A PROPOSAL TO PROVIDE REQUIREMENTS ANALYSIS, DESIGN, DEVELOPMENT AND IMPLEMENTATION OF AN INTEGRATED MANAGEMENT SYSTEM

TECHNICAL PROPOSAL

SUBMITTED TO:

THE NUCLEAR REGULATORY COMMISSION

IN RESPONSE TO

RFP NO. RS-ORM-84-389

SEPTEMBER 26, 1984

WILSON HILL ASSOCIATES, INC
1025 VERMONT AVE. NW WASHINGTON DC 20005 NINTH FLOOR 202-842-7700

September 26, 1984

Mr. Mark Flynn
Nuclear Regulatory Commission
Division of Contracts, Room 2223
4550 Montgomery Avenue
Bethesda, MD 20814

Dear Mr. Flynn,

Wilson-Hill Asscociates, Inc. submits the attached proposal in response to NRC RFP RS-ORM-84-389 to be evaluated for the services to provide a requirements analysis, design, development and implementation of a fully Integrated Management System (IMS).

Our proposal is presented in three (3) separate and distinct parts:

One (1) original signed copy of the entire solicitation package
One (1) original and five (5) copies of the "Cost Proposal"
One (1) original and five (5) copies of the "Technical Proposal".

We believe our proposal is fully responsive to the requirements and intent of the RFP which will develop and implement IMS II for the Nuclear Regulatory Commission.

Wilson-Hill will apply the structured design and development concepts of the DeMarco methodology of system development to this system development. We will also incorporate the use of GANTT charting techniques to monitor and control required resources. We fully intend to maintain close management and technical liaison to insure user satisfaction.

We have had 6 years of corporate experience related to the design and implementation of IMS systems and are intimately familiar with the environment and requirements of NRC and intend to commit the identified resources and whatever supporting facilities are necessary to make this a successful joint venture between Wilson-Hill and NRC.

We will be available at any time to provide further information concerning this offer. If you have any questions regarding our response, please contact either Mr. Joseph Tagliareni or me at (202) 842-7700.

Sincerely,

Patricia W. Hill
President

Enclosures

PWH/jb

Technical and cost data contained in all of this proposal shall not be used or disclosed except for evaluation purposes provided that if a contract is awarded to this offer as a result of or in connection with the submission of this proposal, the Government shall have the right to use or disclose the technical data to the extent provided in the contract. This restriction does not limit the Government's right to use or disclose technical data obtained from another source without restriction.

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INTRODUCTION

Wilson Hill Associates, Inc. is pleased to submit this proposal in response to the U.S. Nuclear Regulatory Commission's Request for proposal to furnish services "entailing a requirements analysis, design, development and implementation of a fully Integrated Management System (IMS)". Specific responsibility for accomplishing the technical activities described in this proposal will be assigned to Wilson-Hill's Information Sciences Division, which contains the required professional resources to successfully and effectively achieve NRC's goals.

This technical proposal presents Wilson-Hill's understanding of the nature and scope of the work required. A thorough knowledge of both the Data General MV series of computer equipment and the full system life cycle development of on-line interactive computer systems are required. Wilson-Hill has demonstrated that knowledge by successfully providing similar support to NRC and other federal agencies for more than 6 years.

This proposal is organized into six sections as follows:

- o Understanding of the Requirements -- describes Wilson-Hill's understanding of the current IMS implementation as well as how it can transition into the requisite environment of IMS II.
- o Task Descriptions and Technical Methodology -- describes Wilson-Hill's approach to developing each of the deliverables presented in the solicitation document.
- o Deliverables -- presents each deliverable, their completion date, person loading for each task and a gantt chart for each phase of the project.
- o Project Management Plan -- describes Wilson-Hill management approach and structure necessary to insure a quality product.
- o Personnel -- presents the Wilson-Hill's staff who will be assigned to the project.
- o Corporate Experience -- describes Wilson-Hill's corporate organization and its experience relevant to the proposed effort.

Wilson-Hill is qualified to support NRC in its task requirements and is capable of providing services of the highest quality. As a team of information and data base specialists, Wilson-Hill has developed the capability to serve the total spectrum of the system life cycle. The combined backgrounds and experience of the corporate staff allow Wilson-Hill to direct and participate in the varied areas of this project.

Since Wilson-Hill is specialized in providing information services, it places a high emphasis on customer satisfaction at all levels. This professional commitment has been the key to Wilson-Hill's success in the service industry. The Nuclear Regulatory Commission can be assured of the staff's dedication to this project and the delivery of quality products in a timely fashion.

SECTION I. UNDERSTANDING OF THE REQUIREMENTS

I.1 BACKGROUND AND UNDERSTANDING

The U.S. Nuclear Regulatory Commission's (NRC) main responsibility is to regulate nuclear activities, through licensing and other means, to protect the health and safety of the public and preserve the quality of the environment. The NRC must be prepared to respond immediately to "incidents" involving NRC licensed activities that have the potential to threaten the public or environment.

Methods and procedures have been established by the NRC for performing their responsibilities. One primary method was to establish the NRC Headquarters Operations Center (OC). The OC whose primary responsibility of the Office of Inspection and Enforcement (I&E) is staffed by duty officers 24 hours per day, 365 days per year for the purpose of tracking and logging of unusual situations. This tracking and logging is performed by a telephone network system. It is the responsibility of the duty officer to phone all plants throughout the United States, usually between 4:00 AM and 8:00 AM daily for gathering information on any unusual situations that occur at the plants, and to check plant and communication status. Exhibit I-1 presents the information flow of incident reporting.

All telephone contacts are taped to have a permanent record of events/activities/questions/response concerning any unusual situation or "incident". Depending on the severity of incidents reported, the NRC and the OC will respond through phases of readiness which include stand-by and activation. In an emergency the OC is activated which requires assembly of seven teams to perform duties of "incident" monitoring, response and coordination. These teams and a description of each is as follows:

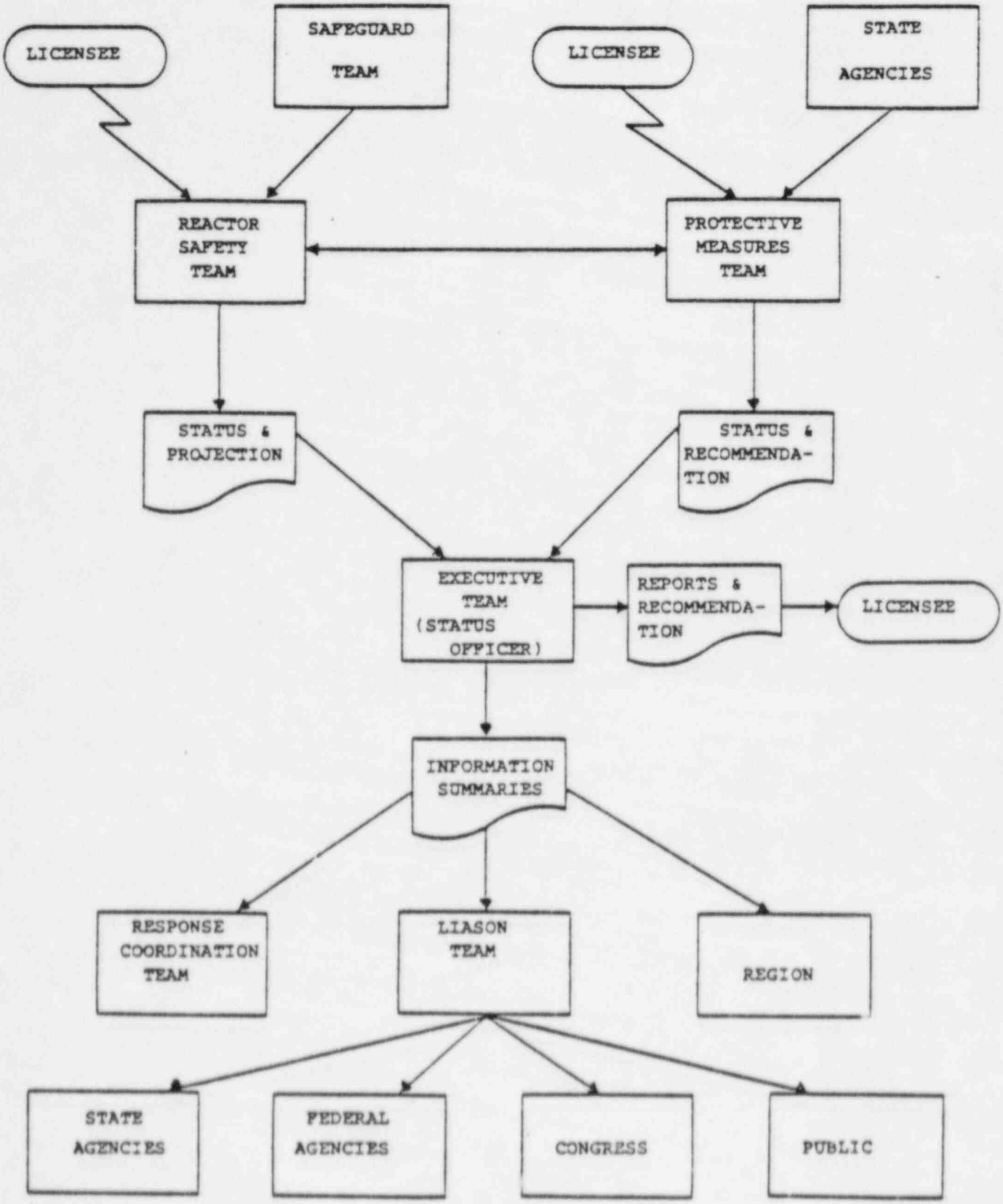


EXHIBIT 1-1. INFORMATION FLOW (INCIDENT REPORTING)

- Executive Team -- This team directs all teams, makes decisions; consults with plant officials, state and federal officials, and others are appropriate. The primary tool used for evaluation is the "Status Board" and any recommendation model by Team Leaders. The "Status Board" utilizes screens presented on the DG MV 6000 computer system. This is used in tracking the time and event situations during the incident.

- Reactor Safety Team -- This team obtains data from the individual site and translates it into useful information. It is responsible for assessing current plant status and projection of plant conditions.

- Protective Measures Team -- This team utilizes data gathered by the Reactor Safety Team, plus data it acquires through its own resources and projects possible risks from radiological releases to residents in the vicinity of the plant.

- Safeguards Team -- The safeguard team coordinates information concerning safeguards of an incident if it involves sabotage or unauthorized access to special NRC material.

- Liasion Team -- Provides information concerning status of incident, licensee, state and local responses and monitors NRC's actions to Federal and State agencies.

- Response Coordination Team -- Coordinates and maintains response plan and procedures by notifying other participants when an incident occurs.

- Administrative Support Team -- Performs word processing, terminal operations and other logistical support.

The following are some overall items which apply to the system used by the Executive, Rector Safety and Protective Measures Teams:

- Specific, easily used, access to the computer system.

- Require methods for forwarding documents to other teams and outside parties.

- I&E has the option of requesting that computer-generated day, date, time to be entered onto all forms or specific forms and in specific fields.

- Upon incident activation, all files, forms, menus, screens etc. will be activated for each team.

- Upon incident de-activation, (Reactor Control Team Director responsibility) all files, forms, menus, screens will be de-activated.

- When the incident is closed everyone is logged off the system. Files are maintained on disk for ready access for 2-weeks. After the 2-week time period the files are loaded on tape for further retention.

Sometimes an exercise is run to simulate a real incident, all users except the IMS authorized users are logged off. These exercises normally run for 2 day duration).

1.2 CURRENT INFORMATION MANAGEMENT SYSTEM

Currently the Information Management System (IMS) consists of three parts:

- Duty Officer Support System (DOSS)
- Intermediate Dose Assessment System (IDAS)
- Information Management System Phase I (IMS-I)

The DOSS is currently located at the National Institute of Health (NIH), Bethesda Maryland, and is processing under an IBM Computer system utilizing SUPERWYLBUR as a command language. It functions as a daily record keeping system. The IDAS and the IMS-I system are located in Bethesda, Maryland at the NRC Headquarters site and run under the Data General MV6000 computer system. When an incident is declared the IDAS is used to track weather conditions, conditions impacting health of people and physical plant environment by running a series of models.

The current IMS-I is a record keeping system whose purpose is to track events that take place during an incident. The current system was designed to use Comprehensive - Electronic Office (CEO) which records data on pre-determined formats for specific NRC-developed forms.

The system permits an apparrent full scale word processing capability (e.g., line wrap, line/word insertion and/or correction); plus filing and mailing capabilities.

Currently there is no interface between IMS-I (System A) and IDAS (System B). The DOSS is run separately from the other two systems on the NIH computer.

Current observations indicate that the CEO consumes an inordinate amount of computer resources, plus an inordinate amount of time is expended in use and application of the CEO function.

As mentioned previously the incident reporting system at the NRC consists of three main "stand alone" systems which include the Duty Officer Support System (DOSS), the Intermediate Dose Assessment System (IDAS), and IMS - Phase I (IMS-I).

The Duty Officer Support System (DOSS) is used to record situations or events that arise at the many plant sites. The Duty Officer contacts each plant by telephone on a daily basis and logs pertinent information into the system.

DOSS consists of four main functions:

- Updated Event File;
- Duty Roster File;
- Monitoring Plant Safety; and,
- Search Capability.

At the present time, DOSS is resident at the National Institutes of Health (NIH) Data Center. It was designed to run with SUPERWYLBUR commands on an IBM mainframe.

