUIREMENTS'
  then do ('Range of Atmospheric Requirements').

if ?menu_choice = 'TEMPERATURE CONTROL AND MEASUREMENT'
  then do ('Temperature Control and Measurement').

if ?menu_choice = 'VIBRATION CONTROL AND MEASUREMENT'
  then do ('Vibration Control and Measurement').

if ?menu_choice = 'TEST MATRICES'
  then do ('Test Matrices').

if ?menu_choice = 'IMAGING REQUIREMENTS'
  then do ('Imaging Requirements').

if ?menu_choice =  'ELECTROMAGNETIC LIMITATIONS'
  then do ('Electromagnetic Limitations').

if ?menu_choice = 'ASTRONAUT INVOLVEMENT'
  then do ('Astronaut Involvement').

if ?menu_choice = 'DATA REQUIREMENTS'
  then do ('Data Requirements').
```

```
if ?menu_choice = 'TELEPRESENCE, TELEROBOTICS'
  then do ('Telepresence, Telerobotics').

if ?menu_choice = 'RETURN TO PREVIOUS MENU'
  then new_kb ('EOUTLINE.HKB').

      close_window ().
      close_all ().
      row = ?row - 1.
      column = ?column -1.
end. (* Science Requirements*)





topic 'Experiment Sample Requirements'.
      row = ?row + 1.
      column = ?column + 1.
      window ('5.1 Experiment Sample Requirements',blue,white,white,
      ?column,?row,76,16).
      say ('#e


     Be sure to include the number of samples and the materials
     used to conduct the experiment.  Then make sure each one
     is justified and/or substantiated in the documentation.

                      Press #fyellow SPACE#d to continue.').
      close_window ().

      row = ?row - 1.
      column = ?column - 1.
end. (* Experiment sample requirements*)

topic 'Range of Atmospheric Requirements'.
      row = ?row + 1.
      column = ?column + 1.
      window ('5.2 Atmospheric Requirements',blue,white,white,
      ?column,?row,76,16).
      say ('#e

      Be sure to include any information related to, including
      the range of values for:

         o  Pressure
         o  Gas composition
         o  Humidity
         o  Vacuum

      Then make sure each one is justified and/or substantiated
      in the documentation.

                 Press #fyellow SPACE#d to continue. ').
      close_window ().

      row = ?row - 1.
      column = ?column - 1.
```

```
end. (* Range of Atmospheric requirements*)

topic 'Temperature Control and Measurement'.

      row = ?row + 1.
      column = ?column + 1.
      window ('5.3 Temperature Control and Measurement',blue,white,white,
      ?column,?row,76,16).
      say ('#e


      As much accuracy as possible is required when describing
      this section and each part must be justified and/or
      substantiated in the documentation.


                           Press #fyellow SPACE#d to continue.').
      close_window ().

      row = ?row - 1.
      column = ?column - 1.
end. (* Temperature control and measurement*)

topic 'Vibration Control and Measurement'.

      row = ?row + 1.
      column = ?column + 1.
      window ('5.4 Vibration Control and Measurement',blue,white,white,
      ?column,?row,76,16).
      say ('#e

     As much accuracy as possible is required, along with
     the frequency of measurement, when describing this section.

     Each part must be justified and/or substantiated in the
     documentation.

                           Press #fyellow SPACE#d to continue.').
      close_window ().

      row = ?row - 1.
      column = ?column - 1.
end. (* Vibration control and measurement*)

topic 'Test Matrices'.

      row = ?row + 1.
      column = ?column + 1.
      window ('5.5 Test Matrices',blue,white,white,?column,?row,76,
     16).
     say ('#e


     Include the number of tests and the required duration of
     each test when describing this section.  Each requirement
     must be justified and/or substantiated in the documentation.

                          Press #fyellow SPACE#d to continue.').
      close_window ().
```

```
      row = ?row - 1.
      column = ?column - 1.
end. (* Test matrices*)

topic 'Imaging Requirements'.
      row = ?row + 1.
      column = ?column + 1.
      window ('5.6 Imaging Requirements',blue,white,white,
      ?column,?row,76,16).
      say ('#e

     Be sure to include any information related to:

        o  Photography
        o  Radiography
        o  Television
        o  Resolution
        o  Frame rate

     Each requirement must be justified and/or substantiated in
     the documentation.

               Press #fyellow SPACE#d to continue.').
      close_window ().

row = ?row - 1.
column = ?column - 1.
end. (* Imaging requirements*)

topic 'Electromagnetic Limitations'.
row = ?row + 1.
column = ?column + 1.
window ('5.7 Electromagnetic Limitations',blue,white,white,?row,?column,
76,16).
say ('#e

       Please list any type of electromagnetic limitations for this type
       of experiment.



                         Press #fyellow SPACE#d to continue.').

column = ?column -  1.
row = ?row - 1.
close_window ().
end. (* Electromagnetic Limitations *)

topic 'Astronaut Involvement'.
      row = ?row + 1.
      column = ?column + 1.
      window ('5.8 Astronaut Involvement',blue,white,white,
      ?column,?row,76,16).
      say ('#e

      Be sure to include any information related to:

         o  Extravehicular activity (EVA)
         o  Activation of experiment
```

```
     Each of the requirements must be justified and/or
     substantiated in the documentation.

                         Press #fyellow SPACE#d to continue.').
     close_window ().

     row = ?row - 1.
     column = ?column - 1.
end. (* Astronaut involvement*)


topic 'Data Requirements'.
column = ?column + 1.
row = ?row + 1.
window ('5.9 Typical Data Requirements',blue,white,white,?row,?column,76,16).
say ('#e

        Please list any typical data requirements for this type of
        experiment.



                        Press #fyellow SPACE#d to continue.').

column =  ?column - 1.
row = ?row -  1.
close_window ().
end. (* Data Requirements *)

topic 'Telepresence, Telerobotics'.
      row = ?row + 1.
      column = ?column + 1.
      window ('5.10 Telepresence, Telerobotics',blue,white,white,
      ?column,?row,76,16).
      say ('#e


     Each requirement must be justified and/or substantiated in
     the documentation.


                Press #fyellow SPACE#d to continue.').
      close_window ().

      row = ?row - 1.
      column = ?column - 1.
end. (*5.10 Telepresence, telerobotics*)
```

```
(*NASA_ENV.KB      This is the activity menu to allow the          *)
(*                 user to select an activity to perform on        *)
(*                          an existing project.                   *)

no_edit_key ().
no_debug ().
do_gloss = 1.
today = date ().
month = element(?today,1).
day = element(?today,2).
year = element(?today,3).
today = concat(?month,'/',?day,'/',?year).
yn is [YES,NO].
curdir is read_line ('CURDIR.DAT').
close (concat('C:\GARDEN\',?CURDIR,'\BASELINE.DAT')).
curdir is string_replace (?curdir,' ','',8).
eof = number_to_char (26).

menu_option is ['FILL OUT DOCUMENTATION','PRINT SCIENCE REQUIREMENTS ENVELOPE DO
'DISPLAY ENVELOPE DOCUMENT','CREATE AN ASCII FILE OF ENVELOPE DOCUMENT',
'BASELINE DOCUMENT','COMPARE BASELINE TO CURRENT REVISION',
'COPY ANSWERS TO DISK','RETURN TO PREVIOUS MENU','RETURN TO MAIN MENU',QUIT].
menu_choice = ' '.

while ?menu_choice <> QUIT
  then do (nasamenu).

topic nasamenu.

  ask (['#e #s
    The project you have selected is:  ',?curdir,'#d #n

    Please enter your choice of activities from the list.'],menu_choice,
         ?menu_option).

if ?menu_choice = 'FILL OUT DOCUMENTATION'
  then new_kb ('envfmenu.hkb').

if ?menu_choice = 'RETURN TO PREVIOUS MENU'
  then new_kb ('EPROJECT.HKB').

if ?menu_choice = 'RETURN TO MAIN MENU'
  then new_kb ('envmmenu.CKB').

if ?menu_choice = 'PRINT SCIENCE REQUIREMENTS ENVELOPE DOCUMENT'
   then new_kb ('ENVPRINT.HKB').

if ?menu_choice = 'DISPLAY ENVELOPE DOCUMENT'
  then
    new_kb ('ENVDISP.HKB').

if ?menu_choice = 'CREATE AN ASCII FILE OF ENVELOPE DOCUMENT'
  then new_kb ('ENVFILE.HKB').

if ?menu_choice = 'BASELINE DOCUMENT'
  then do (baseline_rtn).

if ?menu_choice = 'COPY ANSWERS TO DISK'
  then do (copyfiles).
```

```
if ?menu_choice = 'COMPARE BASELINE TO CURRENT REVISION'
  then do (compare_rtn).

if ?menu_choice = QUIT
  then stop ().

topic 'copyfiles'.

  ask ('Do you want to copy your answers to a different drive?',wantcopy,?yn).
  if ?wantcopy = YES
    then drivelist is [A:,B:,C:,D:,NONE]
  and
    ask
      ('Please choose the drive to which you wish to copy the files: ',
      drive_destination,?drivelist).

  if ?wantcopy = YES and ?drive_destination <> NONE
    then
      copy_command = concat ('COPY C:\GARDEN\',?curdir,'\*.DAT ',?DRIVE_DESTINA
    and
      say ('
      Please insert diskette now if you are copying to a floppy drive.

                    Please press #fyellow SPACE#d when ready.    ')

    and
      move_cursor (1,10)
    and
      dos (?copy_command,restore)
    and
    say ('#e

            Answers have been moved to drive #s',?drive_destination,' #n #n


            Please press #fyellow SPACE#d to exit.    ').

    do (nasamenu).

end. (* copyfiles *)

topic 'baseline_rtn'.

  ask ('#e

  At some point in the documentation process, it is necessary to
  declare that all documents are complete, and that any changes
  to be made will be treated as revisions to the baseline document.

  Do you want to baseline your answers at this time?',baseline,?yn).

  curbase = ?eof.
  overwrite = YES.
  if ?baseline = YES
    then
      curbase is read_line (concat('C:\GARDEN\',?CURDIR,'\BASELINE.DAT'))
      and
      close (concat('C:\GARDEN\',?CURDIR,'\BASELINE.DAT'))
      and
      if ?curbase <> ?eof
```

```
        then
          ask
      ('#e

      You have already baselined this experiment in the past.  Do you
      want to take all revisions and overwrite your previous baseline
      to create a new baseline? ',overwrite,?yn).

  if ?curbase = ?eof and ?baseline = YES
    then
      window (,white,red,yellow,1,14,32,6)
    and
  say ('#e
This selection will invoke
a DOS command, which will
cause your screen to blank
out momentarily.  Do not
be alarmed.  Press #fyellow SPACE#d now. ')
    and
      md_command = concat ('MD C:\GARDEN\',?curdir,'\BASELINE')
    and
      dos (?md_command,restore)
    and
      copy_command = concat
       ('COPY C:\GARDEN\',?CURDIR,'\*.DAT C:\GARDEN\',?CURDIR,'\BASELINE\*.*')
    and
      dos (?copy_command,restore)
    and
      write (concat('C:\GARDEN\',?CURDIR,'\BASELINE.DAT'),?today)
    and
      close_window ()
    and
      say ('#e

        Baseline document has been created.  All changes to this
        document will be stored in the revision.  A new baseline
        must be created to incorporate any revisions into the
        final document.


                       Please press #fyellow SPACE#d to exit.    ').

  if ?curbase <> ?eof and ?baseline = YES and ?overwrite = YES
    then
      xcopy_command = concat
       ('XCOPY C:\GARDEN\',?CURDIR,'\*.DAT C:\GARDEN\',?CURDIR,
       '\BASELINE\*.* /D:',?CURBASE)
    and
      window (,white,red,yellow,1,14,32,6)
    and
  say ('#e
This selection will invoke
a DOS command, which will
cause your screen to blank
out momentarily.  Do not
be alarmed.  Press #fyellow SPACE#d now. ')
    and
      dos (?xcopy_command,restore)
    and
      new_file (concat('C:\GARDEN\',?CURDIR,'\BASELINE.DAT'))
```

```
    and
      write    (concat('C:\GARDEN\',?CURDIR,'\BASELINE.DAT'),?today)
    and
      close_window ()
    and
      say ('#e

        All revisions have been incorporated in the baseline
        document.  Addition changes to this document will be
        stored in a new revision.  A new baseline must be
        created to incorporate any new revisions into the
        final document.


                    Please press #fyellow SPACE#d to exit.    ').

    do (nasamenu).

end. (* baseline_rtn *)

topic 'compare_rtn'.
  close (concat('C:\GARDEN\',?CURDIR,'\BASELINE.DAT')).
  curbase is read_line (concat('C:\GARDEN\',?CURDIR,'\BASELINE.DAT'))
  and
  close (concat('C:\GARDEN\',?CURDIR,'\BASELINE.DAT'))
  and
  if ?curbase = ?eof
  then
    say
      ('#e

      You have not yet baselined this experiment;  therefore,
      no comparison is necessary.


                    Press #fyellow SPACE#d to continue')

    and
    new_kb ('NASA_ENV.HKB').

  comp_choices = ['RUN COMPARISON PROGRAM','DISPLAY COMPARISONS',
                  'PRINT COMPARISONS','RETURN TO PREVIOUS MENU'].

  ask ('#e

    Do you wish to run the comparison program to generate a new
    listing of differences between the baseline and revision,
    print or display the results of the most recent comparison,
    or exit this menu?',comp_ans,?comp_choices).

  if ?comp_ans = 'RETURN TO PREVIOUS MENU'
    then new_kb ('NASA_ENV.HKB').

  if ?comp_ans = 'RUN COMPARISON PROGRAM'
    then
      do (comp_pgm).

topic 'comp_pgm'.
  comp_command = concat
     ('FC /a C:\GARDEN\',?CURDIR,'\*.DAT C:\GARDEN\',?CURDIR,
```

```
    '\BASELINE\*.* > C:\GARDEN\',?CURDIR,'\DIFFER.DAT').
  dos (?comp_command,restore).
  close (concat('C:\GARDEN\',?CURDIR,'\DIFFER.DAT')).

  say ('#e

        Files have been compared.  Please use the display or
        print options to view the results of the comparison.

                       Press #fyellow SPACE#d to continue.').
end.  (* comp_pgm *)

  if ?comp_ans = 'DISPLAY COMPARISONS'
    then
      comp_file = read (concat(C:\GARDEN\,?CURDIR,'\DIFFER.DAT'))
      and
      say (?comp_file).

  if ?comp_ans = 'PRINT COMPARISONS'
    then
      comp_file = read (concat(C:\GARDEN\,?CURDIR,'\DIFFER.DAT'))
      and
      print (#p,?comp_file,#p).

  do (nasamenu).

end. (* compare_rtn *)

end.  (* NASA_ENV *)
```

```
(* ENVFILE.HKB is used to write all sections of the ERD to a user     *)
(* specified file.                                                     *)

no_edit_key ().
no_debug ().
eof = number_to_char (26).
curdir is read_line ('CURDIR.DAT').
curdir is string_replace(?curdir,' ','',8).
orig_curdir = ?curdir.
blankline = '    '.
overwrite = [].
yn = [YES,NO].
line_count = 0.
page_count = 0.
username = ?blankline.
column = 3.
row = 3.

window ('Create an ASCII File of the Envelope Document',
white,blue,white,?column,?row,78,19).

read_response ('#e

      This routine will create an ASCII file of the Science
      Requirements Envelope Document.  Please enter the complete
      file name you wish to create, including drive, file name,
      and extension.  For example, #fyellow A:ENVDOC.TXT#d.  If you do
      not wish to create a file, press the RETURN key without
      entering a file name.

                               ',username).

username = string_replace(?username,' ','',20).

direct is dir (?username).
if ?direct <> []  and ?username <> []
  then
    ask ('#e

        This file already exists.  Do you wish to overwrite it?',overwrite,
        ?yn).

if ?username = ?blankline or ?username = ' ' or ?username = '' or
   ?username = [] or ?overwrite = NO
  then

    window (,white,red,yellow,1,16,27,4)
    and
    say ('#e

     No file created.
 Press SPACE to continue.')
    and
    new_kb ('NASA_ENV.HKB').

base_dir = [].
curbase is read_line (concat('C:\GARDEN\',?CURDIR,'\BASELINE.DAT')).
close (concat('C:\GARDEN\',?CURDIR,'\BASELINE.DAT')).
if ?curbase <> ?eof
  then
```

```
base_choice = ['BASELINE','CURRENT REVISION','NEITHER']
and
ask ('#e

Do you wish to create a file from the baseline or
the current revision?',base_dir,?base_choice)
and
if ?base_dir = BASELINE
  then
    curdir = concat (?curdir,'\BASELINE')
    and
    curdir = string_replace(?curdir,' ','',8)
    and
    new_file ('C:\GARDEN\CURDIR.DAT')
    and
    write ('C:\GARDEN\CURDIR.DAT',?curdir).

if ?base_dir <> NEITHER
  then
    do ('print_title_page')
    and
    remove_topic ('print_title_page')
    and
    do (Print_Routine).

if ?base_dir = BASELINE
  then
    curdir = ?orig_curdir
    and
    curdir = string_replace(?curdir,' ','',8)
    and
    new_file ('C:\GARDEN\CURDIR.DAT')
    and
    write ('C:\GARDEN\CURDIR.DAT',?curdir).

new_kb ('NASA_ENV.HKB').

topic 'print_title_page'.
  no_edit_key ().
  filler = '                                                  '.
  eof = number_to_char (26).
  blankline = '                                               '.

  expname is read(concat(C:\GARDEN\,?CURDIR,'\TITLE.DAT')).

  expname is string_replace(?expname,'    ','',600).
  expname is remove(?expname,'').
  lines = list_length(?expname).
  line_count = 1.
  title_length = 0.

  window (,white,red,yellow,1,16,27,4).
  write ('con:','FILE CREATION IN #nPROGRESS...').

  while ?line_count <= ?lines
    then
      cur_line = element(?expname,?line_count)
      and
      cur_lngth = string_length(?cur_line)
      and
```

```
      line_count = ?line_count + 1
      and
      title_length = ?title_length + ?cur_lngth + 1
      and
      if ?cur_line = ''
        then
          expname = string_replace(?expname,?cur_line).
 expname = concat(element(?expname,1),'~',
                  element(?expname,2),'~',
                  element(?expname,3),'~',
                  element(?expname,4),'~',
                  element(?expname,5),'~',
                  element(?expname,6),'~',
                  element(?expname,7),'~',
                  element(?expname,8),'~',
                  element(?expname,9),'~',
                  element(?expname,10),'~',
                  element(?expname,11),'~',
                  element(?expname,12),'~',
                  element(?expname,13),'~',
                  element(?expname,14),'~',
                  element(?expname,15)).