The Intermediate Dose Assessment System (IDAS) is used by the NRC in incident situations to make decisions based on information collected and generated within IDAS. IDAS consists of three main models that are:

- MESORAD (8 programs)

- TACT (4 programs)
- GRAPH (4 programs)

The IDAS models involve meteorological, human health factors, and plant data. The models are maintained by various other organizations such as, Pacific Northwest Laboratory and converted to run on the DG MV 6000 equipment at the NRC.

IMS-I was developed to provide information to management to enable the NRC to respond to and make the proper decisions to protect the public and environment in case of an incident.

IMS-I was designed to do the "record keeping" functions and store decision data required by the NRC in the event of an incident or exercise. There are fifteen forms in the system that are needed to supply information to twenty-two NRC end users.

The three systems described above have been implemented in different hardware environments as seperate systems requiring dissimilar user interfaces. The upgrade and enhancements of these systems under the current Wilson Hill contract is transitioning each into a standard DG environment making integration of each system for the IMS II project easier. Included in the new design of an integrated system should include the following attributes:

- Continual state of readiness
- Closed file kept at least two weeks after any incident or exercise
- Auto log-off capability
- System security

In addition to the requirements listed above, additional considerations for IMS-II are as follows:

- Human factors engineering
- Communication of two CPU's with shared files
- "Dial-out" capability with the five regions, National Headquarters, and plants
- Evaluation of command decision systems
- Evaluation of DBMS products
- Evaluation of "key-word" search techniques.

1.3 UNDERSTANDING OF DG MV ENVIRONMENT AND HOW IT RELATES TO IMS II

SECTION 2. TASK DESCRIPTIONS AND TECHNICAL METHODOLOGY

Wilson Hill recognizes the complexity of developing computer-based systems, and has accordingly developed a set of rigorous procedures dealing with all facets of the system development process. Exhibit 2-1, an overview of the system life cycle, illustrates how user requirements progress through requirements definition, analysis and design, implementation of system components, integration, testing, installation user training, and turnover to become an operational system.

During the life cycle of a system, Wilson Hill uses the Yourdon-DeMarco Method for structured analysis and structured programming techniques to ensure accurate implementation. Exhibit 2-1 illustrates Wilson Hills overall approach to the systems development and operational maintenance process in the form of a data flow diagram, which identifies major inputs and products of each life cycle phase.

Wilson Hill will prepare a set of standards and procedures to govern all aspects of this project and will maintain this document throughout the life of the contract. In conjunction with NRC, Wilson Hill will determine what standards and procedures are needed. Existing Wilson Hill standards and procedures will be modified to meet NRC's requirements, thereby minimizing preparation time and effort.

Wilson Hill Associates, Inc. approach to systems requirements, design, and development is consistent with FIPS PUB 38 standard and the phases presented in the RFP. To enable NRC to evaluate the methodologies in these areas, a narrative is presented of Wilson Hill's approaches, methods, and solutions to the life cycle development, as depicted in Exhibit 2-2 of a software system. The project is broken down into the phases and tasks as depicted in Exhibit 2-3.

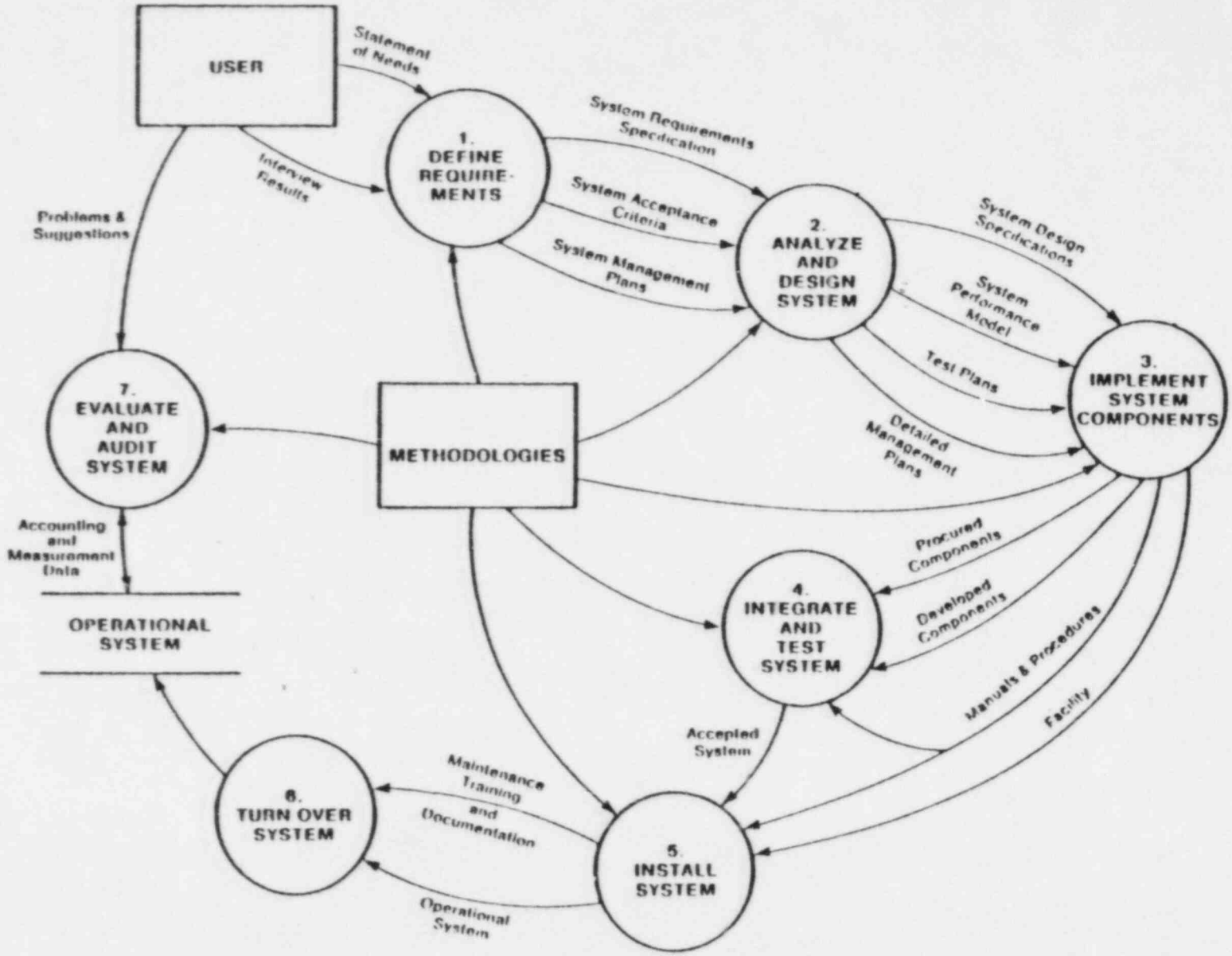


EXHIBIT 2-1. SYSTEM DEVELOPMENT AND MAINTENANCE PROCESS

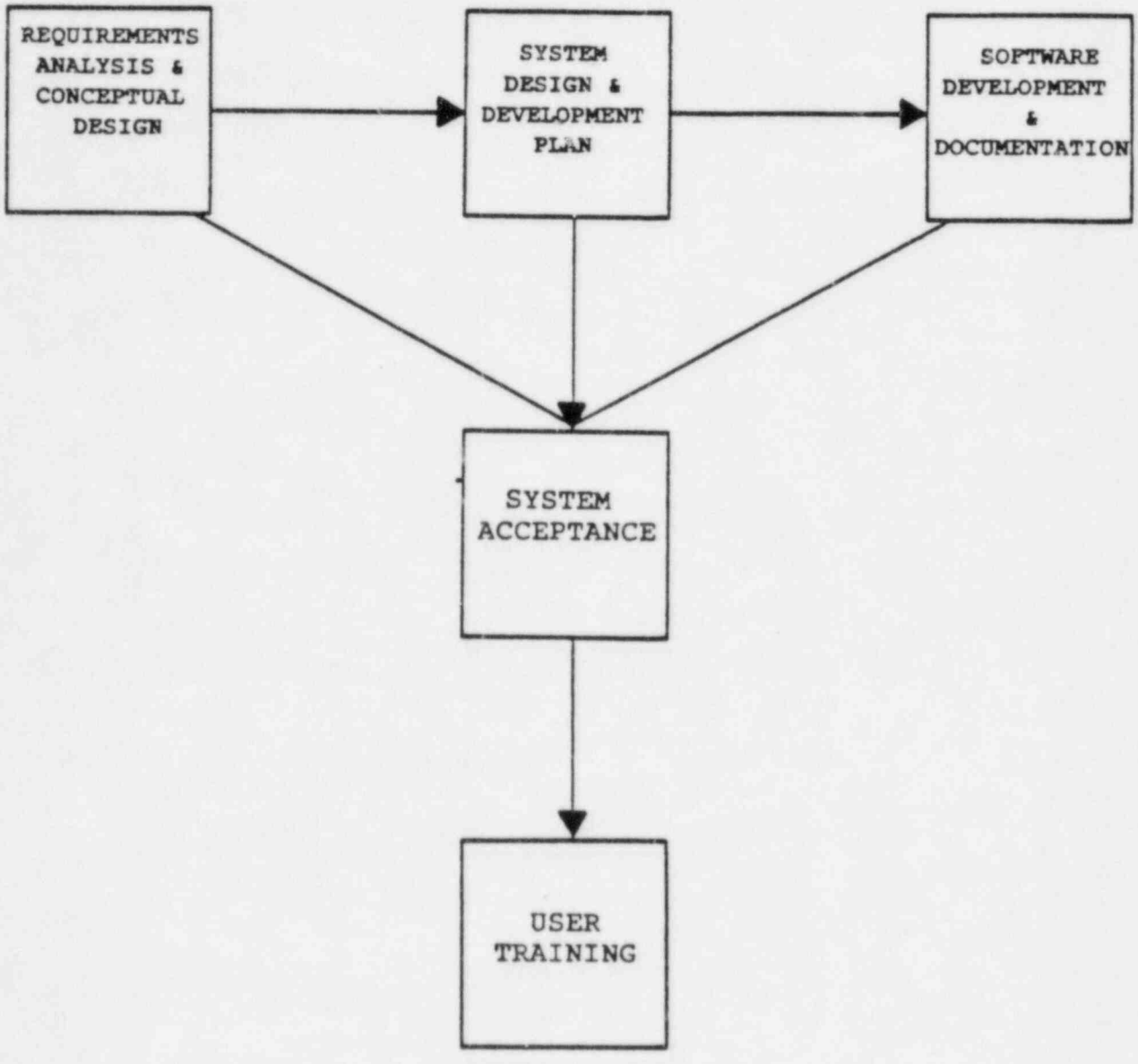


EXHIBIT 2-2. SYSTEM DEVELOPMENT PROCESS

EXHIBIT 2-3. TASK BREAKDOWN CHART

- Phase I - Requirements Analysis and Conceptual Design
  - Task 1.1 - Work Plan Development
  - Task 1.2 - Review of Current Documentation, System and Network Resources
  - Task 1.3 - Structured Interviews
  - Task 1.4 - Development of IMS Requirements Document
  - Task 1.5 - Development of Conceptual Design Document
- Phase II - System Design and Development/Implementation Plan
  - Task 2.1 - System Analysis
  - Task 2.2 - System Design Specification
  - Task 2.3 - Program Design Specification
  - Task 2.4 - Development/Implementation Plan
- Phase III - Development and Implementation
  - Task 3.1 - Test Plan Development
  - Task 3.2 - Software Development
  - Task 3.3 - System Testing
  - Task 3.4 - Documentation
- Phase IV - System Acceptance
  - Task 4.1 - Conduct I&E Workshop
- Phase V - User Training
  - Task 5.1 - Training Planning
  - Task 5.2 - Material Development
  - Task 5.3 - Train Users

2.1 PHASE I - REQUIREMENT ANALYSIS AND CONCEPTUAL DESIGN

2.1.1 Task 1.1 Work Plan Development

Wilson Hill has evolved a work breakdown method specifically for implementation projects. It combines the planning discipline of network development and the definition of tangible intermediate products to be generated regularly throughout the project. This results in continuous visibility of technical content and quality during the analysis and design processes themselves. It also provides a meaningful basis from which management control actions can be taken in directing work activities.

Planning for analysis, specification, and development projects is tracked by the proposed and actual man-loading by project task and subtask using a microcomputer based project management system. This complements the disciplines described above in developing the networks and key event controls. Together, such controls materially assist in maintaining the project's on-time and on-budget status.

Throughout Phase I, Requirements Analysis, Wilson Hill will follow a top-down structured approach ensuring accurate requirements and system definitions. Wilson Hill's approach has been used on similar projects with the federal Government.

During the past six years, since the 1978 publication of Tom DeMarco's Structured Analysis and System Specification, use of structured analysis techniques (with occasional modification) has proven to be a viable methodology to provide effective systems with efficient development efforts. The cornerstone of this methodology is the documentation of the system in logical (rather than organizational or physical) terms relevant to both the system users and the system designer. To the user, this document (the requirements analysis) provides a model of the system which the user can examine for correctness and completness. The model is expressed in functional terms for input, output, data storage (files), and processes. The system designer will later use this model as the basis for the logical and physical design. The requirements analysis will be used to determine the processes to be automated and to

determine specific functional needs. Further, the requirements analysis provides the basis from which to subsequently establish file content and organization, interfile (data base) relationships, and processes for which each file is required or generated.