 title_length = ?title_length + 3.
 counter = 1.
 write_counter = 1.
 line_one = ' '.
 while ?counter < ?title_length
   then
     char = string_copy(?expname,?counter,1)
     and
     counter = ?counter + 1
     and
     write_counter = ?write_counter + 1
     and
     if ?write_counter > 40 and ?char = ' '
       then
         linelgth = string_length(?line_one)
         and
         linelgth = 80 - ?linelgth
         and
         linelgth = ?linelgth / 2
         and
         linefiller = string_copy (?blankline,1,?linelgth)
         and
         line_one = concat(?linefiller,?line_one,'#n',?char)
         and
         write_counter = 1
         and
         new_expname gets ?line_one
         and
         line_one = ''
       else
         line_one = concat(?line_one,?char).

linelgth = string_length(?line_one).
linelgth = 80 - ?linelgth.
linelgth = ?linelgth / 2.
linefiller = string_copy (?blankline,1,?linelgth).
line_one = concat(?linefiller,?line_one,'#n').
```

```
new_expname gets ?line_one.
new_expname = string_replace(?new_expname,'~',' ',600).

authorfile = concat(C:\GARDEN\,?CURDIR,'\AUTHOR.DAT').

titlepage = ('#n#n#n#n#n#n#n#n#n#n#n#n#n#n').
titlepage gets '                              Science Requirements Envelope Document'.
titlepage gets '                                                            for:'.
titlepage gets ' '.
titlepage gets ?new_expname.
titlepage gets '#n#n'.
pagedate = ?date.
mo_num = element(?pagedate,1).
if ?mo_num = 1
  then month = January
  else
  if ?mo_num = 2
  then month = February
  else
  if ?mo_num = 3
  then month = March
  else
  if ?mo_num = 4
  then month = April
  else
  if ?mo_num = 5
  then month = May
  else
  if ?mo_num = 6
  then month = June
  else
  if ?mo_num = 7
  then month = July
  else
  if ?mo_num = 8
  then month = August
  else
  if ?mo_num = 9
  then month = September
  else
  if ?mo_num = 10
  then month = October
  else
  if ?mo_num = 11
  then month = November
  else
  if ?mo_num = 12
  then month = December
  else
  month = ' '.
 year = element(?pagedate,3).
 reportdate = concat(?month,' ',?year).

 datelgth = string_length(?reportdate).
 datelgth = 80 - ?datelgth.
 datelgth = ?datelgth / 2.
 datefiller = string_copy (?blankline,1,?datelgth).
 titlepage gets ' '.
 titlepage gets ' '.
```

```
titlepage gets concat(?datefiller,?reportdate).

basefile = concat('C:\GARDEN\',?CURDIR,'\BASELINE.DAT').
baseline = read(?basefile).
if ?baseline = ?eof
  then
    baseline = 'N/A'.

datelgth = string_length(?baseline).
datelgth = 80 - ?datelgth.
datelgth = ?datelgth / 2.
datefiller = string_copy (?blankline,1,?datelgth).
titlepage gets ' '.
titlepage gets '                                              Baselined: '.
titlepage gets concat(?datefiller,?baseline).


name is read_line (?authorfile).
name is string_replace(?name,'NAME:                   ','',1).
name is string_replace(?name,'   ','',8).
namelgth = string_length(?name).
namelgth = 80 - ?namelgth.
namelgth = ?namelgth / 2.
namefiller = string_copy (?blankline,1,?namelgth).
titlepage gets concat('#n#n#n#n#n#n#n#n#n#n#n',?namefiller,?name).

organization is read_line (?authorfile).
organization is string_replace(?organization,'ORGANIZATION:     ','',1).
organization is string_replace(?organization,'   ','',8).
organizationlgth = string_length(?organization).
organizationlgth = 80 - ?organizationlgth.
organizationlgth = ?organizationlgth / 2.
organizationfiller = string_copy (?blankline,1,?organizationlgth).
titlepage gets concat(?organizationfiller,?organization).

mcode is read_line (?authorfile).
mcode is string_replace(?mcode,'MAIL CODE:         ','',1).
mcode is string_replace(?mcode,'   ','',8).
mcodelgth = string_length(?mcode).
mcodelgth = 80 - ?mcodelgth.
mcodelgth = ?mcodelgth / 2.
mcodefiller = string_copy (?blankline,1,?mcodelgth).
titlepage gets concat(?mcodefiller,?mcode).

street is read_line (?authorfile).
street is string_replace(?street,'STREET:             ','',1).
street is string_replace(?street,'   ','',8).
streetlgth = string_length(?street).
streetlgth = 80 - ?streetlgth.
streetlgth = ?streetlgth / 2.
streetfiller = string_copy (?blankline,1,?streetlgth).
titlepage gets concat(?streetfiller,?street).

city is read_line (?authorfile).
city is string_replace(?city,'CITY, STATE, ZIP: ','',1).
city is string_replace(?city,'   ',' ',8).
city is string_replace(?city,'  ',' ',8).
citylgth = string_length(?city).
citylgth = 80 - ?citylgth.
citylgth = ?citylgth / 2.
```

```
  cityfiller = string_copy (?blankline,1,?citylgth).
  titlepage gets concat(?cityfiller,?city).

  phone is read_line (?authorfile).
  phone is string_replace(?phone,'PHONE:              ','',1).
  phone is string_replace(?phone,'    ','',8).
  phonelgth = string_length(?phone).
  phonelgth = 80 - ?phonelgth.
  phonelgth = ?phonelgth / 2.
  phonefiller = string_copy (?blankline,1,?phonelgth).
  titlepage gets concat(?phonefiller,?phone).
  new_file (?username).
  write (?username,?titlepage,#p).
  close_window ().


end.  (* print_title_page *)



topic 'Print_Routine'.

  window (,white,red,yellow,1,16,27,4).
  write ('con:','FILE CREATION IN #nPROGRESS...').

  do (Print_ENV).

  page_count = ?page_count + 1.
  page_line = concat('                                          ',?page_count).
  while ?line_count < 60
    then
      env_page gets ?blankline
      and
      line_count = ?line_count + 1.
  env_page gets ?page_line.
  env_page gets '#p'.
  write (?username,?env_page).
  close_all ().
  close_window ().

topic 'Print_ENV'.
  env_page gets ?blankline.
  env_page gets ?blankline.
  filename = concat(C:\GARDEN\,?CURDIR,'\env1_1.DAT').
  line is read_line (?filename).
  env_page gets '   1.0 INTRODUCTION/SUMMARY'.
  env_page gets ?blankline.
  env_page gets '       1.1  Descripton of Experiment Type or Class'.
  env_page gets ?blankline.
  line_count = 6.
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  env_page gets ?blankline.
  line_count = ?line_count + 1.
  if ?line_count > 56
    then do (page_advance).

  env_page gets '       1.2  Scientific Knowledge to be Gained From This Type o
  env_page gets ?blankline.
```

```
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env1_2.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
env_page gets ?blankline.
line_count = ?line_count + 1.
if ?line_count > 56
  then do (page_advance).

env_page gets '        1.3  Value of Knowledge of This Type of Experiment'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env1_3.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
env_page gets ?blankline.
line_count = ?line_count + 1.
if ?line_count > 56
  then do (page_advance).

env_page gets '        1.4  Necessity for Space Environment to Experiment Type
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env1_4.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
env_page gets ?blankline.
line_count = ?line_count + 1.
if line_count > 56
 then do (page_advance).

filename = concat(C:\GARDEN\,?CURDIR,'\env2_1.DAT').
line is read_line (?filename).
if ?line_count > 56
  then do (page_advance).

env_page gets ?blankline.
env_page gets ?blankline.
env_page gets '   2.0 BACKGROUND'.
env_page gets ?blankline.
env_page gets '        2.1  Scientific Field to which Experiment Belongs'.
env_page gets ?blankline.
line_count = ?line_count + 6.
while ?line <> ?eof
  then do (read_file).
close (?filename).
env_page gets ?blankline.
line_count = ?line_count + 1.
if ?line_count > 56
  then do (page_advance).

env_page gets '        2.2  Current Application for Research in the Field'.
env_page gets ?blankline.
line_count = ?line_count + 2.
```

```
filename = concat(C:\GARDEN\,?CURDIR,'\env2_1.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
env_page gets ?blankline.
line_count = ?line_count + 1.
if ?line_count > 56
  then do (page_advance).

env_page gets '       2.3  Brief Historical Account of Prior Research'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env2_3.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets '       2.4  Current Research'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env2_4.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets '       2.5  Relationship of Proposed Experiment Type to Experim
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env2_5.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets '       2.6  Anticipated Advance in State of the Art'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env2_6.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if line_count > 56
```

```
 then do (page_advance).

filename = concat(C:\GARDEN\,?CURDIR,'\env3_1.DAT').
line is read_line (?filename).
if ?line_count > 56
  then do (page_advance).

env_page gets ?blankline.
env_page gets ?blankline.
env_page gets '   3.0 JUSTIFICATION FOR CONDUCTING THIS EXPERIMENT IN SPACE'.
env_page gets ?blankline.
env_page gets '       3.1  Limitations of Ground-Based Testing'.
env_page gets ?blankline.
line_count = ?line_count + 6.
while ?line <> ?eof
  then do (read_file).
close (?filename).
env_page gets ?blankline.
line_count = ?line_count + 1.
if ?line_count > 56
  then do (page_advance).

env_page gets '       3.2  Limitations of Drop Towers'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env3_2.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets '       3.3  Limitations of Testing in Aircraft'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env3_3.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets '       3.4  Need for Accommodations in the Shuttle'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env3_4.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).
```

```
env_page gets '       3.5  Limitations of Mathematical Modeling'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env3_5.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets '       3.6  Limitations of Other Modeling Approaches'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env3_6.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
do (page_advance).

filename = concat(C:\GARDEN\,?CURDIR,'\env4_1.DAT').
line is read_line (?filename).
if ?line_count > 56
  then do (page_advance).
env_page gets ?blankline.
env_page gets ?blankline.
env_page gets '   4.0 DESCRIPTION OF EXPERIMENT TYPES'.
env_page gets ?blankline.
env_page gets '       4.1  General Description of Type of Experiments'.
env_page gets ?blankline.
line_count = ?line_count + 6.
while ?line <> ?eof
  then do (read_file).
close (?filename).
env_page gets ?blankline.
line_count = ?line_count + 1.
if ?line_count > 56
  then do (page_advance).

env_page gets '       4.2  Types of Experiment Procedures to be Used'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env4_2.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'       4.3  Types of Measurements and RAnges of Values Required'.
```

```
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env4_3.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if line_count > 56
 then do (page_advance).

filename = concat(C:\GARDEN\,?CURDIR,'\env5_1.DAT').
line is read_line (?filename).
if ?line_count > 56
 then do (page_advance).

env_page gets ?blankline.
env_page gets ?blankline.
env_page gets '   5.0 SCIENCE REQUIREMENTS ENVELOPE'.
env_page gets ?blankline.
env_page gets '       5.1  Experiment Sample Requirements'.
env_page gets ?blankline.
line_count = ?line_count + 6.
while ?line <> ?eof
  then do (read_file).
close (?filename).
env_page gets ?blankline.
line_count = ?line_count + 1.
if ?line_count > 56
  then do (page_advance).

env_page gets
'       5.2  Atmospheric Requirements'.
env_page gets ?blankline.
env_page gets
'       5.2.1  Pressure'.
env_page gets ?blankline.
line_count = ?line_count + 4.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_2_1.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'       5.2.2  Gas Composition'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_2_2.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
```

```
if ?line_count > 56
  then do (page_advance).

env_page gets
'        5.2.3  Humidity'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_2_3.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'        5.2.4  Vacuum'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_2_4.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'        5.3  Temperature Control and Measurement'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_3.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'        5.4  Vibration Control and Measurement'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_4.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
```

```
'       5.5  Test Matrices'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_5.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'       5.6  Imaging Requirements'.
env_page gets ?blankline.
env_page gets
'       5.6.1  Photography'.
env_page gets ?blankline.
line_count = ?line_count + 4.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_6_1.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'       5.6.2  Radiography'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_6_2.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'       5.6.3  Television'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_6_3.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'       5.6.4  Resolution'.
```

```
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_6_4.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'        5.6.5  Frame Rate'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_6_5.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'        5.7  Electromagnetic Limitations'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_7.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'        5.8  Astronaut Involvement'.
env_page gets ?blankline.
env_page gets
'        5.8.1  Extravehicular Activity'.
env_page gets ?blankline.
line_count = ?line_count + 4.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_8_1.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'        5.8.2  Activation of Experiment'.
env_page gets ?blankline.
```

```
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_8_2.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'       5.9  Data Requirements'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_9.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'       5.10  Telepresence and Telerobotics'.
env_page gets ?blankline.
env_page gets
'       5.10.1  Telepresence'.
env_page gets ?blankline.
line_count = ?line_count + 4.
filename = concat(C:\GARDEN\,?CURDIR,'\en5_10_1.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'       5.10.2  Telerobotics'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\en5_10_2.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if line_count > 56
 then do (page_advance).

env_page gets ?blankline.
env_page gets ?blankline.
env_page gets '   6.0 OTHER REQUIREMENTS'.
env_page gets ?blankline.
```

```
   line_count = ?line_count + 4.
   filename = concat(C:\GARDEN\,?CURDIR,'\ENV6_1.DAT').
   line is read_line (?filename).
   while ?line <> ?eof
    then do (read_file).
   close (?filename).
   env_page gets ?blankline.
   line_count = ?line_count + 1.
   do (page_advance).

 end. (* Print_ENV *)

 topic 'page_advance'.
   page_count = ?page_count + 1.
   page_line = concat('                                        ',?page_count).
   while ?line_count < 58
     then
       env_page gets ?blankline
       and
       line_count = ?line_count + 1.
   env_page gets ?page_line.
   env_page gets '#p'.
   write (?username,?env_page).
   env_page = [].
   env_page gets ?blankline.
   env_page gets ?blankline.
   line_count = 2.
   collect ().
 end.  (* page_advance *)


 topic 'read_file'.
   if ?line_count > 56
     then do (page_advance).
   line = concat('        ',?line).
   env_page gets ?line.
   line is read_line (?filename).
   line_count = ?line_count + 1.
 end.  (* read_file *)

 end.  (* Print_Routine *)
```

```
(* ENVDISP.KB is used to display all sections of the Eevelope Document.        *)
no_edit_key ().
no_debug ().
choice = [].
env_page = [ ].
eof = number_to_char (26).
curdir is read_line ('CURDIR.DAT').
curdir is string_replace(?curdir,' ','',8).
orig_curdir = ?curdir.
blankline = '     '.
line_count = 0.
base_dir = [ ].
curbase is read_line (concat('C:\GARDEN\',?CURDIR,'\BASELINE.DAT')).
close (concat('C:\GARDEN\',?CURDIR,'\BASELINE.DAT')).
if ?curbase <> ?eof
  then
    base_choice = ['BASELINE','CURRENT REVISION','NEITHER']
    and
    ask ('#e
            Do yo wish to display documents from the baseline or
            from the current revision?',base_dir,?base_choice)
    and
    if ?base_dir = BASELINE
      then
        curdir = concat (?curdir,'\BASELINE')
        and
        curdir = string_replace (?curdir,' ','',8)
        and
        new_file ('C:\GARDEN\CURDIR.DAT')
        and
        write ('C:\GARDEN\CURDIR.DAT',?curdir)
        and
        do (display_routine).

 if ?base_dir <> NEITHER
   then while ?choice <>  QUIT
     then do (display_routine).

 new_kb ('NASA_ENV.HKB').

 topic 'display_Routine'.
   sections = ['1.0 INTRODUCTION/SUMMARY',
               '2.0 BACKGROUND',
               '3.0 JUSTIFICATION FOR CONDUCTING THE EXPERIMENT IN SPACE',
               '4.0 DESCRIPTION OF EXPERIMENT TYPES',
               '5.0 SCIENCE REQUIREMENTS ENVELOPE',
               '6.0 OTHER REQUIREMENTS',
               'QUIT'].

   window ('Display Science Requirements Envelope Document'
   ,white,blue,white,3,3,78,19).
   ask ('#e

         Which section do you want to display?',choice,?sections).

   if ?choice = '1.0 INTRODUCTION/SUMMARY'
     then do ('1.0 INTRODUCTION/SUMMARY').

   if ?choice = '2.0 BACKGROUND'
     then do ('2.0 BACKGROUND').
```

```
  if ?choice = '3.0 JUSTIFICATION FOR CONDUCTING THE EXPERIMENT IN SPACE'
    then do ('3.0 JUSTIFICATION FOR CONDUCTING THE EXPERIMENT IN SPACE').

  if ?choice = '4.0 DESCRIPTION OF EXPERIMENT TYPES'
    then do ('4.0 DESCRIPTION OF EXPERIMENT TYPES').

  if ?choice = '5.0 SCIENCE REQUIREMENTS ENVELOPE'
    then do ('5.0 SCIENCE REQUIREMENTS ENVELOPE').

  if ?choice = '6.0 OTHER REQUIREMENTS'
    then do ('6.0 OTHER REQUIREMENTS').

  if ?choice = QUIT
   then
    if ?base_dir = BASELINE
    then
    curdir = ?orig_curdir
    and
    curdir = string_replace (?curdir,' ','',8)
    and
    new_file ('C:\GARDEN\CURDIR.DAT')
    and
    write ('C:\GARDEN\CURDIR.DAT',?curdir)
    and
    new_kb ('nasa_env.hkb')
    else
    new_kb ('nasa_env.hkb').

end. (* display_ENV *)


topic '1.0 INTRODUCTION/SUMMARY'.
  page_count = 0.
  env_page gets ?blankline.
  env_page gets ?blankline.
  filename = concat(C:\GARDEN\,?CURDIR,'\env1_1.dat').
  line is read_line (?filename).
  env_page gets '   1.0 INTRODUCTION/SUMMARY'.
  env_page gets ?blankline.
  env_page gets '        1.1  Description of Experiment Type or Class'.
  env_page gets ?blankline.
  line_count = 6.
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  env_page gets ?blankline.
  line_count = ?line_count + 1.
  if ?line_count > 56
    then do (page_advance).

  env_page gets '        1.2  Scientific Knowledge to be Gained From This Type c
                Experimentation'.
  env_page gets ?blankline.
  line_count = ?line_count + 3.
  filename = concat(C:\GARDEN\,?CURDIR,'\env1_2.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
```

```
env_page gets ?blankline.
line_count = ?line_count + 1.
if ?line_count > 56
  then do (page_advance).

env_page gets '       1.3  Value of Knowledge of This Type of Experiment to
                 Scientific Field'.
env_page gets ?blankline.
line_count = ?line_count + 3.
filename = concat(C:\GARDEN\,?CURDIR,'\env1_3.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
env_page gets ?blankline.
line_count = ?line_count + 1.
if ?line_count > 56
  then do (page_advance).

env_page gets '       1.4  Necessity for Space Environment to Experiment Type'
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env1_4.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
env_page gets ?blankline.
line_count = ?line_count + 1.
do (page_advance).
end.  (* 1.0 INTRODUCTION/SUMMARY *)

topic '2.0 BACKGROUND'.
  page_count = 0.
  filename = concat(C:\GARDEN\,?CURDIR,'\env2_1.DAT').
  line is read_line (?filename).
  if ?line_count > 54
    then do (page_advance).

  env_page gets ?blankline.
  env_page gets ?blankline.
  env_page gets '   2.0 BACKGROUND'.
  env_page gets ?blankline.
  env_page gets '       2.1  Scientific Field to which Experiment Type Belongs'
  env_page gets ?blankline.
  line_count = ?line_count + 6.
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  env_page gets ?blankline.
  line_count = ?line_count + 1.
  if ?line_count > 56
    then do (page_advance).

  env_page gets '       2.2  Current Application for Research in the Field'.
  env_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\env2_2.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
```

```
      then do (read_file).
    close (?filename).
    env_page gets ?blankline.
    line_count = ?line_count + 1.
    if ?line_count > 56
      then do (page_advance).

    env_page gets '        2.3  Brief Historical Account of Prior Research in the
    env_page gets ?blankline.
    line_count = ?line_count + 2.
    filename = concat(C:\GARDEN\,?CURDIR,'\env2_3.dat').
    line is read_line (?filename).
    while ?line <> ?eof
      then do (read_file).
    close (?filename).
    line_count = ?line_count + 1.
    env_page gets ?blankline.
    if ?line_count > 56
      then do (page_advance).

    env_page gets '        2.4  Current Research'.
    env_page gets ?blankline.
    line_count = ?line_count + 2.
    filename = concat(C:\GARDEN\,?CURDIR,'\env2_4.dat').
    line is read_line (?filename).
    while ?line <> ?eof
      then do (read_file).
    close (?filename).
    line_count = ?line_count + 1.
    env_page gets ?blankline.
    if ?line_count > 56
      then do (page_advance).

    env_page gets '        2.5  Relationship of Proposed Experiment Type to Experi
    env_page gets ?blankline.
    line_count = ?line_count + 2.
    filename = concat(C:\GARDEN\,?CURDIR,'\env2_5.DAT').
    line is read_line (?filename).
    while ?line <> ?eof
      then do (read_file).
    close (?filename).
    line_count = ?line_count + 1.
    env_page gets ?blankline.
    if ?line_count > 56
      then do (page_advance).

    env_page gets '        2.6  Anticipated Advance in State of the Art for This 1
                 Experimentation'.
    env_page gets ?blankline.
    line_count = ?line_count + 3.
    filename = concat(C:\GARDEN\,?CURDIR,'\env2_6.DAT').
    line is read_line (?filename).
    while ?line <> ?eof
      then do (read_file).
    close (?filename).
    line_count = ?line_count + 1.
    env_page gets ?blankline.
    do (page_advance).
end.  (* 2.0 BACKGROUND *)
```

```
topic '3.0 JUSTIFICATION FOR CONDUCTING THE EXPERIMENT IN SPACE'.
  page_count = 0.
  filename = concat(C:\GARDEN\,?CURDIR,'\env3_1.DAT').
  line is read_line (?filename).
  if ?line_count > 54
    then do (page_advance).

  env_page gets ?blankline.
  env_page gets ?blankline.
  env_page gets '   3.0 JUSTIFICATION FOR CONDUCTING THE EXPERIMENT IN SPACE'.
  env_page gets ?blankline.
  env_page gets '       3.1  Limitations of Ground-Based Testing'.
  env_page gets ?blankline.
  line_count = ?line_count + 6.
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  env_page gets ?blankline.
  line_count = ?line_count + 1.
  if ?line_count > 56
    then do (page_advance).

  env_page gets '       3.2  Limitations of Drop Towers'.
  env_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\env3_2.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
  env_page gets ?blankline.
  if ?line_count > 56
    then do (page_advance).

  env_page gets '       3.3  Limitations of Testing in Aircraft'.
  env_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\env3_3.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
  env_page gets ?blankline.
  if ?line_count > 56
    then do (page_advance).

  env_page gets '       3.4  Need for Accommodations in the Shuttle'.
  env_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\env3_4.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
  env_page gets ?blankline.
  if ?line_count > 56
    then do (page_advance).
```

```
  env_page gets '       3.5  Limitations of Mathematical Modeling'.
  env_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\env3_5.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
  env_page gets ?blankline.
  if ?line_count > 56
    then do (page_advance).

  env_page gets '       3.6  Limitations of Other Modeling Approaches'.
  env_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\env3_6.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
  env_page gets ?blankline.
  do (page_advance).
end.  (* 3.0 JUSTIFICATION FOR CONDUCTING THE EXPERIMENT IN SPACE *)

topic '4.0 DESCRIPTION OF EXPERIMENT TYPES'.
  page_count = 0.
  filename = concat(C:\GARDEN\,?CURDIR,'\env4_1.DAT').
  line is read_line (?filename).
  if ?line_count > 54
    then do (page_advance).

  env_page gets ?blankline.
  env_page gets ?blankline.
  env_page gets '   4.0 DESCRIPTION OF EXPERIMENT TYPES'.
  env_page gets ?blankline.
  env_page gets '       4.1  General Description of Type of Experiments'.
  env_page gets ?blankline.
  line_count = ?line_count + 6.
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  env_page gets ?blankline.
  line_count = ?line_count + 1.
  if ?line_count > 56
    then do (page_advance).

  env_page gets '       4.2  Types of Experiment Procedures to be Used'.
  env_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\env4_2.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
  env_page gets ?blankline.
  if ?line_count > 56
```

```
    then do (page_advance).

  env_page gets
  '        4.3  Types of Measurements and Ranges of Values Required'.
  env_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\env4_3.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
  env_page gets ?blankline.
  do (page_advance).

end.  (* 4.0 DESCRIPTION OF EXPERIMENT TYPES *)

topic '5.0 Science Requirements Envelope'.
  page_count = 0.
  filename = concat(C:\GARDEN\,?CURDIR,'\env5_1.DAT').
  line is read_line (?filename).
  if ?line_count > 56
  then do (page_advance).

  env_page gets ?blankline.
  env_page gets ?blankline.
  env_page gets '   5.0 SCIENCE REQUIREMENTS ENVELOPE'.
  env_page gets ?blankline.
  env_page gets '         5.1  General Description of Experiment Sample Requiremen
  env_page gets ?blankline.
  line_count = ?line_count + 6.
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  env_page gets ?blankline.
  line_count = ?line_count + 1.
  if ?line_count > 54
    then do (page_advance).

  env_page gets
  '        5.2  Range of Atmospheric Requirements'.
  env_page gets ?blankline.
  env_page gets
  '        5.2.1  Pressure'.
  env_page gets ?blankline.
  line_count = ?line_count + 4.
  filename = concat(C:\GARDEN\,?CURDIR,'\env5_2_1.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
  env_page gets ?blankline.
  if ?line_count > 56
    then do (page_advance).

  env_page gets
  '        5.2.2  Gas Composition'.
  env_page gets ?blankline.
  line_count = ?line_count + 2.
```

```
filename = concat(C:\GARDEN\,?CURDIR,'\env5_2_2.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'        5.2.3  Humidity'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_2_3.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'        5.2.4  Vacuum'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_2_4.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'        5.3  Temperature Control and Measurement'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_3.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'        5.4  Vibration Control and Measurement'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_4.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
```

```
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'       5.5  Test Matrices'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_5.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 54
  then do (page_advance).

env_page gets
'       5.6  Imaging Requirements Envelope'.
env_page gets ?blankline.
env_page gets
'       5.6.1  Photography'.
env_page gets ?blankline.
line_count = ?line_count + 4.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_6_1.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'       5.6.2  Radiography'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_6_2.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'       5.6.3  Television'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_6_3.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
```

```
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'        5.6.4  Resolution'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_6_4.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'        5.6.5  Frame Rate'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_6_5.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'        5.7  Electromagnetic Limitations'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_7.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 54
  then do (page_advance).

env_page gets
'        5.8  Astronaut Involvement'.
env_page gets ?blankline.
env_page gets
'        5.8.1  Extravehicular Activity'.
env_page gets ?blankline.
line_count = ?line_count + 4.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_8_1.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
```

```
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'       5.8.2  Activation of Experiment'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_8_2.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'       5.9  Data Requirements'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_9.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 54
  then do (page_advance).

env_page gets
'       5.10  Telepresence and Telerobotics'.
env_page gets ?blankline.
env_page gets
'       5.10.1  Telepresence'.
env_page gets ?blankline.
line_count = ?line_count + 4.
filename = concat(C:\GARDEN\,?CURDIR,'\en5_10-1.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'       5.10.2  Telerobotics'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\en5_10_2.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
```

```
   do (page_advance).
 end.  (* 5.0 SCIENCE REQUIREMENTS ENVELOPE *)



 topic '6.0 OTHER REQUIREMENTS'.
   page_count = 0.
   filename = concat(C:\GARDEN\,?CURDIR,'\env6_1.DAT').
   line is read_line (?filename).
   if ?line_count > 54
     then do (page_advance).

   env_page gets ?blankline.
   env_page gets ?blankline.
   env_page gets '   6.0 OTHER REQUIREMENTS'.
   env_page gets ?blankline.
   line_count = ?line_count + 4.
   while ?line <> ?eof
     then do (read_file).
   close (?filename).
   env_page gets ?blankline.
   line_count = ?line_count + 1.
   do (page_advance).

 end.  (* 6.0 OTHER REQUIREMENTS *)

 topic 'page_advance'.
   page_count = ?page_count + 1.
   window_name = concat(?choice,'  Page: ',?page_count).
   window (?window_name,white,blue,white,3,3,78,19).
   say (?env_page).
   env_page = [].
   env_page gets ?blankline.
   env_page gets ?blankline.
   line_count = 2.
   collect ().
   close_window ().
 end.  (* page_advance *)

 topic 'read_file'.
   if ?line_count > 58
     then do (page_advance).
   line = concat('        ',?line).
   env_page gets ?line.
   line is read_line (?filename).
   line_count = ?line_count + 1.
 end.  (* read_file *)

 end.  (* display_Routine *)
```

```
(* ENVPRINT.KB is used to print all sections of the Envelope Document.     *)

no_edit_key ().
no_debug ().
eof = number_to_char (26).
curdir is read_line ('CURDIR.DAT').
curdir is string_replace(?curdir,' ','',8).
orig_curdir = ?curdir.
blankline = '    '.
choice = ' '.
line_count = 0.
page_count = 0.
base_dir = [ ].
curbase is read_line (concat('C:\GARDEN\',?CURDIR,'\BASELINE.DAT')).
close (concat('C:\GARDEN\',?CURDIR,'\BASELINE.DAT')).

if ?curbase <> ?eof
  then
    base_choice = ['BASELINE','CURRENT REVISION','NEITHER']
    and
    ask ('#e

             Do you wish to print documents from the baseline or
             from the current revision?',base_dir,?base_choice)

  and
  if ?base_dir = BASELINE
    then
      curdir = concat (?curdir,'\BASELINE')
      and
      curdir = string_replace (?curdir,' ','',8)
      and
      new_file ('C:\GARDEN\CURDIR.DAT')
      and
      write ('C:\GARDEN\CURDIR.DAT',?curdir)
      and
      do (print_sections).

  if ?base_dir <> NEITHER
    then  while ?choice <> QUIT
      then do (print_sections).


new_kb ('NASA_ENV.HKB').

topic 'Print_sections'.
env_page = [].
sections = ['1.0 INTRODUCTION/SUMMARY','2.0 BACKGROUND',
 '3.0 JUSTIFICATION FOR CONDUCTING THIS EXPERIMENT IN SPACE',
 '4.0 DESCRIPTION OF EXPERIMENT TYPES','5.0 SCIENCE REQUIREMENTS ENVELOPE',
 '6.0 OTHER REQUIREMENTS','PRINT ENTIRE DOCUMENT','QUIT'].

window ('Print Science Requirements Envelope',white,blue,white,3,3,78,18).
 ask ('#e
               Which section do you wish to Print?',choice,?sections).

  if ?choice = '1.0 INTRODUCTION/SUMMARY'
    then do ('1.0 INTRODUCTION/SUMMARY')
    and
    if ?line_count > 2
```

```
  then
    do (page_advance).

if ?choice = '2.0 BACKGROUND'
  then do ('2.0')
  and
  if ?line_count > 2
  then
    do (page_advance).

if ?choice = '3.0 JUSTIFICATION FOR CONDUCTING THIS EXPERIMENT IN SPACE'
  then do ('3.0')
  and
  if ?line_count > 2
  then do (page_advance).

if ?choice = '4.0 DESCRIPTION OF EXPERIMENT TYPES'
  then do ('4.0')
  and
  if ?line_count > 2
  then
    do (page_advance).

if ?choice = '5.0 SCIENCE REQUIREMENTS ENVELOPE'
  then do ('5.0')
  and
  if ?line_count > 2
  then
    do (page_advance).

if ?choice = '6.0 OTHER REQUIREMENTS'
  then do ('6.0')
  and
  if ?line_count > 2
  then
    do (page_advance).

if ?choice = 'PRINT ENTIRE DOCUMENT'
  then
    load ('envtitle.hkb')
    and
    do ('print_title_page')
    and
    remove_topic ('print_title_page')
    and
    page_count = 0
    and
   window (,white,red,yellow,1,16,27,4)
   and
   write ('con:','PRINT IN PROGRESS...')
   and
   do ('1.0 INTRODUCTION/SUMMARY')
   and
   do ('2.0')
   and
   do ('3.0')
   and
   do ('4.0')
   and
   do ('5.0')
```

```
    and
    do ('6.0')
    and print (#p,' ',#p).

close_window ().

if ?choice = 'QUIT'
  then
  if ?base_dir = BASELINE
  then
  curdir = ?orig_curdir
  and
  curdir = string_replace (?curdir,' ','',8)
  and
  new_file ('C:\GARDEN\CURDIR.DAT')
  and
  write ('C:\GARDEN\CURDIR.DAT',?curdir)
  and
  new_kb ('nasa_env.hkb')
  else
  new_kb ('nasa_env.hkb').

end. (* print sections *)



topic '1.0 INTRODUCTION/SUMMARY'.
  window (,white,red,yellow,1,16,27,4)
  and
  write ('con:','PRINT IN PROGRESS...')
  and
  env_page gets ?blankline.
  env_page gets ?blankline.
  filename = concat(C:\GARDEN\,?CURDIR,'\env1_1.DAT').
  line is read_line (?filename).
  env_page gets '   1.0 INTRODUCTION/SUMMARY'.
  env_page gets ?blankline.
  env_page gets '       1.1  Descripton of Experiment Type or Class'.
  env_page gets ?blankline.
  line_count = 6.
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  env_page gets ?blankline.
  line_count = ?line_count + 1.
  if ?line_count > 56
    then do (page_advance).

  env_page gets '       1.2  Scientific Knowledge to be Gained From This Type of
  env_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\env1_2.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  env_page gets ?blankline.
  line_count = ?line_count + 1.
  if ?line_count > 56
    then do (page_advance).
```

```
  env_page gets '        1.3  Value of Knowledge of This Type of Experiment'.
  env_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\env1_3.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  env_page gets ?blankline.
  line_count = ?line_count + 1.
  if ?line_count > 56
    then do (page_advance).

  env_page gets '        1.4  Necessity for Space Environment to Experiment Type
  env_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\env1_4.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  env_page gets ?blankline.
  line_count = ?line_count + 1.
  if ?line_count > 56
   then do (page_advance).
end. (* 1.0 *)



 topic '2.0'.
  filename = concat(C:\GARDEN\,?CURDIR,'\env2_1.DAT').
  line is read_line (?filename).
  if ?line_count > 56
    then do (page_advance).

  window (,white,red,yellow,1,16,27,4)
  and
  write ('con:','PRINT IN PROGRESS...')
  and
  env_page gets ?blankline.
  env_page gets ?blankline.
  env_page gets '    2.0 BACKGROUND'.
  env_page gets ?blankline.
  env_page gets '        2.1  Scientific Field to which Experiment Belongs'.
  env_page gets ?blankline.
  line_count = ?line_count + 6.
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  env_page gets ?blankline.
  line_count = ?line_count + 1.
  if ?line_count > 56
    then do (page_advance).

  env_page gets '        2.2  Current Application for Research in the Field'.
  env_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\env2_1.DAT').
  line is read_line (?filename).
```

```
while ?line <> ?eof
  then do (read_file).
close (?filename).
env_page gets ?blankline.
line_count = ?line_count + 1.
if ?line_count > 56
  then do (page_advance).

env_page gets '        2.3  Brief Historical Account of Prior Research'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env2_3.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets '        2.4  Current Research'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env2_4.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets '        2.5  Relationship of Proposed Experiment Type to Experim
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env2_5.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets '        2.6  Anticipated Advance in State of the Art'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env2_6.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
 then do (page_advance).
end. (* 2.0 *)
```

```
topic '3.0'.
  filename = concat(C:\GARDEN\,?CURDIR,'\env3_1.DAT').
  line is read_line (?filename).
  if ?line_count > 56
    then do (page_advance).

  window (,white,red,yellow,1,16,27,4)
  and
  write ('con:','PRINT IN PROGRESS...')
  and
  env_page gets ?blankline.
  env_page gets ?blankline.
  env_page gets '   3.0 JUSTIFICATION FOR CONDUCTING THIS EXPERIMENT IN SPACE'.
  env_page gets ?blankline.
  env_page gets '       3.1  Limitations of Ground-Based Testing'.
  env_page gets ?blankline.
  line_count = ?line_count + 6.
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  env_page gets ?blankline.
  line_count = ?line_count + 1.
  if ?line_count > 56
    then do (page_advance).