While the requirements analysis described above appears deceptively simple to accomplish, there are many possibilities for failure. User requirements may be misrepresented in the system model to the degree that the user cannot or will not attempt to make them meaningful. Conversely, a correct model of the system may lack the elements necessary to provide a sound basis for system design. If current considerations and operations are not presented independently of physical constraints or implementations, then cumbersome, irrelevant limitations will be placed upon the logical design. Further, irrelevant physical considerations obscure and deemphasize important logical requirements. The purpose behind representing requirements using logical models is to assure that the requirements (the "whats") are to be clearly and completely defined and that solutions to requirements (the "hows") are not being identified as requirements.

The use of structured analysis techniques facilitates the design process only when applied by knowledgeable and experienced analysts. An understanding of organizational responsibilities and standard operating procedures allows the analyst to concentrate on the user's view of the system under study. Experience in system design and development will ensure that the requirements analysis will meet the needs of the system designer.

The definition of the requirements analysis and system design for this project can best be accomplished by Wilson Hill whose expertise in structured analysis is enhanced by a practical knowledge of management procedures and the application of these methodologies in "real world" situations. The structured analysis techniques deemed applicable to this project's requirements analysis fall generally into seven categories:

- Review of Current Documentation
- Structured Interview

- Documentation of Requirements
- Data Flow Diagrams
- Data Dictionary
- Structured English
- Structured Walkthrough

Each of these categories is described in the following paragraph.

2.1.2 Task 1.2 Review of Current Documentation

The project team must gather and study all existing relative documentation and software systems to gain the necessary familiarity with the IMS requirements. Wilson Hill will review documents including the following:

- Information Management System Requirement Analysis (dated 11/16/82.)
- Requirements for the Duty Officer Support Systems (dated 07/25/83.)
- IMS Phase I Statement of Work and detailed Functional Requirements (dated 05/31/83.)
- Operations Center Computer Auto-Notification System (dated 02/31/84.)
- Description of IMS-1 as installed and how it relates to original requirements cited in document above (05/31/83.)
- System Documentation Manual.
- NRC Operations Center Information Flow.
- Information Management System Equipment count for the New Operations Center.
- Intermediate Dose Assessment System Programs.
- Report on the Functional Analysis of the NRC Operations Center.

- Requirements and Conceptual Design Documents being produced by Wilson Hill under contract # NRC-33-84-378.
- Federal Information Processing Standard Publication 38 (FIPS PUB 38).

The documentation noted above as well as others to be identified would be used to the fullest extent as both an analytical and an informational tool. By understanding the overall requirements of IMS, Wilson Hill will be able to fine-tune its work plan. Once all documentation has been reviewed, Wilson Hill will be able to draw a comprehensive picture of present and future requirements. Only on this basis will it be possible to complete future efforts of this project in a timely, accurate fashion.

2.1.3 Task 1.3 Structured Interviews

Wilson Hill uses a formalized data collection procedure to collect information on the current system. Typically, the results of studying the present requirements are documented. Data elements are identified, their peak hour volume and frequency are described, processes are formulated with their associated inputs, and outputs, and flow-sheets are prepared which interlink data flows with data storage systems. The interrelationship of the components of a systematic study of the present requirements is shown in Exhibit 2-4.

Information that is gathered will be in relationship to the current and future methodologies of IMS usage. Such interviews are an important component of any study to evaluate a user's present requirement and system. However, interviewing is also a highly unpredictable form of securing information. It is valuable when the proper working relationship, confidence, and trust are present; it is unproductive with anything less. Wilson Hill realizes that the conditions for proper interviewing must be created, not presumed. This is most easily accomplished by building on the experience that the Wilson Hill technical staff has gained in similar projects and by developing a thorough work plan and interview guide. The key to this interview process is not to redefine the specification but to gather a first-hand understanding of the requirements and background.

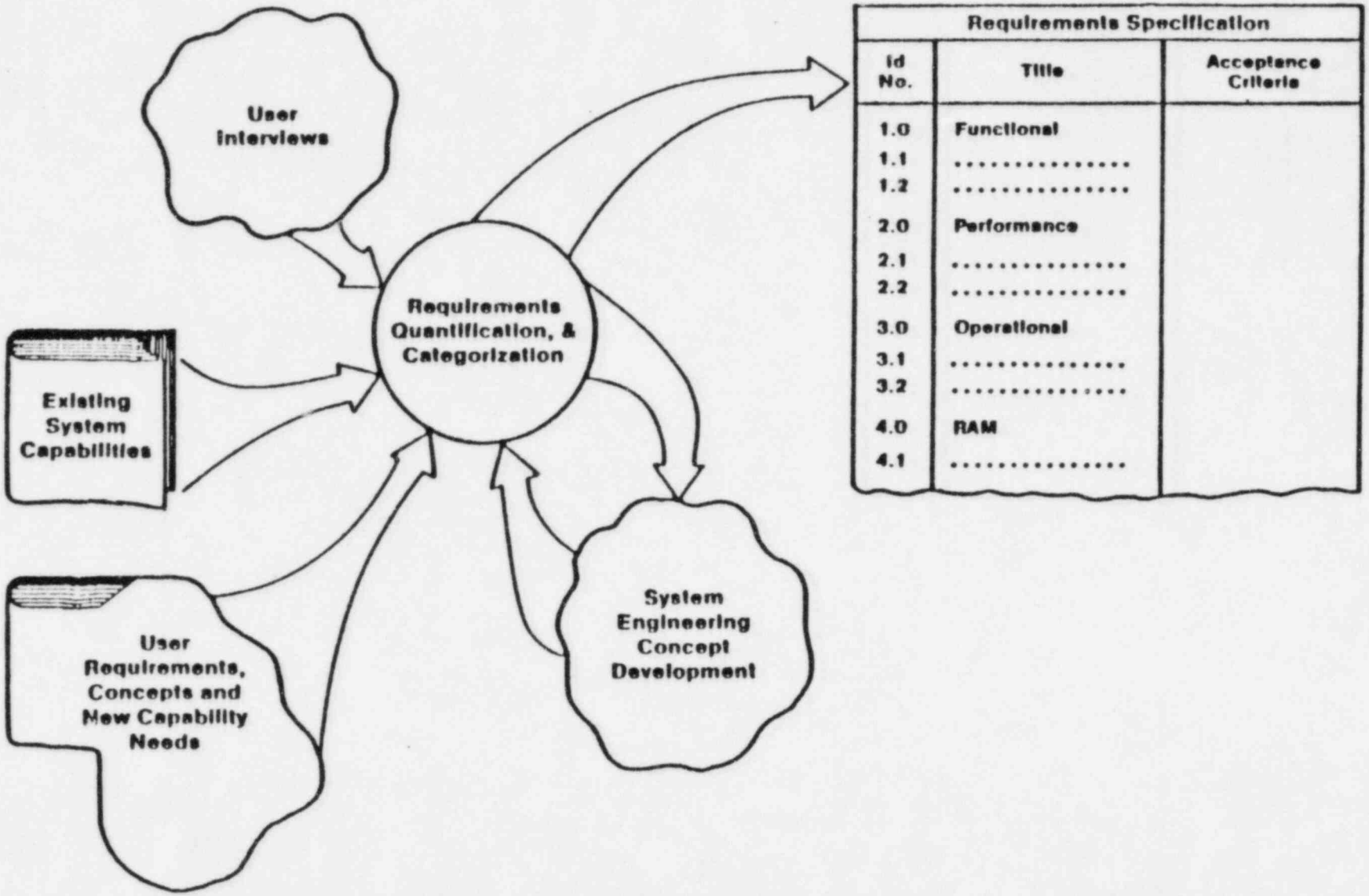


EXHIBIT 2-4. REQUIREMENTS IDENTIFICATION-THE CRITICAL FIRST STEP

Management Interviews

Management interviews will be conducted with persons from the end user organization, I&E as well as ORM whose responsibilities include defining the goals and objectives, formulating strategies to achieve these goals, and managing plans to implement these strategies. The objectives of these interviews is to gain an overall understanding of:

- Basic components of IMS
- Internal environment (e.g., organization, NRC regions)
- External environment (e.g., role of NRC and its, interfaces with other agencies like FEMA, EPA, OSHA, etc.)
- Information currently used or required by I&E
- Forecasted changes that would affect the scope of the operations being conducted (e.g., new microcomputer or terminals, additional communication lines at higher speed)

Technical Staff Interviews

Staff interviews are conducted with persons who are directly working on the operation of one or more functional areas. The objective of these interviews is to gain a more detailed understanding of:

- Interfaces between functional areas
- Rules and policies governing daily operations (schedules and priorities during an incident)
- Effect of forecasted changes on operational areas
- Current and future performance characteristics especially during an incident when stress on the system will be its highest
- Inputs and outputs required by each team using the system

The structured interview is an effective means to accomplish this extensive data collection in a relatively short period of time. These are actually a sequence of steps commencing prior to the interview, executed during the interview and used to acquire data after the interview. These include:

- Interview guidelines will be developed by Wilson Hill and approved by NRC Project Manager and forwarded to the 5 interviewees prior to the interview. The guidelines provide the user with the objectives for the interview and a framework for discussion and notify the user of the need for the reproduction of any documentation that will assist in the requirements study. The user can then be prepared prior to the actual interview.

- At the time of the meeting between the NRC user and Wilson Hill systems analyst the guidelines provide the backbone of the interview. The user will present pertinent information in answer to the analyst's questions. With the topics to be addressed and the purpose of the interview known prior to interview initiation one makes efficient usage of the interviewees and Wilson Hill's staff analysts and help ensure a productive gathering of information.

- After the interview, the information gathered in the form of both oral and written documentation will be consolidated and structured through the completion of forms which will standardize and create an official record of the data gathered at the interview. The consistent manner in which data are recorded facilitates subsequent analysis effort - both manual and automated.

After completion of each of the interviews the documented results will be forwarded to the user for his review and certification of correctness. It is proposed that each interviewee take no more than 3 working days to certify the correctness of the documented requirements.

2.1.4 Task 1.4 Development of IMS Requirements Document

The Requirements Document (RD) describes the functional system design, defines performance requirements, and describes user inputs and system outputs. It will provide the user with a clear statement of the system's operational capability and

serve as the basis for an agreement between user and developer as to the direction to be taken during implementation. The RD must contain, as a minimum, the information necessary to produce an effective system specification.

This is the key element in overall IMS System development and, as such, must be given the highest priority in staffing and work planning. Three major activities must be performed to lay a solid foundation for completeness and consistency. First as stated earlier, the project team must gather and study all existing, relative NRC documentation to gain the necessary familiarity with the IMS requirements. Second, interviews must be conducted with NRC users to learn, first hand, the requirements of the system. Data to be gathered should cover input loads, output volumes and forms, communication interfaces, data base considerations, user needs, and current systems that satisfy those needs. As noted, this activity requires the development of an interview guide to provide for consistency and accuracy of data gathering.

The third activity entails analyzing the data gathered during the first two activities. A complete range of analytical procedures must be covered, from peak report loads to critical output reports, alternate means for input in case of main communications malfunctions and alternate approaches using existing software system. To ensure an effective functional review, the following areas will be covered:

- Design Criteria and System Flows -- Determine considerations for information flows, and relate inputs and outputs to major processing functions
- Data Base -- Analyze existing data bases with a view to possible redesign
- Inputs -- Analyze existing inputs and procedures
- Accuracy and Validity Criteria -- Determine accuracy requirements of existing and proposed systems and define validity of inputs and required input editing
- Outputs -- Analyze output requirements, formats, volumes, and media
- System Environment -- Analyze hardware requirements, communication, software interfaces with other systems, software environment, and existing software systems that may satisfy some of system needs

To perform this effort effectively, the work activities will focus into the same areas listed above. Continuity of design will be ensured through the same personnel to parallel areas. The following work is necessary to the production of a usable functional design:

- Design Criteria and System Flows
  - Define basic functions to be supported
  - Define system components
  - Define environment, organizational levels, and geographic factors
  - Design system flow
  - Analyze current programs
  - Define performance requirements for response time, flexibility, and file storage
- Data Base
  - Determine data characteristics and volume
  - Define data base requirements
  - Define data base load procedures
  - Define data base maintenance procedures
  - Design possible data base configurations
  - Determine data element names
- Inputs
  - Determine input sources
  - Determine input requirements
  - Determine input rates
  - Determine input mode

- Accuracy and Validity Criteria
  - Define accuracy of data — inputs, intermediate files, and outputs
  - Define accuracy of calculated data
- Outputs
  - Define output report layouts
  - Determine output requirements -- volumes and media
  - Define output recipients and classification
- System Environment
  - Define interfaces, both communications and software
  - Define impact of current hardware and software limitations
  - Define facility of operation to support system
  - Determine support requirements
  - Define failure contingencies
  - Determine scope of utilization of existing software

When all work has been performed and a probable Draft Requirements Document solution has been completed, the design team and the Project Manager, and NRC will review the Draft Requirements Document. All facets of IMS will be reviewed in accordance with the Functional Requirements, and a pass-or-fail status will be applied to the total document or portions of it. If rework of all or a portion of the document is required, the problem area will be reworked. After the document passes the internal Wilson Hill design team review, the modified requirements will be presented to the Project Officer for approval of the Final RD.

2.1.5 Task 1.5 - Development of Conceptual Design Document

The conceptual design specification will use structured analysis techniques of:

- Data Flow Diagram (DFD)
- Data Dictionaries (DD)
- Structured English
- Structured Walkthrough

Each is a formal stage in the specification development which will culminate in a structured walkthrough of the specification and evaluation criteria with the NRC Review Team.