  env_page gets '       3.2  Limitations of Drop Towers'.
  env_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\env3_2.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
  env_page gets ?blankline.
  if ?line_count > 56
    then do (page_advance).

  env_page gets '       3.3  Limitations of Testing in Aircraft'.
  env_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\env3_3.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
  env_page gets ?blankline.
  if ?line_count > 56
    then do (page_advance).

  env_page gets '       3.4  Need for Accommodations in the Shuttle'.
  env_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\env3_4.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
```

```
  line_count = ?line_count + 1.
  env_page gets ?blankline.
  if ?line_count > 56
    then do (page_advance).

  env_page gets '       3.5  Limitations of Mathematical Modeling'.
  env_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\env3_5.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
  env_page gets ?blankline.
  if ?line_count > 56
    then do (page_advance).

  env_page gets '       3.6  Limitations of Other Modeling Approaches'.
  env_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\env3_6.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
  env_page gets ?blankline.
  if ?line_count > 56
   then
    do (page_advance).
end. (* 3.0 *)

topic '4.0'.
  filename = concat(C:\GARDEN\,?CURDIR,'\env4_1.DAT').
  line is read_line (?filename).
  if ?line_count > 56
   then
     do (page_advance).

  window (,white,red,yellow,1,16,27,4)
  and
  write ('con:','PRINT IN PROGRESS...')
  and
  env_page gets ?blankline.
  env_page gets ?blankline.
  env_page gets '   4.0 DESCRIPTION OF EXPERIMENT TYPES'.
  env_page gets ?blankline.
  env_page gets '       4.1  General Description of Type of Experiments'.
  env_page gets ?blankline.
  line_count = ?line_count + 6.
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  env_page gets ?blankline.
  line_count = ?line_count + 1.
  if ?line_count > 56
    then do (page_advance).

  env_page gets '       4.2  Types of Experiment Procedures to be Used'.
```

```
  env_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\env4_2.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
  env_page gets ?blankline.
  if ?line_count > 56
    then do (page_advance).

  env_page gets
  '        4.3  Types of Measurements and Ranges of Values Required'.
  env_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\env4_3.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
  env_page gets ?blankline.
  if ?line_count > 56
   then do (page_advance).
end. (* 4.0 *)

topic '5.0'.
  filename = concat(C:\GARDEN\,?CURDIR,'\env5_1.DAT').
  line is read_line (?filename).
  if ?line_count > 56
   then do (page_advance).

  window (,white,red,yellow,1,16,27,4)
  and
  write ('con:','PRINT IN PROGRESS...')
  and
  env_page gets ?blankline.
  env_page gets ?blankline.
  env_page gets '   5.0 SCIENCE REQUIREMENTS ENVELOPE'.
  env_page gets ?blankline.
  env_page gets '        5.1  Experiment Sample Requirements'.
  env_page gets ?blankline.
  line_count = ?line_count + 6.
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  env_page gets ?blankline.
  line_count = ?line_count + 1.
  if ?line_count > 56
    then do (page_advance).

  env_page gets
  '        5.2  Atmospheric Requirements'.
  env_page gets ?blankline.
  env_page gets
  '        5.2.1  Pressure'.
  env_page gets ?blankline.
  line_count = ?line_count + 4.
  filename = concat(C:\GARDEN\,?CURDIR,'\env5_2_1.DAT').
```

```
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'       5.2.2  Gas Composition'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_2_2.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'       5.2.3  Humidity'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_2_3.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'       5.2.4  Vacuum'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_2_4.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'       5.3  Temperature Control and Measurement'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_3.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
```

```
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'        5.4  Vibration Control and Measurement'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_4.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'        5.5  Test Matrices'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_5.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'        5.6  Imaging Requirements'.
env_page gets ?blankline.
env_page gets
'        5.6.1  Photography'.
env_page gets ?blankline.
line_count = ?line_count + 4.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_6_1.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'        5.6.2  Radiography'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_6_2.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
```

```
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'        5.6.3  Television'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_6_3.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'        5.6.4  Resolution'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_6_4.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'        5.6.5  Frame Rate'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_6_5.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'        5.7  Electromagnetic Limitations'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_7.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).
```

```
env_page gets
'        5.8  Astronaut Involvement'.
env_page gets ?blankline.
env_page gets
'        5.8.1  Extravehicular Activity'.
env_page gets ?blankline.
line_count = ?line_count + 4.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_8_1.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'        5.8.2  Activation of Experiment'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_8_2.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'        5.9  Data Requirements'.
env_page gets ?blankline.
line_count = ?line_count + 2.
filename = concat(C:\GARDEN\,?CURDIR,'\env5_9.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
  then do (page_advance).

env_page gets
'        5.10  Telepresence and Telerobotics'.
env_page gets ?blankline.
env_page gets
'        5.10.1  Telepresence'.
env_page gets ?blankline.
line_count = ?line_count + 4.
filename = concat(C:\GARDEN\,?CURDIR,'\en5_10_1.DAT').
line is read_line (?filename).
while ?line <> ?eof
  then do (read_file).
close (?filename).
line_count = ?line_count + 1.
env_page gets ?blankline.
if ?line_count > 56
```

```
    then do (page_advance).

  env_page gets
  '       5.10.2  Telerobotics'.
  env_page gets ?blankline.
  line_count = ?line_count + 2.
  filename = concat(C:\GARDEN\,?CURDIR,'\en5_10_2.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
    then do (read_file).
  close (?filename).
  line_count = ?line_count + 1.
  env_page gets ?blankline.
  if ?line_count > 56
   then do (page_advance).
end. (* 5.0 *)

topic '6.0'.
  window (,white,red,yellow,1,16,27,4)
  and
  write ('con:','PRINT IN PROGRESS...')
  and
  env_page gets ?blankline.
  env_page gets ?blankline.
  env_page gets '   6.0 OTHER REQUIREMENTS'.
  env_page gets ?blankline.
  line_count = ?line_count + 4.
  filename = concat(C:\GARDEN\,?CURDIR,'\ENV6_1.DAT').
  line is read_line (?filename).
  while ?line <> ?eof
   then do (read_file).
  close (?filename).
  env_page gets ?blankline.
  line_count = ?line_count + 1.
  do (page_advance).
end. (* 6.0 *)

topic 'page_advance'.
  page_count = ?page_count + 1.
  page_line = concat('                                                  ',?page_count).
  while ?line_count < 58
    then
      env_page gets ?blankline
      and
      line_count = ?line_count + 1.
  if ?choice = 'PRINT ENTIRE DOCUMENT'
  then
  env_page gets ?page_line.
  print (#p,?env_page).
  env_page = [].
  env_page gets ?blankline.
  env_page gets ?blankline.
  line_count = 2.
  collect ().
end.  (* page_advance *)


topic 'read_file'.
  if ?line_count > 56
    then do (page_advance).
```

```
  line = concat('        ',?line).
  env_page gets ?line.
  line is read_line (?filename).
  line_count = ?line_count + 1.
end.  (* read_file *)

end.  (* Print_Routine *)
```

```
(* ENVTITLE.KB prints the Title Page for the Science Requirements *)
(* Envelope Document.                                              *)

no_edit_key ().
no_debug ().

topic 'print_title_page'.
  no_edit_key ().
  filler = '                                              '.
  eof = number_to_char (26).
  blankline = '                                          '.

  expname is read(concat(C:\GARDEN\,?CURDIR,'\TITLE.DAT')).

  expname is string_replace(?expname,'    ','',600).
  expname is remove(?expname,'').
  lines = list_length(?expname).
  line_count = 1.
  title_length = 0.

  window (,white,red,yellow,1,16,27,4).
  write ('con:','REPORT BEING PRINTED...').

  while ?line_count <= ?lines
    then
      cur_line = element(?expname,?line_count)
      and
      cur_lngth = string_length(?cur_line)
      and
      line_count = ?line_count + 1
      and
      title_length = ?title_length + ?cur_lngth + 1
      and
      if ?cur_line = ''
        then
          expname = string_replace(?expname,?cur_line).
  expname = concat(element(?expname,1),'~',
                   element(?expname,2),'~',
                   element(?expname,3),'~',
                   element(?expname,4),'~',
                   element(?expname,5),'~',
                   element(?expname,6),'~',
                   element(?expname,7),'~',
                   element(?expname,8),'~',
                   element(?expname,9),'~',
                   element(?expname,10),'~',
                   element(?expname,11),'~',
                   element(?expname,12),'~',
                   element(?expname,13),'~',
                   element(?expname,14),'~',
                   element(?expname,15)).

  title_length = ?title_length + 3.
  counter = 1.
  write_counter = 1.
  line_one = ' '.
  while ?counter < ?title_length
    then
      char = string_copy(?expname,?counter,1)
      and
```

```
    counter = ?counter + 1
    and
    write_counter = ?write_counter + 1
    and
    if ?write_counter > 40 and ?char = ' '
      then
        linelgth = string_length(?line_one)
        and
        linelgth = 80 - ?linelgth
        and
        linelgth = ?linelgth / 2
        and
        linefiller = string_copy (?blankline,1,?linelgth)
        and
        line_one = concat(?linefiller,?line_one,'#n',?char)
        and
        write_counter = 1
        and
        new_expname gets ?line_one
        and
        line_one = ''
      else
        line_one = concat(?line_one,?char).

linelgth = string_length(?line_one).
linelgth = 80 - ?linelgth.
linelgth = ?linelgth / 2.
linefiller = string_copy (?blankline,1,?linelgth).
line_one = concat(?linefiller,?line_one,'#n').

new_expname gets ?line_one.
new_expname = string_replace(?new_expname,'~',' ',600).

authorfile = concat(C:\GARDEN\,?CURDIR,'\AUTHOR.DAT').

titlepage = ('#n#n#n#n#n#n#n#n#n#n#n#n').
titlepage gets '                    Science Requirements Envelope Document'.
titlepage gets '                                              for:'.
titlepage gets ' '.
titlepage gets ?new_expname.
titlepage gets '#n#n'.
pagedate = ?date.
mo_num = element(?pagedate,1).
if ?mo_num = 1
  then month = January
  else
  if ?mo_num = 2
  then month = February
  else
  if ?mo_num = 3
  then month = March
  else
  if ?mo_num = 4
  then month = April
  else
  if ?mo_num = 5
  then month = May
  else
  if ?mo_num = 6
  then month = June
```

```
  else
  if ?mo_num = 7
  then month = July
  else
  if ?mo_num = 8
  then month = August
  else
  if ?mo_num = 9
  then month = September
  else
  if ?mo_num = 10
  then month = October
  else
  if ?mo_num = 11
  then month = November
  else
  if ?mo_num = 12
  then month = December
  else
  month = ' '.
year = element(?pagedate,3).
reportdate = concat(?month,' ',?year).

datelgth = string_length(?reportdate).
datelgth = 80 - ?datelgth.
datelgth = ?datelgth / 2.
datefiller = string_copy (?blankline,1,?datelgth).
titlepage gets ' '.
titlepage gets ' '.
titlepage gets concat(?datefiller,?reportdate).

basefile = concat ('C:\GARDEN\',?CURDIR,'\BASELINE.DAT').
baseline = read(?basefile).
if ?baseline = ?eof
  then
    baseline = 'N/A'.

datelgth = string_length (?baseline).
datelgth = 80 - ?datelgth.
datelgth = ?datelgth / 2.
datefiller = string_copy (?blankline,1,?datelgth).
titlepage gets ' '.
titlepage gets '                                  Baselined:  '.
titlepage gets concat(?datefiller,?baseline).

name is read_line (?authorfile).
name is string_replace(?name,'NAME:              ','',1).
name is string_replace(?name,'   ','',8).
namelgth = string_length(?name).
namelgth = 80 - ?namelgth.
namelgth = ?namelgth / 2.
namefiller = string_copy (?blankline,1,?namelgth).
titlepage gets concat('#n#n#n#n#n#n#n#n#n#n#n#n',?namefiller,?name).

organization is read_line (?authorfile).
organization is string_replace(?organization,'ORGANIZATION:     ','',1).
organization is string_replace(?organization,'   ','',8).
organizationlgth = string_length(?organization).
organizationlgth = 80 - ?organizationlgth.
organizationlgth = ?organizationlgth / 2.
```

```
    organizationfiller = string_copy (?blankline,1,?organizationlgth).
    titlepage gets concat(?organizationfiller,?organization).

    mcode is read_line (?authorfile).
    mcode is string_replace(?mcode,'MAIL CODE:        ','',1).
    mcode is string_replace(?mcode,'   ','',8).
    mcodelgth = string_length(?mcode).
    mcodelgth = 80 - ?mcodelgth.
    mcodelgth = ?mcodelgth / 2.
    mcodefiller = string_copy (?blankline,1,?mcodelgth).
    titlepage gets concat(?mcodefiller,?mcode).

    street is read_line (?authorfile).
    street is string_replace(?street,'STREET:           ','',1).
    street is string_replace(?street,'   ','',8).
    streetlgth = string_length(?street).
    streetlgth = 80 - ?streetlgth.
    streetlgth = ?streetlgth / 2.
    streetfiller = string_copy (?blankline,1,?streetlgth).
    titlepage gets concat(?streetfiller,?street).

    city is read_line (?authorfile).
    city is string_replace(?city,'CITY, STATE, ZIP: ','',1).
    city is string_replace(?city,'   ',' ',8).
    city is string_replace(?city,'  ',' ',8).
    citylgth = string_length(?city).
    citylgth = 80 - ?citylgth.
    citylgth = ?citylgth / 2.
    cityfiller = string_copy (?blankline,1,?citylgth).
    titlepage gets concat(?cityfiller,?city).

    phone is read_line (?authorfile).
    phone is string_replace(?phone,'PHONE:            ','',1).
    phone is string_replace(?phone,'   ','',8).
    phonelgth = string_length(?phone).
    phonelgth = 80 - ?phonelgth.
    phonelgth = ?phonelgth / 2.
    phonefiller = string_copy (?blankline,1,?phonelgth).
    titlepage gets concat(?phonefiller,?phone).

  print (#p,?titlepage,#p).
  close_window ().
end.  (* print_title_page *)
```

```
(*ENVFMENU.KB     This is the menu provided to the user to            *)
(*                  determine what he/she is to do on a                *)
(*                               project.                              *)


no_edit_key ().
no_debug ().
fdaction = '  '.

curdir is read_line ('CURDIR.DAT').
curdir is string_replace (?curdir,' ','',8).

while ?fdaction <> 'Exit System'
  then do (filldoc).

topic 'filldoc'.

fdchoices = ['Enter Project Initialization Information',
            'Complete Science Requirements Envelope Document',
            'Mark Answers in Envelope as "Not Applicable"',
            'Return to Previous Menu',
            'Return to Main Menu',
            'Exit System'].

window (,white,red,yellow,5,5,75,16).
  set_number_of_values (fdaction,1).

  ask (['#e #s
    Please select the activity you wish to perform on #n
     the',?curdir,'#dproject.'],fdaction,?fdchoices).

close_window ().

if ?fdaction = 'Enter Project Initialization Information'
  then new_kb ('einitial.hkb').

if ?fdaction = 'Complete Science Requirements Envelope Document'
  then new_kb ('fillenv.hkb').

if ?fdaction = 'Mark Answers in Envelope as "Not Applicable"'
  then new_kb ('envelim.hkb').

if ?fdaction = 'Return to Main Menu'
  then new_kb ('ENVMMENU.ckb').

if ?fdaction = 'Return to Previous Menu'
  then new_kb ('nasa_env.hkb').

if ?fdaction = 'Exit System'
  then exit ().
```

```
(*EINITIAL.KB      This program is used to allow the user          *)
(*                to enter standard project initialization         *)
(*               information, i.e. name, address, title, etc.      *)

no_edit_key ().
no_debug ().
curdir is read_line ('CURDIR.DAT').
curdir = string_replace(?curdir,' ','',8).

eof = number_to_char (26).
yn is [YES,NO].
chgwant = '  '.

do (personal_info).
new_kb ('envfmenu.hkb').

topic 'personal_info'.

  blankline = '.'.
  close_window ().
  oldtext is read (concat (C:\GARDEN\,?CURDIR,'\AUTHOR.DAT')).
  if ?oldtext = ?eof
    then do (new_personal)
  else
    chgwant = '    '
    and
    while ?chgwant <> QUIT
      then do (edit_personal).

(* ================== get new personal information ======================*)

topic 'new_personal'.
  WRITE ('con:','#eIn the window below, please provide some general information
  about yourself and your experiment.                                    ').

  window (,white,red,yellow,5,5,75,16).

  read_response ('#e
     #fyellow Please enter your first and last names, i.e. Dr. John Doe.#d
                                                              #n ',name,?
                                                              blankline).
  name = concat ('NAME:              ',?name).
  personal gets ?name.

  read_response ('#e
     #fyellow Please enter the name of your organization.#d
                                                     #n  ',organization,
                                                     ?blankline).

  organization = concat ('ORGANIZATION:     ',?organization).
  personal gets ?organization.

  read_response ('#e
     #fyellow Please enter the mail code, P.O Box, room number, or other needed
     address information of your organization.#d
                                                 #n',mail_code,?blankline).

  mail_code = concat ('MAIL CODE:        ',?mail_code).
  personal gets ?mail_code.
```

```
read_response ('#e
   #fyellow Please enter the street address of your organization.#d
                                                            #n',street,
                                                            ?blankline).

street = concat ('STREET:                 ',?street).
personal gets ?street.

read_response ('#e
   #fyellow Please enter the city, state, and zip code of your organization.
   #d                                                  #n',city_st_zip,
                                                           ?blankline).

city_st_zip = concat ('CITY, STATE, ZIP: ',?city_st_zip).
city_st_zip = string_replace (?city_st_zip,'  ',' ',8).
personal gets city_st_zip.

read_response ('#e
   #fyellow Please enter your phone number.#d
                                                            #n',phone,
                                                            ?blankline).

phone = concat ('PHONE:                 ',?phone).
personal gets ?phone.

say ('#e

  Please enter the title of your experiment.