Data Flow Diagrams

Data Flow Diagrams (DFDs) are a graphics based method used to represent a system in a strictly defined manner. Exhibit 2-5 presents an example Data Flow Diagram. DFDs consist of four basic elements which are: data flows; processes; files and, sources. These elements can be used, using standard symbol representations plus procedural annotations, to develop a logical model of basically any system. System, as used within DeMarco's structured analysis technique, refers to a set manual and/or automated procedures used to achieve a desired result.

In structured analysis techniques, DFDs are produced once the analyst has completed a data gathering effort toward the goal of understanding the system. The data gathered can be classified according to those basic elements, represented using the standard symbols and labelled using the procedural annotations. The data would then be grouped as:

- Data Flows which are the movement of known pieces of information. Data flows are represented by vectors showing the direction of flow into or out of a process or from a source or to a destination. When two or more data flows are to a process, they can be annotated to show the conjunction of flow. Conversely when two or more data flows are from a process, the annotation would portray the disjunction of flow.

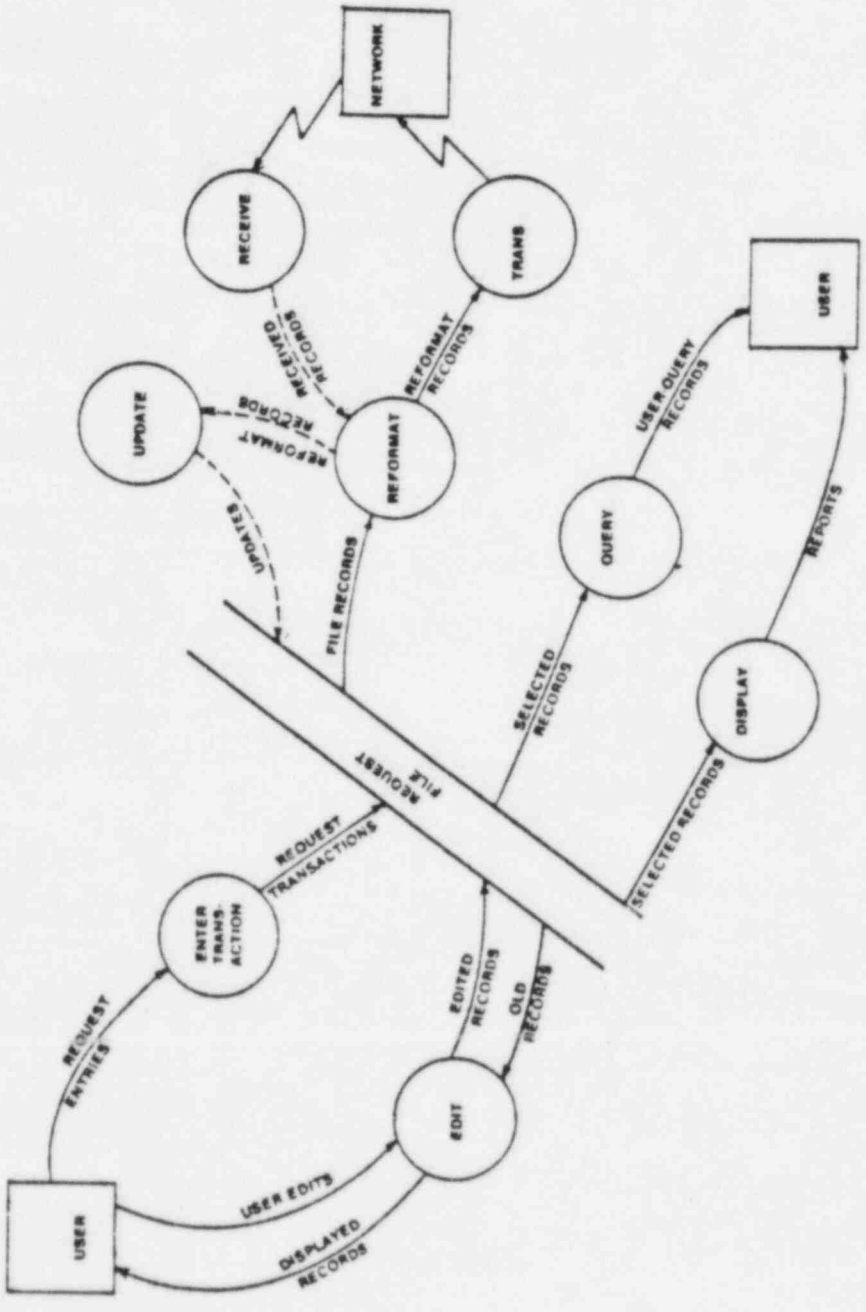


EXHIBIT 2-5. EXAMPLE DATA FLOW DIAGRAM

- Processes in which some action is taken resulting in a transportation of incoming data flows into outgoing ones. DeMarco uses circles or "bubbles" to represent processes.

- Files which in structured analysis jargon, are any type of temporary repositories of data are represented by a straight line which bears the files name.

- Sources which are persons or organizations, lying outside the context of the system, are represented by boxes.

With these definitions and conventions in mind, the analyst can construct DFDs which represent the system in a logical manner. Various levels of detail can be employed to provide very general overviews, specific indepth portrayals or something in between.

Data Dictionary

The Data Dictionary (DD) is a required companion to the DFD. Its purpose is to serve as the repository of data about that information which flows through DFDs plus data about the files which provide temporary respositories of information and processes which act on data. This information on data flows, components of data flows, files and processes represents the minimum requirements for which DD entries are required. However, in the analysis phase, the analyst is working with a myriad of information; producing dozens - even hundreds - of DFDs; multiple sources destinations of information, etc. Therefore the DD can be, usually is, expanded to add anything else that needs to be defined in standard terms.

There are some definite rules to follow which include:

- Definitions must be readily accessible by name
- There can be no redundancy in the DD
- The DD must be easily updated
- There must be only one (standard) way to write definitions.

The final thing to consider about the DD is that there should be provisions for cross-referencing, error detection, consistency checking, etc.

Structured English

The previously discussed DFDs and DDs represent the first two components of the logical system model. The third component to that model is the text description of the DFDs plus general comments about the project and assumptions.

In the DFDs, the system is shown using a few basic symbols and strictly enforced conventions. Using a natural language (like English) to produce an accompanying narrative introduces weaknesses such as imprecise language, wordiness, redundancy and various implications, connotations and innuendos. Therefore a procedure, called Structured English, is employed to trim non-essential facilities of the English language and thus restrict the possibility of stated weaknesses entering the DFD descriptions.

Structured Walkthrough

In producing a logical model of an existing system, the analyst has employed a strict set of symbolism and conventions to achieve the goal of a level set of representative diagrams. Although the user has participated in this process throughout, the final product - enhanced and modified DFDs - is not going to be self describing. Failure to address the possibility of a DFD being less than correct can have adverse implications later. It is therefore essential for NRC to fully understand the DFDs and to concur in their validity. Successful analysts employing structured analysis techniques use a tool in achieving understanding and concurrence: that tool is the Structured Walkthrough.

In the presentation of the logical model to NRC, the analyst employs various techniques of Structured Walkthroughs. These include:

- Oral presentation of physical details of each DFD. This tells the user how new data flows were derived, the specific people and organizations performing the depicted processes, and, the actual files that have been replaced by logical file structure.

- Keep the names of new data flows and processes derived (out of the logical ordering of the system) meaningful to the user. If possible the users should give their opinions on new names which describe the flows/processes in terms they understand.

These steps, when combined with the earlier stated requirement for user participation throughout the logical ordering and DFD development processes, inevitably lead to a more complete product and enhance user confidence in what has been done. Both are essential, finishing touches to a successful application of structured analysis techniques. Similar to the RD review cycles Wilson Hill will first deliver a Draft Conceptual Design Document for NRC review and comments. After NRC comments are received by Wilson Hill a Final Document will be developed and delivered.

2.2 PHASE II - SYSTEM DESIGN AND DEVELOPMENT/IMPLEMENTATION PLAN

The purpose of the System Specification (SS) stage is to take the user's Functional Requirements and map it onto the computer in order to describe intermediate levels of the system's requirements. The specification will contain precise baseline data relevant to the environment and functional design and implementation efforts. The SS will state, in concise form, the component parts of the system, including requirements for programming specifications development.

Like a Functional Description, the System/Subsystem Specification(s) produced will conform to the NRC standards. The following paragraphs describe Wilson Hill's proposed approach to the developing of a complete and consistent System Specification document. Three work areas have been defined for the effective completion of this Phase of system development. The major SS work areas are discussed in detail below.

2.2.1 Task 2.1 System Analysis

The major objective of this work area is to perform a "systems analysis" on the data collected and the Functional Description produced during previous tasks. The term "systems analysis" incorporates the idea and techniques of defining a problem statement and finding problem solutions. Specifically, the systems analysis should encompass the functions defined and lead to a determination of the best data processing solutions to implement these functions.

Specific work required to perform a systems analysis include the following:

- Determine input flows and sources
- Determine input rates
- Determine input storage media
- Define input layouts and screens
- Determine output volumes, characteristics, and formats
- Determine data base needs and design considerations and interfaces

- Determine programming requirements by investigating existing available programming
- Determine the need for tables, dictionaries, and directories
- Determine efficient use of intermediate and work files
- Design data collection instruments and instructions for data entry and update requirements for user organization
- Determine hardware and software limitations of the computer facilities available for operations
- Solve problems and alternate methods for inputs and outputs for degraded modes of operation

Six areas have been defined to structure the systems analysis work effort. These describe a logical distribution of work effort that covers all aspects of the analysis. They are:

- Input analysis
- Output analysis
- Intermediate and work file analysis
- Tables, dictionaries, and directory analysis
- Master file and data base analysis
- Program specification analysis

2.2.2 Task 2.2 System Design Specification Development

Incorporated in this task will be the definition of all system components, input procedures, and output structures. All components requiring computer programming will be described and defined, using Data Flow Designs and HIPO charts. The development of data base structures will be performed during this task. Specifically, the work to be performed can be outlined as follows:

- Design communications linkages for I/O
- Design input formats

- Design output formats
- Design work files and intermediate storage files for program and system module communications
- Develop tables, dictionaries, and directories for generalized data base inquiries and other program uses
- Design data bases and their load procedures
- Design programs to be developed in the system and their linkages with existing programs

This work area contains two review cycles. The first, the Wilson Hill's review of the design, will determine the validity of the IMS designs. After the designs have been approved internally, an NRC design approval review will be initiated. Development of the System Specification Document will begin after all designs are considered satisfactory.

Development of System Specifications will deal with six work areas whose titles coincide with pertinent sections of an SS document. Personnel applied to parallel areas above should remain in that status during the document development. Major sections of the SS document to be addressed are:

- Inputs
- Outputs
- Intermediate and work files
- Tables, dictionaries, and directories
- Data base
- Program specification

2.2.3 Task 2.3 Program Design Specification

Since Wilson Hill uses both conventional and structured system design techniques as its method of presenting program design information, the development of these specifications will provide no difficulty to the company.

The structured technique was developed to display in a graphic manner what a system does, and what data it uses and creates. Consequently, these techniques provide both design and documentation tools. The company's experience shows that the structured approach, when supported by data flow diagrams and decision tables, provides a significant dimension to the design process. It is particularly applicable in design efforts for ensuring that all functional capabilities are defined.

The company uses these methods for a design effort in which the design specification proceeds from the high to the lowest level. This approach is commonly referred to as top-down design. In each iteration similar functions are defined and features of the software system are generated and designed.

Top-down design as a method provides an opportunity for better design. It enables the designer to provide the following in software architecture:

- Modularity -- the ability to segregate like functions for easy diagnosis of problems and ease of modifications
- Transportability -- the capability to move the software design to different hardware or to interface to different external software systems
- Testability -- the capability to test more exhaustively all stimuli and response of the system
- Maintainability -- the capacity of the system to be comprehended and appropriate modifications made with greater ease and flexibility

For example, a frequent design strategy is that of providing a technique for generating multiple reports from one data base. Let us assume the reports to be generated pass the data base sequentially. A subsystem called the IMS Generalized Report Driver (GRD) has been designed in the System Specification. Its purpose is to access the IMS data base and select appropriate records for the report generation modules. The essence of this strategy is to increase transportability, modularity, testability, and maintainability.

The transportability is enhanced, since the IMS data base can be modified and only the Generalized Report Driver would be affected. The modularity is increased, since all accesses to the data base are through one module, the GRD. Testability and maintainability are enhanced, since data base I/O problems can usually be assigned only to the GRD. Using structured design methods, the designation of Generalized Report Driver and its functional capabilities constitutes a Level 2 design. Major programs within the GRD, such as report programs, consitutes a Level 3 design. The major modules such as top-of-page routines and their functions constitute a Level 4 design. The working subroutines within major modules are a Level 5 design (subroutines such as LINE-COUNT and TOTAL-LINE are examples).

Wilson Hill has identified tasks to be performed in preparing the Program Design Specifications. The tasks are:

- Development of Level 2 structure charts (subsystem design)
- Development of Level 3 structure charts descriptions (major program design)
- Development of Level 4 structure charts (major module design)
- Development of Level 5 structure charts (lowest level module design)
- Preparation of Program Specifications

Development of Level 2 Program Specifications (Subsystem Design)

This step will begin the progressive definition of system functions to various Level 2 subsystems. As the systems functional requirements are allocated to Level 2 subsystems, similar functions will be generated. A review group will be used for this and future tasks, for review (structured walkthroughs), rework, and approval of design. This effort is concluded when all Level 2 Program Design Specifications have been approved by the COTR.

Development of Level 3 Program Specifications (Major Program Design)

This step, similar in nature to Level 2, consists of the design of Level 3 descriptions. Whereas Level 2 work allocated and generated functions to subsystems, this work specifies functions within a subsystem to specific major programs within the subsystem. This effort will be concluded when all Level 3 Program Design Specifications have been approved.

Development of Level 4 Program Specifications (Major Module Design)

This is also a reiteration of functions similar to previous subtasks but conducted on a lower level and in greater detail. In this case descriptions for major modules (Level 4) within major programs (Level 3) within major subsystems (Level 2) of the system Level 1 will be delineated and developed. This task is concluded with approval of all Level 4 program specifications.

Development of Level 5 Program Specifications (Lowest Level Module Design)

This step, similar in nature to preceding steps, consists of the design and preparation of description for lowest level subroutines and moduels (Level 5) within a software system.

Hierarchies lower than Level 4 or 5 are frequently required. If the system complexity requires lower levels, the efforts required to design these instances will be accomplished in this subtask. As in other efforts, all work will be subject to a review, rework, and approval cycle. This subtask will be concluded with the final acceptance of all Level 5 (and lower) module designs.

Prepare Program Description Specifications

This step consists of preparing the Program Specifications. Since structured walkthroughs and approval has already been achieved for the technical contents in the preceding steps, the review cycle should be short and probably will consist of editorial revisions.

2.2.4 Task 2.4 Development/Implementation Plan

Parallel with the system design effort, a development/implementation plan including a quality assurance plan will be prepared. The implementation plan will incorporate the major phases, tasks, and subtasks required to implement the IMS II system for each of the following:

- Objectives
- Milestones
- Schedule
- Resources required
- Major activities
- Assumptions
- Contingencies and interdependencies

In preparing the plan, the overall system life cycle for the IMS II system will be considered. Wilson Hill is highly experienced in developing top-level and detailed test and implementation plans. The key to implementation planning is to maintain an orientation toward objectives and clearly measurable milestones and to avoid such nebulous concepts as "90 percent completed".

2.3 PHASE III - DEVELOPMENT AND IMPLEMENTATION

2.3.1 Task 3.1 Test Plan Development

The objective of the system and program test planning and testing task is not only to ensure that the program or system operates properly, but also to verify the integrity of the documentation.

Batches of modules should be prepared to machine test each as a stand-alone entity. Those elements of the program that interact with each other or play a supporting role for multiple programs to systems will be tested as unique processing entities prior to any integrated test. As they pass their stand-alone tests, they will be linked together in a top-down fashion and tested as program components or subsystems. If an existing program is being modified as part of an upgrade, the testing operation must also validate the integrity of those processing functions that were not modified.

The implementation of a computer-based system requires the design of formal procedures to ensure that the delivered product meets the specified needs of the user. These procedures will take the form of a formal test plan. Included in the plans are test procedures, acceptance criteria, test duration, and test responsibility for each item to be delivered as part of the system. Wilson Hill will develop the plan according to FIPS PUB 38 standards where outline can be found in Exhibit 2-6.

The specific structure of the plan will include the following:

- Software Deliverable item name
- Subsystem name (if applicable)
- Brief description of the purpose of the item
- List of acceptable inputs that cause the deliverable item to be fully exercised
- List of validated, known results (outputs) that are produced by the inputs supplied above

The purpose of the Test Plan is to provide a plan for the testing of software; detailed specifications, descriptions, and procedures for all tests; and test data reduction and evaluation criteria.

Contents

EXHIBIT 2-6. TEST PLAN OUTLINE

As each item is tested and validated, the next phase in the test cycle will begin: integration testing. Since each of the items tested is part of the system, an integrated test will be instituted to fully test the system and all items associated with it. The specific structure of the integrated test plan will adhere to the following:

- System name
- Description of the system
- List of specific inputs that cause the interaction between items of the system
- Known results that are caused by these inputs

When the test plan is accepted, the formal test period may begin for each completed module and data segment as detailed in teh topdown testing methodology outlined later. When all tests are completed and all results validated a formal test report will be produced. This report will reflect the results of the test, including validation of outputs, program errors encountered, and procedures necessary to correct the program errors. When all known program and data errors are fixed, tested, and certified to be correct, and the test report is accepted; the system, on a data segment by data segment level, is then assumed to be accepted. The system will then be implemented on the operational hardware and placed into an operational stage ready for user demonstration and training.

2.3.2 Task 3.2 Software Development

The implementation of a system is accomplished through the programming effort, which translates the system specifications into an operational system. In a top-down Design the program implementation and design are performed concurrently, and with the use of structured programming a definitive programming methodology is necessary. The implementation of the IMS will be developed using structured programming methodologies.

Program Specification

Program Specifications (discussed earlier) are written to communicate the processing requirements to programmers precisely enough to allow them to proceed immediately with programming. The end product of a program specification is the integrated program design. In a top-down design, the actual integration process is performed continuously during system development. The designers must maintain close working relations to assure proper handling of tradeoffs and interfaces. In the case of this project the programmer-analysts will act as the programmers to ensure the continuity of design to coding production.

Program specifications include detailed designs as derived from overall system designs. Each design must include all of the major program decision points and the criteria for making the selection. The specifications are designed so that a programmer can write the computer instructions directly from them. Design symbols must be standardized so that each designer can create specifications understood by any programmer.

Top-Down Program Development

Structured system design and programming techniques are used to create programs in an orderly and logical manner. Top-down design implements programs in a stepwise manner; programs are designed at successively lower levels of detail. At each level of the design, the program is specified, coded, and tested, and lower levels are "stubbed" or "short-circuited" to allow a working version of the program-to-date to be tested. Once a level has been completed, the next level of design is addressed, and the program is thus expanded incrementally until it is complete.

Three initial advantages arise from the use of top-down design and programming techniques:

- The program and/or system can be conceptually tested and integrated at the onset of programming, thus eliminating compatibility problems upon completion of separate program modules.

- Once the highest level of design is implemented, programmer teams can be divided to work on different portions of the program without any fear of duplication of effort or conflict, and this division of labor greatly increases programmer productivity.

- The programming effort itself can be funneled into the structured mode, using the three constructs of binary decision, loop, and sequence.

In addition, operational systems that have been designed using structured programming techniques have two distinct advantages:

- They are easier to maintain, because the program modules are more readily understood since they contain few complex branching operations.

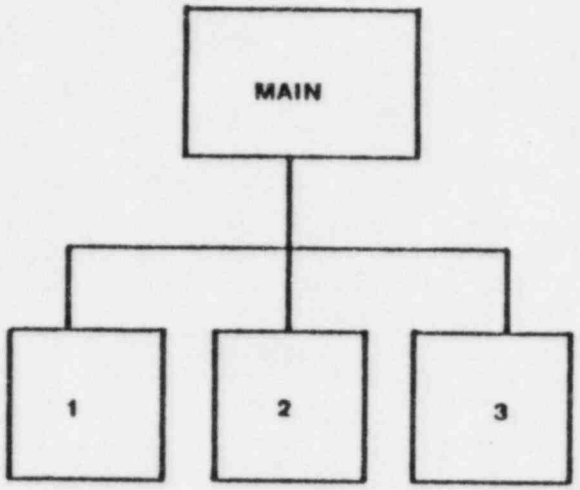
- Should alterations or enhancements of the system become necessary, they are easier to implement, because the top-down system design is readily comprehensible.

Top-down design approach will be used for all IMS programming efforts. It increases speed and efficiency in program development, and allows ready response to changes in client specifications or enhancements to the resultant system.

Wilson Hill requires all programmers to fully document all programs. This is essential in order to provide an easy-to-read, maintainable system. In this subtask they will be required to adhere to this requirement, and to add additional comments to programs where needed for clarity. Once this is done, machine-readable versions of the software will be generated to load on the operational computer facility.

2.3.3 Task 3.3 System Testing

To be consistent with structured programming, Wilson Hill will utilize the concept of top-down testing. The top-down testing of computer systems should run in parallel with top-down design and top-down coding concepts. As shown in Exhibit 2-7, the main program plus one or more lower level modules begins the cycle of development as well as testing. As depicted in the exhibit, MAIN is developed and tested using



ALL OF THE MODULES CALLED
1, 2 AND 3 ARE PROGRAM STUBS,
I.E., THEY RETURN IMMEDIATELY.

EXHIBIT 2-7. PROGRAM STUBBING: EXAMPLE 1

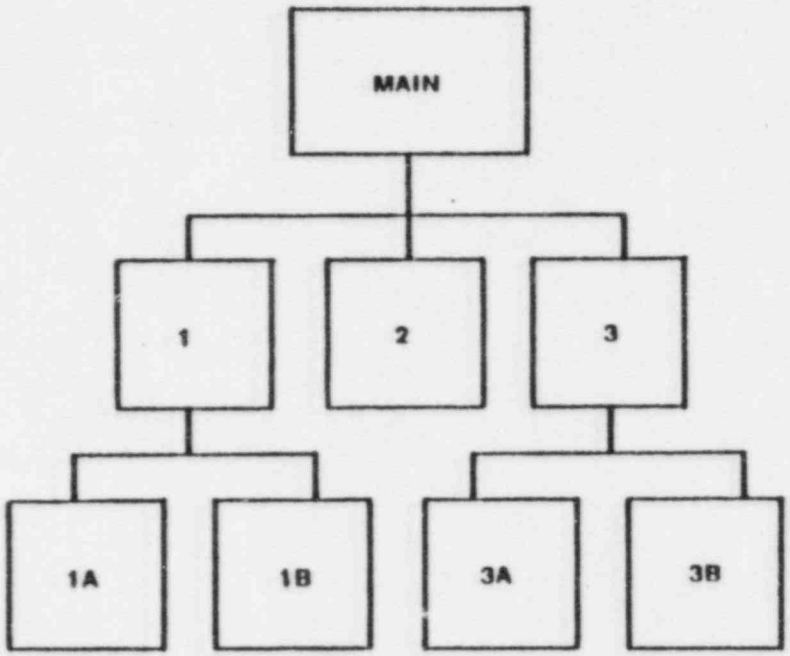
program stubs 1, 2, and 3. After this skeleton is tested, ensuring that all major interfaces are working, another level of logic is added, as in Exhibit 2-8. Modules 1, 2, and 3 are now "real" problems and 1A, 1B, 3A and 3B are program stubs. Again, testing is top-down, from MAIN to 1, 2, or 3 to 1A, 1B, 3A or 3B. When all logic paths are satisfactory, an additional level of logic (program stubs) may be added, as the top-down design dictates.

This scheme requires the use of program stubs so that the higher level modules can be tested. That is, the higher-level modules are Calling or Performing the low-level modules. These program stubs will be implemented as follows:

- Return immediately if the function it performs is not critical
- Provide constant output if needed
- Provide random output if needed
- Indicate stub entry and exit as necessary
- Provide a primitive version of logic of the functions of the modules that the stubs are replacing

Using the above rules or a combination of them, the higher level module will be fully tested as each subsequent lower-level is added. At the end of this process -- that is, when all stubs are replaced by a "real" module -- the whole system integration test will be completed.

Naturally, it is impossible to perform a complete test of the program while it is still in the skeleton form. However, the interfaces between the major modules in the program can be exercised to see that the output from one module is indeed capable of being accepted as input by the next module. When the next lower level of modules are added, a substantially more thorough test can be performed, since each major module of the program will be capable of carrying out a more complete version of its ultimate function. The goal at each level of testing is to pass some data through the entire program, so that one can be relatively sure that all of the interfaces are working together.



ALL OF THE MODULES CALLED 1A, 1B, 3A AND 3B ARE PROGRAM STUBS.

EXHIBIT 2-8. PROGRAM STUBBING: EXAMPLE 2

In theory, the main program can be tested with all the lower-level modules as program stubs; in practice, or course, this would be rather clumsy. Common sense will usually dictate the number of levels that must be implemented to form a reasonable skeleton; subsequent testing can be thought of as adding flesh to the skeleton until the entire program has been finished.

It should be clear that top-down testing is intended to go hand-in-hand with top-down design and top-down coding. In its extreme form, it suggests that one should design the main program, code it, and test it; then design the next level of modules, code them, and add them to the existing skeleton for testing; and so on until the level has been designed, coded, and integrated into the program.

One of the salient aspects of top-down testing is that it can usually be planned in advance -- that is, for most types of programs, it is not too difficult to identify the stages of testing. The major point to recognize here is that one can do this planning at the beginning of the project. Indeed, it does not seem very difficult to build a schedule around the testing stages. That is, at the beginning of the project, one should be able to assess the extent of work to be done at each stage and determine that stage one will be finished on the first of January, stage two on the first of February, and so forth.

At the end of the process of testing, one finds, to no great surprise, that there is no need to do system integration testing. It has already been done.

Benefits that can be derived from top-down testing are as follows:

- System testing, in its classical sense, is virtually eliminated.
- Major interfaces of the program are tested first. As a result, major bugs are discovered before the end of the project.
- The users can be given a preliminary version of the program at a relatively early stage.
- It is often much easier to find bugs (i.e., debugging as opposed to testing) with a top-down testing approach.

- Testing time is distributed more evenly throughout the project, thus eliminating the requirements for large amounts of computer time toward the end of the project.

- The programmer's morale is improved considerably when they can see the results of a successful test of a skeleton of the final program.

- Top-down testing provides a natural "test harness" for the testing of lower-level modules.

A formal set of procedures should be developed that describe the testing environment in detail. These procedures are called the test plan. It should describe the skeleton of the system and the sequence of development/testing of modules. When the test plan is accepted, the formal test periods may begin. When all program errors are identified, fixed, and certified correct, the system is assumed to be accepted.