  Press the #fyellow RETURN KEY#d to enter the editor,
  #fyellow ESC#d to leave the editor, and #fyellow RETURN#d to confirm save.')

edit_file (concat (C:\GARDEN\,?CURDIR,'\TITLE.DAT'),yellow,black,red,9,11,70,1

author_info is [?name,#n,?organization,#n,?mail_code,#n,?street,#n,
?city_st_zip,#n,?phone,#n].
new_file (concat (C:\GARDEN\,?CURDIR,'\AUTHOR.DAT')).
write    (concat (C:\GARDEN\,?CURDIR,'\AUTHOR.DAT'),?author_info,#n).
close    (concat (C:\GARDEN\,?CURDIR,'\AUTHOR.DAT')).

if ?chgwant <> QUIT
  then
    ask
  ([?author_info, '#n #fyellow
  The information listed has been written to a file.
  Do you wish to change any of these entries?#d'],
  change_again,?yn,60,16)
    and
    if ?change_again = YES
      then
        oldtext is read (concat (C:\GARDEN\,?CURDIR,'\AUTHOR.DAT'))
        and
        change_again = NO
        and
        chgwant = '    '
        and
        while ?chgwant <> QUIT
          then
            do (edit_personal).

close_window ().
```

```
WRITE ('con:','#e     ').
end. (* new_personal *)

(* =============== get corrected personal information ===================*)

topic 'edit_personal'.

  change_info is [NAME,ORGANIZATION,'MAIL CODE',STREET,'CITY STATE ZIP',
  PHONE,TITLE,QUIT].

  ask ('Which entry in the below list do you wish to change?',chgwant,
    ?change_info).

  if ?chgwant = NAME
    then
      old_name = element(?oldtext,1)
      and
      old_value = string_replace (?old_name,'NAME:                  ','',1)
      and
      read_response (['#e
    #fyellow Your original entry for name was#s', ?old_value, '.#d #s #n#n
    Please enter the corrected name in its entirety.#n #o'],new_name,?old_value)


  if ?chgwant = NAME
    then
      new_name = concat ('NAME:                  ',?new_name)
      and
      oldtext is replace(?oldtext,?old_name,?new_name).


  if ?chgwant = ORGANIZATION
    then
      old_org = element(?oldtext,2)
      and
      old_value = string_replace (?old_org,'ORGANIZATION:      ','',1)
      and
      read_response (['#e
 #fyellow Your original entry for organization was#s #n', ?old_value,
'.#d #s #n#n
 Please enter the corrected organization in its entirety.#n'],new_org,?old_valı

 if ?chgwant = ORGANIZATION
   then
     new_org = concat ('ORGANIZATION:      ',?new_org)
     and
     oldtext is replace(?oldtext,?old_org,?new_org).

 if ?chgwant = 'MAIL CODE'
   then
     old_mc = element(?oldtext,3)
     and
     old_value = string_replace (?old_mc,'MAIL CODE:         ','',1)
     and
     read_response (['#e
 #fyellow Your original entry for mail code was#s #n', ?
 old_value, '.#d #s #n#n
 Please enter the corrected mail code in its entirety.#n'],new_mc,?old_value).
```

```
 if ?chgwant = 'MAIL CODE'
   then
     new_mc = concat ('MAIL CODE:        ',?new_mc)
     and
     oldtext is replace(?oldtext,?old_mc,?new_mc).

 if ?chgwant = STREET
   then
     old_street = element(?oldtext,4)
     and
     old_value = string_replace (?old_street,'STREET:           ','',1)
     and
     read_response (['#e
 #fyellow Your original entry for street was#s #n', ?
 old_value,'.#d #s #n#n
 Please enter the corrected street address in its entirety.#n'],new_street,
 ?old_value).

 if ?chgwant = STREET
   then
     new_street = concat ('STREET:           ',?new_street)
     and
     oldtext is replace(?oldtext,?old_street,?new_street).

if ?chgwant = 'CITY STATE ZIP'
  then
  old_city = element(?oldtext,5)
  and
  old_value = string_replace (?old_city,'CITY, STATE, ZIP: ','',1)
  and
  read_response (['#e #fyellow Your original entry for city, state and zip was#s
  old_value,'.#d #s #n#n
Please enter the corrected city, state, and zip address in its entirety.#n'],
new_city,?old_value).

if ?chgwant = 'CITY STATE ZIP'
  then
  new_city = concat ('CITY, STATE, ZIP: ',?new_city)
  and
  new_city = string_replace (?new_city,'   ',' ',8)
  and
  oldtext is replace(?oldtext,?old_city,?new_city).


if ?chgwant = PHONE
  then
  old_phone = element(?oldtext,6)
  and
  old_value = string_replace (?old_phone,'PHONE:            ','',1)
  and
  read_response (['#e #fyellow Your original entry for phone was#s #n', ?
  old_value,'.#d #s #n#n
Please enter the corrected phone number in its entirety.#n'],
new_phone,?old_value).

if ?chgwant = PHONE
  then
  new_phone = concat ('PHONE:             ',?new_phone)
  and
  oldtext is replace(?oldtext,?old_phone,?new_phone).
```

```
if ?chgwant = 'TITLE'
  then
  say ('#e

    Please enter the corrected title of your experiment.

    Press the #fyellow RETURN KEY#d to enter the editor,
    #fyellow ESC#d to leave the editor, and #fyellow RETURN#d to confirm save.'
  and
    edit_file (concat (C:\GARDEN\,?CURDIR,'\TITLE.DAT'),yellow,black,red,5,9,70


if ?chgwant = QUIT
  then
     new_file    (concat (C:\GARDEN\,?CURDIR,'\AUTHOR.DAT'))
    and
     write       (concat (C:\GARDEN\,?CURDIR,'\AUTHOR.DAT'),?oldtext,#n)
    and
     close       (concat (C:\GARDEN\,?CURDIR,'\AUTHOR.DAT')).

if ?chgwant = QUIT
  then
  say
 ([?oldtext,'#fyellow      The information listed has been written to a file.
            Please press #flightgreen SPACE#d #fyellow to continue.
                                         ']).

end. (* edit_personal *)


end. (* personal_info *)

(* ================== end personal information =======================*)
```

```
(*FILLENV.KB       This program is used to allow the user              *)
(*                 to navigate and complete all pertinent              *)
(*          sections of the Science Requirements Envelope Document.    *)

no_edit_key ().
no_debug ().
do (nasasys).

topic nasasys.

column = 3.
row = 3.
ckount = [].

curdir is read_line ('CURDIR.DAT').
curdir = string_replace(?curdir,' ','',8).

yn is [YES,NO].
chgwant = '  '.
tried = 0.
type_change = '  '.
change_type = '  '.


ask ('
       Have you already begun to fill out the Science Requirements
            Envelope Document in a previous session?',begun,?yn)
and
      if ?begun = NO
        then
          new_one = ' '
          and
          do (fillENV)
          and
          new_kb ('ENVFMENU.hkb')
      else
        type_change is ['CHANGE ONE ITEM','CHANGE AND CONTINUE',
        'COMPLETE UNANSWERED TOPICS',QUIT]
         and

      while ?change_type <> QUIT
        then ask ('
        Do you wish to change only one item, resume at a point
        and continue sequentially through the remainder of the
        Envelope Document, or complete all topics previously
        unanswered?',change_type,?type_change)
        and
        if ?change_type = 'CHANGE ONE ITEM'
          then
            WRITE ('con:','#e  ')
            and
            window (,white,red,yellow,1,16,27,4)
            and
            WRITE ('con:',
'One moment please...
                    ')
            and
            do (ENV_start)
          else
            if ?change_type = 'COMPLETE UNANSWERED TOPICS'
```

```
              then
                WRITE ('con:','#e  ')
                and
                window (,white,red,yellow,1,15,32,5)
                and
                do (ENV_complete)
              else
                if ?change_type = 'CHANGE AND CONTINUE'
                then
                  WRITE ('con:','#e  ')
                  and
                  window (,white,red,yellow,1,16,27,4)
                  and
                  WRITE ('con:',
'One moment please...
                      ')
                  and
                  resume = 1
                  and
                  choice = ' '
                  and
                  do (ENV_continue)
                  and
                  new_kb ('envfmenu.hkb')
                else
                  new_kb ('envfmenu.hkb').

      if ?change_type = QUIT
        then new_kb ('envfmenu.hkb').


topic 'ENV_start'.
  resume = 1.
  choice = ' '.
  while ?choice <> Quit
    then do (ENV_begin).
  close_window ().
  WRITE ('con:','#e     ').
  reset (ENV_begin).
  collect ().
end. (* ENV_start *)


(* ********************** BEGIN FILLING OUT ENVELOPE ************************ *)
topic 'fillENV'.
   if ?new_one = ' '
     then load ('envquest.hkb')
     and fs gets children(fillENV)
     and fs is remove (?fs,'related answer')
     and stopENV = 'N'
     and new_one = 'X'
     and x = 1.


   y = (element(?fs,?x)).

   if ?y <> ' ' and ?stopENV <> 'Y'
     then do (?y).
   x = ?x + 1.
   if ?x = 8
```

```
     or ?x = 16
       or ?x = 24
         or ?x = 32
           then collect ().
   WRITE ('con:','#e      ').

   continuex = NO.
   ask ('#e

   Do you wish to continue with the next question?',continuex,?yn).

   if ?continuex = NO
     then
       stopENV = 'Y'.


   if ?y = last(?fs)
     then stopENV = 'Y'.

   if ?stopENV <> 'Y'
     then do (fillENV).

end. (* fillENV *)

(* ************************************************************************ *)

topic 'ENV_begin'.
if ?resume = 1
  then load ('envquest.hkb').
  close_window ().

   if ?resume = 1
     then begin is 'Quit'.
   if ?resume = 1
     then begin gets children(ENV_begin).
   if ?resume = 1
     then begin gets 'Quit'
     and
     begin is remove (?begin,'related answer')
     and
     choice = ' '.

  while ?choice <> Quit
    then
     window ('Change One Item',blue,white,white,?column,?row,)
     and
     ask ('Which subtopic do you wish to change?',choice, ?begin)
     and
     close_window ()
     and
      if ?choice <> 'Quit'
        then do (?choice)
     and
      resume = 2
     and
      close_window ().
  if ?choice = 'Quit'
    then
      close_window ()
      and
```

```
      WRITE ('con:','#e     ')
      and
      window (,white,red,yellow,1,16,27,4)
      and
      WRITE ('con:',
'A slight delay will occur
while the next segment of
this application is loaded.
Please stand by.          ') and
      stop_at = where (?begin,Quit,2) and
      kounter = 1 and
      stop_at = remove(?stop_at,1) and
      while ?kounter < ?stop_at
        then
          eraser = element (?begin,?kounter) and
          remove_topic (?eraser) and
          kounter = ?kounter + 1.

end. (* ENV_begin *)

(* ********************* RESUME FILLING OUT ENVELOPE ********************** *)

topic 'ENV_continue'.
   choice = '   '.

   if ?resume = 1
     then load ('envquest.hkb').
   close_window ().
   window ('Change and Continue',blue,white,white,?column,?row).

   if ?resume = 1
     then
       continue is children (ENV_continue).

   if ?resume = 1
     then
     continue gets 'Quit'
     and
     continue is remove (?continue,'related answer').

   ask ('
   With which subtopic do you wish to resume your activity?',
   choice, ?continue).


   if ?choice <> 'Quit'
    then
      cont_where = where(?continue,?choice) and
      ckount = 1 and
      while ?ckount < ?cont_where
        then
          rem_top = element(?continue,?ckount)
          and
          remove_topic (?rem_top)
          and
          ckount = ?ckount + 1.

   collect ().

   while ?choice <> 'Quit'
```

```
      then
        choice = element(?continue,?ckount)
        and
        if ?choice <> ' ' and ?choice <> 'Quit'
          then
            do (?choice)
            and
            ckount = ?ckount + 1
            and
            remove_topic (?choice)
            and
            continuey = NO
            and
            ask ('#e

    Do you wish to continue with the next question?',continuey,?yn)
            and
            if ?continuey = NO
              then
                choice = 'Quit'.

    if ?ckount = 8
      or ?ckount = 16
      or ?ckount = 24
      or ?ckount = 32
      then collect ().
    resume = 2.
    close_window ().

    WRITE ('con:','#e     ').

end. (* ENV_continue *)

(* ************************************************************************ *)
topic 'ENV_complete'.
  say ('#e
 This selection will invoke
 a DOS command, which will
 cause your screen to blank
 out momentarily.  Do not
 be alarmed.  Press #fyellow SPACE#d now. ').
  close (concat (C:\GARDEN\,?curdir,'\ELISTING.OUT')).
  dos (esearch,restore).
  eof = number_to_char (26).

  WRITE ('con:',
'#eOne moment please...
                       ').
  searchtext is read_line (concat (C:\GARDEN\,?CURDIR,'\ELISTING.OUT')).
  if ?searchtext = ?eof
    then
      close_window ()
      and
      column = ?column + 1
      and
      row = ?row + 1
      and
      window (,white,red,yellow,10,10,60,8)
      and
      say
```

```
      ('#e

    All required sections of the Envelope Document
    have been addressed.  Please use the CHANGE ONE
    ITEM option to choose individual items to edit.

        Please press the #fyellow SPACE#d key to continue.')
      and
      column = ?column - 1
      and
      row = ?row - 1
      and
      bypass_unload = Y
      and
      close_window ()
    else
      load ('ENVQUEST.HKB')
      and
      searchlist is read (concat (C:\GARDEN\,?curdir,'\ELISTING.OUT'))
      and
      close (concat (C:\GARDEN\,?curdir,'\ELISTING.OUT'))
      and
      searchlist gets 'Quit'
      and
      chgwant = '    '
      and
      while ?chgwant <> Quit
        then
          do (complete_ENV).

  if ?bypass_unload <> Y
    then
      window (,white,red,yellow,1,16,27,4)
      and
      WRITE ('con:',
'A slight delay will occur
while the remainder of the
application is loaded.
Please stand by.          ')
      and
      stop_at = where (?searchlist,Quit,2)
      and
      kounter = 1
      and
      stop_at = remove(?stop_at,1)
      and
      while ?kounter < ?stop_at
        then
          eraser = element (?searchlist,?kounter)
          and
          remove_topic (?eraser)
          and
          kounter = ?kounter + 1.
  close_window ().


(* ******************************************************************** *)

topic 'complete_ENV'.
```

```
 bypass_unload = N.
 close_window ().
 window ('Complete Unanswered Questions',blue,white,white,?column,?row).
 complete is 'Quit'.
 complete gets ?searchlist.
 ask ('#e
     These subtopics have not yet been addressed.  Please
     choose the one you wish to complete, or choose Quit
     to exit this screen.',chgwant,?complete).
 if ?chgwant <> Quit
   then
     do (?chgwant).
 close (concat (C:\GARDEN\,?curdir,'\ELISTING.OUT')).
 if ?chgwant <> Quit
   then
     dos (esearch, restore).
 close (concat (C:\GARDEN\,?curdir,'\ELISTING.OUT')).
 searchtext is read_line (concat (C:\GARDEN\,?curdir,'\ELISTING.OUT')).
 if ?searchtext = ?eof
   then
     close_window ()
     and
     window (,white,red,yellow,10,10,60,8)
     and
     say ('#e
   All required sections of the Envelope Document
   have now been addressed.  Please use the CHANGE
   ONE ITEM option to choose individual items to edit.')
     and
       close_window ()
     and
       chgwant = 'Quit'
   else
     searchlist is read
       (concat (C:\GARDEN\,?curdir,'\ELISTING.OUT'))
     and
       searchlist gets 'Quit'.
  close_window ().

end. (* complete_ENV *)

end. (* ENV_complete *)

(* ******************************************************************* *)

topic mark (find_string).
  column = ?column + 1.
  row    = ?row + 1.
  text is read ('nasaterm.dat',concat('//',?find_string),'/end').
  window (?find_string,blue,white,white,?column,?row,72,).
  say (?text).
  column = ?column - 1.
  row = ?row - 1.
  close_window ().
end. (* mark *)

end. (* nasasys *)
```

```
(*ENVELIM.KB      This program allows the user to eliminate          *)
(*                  questions within the ENV by selecting             *)
(*              topics from a list.  Each selected topic's associated *)
(*                 file is filled with a ''Not Applicable'' entry.    *)

no_edit_key ().
no_debug ().
column = 3.
row = 3.
eof = number_to_char(26).
curdir is read_line ('CURDIR.DAT').
curdir = string_replace(?curdir,' ','',8).
yn is [YES,NO].
na = 'Not Applicable'.
file = [].

do (nasasys).
new_kb ('envfmenu.hkb').


topic nasasys.
  elim_choices = [].
  WRITE ('con:','#e  ')
  and
  window (,white,red,yellow,1,16,27,4)
  and
  WRITE ('con:',
'One moment please...
                          ').
  do (ENV_begin).

  if ?elim_choices = QUIT
    then new_kb ('envfmeun.hkb').


(* ************************************************************************** *)
topic 'ENV_begin'.
  load ('ENVquest.hkb').
  remove_topic ('Imaging Requirements').
  remove_topic ('Atmospheric Requirements').
  ENV_topics gets children(ENV_begin).
  ENV_topics gets 'Quit'.
  ENV_topics is remove (?ENV_topics,'related answer').
  close_window ().
end.  (* ENV_begin *)



  window ('Select Topics',blue,white,white,?column,?row,).
  ask ('#e

    Which topics do you wish to answer as ''Not Applicable''?

    Press F4 for #mInstructions#m.',elim_choices,?ENV_topics).

topic 'Instructions'.
  window ('Instructions for Marking Questions as Not Applicable',blue,white,
    white,?column,?row,,15).
```

```
  say ('#e

    Please choose the topics to mark as ''Not Applicable'' by
    one of the below two methods.

    Mouse Users:  Please use the RIGHT side mouse button and
    click on each topic to be selected.  When the list is
    complete, click the LEFT side mouse button.

    Non-mouse users:  Please use the arrow keys to move to the
    topic to be selected, then use the INSERT key to select it.
    To move from one page to another, use the Page Up/Page Down
    keys.  When the list is complete, press the RETURN key.

                       Press #fyellow SPACE#d to continue.').
  close_window ().
end.  (* Instructions *)

  close_window ().
  if ?elim_choices <> 'Quit'
    then do (?eliminate_questions).