Wilson Hill will prepare the test plan for approval by NRC. The final test of the system will be performed by Wilson Hill using current data for the data base. Any errors found by the tester in the programs or data will be corrected by the Wilson Hill team for further certification. This summary description is intended only as a guide. The actual responsibilities for testing will be detailed in the test plan.

2.3.4 Task 3.4 Documentation

A computer program or system generally involves the interaction of several diverse groups of individuals who are responsible for specific system functions. To coordinate or orchestrate these diverse groups, a comprehensive set of documentation is required that will adhere to NRC Documentation Standards. The following paragraphs provide Wilson Hill's approach to these areas.

The first level of documentation, discussed earlier, is prepared as an integral part of the requirements analysis, system design, and program development activities. The elements of this documentation level are:

- Functional Specification -- A statement of the various functions performed by an user organizational unit with a detailed definition of the information sources and elements required to support them.

- System Design Specifications -- A graphic and narrative presentation of the processing functions to be performed, files to be utilized, inputs, outputs, and an attendant discussion of the rationale for arriving at the design. Also involved should be the data base design if required, conversion planning, and system operational considerations.

- Programming Specifications -- A detailed description of the program or system presented in flowchart and narrative form, which will cover detailed input, file or data base and output structures, and processing functions.

The second level of documentation, which will be produced during this phase, will supprt the operational aspects of the program or system. Specifically, it will describe to the user/operator and maintenance programmer how the program operates. The elements of this documentation level are:

- User's Manuals and Training Manuals -- A clear and concise description of how the program is to be used, describing the program inputs and including language and option specifications. Outputs will be described in terms of their content as well as how they are to be used.

- Operations and System Manual -- These documents will include a reference section containing all program messages and a logical step-by-step presentation of operating procedures. Generally, the format for this manual will be prescribed by the operations unit. In addition to this manual, some form of runbook also may be required.

- Program Maintenance Documentation -- A detailed explanation of the program or system programming specification is required in addition to the specifications previously mentioned. The layouts for tables, matrices, and lists will be provided. The narrative will be linked to the program flowcharts and the program code via program and subroutine labels. A section of all thresholds and limits will be provided with instructions on how to modify them where possible and test plan to validate accuracy of systems.

2.4 PHASE IV - SYSTEM ACCEPTANCE

Using the results generated during Phase I and Phase II Wilson Hill will generate a complete list of IMS II requirements. Areas that will be covered are:

- Input processing and user interface
- Data base requirements and processing
- Output reports and screens

The checklist will be used as a guide for the formal presentation related to each of the subsystems.

The purpose of the system aceptance by the user is to test the functional capabilities of each component of the system. Since most components contain more than one functional capability, the demonstration and test will contain single function tests and multifunction tests. Single function testing provides the explicit verification of each software function. Multifunction tests should also be employed to assure that functions interface properly and that the execution of one function does not adversely affect the performance of another function.

In addition to testing the capabilities within each component, a group of tests, called regression tests, will be run to assure that newly integrated software elements do not adversely impact the performance of existing software.

The system acceptance demonstration and testing is designed to demonstrate the as-built system as it compares to its requirement specifications. The software design specification plays only a minor role in this phase. Instead, the early documents stating the mission or product objectives, software or system requirements, and user documentation to be delivered, are the main sources from which test and demonstration cases are derived. All nominal and error functions at the system level should be demonstrated in all feasible combinations.

All discrepancies between the requirements and the presented system will be formally reported and solutions will be controlled by formal change procedures.

2.5 PHASE V - USER TRAINING

A comprehensive understanding of the IMS system is critical to successful operations, and such understanding is necessary at all levels of the user organization. For example, top management needs an overview application of system capabilities, benefits and features. For clerical type personnel, the need is for an understanding of the more detailed aspects of the system, such as coding, system usage, and the preparation of input data. Other users, such as analysts and programmers, need other levels of system understanding.

The following paragraphs describes Wilson Hill's approach to training by presenting training planning, training material development and conducting the actual training.

2.5.1 Task 5.1 Training Planning

The transition into a new computing system would be made smooth and effective through a customized and varied training program. A system user training program must be planned and designed to address the various levels of detail, dependent on the characteristics of the intended audience. In addition, it is anticipated that the particular training style and methodology employed may also be trainee dependent. For example, training may range from instruction on the proper completion of forms by data sources for completing detailed instructions on personal computer usage to programmer analysts who will maintain the computer systems. The critical point of training is normally at the clerical level where skill level may be low yet a high degree of task reliability and output accuracy is essential.

Regardless of the level of content detail the general objectives and key job training plan of user training will be:

- To ensure universal and thorough training in all user environments and to enable the users to apply the system to its potential, and
- To serve as a checkpoint by ensuring that each user is completely trained in the procedures to be followed in utilizing the system.

The Wilson Hill approach to training derives from our history as an information systems consulting organization. Wilson Hill's success has been achieved as a result of satisfying customer technical needs and, in the process, educating our clients to new data processing systems. The training organization we apply to user systems has enabled our customers, who typically have had little or no experience with their new system, to understand and better participate in our recommended design and procedures. The NRC user base is characteristically transdisciplinary. Often it includes people who are not technically oriented. As a result, Wilson Hill will be diligent in translating technical concepts and terms so that they are practical and understandable at various levels, both in writing and orally.

The training tasks are approached as unique learning experiences for the trainee's. Training programs are structured to include both outcome and process objectives. Outcome objectives are established to raise levels of technical awareness, impart information, and develop skills and the ability to carry out new instructions and procedures.

The plan will address the training process objectives of having participants actively involved and working in partnership with Wilson Hill trainers to achieve the course objectives. By approaching learning as an experimental and participatory activity, trainees clearly understand information and retain it over a longer period of time. Trainees are better able to apply the course material upon return to their job setting when they have the opportunity to share new information immediately and interactively with other course participants and the training staff. Their new ability upon course completion then also includes:

- Being aware of and open to alternative solutions
- Being flexible for future changes
- Being attuned to current and new trends in the field

Specifically applied to the information system field, the training methodology produces system user trainees that can effectively operate and maintain their new system and mode of operations.

The Training program plan development is a reiterative process. It begins with a macro understanding of the types of people to be trained and the purpose of training. Exhibit 2-9 is a simplified diagram of the major steps that will be followed by Wilson Hill to prepare a system training program. Many of the steps will occur concurrently and be carried out reiteratively as shown in the flow chart. For example, the initial subdivision of the training curriculum into modules and the allocation of training time for each of the modules is a concurrent process. Each module content level of aggregation and its major chunks of information are reiteratively regrouped and subdivided into submodules. Training time is often reallocated and refined for each of the submodules. Reordering of information for presentation occurs throughout the process. This dynamic and creative activity continues until each major point that is required to support the module process and outcome objectives is evolved and established.

The training planning process ends with a training plan, i.e., a very detailed series of related and integrated training modules, each its their respective outcome and process objectives, content specifications, order of presentation, delivery methodologies, time associations and identified support resources. The detailed training plan allows for maximum flexibility during class presentation. The instructors can concentrate on the specific responses of the class and weave the intended curriculum around the "teachable moments" that occur through questions, concerns and expressed trainee interests. It should be noted that although Wilson Hill developed systems will be user friendly, it is important that the proper approach to end user exposure to the system be as non-threatening as possible. Therefore, proper planning is essential to the task.

The flow-charted steps of the training program are presented below in linear order in greater detail:

While these major steps are being taken, the specific time and location of the training will be arranged with the project officer for each task. In addition, class participants will be notified well in advance to avoid scheduling conflicts.

2.5.2 Task 5.2 Material Development

The training methodology employs the concepts of whole-person-learning and trainers-as-facilitators. Therefore, the material that Wilson Hill will develop will support this methodology.

Whole-person-learning involves self-directed learning. Through this process, participants are utilized as resources through the inclusion of their experience and their particular technical tasks and problems in the prepared curriculum. They are fully involved in presentations by being encouraged to participate through the questioning of instructors and contributions specific throughout the course.

To enable whole-person-learning to occur, our training personnel function as facilitators. Besides being experts in the field and imparters of information, they also:

- Make the material seem easy through detailed, well developed, and structured lesson plans that include session objectives; a detailed outline of content; specified presentation techniques; and prepared support materials such as audio-visuals and handouts
- Create an environment for learning by presenting materials in an informal and flexible, but at the same time well organized, manner and at a consistent level of detail
- Remain continually sensitive to the needs of the participants by encouraging questions and stimulating discussions throughout their presentation

Training material development will be carried out by the training instructors. System findings and design conclusions will form the basis for the background as well as a portion of the training curriculum.

As a result of the training, appropriate personnel will know how to operate the system. This includes how to:

- Turn on the terminal
- Gain access to the system and run it
- Run specific modules of the system
- Initiate remote batch processing if required
- Transmit data across communication lines if required

2.5.3 Task 5.3 Training Users

As indicated previously, the training program anticipated at this time will consist of a curriculum that will be directed at end users and system personnel. The training modules will be presented by highly experienced systems analysts-trainers. They are senior staff people of Wilson Hill having extensive experience in adult training and team teaching.

Adult training allows for, utilizes, and addresses the special needs involved in the adult learning process. Of paramount importance to this process is the need for students to experience and engage in self-directed learning, e.g., motivation generated from within based upon curiosity and internal incentives, using the self as a rich resource for learning. This is achieved through a task-job or problem-centered curriculum. The training program envisioned will focus on teaching pragmatic skills and increasing participant job-related functional knowledge.

Adult learning also requires a training presentation style that focuses on facilitation as opposed to didactic delivery techniques. This requires that the training be managed by content experts that have the additional ability to be flexible and highly responsive to the individual and group needs of each class while it is in progress. The relevance of the curriculum content and the method of delivery will determine the degree to which students will be able to carry out their specific job tasks upon completion of the training.

The instructor-facilitators will team-teach the entire training program. This will provide participants with a variation of presentation styles, delivery techniques and a broader perspective than can be provided by one person. Our experience is that team-training creates a high energy level that is transmitted to the class. This results in increased student attention and interest.

An informal environment will be encouraged to maximize information exchange and facilitate the learning process. The training will be "hands-on" and attempt to duplicate the real work world. This increases learning and retention, and makes the learning process highly relevant.

The training program will be highly interactive. The training approach is to stimulate a high level of trainee participation and interaction among trainees and between trainees and the instructors.

Although exercises and class discussion will be used to enhance participants' understanding of concepts and techniques, feedback from participants will be very important to the learning process. Therefore, each person will be encouraged to ask questions, make comments, and offer suggestions throughout the training.

SECTION 3. DELIVERABLES

Products to be delivered in connection with this proposed effort are those specified in the solicitation Document and discussed in Section 2 of this proposal. They are presented as follows:

- A deliverable list consisting of items to be delivered in each phase of the project and expected delivery date of each item expressed in weeks after contract award.
- A GANTT chart for each phase of the project.
- A person loading chart for each phase of the project.

In addition to each of the technical deliverables Wilson Hill will also provide biweekly status reports to NRC. The charts that follow detail Wilson Hill deliverable schedule.

REQUIRED DELIVERY SCHEDULE

ITEM NO.		QUANTITY	WITHIN WEEKS AFTER DATE OF CONTRACT
PHASE I - Requirements Study			
1.	Read and comprehend all material	-	1
2.	Become familiar with current system	-	2
3.	Read and comprehend IDAS material	-	3
4.	Interview	-	5
5.	Write Draft Requirements Document	5 copies	7
6.	NRC Review	-	** within 2 weeks
7.	Write Final Requirements Document	5 copies	11
8.	NRC Review	-	** within 1 week
9.	Develop Conceptual Design	5 copies	13
10.	Documented Interviews	5 copies	5
11.	Phase II - Schedule	5 copies	14
Completion of Phase I NRC review of Phase I (10 working days)			14 weeks
PHASE II - System Design			
1.	Prepare Draft System Design Document	5 copies	22
2.	NRC Review	-	** within 2 weeks
3.	Prepare Final System Design Document	5 copies	25
4.	NRC Acceptance	-	** within 1 week

REQUIRED DELIVERY SCHEDULE

ITEM NO.		QUANTITY	WITHIN WEEKS AFTER DATE OF CONTRACT
5.	Prepare Draft Development and Implementation Plan	5 copies	24
6.	NRC Review	-	** within 1 week
7.	Final Development and Implementation Plan	5 copies	26
8.	NRC Acceptance (Since the phase ends with deliverable this review cycle is overlapped with the Phase II review by the NRC)	-	** within 1 week
Completion of Phase II NRC Review of Phase II (10 working days)			26 weeks
PHASE III - Development and Implementation			
1.	Write test plan	5 copies	29
2.	NRC Project Officer Review	-	** within 1 week
3.	Write final plan	5 copies	31
4.	Project Officer's Accept	-	** within 1 week
5.	Write programs	-	41
6.	Test programs	-	45
7.	Conduct System test	-	48
8.	Program Listing	1 copy	50
9.	Sample Printouts	1 copy	50
10.	AIDS Documentation Notebook	5 copies	50
11.	Documentation	6 copies	50
12.	Converted Production Database	1 copy	48
Completion of Phase III NRC Review of Phase III (10 working days)			50 weeks

REQUIRED DELIVERY SCHEDULE

ITEM NO.	QUANTITY	WITHIN WEEKS AFTER DATE OF CONTRACT
PHASE IV - System Acceptance		
1. Checklist of IMS Requirements	5 copies	54
2. Conduct Acceptance Workshop	1 workshop	55
3. Resolution of Problems		57
Completion of Phase IV NRC Review of Phase IV (10 working days)		57 weeks
PHASE V - User Training		
1. Draft training plan	5 copies	60
2. Project Officer's review	-	** within 1 week
3. Final Training plan	5 copies	62
4. Project Officer's Accept	-	** within 1 week
5. Course sylabus and training material	20 copies	64
6. Training manuals	-	64
7. Training classes	6 copies	66
Completion of Phase V		66 weeks

SECTION 4. PROJECT MANAGEMENT PLAN

This section presents the Wilson Hill's plan for organizing, staffing and managing all of the activities necessary to carry out the requirements of the five project phases for developing the NRC Integrated Management System. The structure of a project team consisting of senior staff who have the following qualifications:

- An understanding of the information and program management environment and its unique management requirements
- An indepth understanding of the "management process" as well as a high level of ADP systems technology
- A diversity of operational and organizational analysis skills
- An indepth knowledge of ADP systems design, development and implementation including:
  - Experience in the evaluation, selection and application of data base management systems
  - Experience with Data General MV Series computer systems
  - Demonstrated ability to design and develop stand-alone systems and procedures into a multi-function, integrated data base system
  - Knowledge of Data General COBOL with full screen editing and command language interface
  - Knowledge of interactive processing with real time update and ad hoc query facilities.

Further, the project management team should have proven record of performance in the successful implementation of complex, interactive information systems. Wilson Hill's project team meets all of the above requirements.

The following topics are discussed in this section:

- Project Organization
  - Rationale for Project Organization
  - Relationship to Corporate Structure
  - Project Organization Structure and Management Staffing
  - Qualifications of Key Personnel
- Project Management
  - Project Director Responsibilities
  - Project Manager Responsibilities
  - Client Liaison
  - Internal Project Control
  - Quality Control
- Project Management Philosophy

The organization and management plan, in conjunction with the project team that has been assigned, provides the framework and technical and management competency for the successful completion of the project.

4.1 PROJECT ORGANIZATION

This subsection presents the rationale for the project organization structure and staffing and provides background information on project team members.

4.1.1 Rationale for Project Organization

Several factors greatly influence successful project performance. These factors are discussed below and provide the basis for the proposed organization and staffing approach.

- The Structure of the Project Team Must Provide for the Multi-Disciplinary Requirements of this Project

  The project team must be comprised of individuals with an indepth understanding of the management process -- organization, personnel and operations -- as well as high level of operational analysis and conceptual systems design capability

to carry out the PHASE I Requirements Study from organization evaluation and development of systems and procedures requirements and specifications for both manual and automated processes to definition of ADP systems concepts and initial systems design for approved automated applications. The PHASE I assigned project team members possess these requisite management and analysis skills. The project team must also be comprised of individuals possessing a high level of ADP systems technology to perform the design, implementation, acceptance and training activities of Phase II through Phase V. Both of these management and management information system's consulting capabilities are resident in the skills of the project team.

- The Project Team Must Be Sensitive to the Interests and Requirements of the Offices and Organizations Within NRC With Which the IMS Interfaces

This project will require contact with a wide range of personnel, both in the Operations Center and in other NRC and external organizations. Proper attention must be paid to protocol and organizational relationships so that all interested parties are properly informed and aware of the project objectives and its needs and requirements. All of the key project team members are senior level consultants who have indepth experience in working in this type of personal contact environment.

- The Project Organization Structure Should Maximize the Professional Time Devoted to Task Accomplishment and Minimize Overall Administrative Requirements

The project team has been organized to minimize management and administrative overhead and eliminate redundant activities. Proposed is a project structure that allows the Project Manager to participate in direct task performance, particularly in the initial project tasks where a strong managerial background is especially critical. Further, the organization structure has been designed to provide continuity of staff from the PHASE I and PHASE II efforts to the subsequent acceptance and training activities in Phase IV and Phase V.

- Project Results Will Be of the Highest Quality if Effective Means for Communication and Information Exchange Among Project Team Members is Made an Internal Part of the Project Plan

WHA's approach is designed to integrate all project activities throughout the conduct of the project so that all staff (as well

as the NRC Project Officer) are informed and up-to-date on project work status at all times. Prior to the initiation of each task, the work plan will be reviewed and approved by the Project Manager and Project Director. All interim findings will be distributed as developed to all team leaders for review and comment. Final task products will be reviewed and approved by the Project Manager and Project Director for submission to the NRC Project Officer.

4.1.2 Relationship to Corporate Structure

This IMS project will be the direct responsibility of Director of the Wilson Hill Information Sciences Division. This reporting relationship will ensure that the project has the highest possible Corporate visibility. will meet on a scheduled basis with the NRC Project Officer, to ensure that this project receives the technical and management performance of the highest quality throughout the period of the contract.

Wilson Hill managers and system specialists are professionals who work closely with the client to ensure customer satisfaction, and develop trust and confidence between the customer and the contractor. Day-to-day relationships are informal and therefore management has the flexibility to provide quick responses to dynamic customer requirements. The emphasis is on the communication channels that are open between the corporation and the NRC Project Officer (see Exhibit 4-1). The first one is the direct communication link between the NRC Project Officer and the Wilson Hill Project Manager, who acts as the principal representative of the corporation. However, because Wilson Hill has retained a strong commitment to service, a contract administrator is assigned to this project and is accessible at any time during the project to the Contracting Officer and Project Officer.

This permits the technical and administrative questions and activities with those people responsible for defining and analyzing these questions. It also provides a central communications link with the other elements of the project such as the technical consultants within Wilson Hill who will make their considerable reservoir of knowledge available to the NRC Project Officer and the NRC project team.

4.1.3 Project Organization Structure and Staffing

Exhibit 4-2 presents Wilson Hill's proposed organization structure and project staffing, taking into account those factors described above. The project management team consists of and Berkut.

The members of the project management team will be deeply involved in project activities -- from an overall corporate monitoring and quality control point of view and Mr. Berkut in day-to-day project activities. The project management team will be supported by a strong cadre of technical professionals as depicted on the organization chart. All of the full-time ADP systems design staff have Data General MV Series computer experience.

4.1.4 Qualifications of Management Personnel

Our selection of the key members of the project team is based on the premise that the success of the project will depend upon Wilson Hill staff members who have: (1) an indepth understanding of the mangement process and extensive experience in a wide range of mangement and information systems consulting projects, (2) a diversity of systems analysis skills, and (3) the indepth knowledge of ADP systems design, development and implementation necessary to carry out all phases of the project. A brief overview of the backgrounds of the key members of the project team is presented below:

- Mr. Jack Berkut, Project Manager

  Mr. Berkut has more than 20 years experience in data processing and information system development. He has extensive project experience at the NRC and is currently the Project Manager of the Wilson Hill contract there. Mr. Berkut's technical and management experience ideally qualify him for assignment as Project Manger for the IMS development project.

4.2 PROJECT MANAGEMENT

While individual professionals are the basic ingredient for success on any project, much of the overall effectiveness of the project team is dependent upon the project management leading the effort. In addition to the Project Director who will monitor and guide the project from the overall Wilson Hill perspective, we have selected a Project Manager to participate in the day-to-day project management effort. Specific, as well as joint, responsibilities for each of these positions follow.

4.2.1 Project Director Responsibilities

The Project Director Director of Wilson Hill's Information Science Division -- will be responsible for:

- Overall technical guidance
- Day-to-day corporate control of the project and assignment of priorities and key personnel within the company
- Reviewing steps at each stage of project development to ensure that high quality is being maintained
- Monitoring progress against scheduled milestones and costs.

4.2.2 Project Manager Responsibilities

The Project Manager, Mr. Jack Berkut, will be responsible for:

- Day-to-day project management
- Overall project planning
- Control of project personnel and resources
- Direct liaison with the NRC Project Officer and representatives
- Direct accountability for and technical direction of all project work.

4.2.3 Client Liaison

A major consideration in every Wilson Hill project is client liaison. This is essential to ensure that the client is continually aware of project progress and performance and also to ensure that the project receives the benefit of continued interaction with those who must understand and utilize the results. The efforts expended on a project, such as the one proposed, are of little value if the results are not directed to address the relevant needs and carried out in a manner to ensure the basis for a useful product. Client liaison will be a prime resonsibility of the Project Manager. It will take place through several mechanisms.

- An initial meeting of our senior project staff with the NRC Project Officer and other members of the NRC, as appropriate. This meeting is to ensure a thorough orientation of the Project Director and Project Manager.
- Periodic meetings between the project staff and the Project Officer and other NRC representatives. These meetings will provide a forum for discussing progress, problems, interim reports and substantial issues.
- Written and oral progress reports.
- The scheduled project deliverables.

4.2.4 Interim Project Control

Experience has indicated that a project of this nature requires internal control mechanisms of the following types:

- Files on each project task, including:
  - Task objectives and products
  - Task schedules and staffing allocations
  - Written biweekly progress reports
  - Monthly comparisons of cost performance vs. budget
  - Monthly comparisons of actual progress vs. schedule
  - Detailed schedules for project deliverables and contractually required status reports
- Copies of all project interim reports, and other project deliverables
- Other pertinent project materials.

The administrative and control techniques mentioned above will assure the most effective use of staff while meeting critical deadlines for professionally developed work products.

Another factor which relates to maintenance of necessary levels of control in project administration is the involvement of the Project Manager in the preparation of all products and execution of all tasks. Our experience has shown that the direct involvement of supervisory staff in the day-to-day work is beneficial to the quality and conduct of the technical aspects of the project and to the overall direction and control of work tasks. Direct participation in project work by the Project Manager assures that he will have firsthand knowledge of:

- The problems, needs and progress on all work tasks and activities
- The performance levels of assigned staff in the execution of their responsibilities

Additionally, project staff will be required to submit information concerning potential problems and delays to project progress. The Project Manager, after having received all required information from these individuals reviews the information for potential problems, updates all master schedules and disseminates reports to the Project Director. Of importance at this stage is the identification of slippage in one area which may adversely impact others. The Project Manager will have a sufficiently broad perspective to immediately identify such problems, and after review with the Project Director will submit all information on such problems to the attention of the NRC Project Officer, as appropriate.

Through these control techniques and through the organizational plans previously described, a high degree of project management control and coordination will be achieved.

4.2.5 Quality Control

The nature and scope of this project are sufficiently complex that several reporting and control mechanisms will be utilized to ensure: (1) the necessary manpower and appropriate skills are available at the proper time and (2) the required deliverables are effectively monitored and controlled to ensure they include the appropriate technical information, are responsive to the NRC requirements and satisfy quality criteria established by the NRC and Wilson Hill. There are two basic mechanisms Wilson Hill will use for quality control on this project:

- Project Manager's Notebook
- Quality Review Panel.

The Project Manager's Notebook is a loose-leaf notebook, as depicted in Exhibit 4-3, containing a series of charts, tables, and narrative materials on the project. The contents of the notebook partially described above contain:

Volume I

- products;

- the Wilson Hill Work Plan with task schedules and staffing allocations;
- copies of monthly progress reports;
- technical notes and internal memos;
- copies of all correspondence;
- resource management reports with a comparison of actual to planned;
- copies of relevant administrative notes and memos;
- copies of all invoices and other detailed financial information;
- miscellaneous project research and backup notes.

Volume 2

- copies of project documentation.

As indicated on the Project Organization Chart, a Corporate Quality Review Panel has been established. The object of this Quality Review Panel is to provide an independent corporate review which examines all contract and interim deliverables prior to their submission to NRC. The major criteria the Quality Review Panel uses in the review process are as follows:

- Are the deliverables responsive to the specific requirements and guidelines of NRC?
- Are the proposed/alternatives realistic and/or technically feasible?
- Are the deliverables responsive to NRC needs?
- Is the proposed design cost-effective to implement?
- Do the various deliverables convey the proper technical and managerial perspective, are they clearly and concisely written, and do they meet the editorial standards of the firm?

The Quality Review Panel not only examines contractually specified deliverables, but also reviews all interim reports prepared during the course of the project. Any interim report or draft of a contractually required report that does not satisfy the criteria above is returned to the Project Manager for immediate review and revision. The Quality Review Panel must approve all deliverables before they are formally transmitted to NRC.

has more than 20 years experience in systems analysis, design, development and implementation. He currently is responsible for the management of all of Wilson Hill's Data General software development projects. His extensive experience on the DG MV/8000 will directly benefit this project as applied in his role as a member of the Quality Review Panel.

The primary responsibility for project management and quality control, however, remains with the Project Manager. The performance standards and reporting criteria are developed at the beginning of each project through close dialogue between Wilson Hill and the NRC. The Project Manager will communicate these standards to all of the project staff clearly and early in the project to avoid any misunderstandings, misinterpretations, or misdirection of project resources.

4.3 PROJECT MANAGEMENT PHILOSOPHY

The project management philosophy of Wilson Hill is structured to fulfill our goal of guaranteeing complete client satisfaction on all of our projects. The basic tenets of this philosophy which were discussed in the previous paragraphs are summarized below:

- Authority Commensurate with Responsibility

  Full authority must go along with responsibility. The Project Manager has the authority to make on-the-spot commitments of the resources at his disposal.

- Close Contact with Client

  The project must be afforded complete visibility. Close communications must be maintained with client personnel assigned responsibility for the contract and the project in all technical and contractual areas.

- Highest Quality of Work

  Deliverables must be timely and consistently of the highest quality. Rigid quality assurance procedures must be maintained, and periodic (bi-weekly) reviews of task activities scheduled. Tasks must be accomplishd within the time and resources allotted to them, and each with the quality promised.