(* ******************************************************************* *)

topic mark (find_string).
  column = ?column + 1.
  row    = ?row + 1.
  text is read ('nasaterm.dat',concat('//',?find_string),'/end').
  window (?find_string,blue,white,white,?column,?row,72,).
  say (?text).
  column = ?column - 1.
  row = ?row - 1.
  close_window ().
end. (* mark *)

end. (* nasasys *)


topic 'eliminate_questions'.
  do (write_message).
topic 'write_message'.
  WRITE ('con:','#e  ')
  and
  window (,white,red,yellow,1,16,27,4)
  and
  WRITE ('con:',
'Answers being written...
                         ').
end.  (* write_message *)

  if one_of (?elim_choices,'Description of Experiment Type or Class')
    then
      file = (concat (C:\GARDEN\,?CURDIR,'\ENV1_1.DAT'))
      and
      empty_check = read_line (?file)
      and
      if ?empty_check = ?eof
        then
          new_file (?file)
          and
```

```
          write (?file,?na)
        else
          close_window ()
          and
          say ('#e

      An answer already exists for:

           Description of Experiment Type or Class

      This answer was retained.  Please edit that question
      if necessary.

                 Press #fyellow SPACE#d to continue.')
          and
          do (write_message).
close (?file).

if one_of (?elim_choices,'Scientific Knowledge to be Gained')
  then
    file = (concat (C:\GARDEN\,?CURDIR,'\ENV1_2.DAT'))
    and
    empty_check = read_line (?file)
    and
    if ?empty_check = ?eof
      then
        new_file (?file)
        and
        write (?file,?na)
      else
        close_window ()
        and
        say ('#e

      An answer already exists for:

           Scientific Knowledge to be Gained

      This answer was retained.  Please edit that question
      if necessary.

                 Press #fyellow SPACE#d to continue.')
          and
          do (write_message).
close (?file).

if one_of (?elim_choices,'Value of Knowledge to Scientific Field')
  then
    file = (concat (C:\GARDEN\,?CURDIR,'\ENV1_3.DAT'))
    and
    empty_check = read_line (?file)
    and
    if ?empty_check = ?eof
      then
        new_file (?file)
        and
        write (?file,?na)
      else
        close_window ()
        and
```

```
        say ('#e

      An answer already exists for:

        Value of Knowledge to Scientific Field

      This answer was retained.  Please edit that question
      if necessary.

                   Press #fyellow SPACE#d to continue.')
        and
        do (write_message).
close (?file).

if one_of (?elim_choices,'Necessity for Space Environment')
  then
    file = (concat (C:\GARDEN\,?CURDIR,'\ENV1_4.DAT'))
    and
    empty_check = read_line (?file)
    and
    if ?empty_check = ?eof
      then
        new_file (?file)
        and
        write (?file,?na)
      else
        close_window ()
        and
        say ('#e

      An answer already exists for:

           Necessity for Space Environment

      This answer was retained.  Please edit that question
      if necessary.

                   Press #fyellow SPACE#d to continue.')
        and
        do (write_message).
close (?file).

if one_of (?elim_choices,'Description of Scientific Field')
  then
    file = (concat (C:\GARDEN\,?CURDIR,'\ENV2_1.DAT'))
    and
    empty_check = read_line (?file)
    and
    if ?empty_check = ?eof
      then
        new_file (?file)
        and
        write (?file,?na)
      else
        close_window ()
        and
        say ('#e

      An answer already exists for:
```

```
          Description of Scientific Field

     This answer was retained.  Please edit that question
     if necessary.

                 Press #fyellow SPACE#d to continue.')
        and
        do (write_message).
close (?file).

if one_of (?elim_choices,'Current Applications for Research')
  then
    file = (concat (C:\GARDEN\,?CURDIR,'\ENV2_2.DAT'))
    and
    empty_check = read_line (?file)
    and
    if ?empty_check = ?eof
      then
        new_file (?file)
        and
        write (?file,?na)
      else
        close_window ()
        and
        say ('#e

     An answer already exists for:

          Current Applications for Research

     This answer was retained.  Please edit that question
     if necessary.

                 Press #fyellow SPACE#d to continue.')
        and
        do (write_message).
close (?file).

if one_of (?elim_choices,'Account of Prior Research')
  then
    file = (concat (C:\GARDEN\,?CURDIR,'\ENV2_3.DAT'))
    and
    empty_check = read_line (?file)
    and
    if ?empty_check = ?eof
      then
        new_file (?file)
        and
        write (?file,?na)
      else
        close_window ()
        and
        say ('#e

     An answer already exists for:

          Account of Prior Research

     This answer was retained.  Please edit that question
     if necessary.
```

```
                Press #fyellow SPACE#d to continue.')
        and
        do (write_message).
close (?file).



if one_of (?elim_choices,'Current Research')
  then
    file = (concat (C:\GARDEN\,?CURDIR,'\ENV2_4.DAT'))
    and
    empty_check = read_line (?file)
    and
    if ?empty_check = ?eof
      then
        new_file (?file)
        and
        write (?file,?na)
      else
        close_window ()
        and
        say ('#e

     An answer already exists for:

       Current Research

     This answer was retained.  Please edit that question
     if necessary.

                Press #fyellow SPACE#d to continue.')
        and
        do (write_message).
close (?file).

if one_of (?elim_choices,'Relationship to Scientific Field')
  then
    file = (concat (C:\GARDEN\,?CURDIR,'\ENV2_5.DAT'))
    and
    empty_check = read_line (?file)
    and
    if ?empty_check = ?eof
      then
        new_file (?file)
        and
        write (?file,?na)
      else
        close_window ()
        and
        say ('#e

     An answer already exists for:

          Relationship to Scientific Field

     This answer was retained.  Please edit that question
     if necessary.

                Press #fyellow SPACE#d to continue.')
```

```
         and
         do (write_message).
close (?file).

if one_of (?elim_choices,'Anticipated Advance')
  then
    file = (concat (C:\GARDEN\,?CURDIR,'\ENV2_6.DAT'))
    and
    empty_check = read_line (?file)
    and
    if ?empty_check = ?eof
      then
        new_file (?file)
        and
        write (?file,?na)
      else
        close_window ()
        and
        say ('#e

     An answer already exists for:

          Anticipated Advance

     This answer was retained.  Please edit that question
     if necessary.

                Press #fyellow SPACE#d to continue.')
        and
        do (write_message).
close (?file).

if one_of (?elim_choices,'Limitations of Ground-Based Testing')
  then
    file = (concat (C:\GARDEN\,?CURDIR,'\ENV3_1.DAT'))
    and
    empty_check = read_line (?file)
    and
    if ?empty_check = ?eof
      then
        new_file (?file)
        and
        write (?file,?na)
      else
        close_window ()
        and
        say ('#e

     An answer already exists for:

          Limitations of Ground-Based Testing

     This answer was retained.  Please edit that question
     if necessary.

                Press #fyellow SPACE#d to continue.')
        and
        do (write_message).
close (?file).
```

```
if one_of (?elim_choices,'Limitations of Drop Towers')
  then
    file = (concat (C:\GARDEN\,?CURDIR,'\ENV3_2.DAT'))
    and
    empty_check = read_line (?file)
    and
    if ?empty_check = ?eof
      then
        new_file (?file)
        and
        write (?file,?na)
      else
        close_window ()
        and
        say ('#e

     An answer already exists for:

          Limitations of Drop Towers

     This answer was retained.  Please edit that question
     if necessary.

                Press #fyellow SPACE#d to continue.')
        and
        do (write_message).
close (?file).

if one_of (?elim_choices,'Limitations of Testing in Aircraft')
  then
    file = (concat (C:\GARDEN\,?CURDIR,'\ENV3_3.DAT'))
    and
    empty_check = read_line (?file)
    and
    if ?empty_check = ?eof
      then
        new_file (?file)
        and
        write (?file,?na)
      else
        close_window ()
        and
        say ('#e

     An answer already exists for:

          Limitations of Testing in Aircraft

     This answer was retained.  Please edit that question
     if necessary.

                Press #fyellow SPACE#d to continue.')
        and
        do (write_message).
close (?file).

if one_of (?elim_choices,'Need for Acomodations in the Shuttle')
  then
    file = (concat (C:\GARDEN\,?CURDIR,'\ENV3_4.DAT'))
    and
```

```
    empty_check = read_line (?file)
    and
    if ?empty_check = ?eof
      then
        new_file (?file)
        and
        write (?file,?na)
      else
        close_window ()
        and
        say ('#e

     An answer already exists for:

          Need for Acomodations in the Shuttle

     This answer was retained.  Please edit that question
     if necessary.

                Press #fyellow SPACE#d to continue.')
        and
        do (write_message).
close (?file).

if one_of (?elim_choices,'Limitations of Mathematical Modeling')
  then
    file = (concat (C:\GARDEN\,?CURDIR,'\ENV3_5.DAT'))
    and
    empty_check = read_line (?file)
    and
    if ?empty_check = ?eof
      then
        new_file (?file)
        and
        write (?file,?na)
      else
        close_window ()
        and
        say ('#e

     An answer already exists for:

          Limitations of Mathematical Modeling

     This answer was retained.  Please edit that question
     if necessary.

                Press #fyellow SPACE#d to continue.')
        and
        do (write_message).
close (?file).

if one_of (?elim_choices,'Limitations of Other Modeling Approaches')
  then
    file = (concat (C:\GARDEN\,?CURDIR,'\ENV3_6.DAT'))
    and
    empty_check = read_line (?file)
    and
    if ?empty_check = ?eof
      then
```

```
        new_file (?file)
        and
        write (?file,?na)
      else
        close_window ()
        and
        say ('#e

     An answer already exists for:

          Limitations of Other Modeling Approaches

     This answer was retained.  Please edit that question
     if necessary.

               Press #fyellow SPACE#d to continue.')
        and
        do (write_message).
close (?file).


if one_of (?elim_choices,'Description of Type of Experiment')
  then
    file = (concat (C:\GARDEN\,?CURDIR,'\ENV4_1.DAT'))
    and
    empty_check = read_line (?file)
    and
    if ?empty_check = ?eof
      then
        new_file (?file)
        and
        write (?file,?na)
      else
        close_window ()
        and
        say ('#e

     An answer already exists for:

          Description of Type of Experiment

     This answer was retained.  Please edit that question
     if necessary.

               Press #fyellow SPACE#d to continue.')
        and
        do (write_message).
close (?file).

if one_of (?elim_choices,'Experiment Procedures to be Used')
  then
    file = (concat (C:\GARDEN\,?CURDIR,'\ENV4_2.DAT'))
    and
    empty_check = read_line (?file)
    and
    if ?empty_check = ?eof
      then
        new_file (?file)
        and
        write (?file,?na)
```

```
        else
          close_window ()
          and
          say ('#e

       An answer already exists for:

            Experiment Procedures to be Used

       This answer was retained.  Please edit that question
       if necessary.

                    Press #fyellow SPACE#d to continue.')
          and
          do (write_message).
 close (?file).

 if one_of (?elim_choices,'')
   then
     file = (concat (C:\GARDEN\,?CURDIR,'\ENV4_3.DAT'))
     and
     empty_check = read_line (?file)
     and
     if ?empty_check = ?eof
       then
         new_file (?file)
         and
         write (?file,?na)
       else
         close_window ()
         and
         say ('#e

       An answer already exists for:

            Measurements and Range of Values Required

       This answer was retained.  Please edit that question
       if necessary.

                    Press #fyellow SPACE#d to continue.')
          and
          do (write_message).
close (?file).

if one_of (?elim_choices,'Experiment Sample Requirements')
  then
    file = (concat (C:\GARDEN\,?CURDIR,'\ENV5_1.DAT'))
    and
    empty_check = read_line (?file)
    and
    if ?empty_check = ?eof
      then
        new_file (?file)
        and
        write (?file,?na)
      else
        close_window ()
        and
        say ('#e
```

```
     An answer already exists for:

          Experiment Sample Requirements

     This answer was retained.  Please edit that question
     if necessary.

                Press #fyellow SPACE#d to continue.')
        and
        do (write_message).
close (?file).

if one_of (?elim_choices,'Atmospheric Requirements (Pressure)')
  then
    file = (concat (C:\GARDEN\,?CURDIR,'\ENV5_2_1.DAT'))
    and
    empty_check = read_line (?file)
    and
    if ?empty_check = ?eof
      then
        new_file (?file)
        and
        write (?file,?na)
      else
        close_window ()
        and
        say ('#e

     An answer already exists for:

          Atmospheric Requirements (Pressure)

     This answer was retained.  Please edit that question
     if necessary.

                Press #fyellow SPACE#d to continue.')
        and
        do (write_message).
close (?file).

if one_of (?elim_choices,'Atmospheric Requirements (Gas Composition)')
  then
    file = (concat (C:\GARDEN\,?CURDIR,'\ENV5_2_2.DAT'))
    and
    empty_check = read_line (?file)
    and
    if ?empty_check = ?eof
      then
        new_file (?file)
        and
        write (?file,?na)
      else
        close_window ()
        and
        say ('#e

     An answer already exists for:

          Atmospheric Requirements (Gas Composition)
```

```
      This answer was retained.  Please edit that question
      if necessary.

                  Press #fyellow SPACE#d to continue.')
         and
         do (write_message).
 close (?file).

 if one_of (?elim_choices,'Atmospheric Requirements (Humidity)')
   then
     file = (concat (C:\GARDEN\,?CURDIR,'\ENV5_2_3.DAT'))
     and
     empty_check = read_line (?file)
     and
     if ?empty_check = ?eof
       then
         new_file (?file)
         and
         write (?file,?na)
       else
         close_window ()
         and
         say ('#e

      An answer already exists for:

           Atmospheric Requirements (Humidity)

      This answer was retained.  Please edit that question
      if necessary.

                  Press #fyellow SPACE#d to continue.')
         and
         do (write_message).
close (?file).

if one_of (?elim_choices,'Atmospheric Requirements (Vacuum)')
  then
    file = (concat (C:\GARDEN\,?CURDIR,'\ENV5_2_4.DAT'))
    and
    empty_check = read_line (?file)
    and
    if ?empty_check = ?eof
      then
        new_file (?file)
        and
        write (?file,?na)
      else
        close_window ()
        and
        say ('#e

     An answer already exists for:

          Atmospheric Requirements (Vacuum)

     This answer was retained.  Please edit that question
     if necessary.
```

```
                Press #fyellow SPACE#d to continue.')
        and
        do (write_message).
close (?file).

if one_of (?elim_choices,'Temperature Control and Measurement')
  then
    file = (concat (C:\GARDEN\,?CURDIR,'\ENV5_3.DAT'))
    and
    empty_check = read_line (?file)
    and
    if ?empty_check = ?eof
      then
        new_file (?file)
        and
        write (?file,?na)
      else
        close_window ()
        and
        say ('#e

      An answer already exists for:

           Temperature Control and Measurement

      This answer was retained.  Please edit that question
      if necessary.

                Press #fyellow SPACE#d to continue.')
        and
        do (write_message).
close (?file).

if one_of (?elim_choices,'Vibration Control and Measurement')
  then
    file = (concat (C:\GARDEN\,?CURDIR,'\ENV5_4.DAT'))
    and
    empty_check = read_line (?file)
    and
    if ?empty_check = ?eof
      then
        new_file (?file)
        and
        write (?file,?na)
      else
        close_window ()
        and
        say ('#e

      An answer already exists for:

           Vibration Control and Measurement

      This answer was retained.  Please edit that question
      if necessary.

                Press #fyellow SPACE#d to continue.')
        and
        do (write_message).
close (?file).
```

```
  if one_of (?elim_choices,'Test Matrices')
    then
      file = (concat (C:\GARDEN\,?CURDIR,'\ENV5_5.DAT'))
      and
      empty_check = read_line (?file)
      and
      if ?empty_check = ?eof
        then
          new_file (?file)
          and
          write (?file,?na)
        else
          close_window ()
          and
          say ('#e

       An answer already exists for:

            Test Matrices

       This answer was retained.  Please edit that question
       if necessary.

                  Press #fyellow SPACE#d to continue.')
         and
         do (write_message).
 close (?file).

 if one_of (?elim_choices,'Imaging Requirements (Photography)')
   then
     file = (concat (C:\GARDEN\,?CURDIR,'\ENV5_6_1.DAT'))
     and
     empty_check = read_line (?file)
     and
     if ?empty_check = ?eof
       then
         new_file (?file)
         and
         write (?file,?na)
       else
         close_window ()
         and
         say ('#e

      An answer already exists for:

           Imaging Requirements (Photography)

      This answer was retained.  Please edit that question
      if necessary.

                 Press #fyellow SPACE#d to continue.')
        and
        do (write_message).
close (?file).

if one_of (?elim_choices,'Imaging Requirements (Radiography)')
  then
    file = (concat (C:\GARDEN\,?CURDIR,'\ENV5_6_2.DAT'))
```

```
    and
    empty_check = read_line (?file)
    and
    if ?empty_check = ?eof
      then
        new_file (?file)
        and
        write (?file,?na)
      else
        close_window ()
        and
        say ('#e

     An answer already exists for:

          Imaging Requirements (Radiography)

     This answer was retained.  Please edit that question
     if necessary.

                Press #fyellow SPACE#d to continue.')
        and
        do (write_message).
close (?file).

if one_of (?elim_choices,'Imaging Requirements (Television)')
  then
    file = (concat (C:\GARDEN\,?CURDIR,'\ENV5_6_3.DAT'))
    and
    empty_check = read_line (?file)
    and
    if ?empty_check = ?eof
      then
        new_file (?file)
        and
        write (?file,?na)
      else
        close_window ()
        and
        say ('#e

     An answer already exists for:

          Imaging Requirements (Television)

     This answer was retained.  Please edit that question
     if necessary.

                Press #fyellow SPACE#d to continue.')
        and
        do (write_message).
close (?file).

if one_of (?elim_choices,'Imaging Requirements (Resolution)')
  then
    file = (concat (C:\GARDEN\,?CURDIR,'\ENV5_6_4.DAT'))
    and
    empty_check = read_line (?file)
    and
    if ?empty_check = ?eof
```

```
        then
          new_file (?file)
          and
          write (?file,?na)
        else
          close_window ()
          and
          say ('#e

      An answer already exists for:

           Imaging Requirements (Resolution)

      This answer was retained.  Please edit that question
      if necessary.

                 Press #fyellow SPACE#d to continue.')
          and
          do (write_message).
 close (?file).

 if one_of (?elim_choices,'Imaging Requirements (Frame Rate)')
   then
     file = (concat (C:\GARDEN  ...RDIR,'\ENV5_6_5.DAT'))
     and
     empty_check = read_line (?file)
     and
     if ?empty_check = ?eof
       then
         new_file (?file)
         and
         write (?file,?na)
       else
         close_window ()
         and
         say ('#e

      An answer already exists for:

           Imaging Requirements (Frame Rate)

      This answer was retained.  Please edit that question
      if necessary.

                 Press #fyellow SPA   d to continue.')
          and
          do (write_message).
close (?file).

if one_of (?elim_choices,'Electromagnetic Limitations')
  then
    file = (concat (C:\GARDEN\,?CURDIR,'\ENV5_7.DAT'))
    and
    empty_check = read_line (?file)
    and
    if ?empty_check = ?eof
      then
        new_file (?file)
        and
        write (?file,?na)
```

```
        else
          close_window ()
          and
          say ('#e

      An answer already exists for:

           Electromagnetic Limitations

      This answer was retained.  Please edit that question
      if necessary.

                    Press #fyellow SPACE#d to continue.')
          and
          do (write_message).
  close (?file).

  if one_of (?elim_choices,'Astronaut Involvement (Extravehicular Activity)')
    then
      file = (concat (C:\GARDEN\,?CURDIR,'\ENV5_8_1.DAT'))
      and
      empty_check = read_line (?file)
      and
      if ?empty_check = ?eof
        then
          new_file (?file)
          and
          write (?file,?na)
        else
          close_window ()
          and
          say ('#e

      An answer already exists for:

           Astronaut Involvement (Extravehicular Activity)

      This answer was retained.  Please edit that question
      if necessary.

                    Press #fyellow SPACE#d to continue.')
          and
          do (write_message).
  close (?file).

  if one_of (?elim_choices,'Astronaut Involvement (Activation of Experiment)')
    then
      file = (concat (C:\GARDEN\,?CURDIR,'\env5_8_2.DAT'))
      and
      empty_check = read_line (?file)
      and
      if ?empty_check = ?eof
        then
          new_file (?file)
          and
          write (?file,?na)
        else
          close_window ()
          and
          say ('#e
```

```
       An answer already exists for:

            Astronaut Involvement (Activation of Experiment)

       This answer was retained.  Please edit that question
       if necessary.

                  Press #fyellow SPACE#d to continue.')
         and
         do (write_message).
  close (?file).

  if one_of (?elim_choices,'Data Requirements')
    then
      file = (concat (C:\GARDEN\,?CURDIR,'\ENV5_9.DAT'))
      and
      empty_check = read_line (?file)
      and
      if ?empty_check = ?eof
        then
          new_file (?file)
          and
          write (?file,?na)
        else
          close_window ()
          and
          say ('#e

      An answer already exists for:

           Data Requirements

      This answer was retained.  Please edit that question
      if necessary.

                 Press #fyellow SPACE#d to continue.')
        and
        do (write_message).
close (?file).

if one_of (?elim_choices,'Telepresence')
  then
    file = (concat (C:\GARDEN\,?CURDIR,'\EN5_10_1.DAT'))
    and
    empty_check = read_line (?file)
    and
    if ?empty_check = ?eof
      then
        new_file (?file)
        and
        write (?file,?na)
      else
        close_window ()
        and
        say ('#e

     An answer already exists for:

          Telepresence
```

```
     This answer was retained.  Please edit that question
     if necessary.

                    Press #fyellow SPACE#d to continue.')
        and
        do (write_message).
close (?file).

if one_of (?elim_choices,'Telerobotics')
  then
    file = (concat (C:\GARDEN\,?CURDIR,'\EN5_10_2.DAT'))
    and
    empty_check = read_line (?file)
    and
    if ?empty_check = ?eof
      then
        new_file (?file)
        and
        write (?file,?na)
      else
        close_window ()
        and
        say ('#e

     An answer already exists for:

          Telerobotics

     This answer was retained.  Please edit that question
     if necessary.

                    Press #fyellow SPACE#d to continue.')
        and
        do (write_message).
close (?file).

if one_of (?elim_choices,'Other Requirements')
  then
    file = (concat (C:\GARDEN\,?CURDIR,'\ENV6_1.DAT'))
    and
    empty_check = read_line (?file)
    and
    if ?empty_check = ?eof
      then
        new_file (?file)
        and
        write (?file,?na)
      else
        close_window ()
        and
        say ('#e

     An answer already exists for:

          Other Requirements

     This answer was retained.  Please edit that question
     if necessary.
```

```
                 Press #fyellow SPACE#d to continue.')
         and
         do (write_message).
  close (?file).

end. (* eliminate_questions *)
```

```
(* Envquest.kb *)
(* These are the questions to be asked, and the files where the answers
   are to be stored, for the completion of the Science Requirements
   Envelope Document.                                                  *)

no_edit_key ().
no_debug ().

topic 'Description of experiment type or class'.
  window ('Description of Experiment Type or Class (Question 1 of 39)',blue,whit

  say ('#e
      Please enter a narrative description of the type or class
     of the #mexperiment#m.  This topic is also addressed under
     the headings "Experiment Procedures to be Used" and "General
     Description of Type of Experiments".

         Press the #fyellow RETURN KEY#d to enter the editor,
        #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm save.')

  edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV1_1.DAT'),yellow,black,red,5,10,70,
  close_window ().
  close     (concat (C:\GARDEN\,?CURDIR,'\ENV1_1.DAT')).
end. (* Description of experiment *)


topic 'Scientific Knowledge to be Gained'.
  window ('Scientific Knowledge to be Gained (Question 2 of 39)',
  blue,white,white,2,2,70,6).

  say ('#e
      Please enter the scientific knowledge to be gained through
       this experiment.  This topic is also addressed under the
          heading "Anticipated Advance in State of the Art".

          Press the #fyellow RETURN KEY#d to enter the editor,
        #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm save.')

  edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV1_2.DAT'),yellow,black,red,5,9,70,1
  close_window ().
  close     (concat (C:\GARDEN\,?CURDIR,'\ENV1_2.DAT')).
end. (* Scientific Knowledge to be Gained *)

topic 'Value of Knowledge to Scientific Field'.
  window ('Value of Knowledge to Scientific Field (Question 3 of 39)',blue,white

  say ('
        Please enter a brief narrative describing the value of
      knowlege of this type of experimentation to scientific field.

        Press the #fyellow RETURN KEY#d to enter the editor,
       #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm save.').

  edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV1_3.DAT'),yellow,black,red,5,9,70,1
  close_window ().
  close     (concat (C:\GARDEN\,?CURDIR,'\ENV1_3.DAT')).
end.  (* Value of Knowledge to Scientific Field *)


topic 'Necessity for Space Environment'.
```

```
  window ('Necessity for Space Environment to Experiment (Question 4 of 39)'
  ,blue,white,white,2,
  2,70,6).

  say ('
         Please enter a narrative justifying the need for a
                         space environment.

            Press the #fyellow RETURN KEY#d to enter the editor,
         #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm save.'

  edit_file  (concat (C:\GARDEN\,?CURDIR,'\ENV1_4.DAT'),yellow,black,red,5,9,70,
  close_window ().
  close      (concat (C:\GARDEN\,?CURDIR,'\ENV1_4.DAT')).
end.  (* Justification of the Need for Space Environment *)

topic 'Description of Scientific Field'.
  window ('Description of Scientific Field (Question 5 of 39)',blue,white,white,

  say ('
       Please enter a description of the scientific field
               to which the experiment belongs.

          Press the #fyellow RETURN KEY#d to enter the editor,
        #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm save.')

  edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV2_1.DAT'),yellow,black,red,5,9,70,1
  close_window ().
  close      (concat (C:\GARDEN\,?CURDIR,'\ENV2_1.DAT')).
end. (* Description of Scientific Field *)

topic 'Current Applications for Research'.
  window ('Current Applications for Research (Question 6 of 39)',blue,white,whit

  say ('
        Please enter a narrative of the current applications
                    for research in the field.

           Press the #fyellow RETURN KEY#d to enter the editor,
         #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm save.

  edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV2_2.DAT'),yellow,black,red,5,9,70,1
  close_window ().
  close      (concat (C:\GARDEN\,?CURDIR,'\ENV2_2.DAT')).
end. (* Current Applications for Research *)

topic 'Account of Prior Research'.
  window ('Account of Prior Research (Question 7 of 39)',blue,white,white,2,2,70

  say ('
         Please enter a brief historical account of the
                prior research in the field.

          Press the #fyellow RETURN KEY#d to enter the editor,
        #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm save.')

  edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV2_3.DAT'),yellow,black,red,5,9,70,1
  close_window ().
  close      (concat (C:\GARDEN\,?CURDIR,'\ENV2__3.DAT')).
end. (* Account of Prior Research *)
```

```
topic 'Current Research'.
  window ('Current Research (Question 8 of 39)',blue,white,white,2,2,70,6).

  say ('
       Please enter a brief account of the current
                research in the field.

        Press the #fyellow RETURN KEY#d to enter the editor,
      #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm save.')

  edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV2_4.DAT'),yellow,black,red,5,9,70,1
  close_window ().
  close      (concat (C:\GARDEN\,?CURDIR,'\ENV2_4.DAT')).
end. (* Current Research *)


topic 'Relationship to Scientific Field'.
  window ('Relationship to Scientific Field (Question 9 of 39)',blue,white,white

  say ('
      Please enter an account of the relationship of
       proposed experiment to the scientific field.

        Press the #fyellow RETURN KEY#d to enter the editor,
      #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm save.'

  edit_file  (concat (C:\GARDEN\,?CURDIR,'\ENV2_5.DAT'),yellow,black,red,5,9,70,
  close_window ().
  close      (concat (C:\GARDEN\,?CURDIR,'\ENV2_5.DAT')).
end.  (* Relationship to Scientific Field *)

topic 'Anticipated Advance'.
  window ('Anticipated Advance (Question 10 of 39)',blue,white,white,2,2,70,8).
  relatedfile = '\ENV1_2.DAT'.
  relatedtopic = 'Scientific Knowledge to be Gained'.
  filename = '\ENV2_6.DAT'.

  say ('
      In a #mrelated answer#m you were asked to describe the
            "Scientific Knowledge to be Gained".
    Please elaborate on that answer to give a brief account of
        the anticipated advance in state of the art.

          Press the #fyellow RETURN KEY#d to enter the editor,
        #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm save

  edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV2_6.DAT'),yellow,black,red,5,12,70
  close_window ().
  close     (concat (C:\GARDEN\,?CURDIR,'\ENV2_6.DAT')).

topic 'Scientific Knowledge to be Gained'.
  window ('Scientific Knowledge to be Gained',blue,white,white,2,2,70,6).

  say ('
      Please enter the scientific knowledge to be gained
                  through this experiment.
```

```
          Press the #fyellow RETURN KEY#d to enter the editor,
        #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm save.'

   edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV1_2.DAT'),yellow,black,red,5,9,70,:
   close_window ().
   close      (concat (C:\GARDEN\,?CURDIR,'\ENV1_2.DAT')).
 end. (* Scientific Knowledge to be Gained *)
 end.  (* Anticipated Advance *)

 topic 'Limitations of Ground-Based Testing'.
   window ('Limitations of Ground-Based Testing (Question 11 of 39)',blue,white,w

   say ('
       Please enter the limitations of ground-based testing.

           Press the #fyellow RETURN KEY#d to enter the editor,
         #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm save.'

   edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV3_1.DAT'),yellow,black,red,5,9,70,1
   close_window ().
   close      (concat (C:\GARDEN\,?CURDIR,'\ENV3_1.DAT')).
 end.  (* Limitations of Ground-Based Testing *)

 topic 'Limitations of Drop Towers'.
   window ('Limitations of Drop Towers (Question 12 of 39)',blue,white,white,2,2,

   say ('
       Please enter the limitations of drop towers.

         Press the #fyellow RETURN KEY#d to enter the editor,
       #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm save.').

   edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV3_2.DAT'),yellow,black,red,5,9,70,1
   close_window ().
   close      (concat (C:\GARDEN\,?CURDIR,'\ENV3_2.DAT')).
 end.  (* Limitations of Drop Towers *)

 topic 'Limitations of Testing in Aircraft'.
   window ('Limitations of Testing in Aircraft (Question 13 of 39)',blue,white,wh

   say ('
       Please enter the limitations of testing in aircraft.

           Press the #fyellow RETURN KEY#d to enter the editor,
         #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm save.'

   edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV3_3.DAT'),yellow,black,red,5,9,70,1
   close_window ().
   close      (concat (C:\GARDEN\,?CURDIR,'\ENV3_3.DAT')).
 end.  (* Limitations of Testing in Aircraft *)

 topic 'Need for accommodations in the Shuttle'.
   window ('Need for Accommodations in the Shuttle (Question 14 of 39)',blue,whit

   say ('
       Please enter the need for accommodations in the Shuttle.

           Press the #fyellow RETURN KEY#d to enter the editor,
         #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm save.
```

```
  edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV3_4.DAT'),yellow,black,red,5,9,70,1
  close_window ().
  close     (concat (C:\GARDEN\,?CURDIR,'\ENV3_4.DAT')).
end.  (*  Need for accommodations in the Shuttle *)

topic 'Limitations of Mathematical Modeling'.
  window ('Limitations of Mathematical Modeling (Question 15 of 39)',blue,white,
  say ('
    Please enter the limitations of mathematical modeling.

           Press the #fyellow RETURN KEY#d to enter the editor,
                 and    #fyellow ESC#d to leave editor.').

  edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV3_5.DAT'),yellow,black,red,5,9,70,1
  close_window ().
  close     (concat (C:\GARDEN\,?CURDIR,'\ENV3_5.DAT')).
end.  (* Limitations of Mathematical Modeling *)


topic 'Limitations of Other Modeling Approaches'.
  window ('Limitations of Other Modeling Approaches (Question 16 of 39)',blue,wh

  say ('
   Please enter the limitations of other modeling approaches.

           Press the #fyellow RETURN KEY#d to enter the editor,
         #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm save

  edit_file  (concat (C:\GARDEN\,?CURDIR,'\ENV3_6.DAT'),yellow,black,red,5,9,70,
  close_window ().
  close      (concat (C:\GARDEN\,?CURDIR,'\ENV3_6.DAT')).
end.   (* Limitations_of_Other_Modeling_Approaches *)


topic 'Description of Type of Experiment'.
  window ('Description of Type of Experiment (Question 17 of 39)',blue,white,whi
  relatedfile = '\ENV1_1.DAT'.
  relatedtopic = 'Description of Experiment Type or Class'.
  filename = '\ENV4_1.DAT'.
  say ('
        In a #mrelated answer#m you were asked to describe the
    "Description of Experiment Type or Class".  Please elaborate
    on that answer to give a general description of the TYPE of
    experiments.

               Press the #fyellow RETURN KEY#d to enter the editor,
             #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm

  edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV4_1.DAT'),yellow,black,red,5,12,70,
  close_window ().
  close     (concat (C:\GARDEN\,?CURDIR,'\ENV4_1.DAT')).

topic 'Description of Experiment Type or Class'.
  window ('Description of Experiment Type or Class (Question 1 of 39)',blue,whit

  say ('#e
     Please enter a narrative description of the type or class
    of the #mexperiment#m.  This topic is also addressed under
    the headings "Experiment Procedures to be Used" and "General
    Description of Type of Experiments".
```

```
        Press the #fyellow RETURN KEY#d to enter the editor,
       #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm save.')

  edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV1_1.DAT'),yellow,black,red,5,9,70,1
  close_window ().
  close      (concat (C:\GARDEN\,?CURDIR,'\ENV1_1.DAT')).

end. (* Description of experiment type or class *)
end.  (* Description of type of experiments *)

topic 'Experiment Procedures to be Used'.
  window ('Experiment Procedures to be Used (Question 18 of 39)',blue,white,whit
  relatedfile = '\ENV1_1.DAT'.
  relatedtopic = 'Description of Experiment Type or Class'.
  filename = '\ENV4_2.DAT'.
  say ('
          In a #mrelated answer#m you were asked to describe
      the "Description of Experiment Type or Class".  Please
      elaborate on that answer to describe the TYPES of experiment
       procedures to be used.

                Press the #fyellow RETURN KEY#d to enter the editor,
              #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm

  edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV4_2.DAT'),yellow,black,red,5,12,70,
  close_window ().
  close      (concat (C:\GARDEN\,?CURDIR,'\ENV4_2.DAT')).

topic 'Description of Experiment Type or Class'.
  window ('Description of Experiment Type or Class (Question 1 of 39)',blue,whit

  say ('#e
        Please enter a narrative description of the type or class
     of the #mexperiment#m.  This topic is also addressed under
     the headings "Experiment Procedures to be Used" and "General
     Description of Type of Experiments".

         Press the #fyellow RETURN KEY#d to enter the editor,
        #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm save.')

  edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV1_1.DAT'),yellow,black,red,5,9,70,1
  close_window ().
  close      (concat (C:\GARDEN\,?CURDIR,'\ENV1_1.DAT')).

end. (* Description of Experiment Type or Class *)
end.  (* Experiment Procedures to be Used *)

topic 'Measurements and Range of Values Required'.
  window ('Measurements and Range of Values Required (Question 19 of 39)'
  ,blue,white,white,2,2,70,6).

  say ('
      Please enter the types of measurements and the ranges
      of values required for the experiment.

             Press the #fyellow RETURN KEY#d to enter the editor,
            #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm sa

  edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV4_3.DAT'),yellow,black,red,5,9,70,1
```

```
  close_window ().
  close     (concat (C:\GARDEN\,?CURDIR,'\ENV4_3.DAT')).
end.  (* Measurements and Values of Ranges Required *)

topic 'Experiment Sample Requirements'.
  window ('Experiment Sample Requirements (Question 20 of 39)',blue,white,white,

  say ('
        Please enter the experiment sample requirements,
           both in terms of number and materials.

          Press the #fyellow RETURN KEY#d to enter the editor,
         #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm save

  edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV5_1.DAT'),yellow,black,red,5,9,70,1
  close_window ().
  close     (concat (C:\GARDEN\,?CURDIR,'\ENV5_1.DAT')).
end.  (* Experiment Sample Requirements *)

topic 'Atmospheric Requirements'.
  window ('Atmospheric Requirements',blue,white,white,2,2,70,6).
  changem = NO.
  na = 'NOT APPLICABLE'.

  ask ('
    Are there any atmospheric requirements for your experiments?',
    atmosreqt,?yn).
    eof = number_to_char (26).
    if ?atmosreqt = YES
      then
        do ('Atmospheric Requirements (Pressure)')
        and
        do ('Atmospheric Requirements (Gas Composition)')
        and
        do ('Atmospheric Requirements (Humidity)')
        and
        do ('Atmospheric Requirements (Vacuum)')
      else
        pressure = read_line (concat(C:\GARDEN\,?CURDIR,'\ENV5_2_1.DAT'))
        and
        pressure      is string_copy(?pressure,1,14)
        and
        gas = read_line (concat(C:\GARDEN\,?CURDIR,'\ENV5_2_2.DAT'))
        and
        gas      is string_copy(?gas,1,14)
        and
        hum   = read_line (concat(C:\GARDEN\,?CURDIR,'\ENV5_2_3.DAT'))
        and
        hum         is string_copy(?hum,1,14)
        and
        vacuum = read_line (concat(C:\GARDEN\,?CURDIR,'\ENV5_2_4.DAT'))
        and
        vacuum is string_copy(?vacuum,1,14)
        and
          if (?pressure   <>  ?NA and ?pressure <> ?eof)
             or
             (?gas      <>  ?NA and ?gas <> ?eof)
             or
             (?hum         <>  ?NA and ?hum    <> ?eof)
             or
```

```
          (?vacuum <>  ?NA and ?vacuum <> ?eof)
        then
      window (' ',yellow,blue,yellow,2,2,70,14)
        and
        ask ('
      There are answers on file that indicate this question
      was previously answered YES, rather than NO.  If the
      correct answer is NO, the system will need to change the
      answers from your previous session that were directly
      related to the YES response, since they are no longer
      applicable.  Do you authorize the system to change
      these previous answers?',c    jem,?yn)
       and
       close_window ()
         else
           changem = YES.

      if ?changem = YES
        then
        new_file (concat(C:\GARDEN\,?CURDIR,'\ENV5_2_1.DAT'))
        and
        write    (concat(C:\GARDEN\,?CURDIR,'\ENV5_2_1.DAT'),?NA)
        and
        close    (concat(C:\GARDEN\,?CURDIR,'\ENV5_2_1.DAT'))
        and
        new_file (concat(C:\GARDEN\,?CURDIR,'\ENV5_2_2.DAT'))
        and
        write    (concat(C:\GARDEN\,?CURDIR,'\ENV5_2_2.DAT'),?NA)
        and
        close    (concat(C:\GARDEN\,?CURDIR,'\ENV5_2_2.DAT'))
        and
        new_file (concat(C:\GARDEN\,?CURDIR,'\ENV5_2_3.DAT'))
        and
        write    (concat(C:\GARDEN\,?CURDIR,'\ENV5_2_3.DAT'),?NA)
        and
        close    (concat(C:\GARDEN\,?CURDIR,'\ENV5_2_3.DAT'))
        and
        new_file (concat(C:\GARDEN\,?CURDIR,'\ENV5_2_4.DAT'))
        and
        write    (concat(C:\GARDEN\,?CURDIR,'\ENV5_2_4.DAT'),?NA)
        and
        close    (concat(C:\GARDEN\,?CURDIR,'\ENV5_2_4.DAT')).


topic 'Atmospheric Requirements (Pressure)'.
  window ('Atmospheric Requirements (Pressure) (Question 21 of 39)',blue,white,w

  say ('
           Please enter the experiment requirements
               in terms of atmospheric pressure.

           Press the #fyellow RETURN KEY#d to enter the editor,
         #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm save.'

  edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV5_2_1.DAT'),yellow,black,red,5,9,70
  close_window ().
  close      (concat (C:\GARDEN\,?CURDIR,'\ENV5_2_1.DAT')).
end.  (* Atmospheric Requirements (Pressure) *)

topic 'Atmospheric Requirements (Gas Composition)'.
```

```
 window('Atmospheric Requirements (Gas Composition) (Question 22 of 39)',blue,w

 say ('
          Please enter the experiment requirements
          in terms of atmospheric gas composition.

          Press the #fyellow RETURN KEY#d to enter the editor,
        #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm sav

 edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV5_2_2.DAT'),yellow,black,red,5,9,70
 close_window ().
 close     (concat (C:\GARDEN\,?CURDIR,'\ENV5_2_2.DAT')).
end.  (* Atmospheric Requirements (Gas Composition) *)

topic 'Atmospheric Requirements (Humidity)'.
  window ('Atmospheric Requirements (Humidity) (Question 23 of 39)',blue,white,w

  say ('
          Please enter the experiment requirements
             in terms of atmospheric humidity.

          Press the #fyellow RETURN KEY#d to enter the editor,
        #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm save

  edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV5_2_3.DAT'),yellow,black,red,5,9,70
  close_window ().
  close     (concat (C:\GARDEN\,?CURDIR,'\ENV5_2_3.DAT')).
end.  (* Atmospheric Requirements (Humidity) *)

topic 'Atmospheric Requirements (Vacuum)'.
  window ('Atmospheric Requirements (Vacuum) (Question 24 of 39)',blue,white,whi

  say ('
          Please enter the experiment requirements
               in terms of atmospheric vacuum.

          Press the #fyellow RETURN KEY#d to enter the editor,
        #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm save

  edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV5_2_4.DAT'),yellow,black,red,5,9,70
  close_window ().
  close     (concat (C:\GARDEN\,?CURDIR,'\ENV5_2_4.DAT')).
end.  (* Atmospheric Requirements (Vacuum) *)
  close_window ().
END. (*Atmospheric Requirements*)

topic 'Temperature Control and Measurement'.
  window ('Temperature Control and Measurement (Question 25 of 39)',blue,white,w

  say ('
       Please enter the experiment requirements in terms of
     temperature control, measurement range, and the accuracy
       required.

          Press the #fyellow RETURN KEY#d to enter the editor,
        #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm sav

  edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV5_3.DAT'),yellow,black,red,5,10,70
  close_window ().
  close     (concat (C:\GARDEN\,?CURDIR,'\ENV5_3.DAT')).
```

```
end.  (* Temperature Control and Measurement *)

topic 'Vibration Control and Measurement'.
  window ('Vibration Control and Measurement (Question 26 of 39)',blue,white,wh

  say ('
         Please enter the experiment requirements in terms of
    vibration control and measurement range, along with the accuracy
    and frequency of measurements required.

             Press the #fyellow RETURN KEY#d to enter the editor,
           #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm sa

  edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV5_4.DAT'),yellow,black,red,5,10,70,
  close_window ().
  close      (concat (C:\GARDEN\,?CURDIR,'\ENV5_4.DAT')).
end.  (* Vibration Control and Measurement *)

topic 'Test Matrices'.
  window ('Test Matrices (Question 27 of 39)',blue,white,white,2,2,70,6).

  say ('
       Please enter the experiment requirements in the form of
  test matrices to describe the number and duration of tests required.

             Press the #fyellow RETURN KEY#d to enter the editor,
           #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm sa

  edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV5_5.DAT'),yellow,black,red,5,9,70,1
  close_window ().
  close      (concat (C:\GARDEN\,?CURDIR,'\ENV5_5.DAT')).
end.  (* Test Matrix *)

topic 'Imaging Requirements'.
  window ('Imaging Requirements',blue,white,white,2,2,70,6).
  changem = NO.
  na = 'NOT APPLICABLE'.

  ask ('
    Are there any imaging requirements for your experiments?',
    imagereqt,?yn).
    eof = number_to_char (26).
    if ?imagereqt = YES
      then
        do ('Imaging Requirements (Photography)')
        and
        do ('Imaging Requirements (Radiography)')
        and
        do ('Imaging Requirements (Television)')
        and
        do ('Imaging Requirements (Resolution)')
        and
        do ('Imaging Requirements (Frame Rate)')
      else
        photo = read_line (concat(C:\GARDEN\,?CURDIR,'\ENV5_6_1.DAT'))
        and
        photo      is string_copy(?photo,1,14)
        and
        radio = read_line (concat(C:\GARDEN\,?CURDIR,'\ENV5_6_2.DAT'))
        and
```

```
  radio      is string_copy(?radio,1,14)
  and
  tv    = read_line (concat(C:\GARDEN\,?CURDIR,'\ENV5_6_3.DAT'))
  and
  tv         is string_copy(?tv,1,14)
  and
  resolution = read_line (concat(C:\GARDEN\,?CURDIR,'\ENV5_6_4.DAT'))
  and
  resolution is string_copy(?resolution,1,14)
  and
  frame = read_line (concat(C:\GARDEN\,?CURDIR,'\ENV5_6_5.DAT'))
  and
  frame      is string_copy(?frame,1,14)
  and
    if (?photo      <>  ?NA and ?photo <> ?eof)
       or
       (?radio      <>  ?NA and ?radio <> ?eof)
       or
       (?tv         <>  ?NA and ?tv    <> ?eof)
       or
       (?resolution <>  ?NA and ?resolution <> ?eof)
       or
       (?frame      <>  ?NA and ?frame <> ?eof)
  then
window (' ',yellow,blue,yellow,2,2,70,14)
  and
  ask ('
There are answers on file that indicate this question
was previously answered YES, rather than NO.  If the
correct answer is NO, the system will need to change the
answers from your previous session that were directly
related to the YES response, since they are no longer
applicable.  Do you authorize the system to change
these previous answers?',changem,?yn)
 and
 close_window ()
   else
     changem = YES.

if ?changem = YES
  then
  new_file (concat(C:\GARDEN\,?CURDIR,'\ENV5_6_1.DAT'))
  and
  write    (concat(C:\GARDEN\,?CURDIR,'\ENV5_6_1.DAT'),?NA)
  and
  close    (concat(C:\GARDEN\,?CURDIR,'\ENV5_6_1.DAT'))
  and
  new_file (concat(C:\GARDEN\,?CURDIR,'\ENV5_6_2.DAT'))
  and
  write    (concat(C:\GARDEN\,?CURDIR,'\ENV5_6_2.DAT'),?NA)
  and
  close    (concat(C:\GARDEN\,?CURDIR,'\ENV5_6_2.DAT'))
  and
  new_file (concat(C:\GARDEN\,?CURDIR,'\ENV5_6_3.DAT'))
  and
  write    (concat(C:\GARDEN\,?CURDIR,'\ENV5_6_3.DAT'),?NA)
  and
  close    (concat(C:\GARDEN\,?CURDIR,'\ENV5_6_3.DAT'))
  and
  new_file (concat(C:\GARDEN\,?CURDIR,'\ENV5_6_4.DAT'))
```

```
        and
        write    (concat(C:\GARDEN\,?CURDIR,'\ENV5_6_4.DAT'),?NA)
        and
        close    (concat(C:\GARDEN\,?CURDIR,'\ENV5_6_4.DAT'))
        and
        new_file (concat(C:\GARDEN\,?CURDIR,'\ENV5_6_5.DAT'))
        and
        write    (concat(C:\GARDEN\,?CURDIR,'\ENV5_6_5.DAT'),?NA)
        and
        close    (concat(C:\GARDEN\,?CURDIR,'\ENV5_6_5.DAT')).


topic 'Imaging Requirements (Photography)'.
  window ('Imaging Requirements (Photography) (Question 28 of 39)',blue,white,wh

  say ('
      Please enter the imaging requirements of your experiment
                  in regards to photography needs.

            Press the #fyellow RETURN KEY#d to enter the editor,
         #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm save

  edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV5_6_1.DAT'),yellow,black,red,5,9,70
  close_window ().
  close      (concat (C:\GARDEN\,?CURDIR,'\ENV5_6_1.DAT')).
end.  (* Imaging Requirements (Photography) *)

topic 'Imaging Requirements (Radiography)'.
  window ('Imaging Requirements (Radiography) (Question 29 of 39)',blue,white,wh

  say ('
      Please enter the imaging requirements of your experiment
                 in regards to radiography needs.

            Press the #fyellow RETURN KEY#d to enter the editor,
         #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm save

  edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV5_6_2.DAT'),yellow,black,red,5,9,70
  close_window ().
  close      (concat (C:\GARDEN\,?CURDIR,'\ENV5_6_2.DAT')).
end.  (* Imaging Requirements (Radiography) *)

topic 'Imaging Requirements (Television)'.
  window ('Imaging Requirements (Television) (Question 30 of 39)',blue,white,whi

  say ('
      Please enter the imaging requirements of your experiment
                 in regards to television needs.

            Press the #fyellow RETURN KEY#d to enter the editor,
         #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm save

  edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV5_6_3.DAT'),yellow,black,red,5,9,70
  close_window ().
  close      (concat (C:\GARDEN\,?CURDIR,'\ENV5_6_3.DAT')).
end.  (* Imaging Requirements (Television) *)

topic 'Imaging Requirements (Resolution)'.
  window ('Imaging Requirements (Resolution) (Question 31 of 39)',blue,white,whi
```

```
  say ('
      Please enter the imaging requirements of your experiment
                in regards to resolution needs.

           Press the #fyellow RETURN KEY#d to enter the editor,
         #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm save

  edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV5_6_4.DAT'),yellow,black,red,5,9,70
  close_window ().
  close     (concat (C:\GARDEN\,?CURDIR,'\ENV5_6_4.DAT')).
end.  (* Imaging Requirements (Resolution) *)

topic 'Imaging Requirements (Frame Rate)'.
  window ('Imaging Requirements (Frame Rate) (Question 32 of 39)',blue,white,whi

  say ('
      Please enter the imaging requirements of your experiment
                in regards to frame rate needs.

           Press the #fyellow RETURN KEY#d to enter the editor,
         #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm save

  edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV5_6_5.DAT'),yellow,black,red,5,9,70
  close_window ().
  close     (concat (C:\GARDEN\,?CURDIR,'\ENV5_6_5.DAT')).
end.  (* Imaging Requirements (Frame Rate) *)
  close_window ().
END. (*Imaging Requirements*)

topic 'Electromagnetic Limitations'.
  window ('Electromagnetic Limitations (Question 33 of 39)',blue,white,white,2,

  say ('
        Please enter the electromagnetic limitations for the type
             of your experiment.

           Press the #fyellow RETURN KEY#d to enter the editor,
         #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm save

  edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV5_7.DAT'),yellow,black,red,5,9,70,
  close_window ().
  close     (concat (C:\GARDEN\,?CURDIR,'\ENV5_7.DAT')).
end.  (* Electromagnetic Limitations *)

topic 'Astronaut Involvement (Extravehicular Activity)'.
  window ('Astronaut Involvement (Extravehicular Activity) (Question 34 of 39)'

  say ('
      Please enter the astronaut involvement in regards to
         extravehicular activity.

           Press the #fyellow RETURN KEY#d to enter the editor,
         #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm save

  edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV5_8_1.DAT'),yellow,black,red,5,9,7
  close_window ().
  close     (concat (C:\GARDEN\,?CURDIR,'\ENV5_8_1.DAT')).
end.  (* Astronaut Involvement (Extravehicular Activity) *)

topic 'Astronaut Involvement (Activation of Experiment)'.
```

```
   window ('Astronaut Involvement (Activation of Experiment) (Question 35 of 39)'
   ,blue,white,white,2,2,70,6).

   say ('
          Please enter the astronaut involvement in regards
                to their activating the experiment.

              Press the #fyellow RETURN KEY#d to enter the editor,
            #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm save

   edit_file (concat (C:\GARDEN\,?CURDIR,'\env5_8_2.DAT'),yellow,black,red,5,9,70
   close_window ().
   close      (concat (C:\GARDEN\,?CURDIR,'\env5_8_2.DAT')).
 end.  (* Astronaut Involvement (Activation of Experiment) *)


 topic 'Data Requirements'.
   window ('Data Requirements (Question 36 of 39)
 ',blue,white,white,2,2,70,6).

   say ('
         Please enter the data requirements for your experiment.

              Press the #fyellow RETURN KEY#d to enter the editor,
            #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm save

   edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV5_9.DAT'),yellow,black,red,5,9,70,1
   close_window ().
   close      (concat (C:\GARDEN\,?CURDIR,'\ENV5_9.DAT')).
 end.  (* Data Requirements *)

 topic 'Telepresence'.
   window ('Telepresence (Question 37 of 39)',blue,white,white,2,2,70,6).

   say ('
      Please enter the telepresence requirements for your experiment.

              Press the #fyellow RETURN KEY#d to enter the editor,
            #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm save

   edit_file (concat (C:\GARDEN\,?CURDIR,'\EN5_10_1.DAT'),yellow,black,red,5,9,70
   close_window ().
   close      (concat (C:\GARDEN\,?CURDIR,'\EN5_10_1.DAT')).
 end.  (* Telepresence *)

 topic 'Telerobotics'.
   window ('Telerobotics (Question 38 of 39)',blue,white,white,2,2,70,6).

   say ('
     Please enter the telerobotics requirements for your experiment.

              Press the #fyellow RETURN KEY#d to enter the editor,
            #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm sav

   edit_file (concat (C:\GARDEN\,?CURDIR,'\EN5_10_2.DAT'),yellow,black,red,5,9,7
   close_window ().
   close      (concat (C:\GARDEN\,?CURDIR,'\EN5_10_2.DAT')).
 end.  (* Telerobotics *)
```

```
topic 'Other Requirements'.
  window ('Other Requirements (Question 39 of 39)',blue,white,white,2,2,70,6).

  say ('
     As the Principal Investigator (#mPI#m), please describe other
      applicable material not addressed in these requirements.

             Press the #fyellow RETURN KEY#d to enter the editor,
           #fyellow ESC#d to leave editor, and #fyellow RETURN#d to confirm save

  edit_file (concat (C:\GARDEN\,?CURDIR,'\ENV6_1.DAT'),yellow,black,red,5,9,70,1
  close_window ().
  close     (concat (C:\GARDEN\,?CURDIR,'\ENV6_1.DAT')).
end.  (* Other Requirements *)

topic 'related answer'.
  related_answer is read(concat(C:\GARDEN\,?CURDIR,?RELATEDFILE)).
  window ('Related Topic',blue,white,white,2,2,76,14).
  say ('
     This is your answer for the: #fyellow #t',
              ?relatedtopic,'#d #n #n',
  ?related_answer,'#n #n
              Press #fyellow SPACE #d to continue.').
  window ('Use this answer?',yellow,blue,red,2,12,74,6).
  ask ('
  Would you like to incorporate this answer into your current response?',
  incorporate,?yn).
  if ?incorporate = YES
    then write (concat(C:\GARDEN\,?CURDIR,?FILENAME),?related_answer).
  close_window ().
  close_window ().
  close (concat(C:\GARDEN\,?CURDIR,?FILENAME)).
```