- Open Staff Communications

  The Project Manager and Project Director must be in continual contact concerning the project. Communication lines among staff members will be open and contact frequent.

To ensure that the tenets of our philosophy, as outlined above, are followed, Wilson Hill clearly identifies the scope and requirements of the project. The overall project is subdivided into a set of well-defined tasks, as specified in the Detailed Task Plan in Section 3. To attain control and ensure quality, a series of sub-tasks are identified and for each individual sub-task, the objectives are specified as well as the end products to be delivered, and the schedule to be followed.

- Definition of Tasks and Objectives

  For each task Wilson Hill will specify the objectives to be accomplished. A physical product will be associated with the completion of each task or sub-task, as "hard evidence" that the task has been completed. This product may be a list of persons contacted, a letter to the project files, or a short report to be included in a later report. Controls are strict and continuously applied.

- Detailed Specifications of Expected End Products

  Wilson Hill specifies clearly and thoroughly the expected end products of the project. Since these products must be consistent with client satisfaction, early agreement is established regarding what the client expects, covering subjects ranging from the format and content of all reports to the findings. In this way, there will be no surprises.

- Development of Schedules

  A detailed schedule will be developed which includes the start and end dates of each task. Biweekly review meetings, monthly progress reports, and interim report dates are established and integrated into the schedule. Meetings with the NRC Project Officer as desired.

- Resource Allocation and Internal Controls

  Given the task statements, the end products and the schedule, our professional resources as allocated as required to carry out the project successfully.

- Reports

  Biweekly reports covering both progress and cost are provided. These reports include a discussion of our activities, the problems encountered and the solutions adopted, the planned activities for the next reporting period and the anticipated problems ahead. Also included are results of bi-weekly project review meetings.

4.4 PROJECT STAFFING PHILOSOPHY

Wilson Hill's proposed staff will come to the project fully qualified to begin the technical activity as detailed in our technical work plan. As they undertake these tasks, they will also accumulate knowledge specific to NRC's procedures and standards -- knowledge that will permit them to respond more and more rapidly and appropriately to NRC requirements. Thus, it is important that the same staff members, whenever possible, perform related activities.

Wilson Hill's policy is to attempt to staff all contract activities with full-time personnel already in the company's employ. The turnover of unavailability of staff for any reason will be minimized on the IMS Project by:

- Wilson Hill having a significant number of staff having DG MV series computer experience.

-

- Wilson Hill maintaining at least two full-time employees on the project at all times, ensuring redundancy/continuity should there be any unforeseen staff turnover.

Wilson Hill will commit the total resources of the firm to the successful completion of this project. We assure the availability and dedication of the Project Director, Project Manager and other key project staff.

SECTION 5. PROPOSED PERSONNEL

The proposed staff for the accomplishment of NRC's IMS II project possesses extensive experience in all phases of the tasks required for this project. Presented here are Wilson Hill personnel who have demonstrated experience in one or more of the following disciplines:

- Systems Analysis and Design.
- Requirements Studies.
- Systems development for online, interactive systems using the DG MV6000/8000 series hardware unser AOS/VS.
- Systems development utilizing COBOL with full screen editing..
- Fortran/scientific programming experience.
- Utilization of DG's Command Language Interface (CLI).
- Documentation of online - real time interactive systems.
- Systems Testing.
- Training.

The specific project personnel proposed will be shown here as the entire team Wilson Hill will make available to NRC. These people will be available either on a full time basis or as required to perform the varied functions required by the phases of this project. We have identified and commited personnel who are key to the project as well as support personnel who will perform specific functions. This will allow for both continuity of the project from an experience standpoint as well as the utilization and application of specific disciplines where needed to support the effort.

5.1 PROPOSED PROJECT TEAM

Wilson Hill presents the following personnel for the completion of this project. These employees are shown within the functional category we feel necessary to perform this task.

5.1.1 Management

- Mr. Jack Berkut - Project Manager. Mr. Berkut's role will be to provide technical direction to the project team and provide overall coordination with NRC's project director.

5.1.2 Quality Assurance Review Panel

5.1.3 Key Personnel

- Mr. Phillip Saunders - Senior Analyst
- Mr. Ronald Hirschhorn - Senior Scientific Analyst/Programmer

These three employees will be dedicated to NRC for the duration of the project and will be directly responsible for the completion of the technical phases of this project.

5.1.4 Technical Support Personnel

These individuals will actively participate in various phases of the project in support of the key personnel. will participate in the Requirements Phase having performed several requirements studies and being intimately familiar with Wilson Hill's structured approach to project development. is a training specialist as well as a documentation specialist and will participate in these phases of the project. has extensive design and development experience on the DG MV 6000/8000 series and will participate in the systems development phase.

5.1.5 Additional Support/Backup Personnel

These individuals will be available if necessary to replace and or supplement active project personnel. They possess skills which are directly relevant to this project particularly in the areas of scientific/Fortran programming and the development of Systems and User documentation.

5.2 SKILLS MATRIX

The following skills matrix as shown in Exhibit 5-1 represents a composite of the disciplines and experience of the proposed project personnel.

5.3 PROPOSED PERSONNEL RESUMES

The following section presents the detailed resumes of the entire project team including the additional backup/support personnel.

SECTION 6. RELATED CORPORATE EXPERIENCE

Wilson Hill has for the past 6 years been involved in the development and implementation of large scale business and scientific systems primarily for the U.S. Government. We have been involved with every segment of the systems life cycle from requirements studies through user training. Our professional staff has experience in the entire range of engineering and data processing disciplines for the support of over 150 clients.

As is illustrated in the specific experience citations, Wilson Hill has remained at the forefront in the development of skills and technological advances in providing system services that directly relate to the requirements at NRC.

The remainder of this section provides a brief corporate history and background, and specific client citations which directly relate to the NRC requirements.

6.1 CORPORATE EXPERIENCE AND QUALIFICATIONS

Wilson Hill was established in 1978 to provide professional and technical services to the public and private sectors. In the years since its founding, Wilson Hill has grown into a company of 120 professional, technical and support personnel dedicated to the analysis design, development and implementation of computer-dependent products. The team of engineers, computer scientists, operations research analysts, engineering psychologists, policy analysts, documentation specialists, subject-area specialists and support staff has successfully engaged in efforts ranging from the design of a distributed decision-support system for the U.S. Coast Guard to the development of a long range ADP computer hardware and telecommunications plan for the Federal Aviation Administration.

With offices in Washington, D.C., and Sagamore, Massachusetts, and a computer center in Arlington, Virginia, Wilson Hill has the capabilities and capacity to develop solutions, using advanced technologies, to a wide range of scientific and technical problems.

6.2 CORPORATE ORGANIZATION

Wilson Hill is organized into three separate yet interdependent groups, as shown in Exhibit 6-1. The functions and capabilities of each are described under the following headings.

Advanced Systems Group

Wilson Hill's Advanced Systems Group (ASG) is responsible for the engineering, design, development, implementation, and management of computer systems and embedded computer subsystems. ASG is subdivided into three divisions, as illustrated in Exhibit 6-2.

With a unique blend of computer scientists, telecommunications specialists, systems engineers, engineering psychologists, and procurement specialists, the System Engineering Division (SED) has been successful in supporting government and commercial client's hardware and software acquisition and development efforts. Providing a level of technical ability and objectivity not often available within other companies, SED's efforts have enabled numerous clients to acquire hardware, software and timesharing services which are of optimal benefit in the short to mid-term, and which will remain suitable in the long term.

In pursuing contractual objectives, SED has been involved in:

- Computer Systems Engineering
- Human Factors Engineering
- Computer Performance Management

CORPORATE ORGANIZATION

OFFICE OF THE PRESIDENT

ADVANCED SYSTEMS GROUP	TRANSPORTATION SYSTEMS GROUP	TRAINING TECHNOLOGY GROUP
Computer Systems Engineering	Transportation Planning	Instructional Systems Design
Software Engineering & Development	Transportation Systems Engineering	Courseware Development
Systems Development		Computer-Based Training Systems
		Trainers/Simulators

EXHIBIT 6-1. CORPORATE ORGANIZATION

ADVANCED SYSTEMS GROUP ORGANIZATION

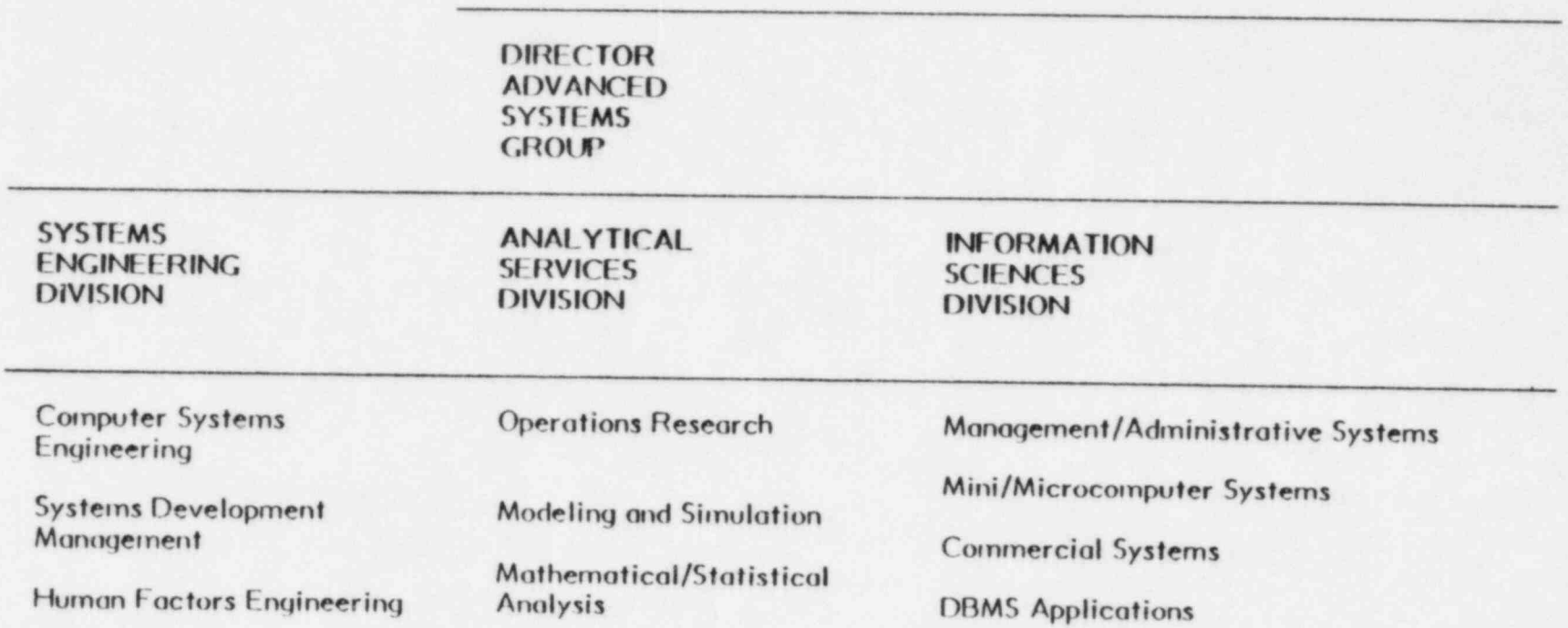


EXHIBIT 6-2. ASG ORGANIZATION

- Independent Validation and Verification
- Configuration Management.

ASG's Analytical Services Division (ASD) is involved in efforts pertaining to development of computer-based solutions to scientific problems. ASD personnel include engineers, mathematicians and statisticians, operations research analysts, physical scientists, management analysts, and computer scientists. ASD is successfully performing contracts in areas including:

- Software Engineering
- Operations Research
- Modeling and Simulation
- Mathematical/Statistical Analysis
- Program Planning and Evaluation.

The Information Sciences Division (ISD), under whose domain the NRC project will fall, is engaged in front end studies, the design, development, implementation training, documentation and maintenance of automated information systems and related manual systems. ISD efforts encompass the full spectrum of software engineering and life cycle activities, and are supported by a professional team of computer and information scientists, telecommunications specialists, engineers and subject area specialists. ISD efforts include development of:

- Management/Administrative Systems
- Mini/Microcomputer Systems
- Data Base Management System Applications
- Commercial Systems.

Transportation System Group

Wilson Hill's Transportation Systems Group (TSG) provides support to the transportation development, management, and operational activities of government and private organizations. TSG's staff of transportation planners, operations research analysts, engineers, and computer scientists are engaged in the following types of contractual efforts:

- Transportation Planning
- Transportation Systems Engineering
- Transit System Design and Evaluation
- Transit Management Information Systems
- Operations Research.

Training Technology Group

Wilson Hill's Training Technology Group is engaged in the design and development of computer-based training systems. Our engineering psychologists, educational psychologists, computer scientists and support personnel are involved in:

- Instructional Systems Design
- Courseware Design and Development
- Development of Computer-based Training Systems
- Design and Development of Part Task and Maintenance Trainers.

Exhibit 6-3 provides a summary of selected Wilson Hill corporate experience considered most relevant to the functional areas of expertise required on the IMS II project. Specific project descriptions follow Exhibit 6-3.

	NRC IMS/IDAS SUPPORT SERVICES	DEFENSE LOGISTICS AGENCY	FAA DATA MANAGEMENT SUPPORT	FAA ORACLE DBMS STUDY	FAA GRANTS MANAGEMENT SYSTEMS	FAA AIRPORTS CERTIFICATION SAFETY SYSTEM	FAA AIRSPACE RULES	DEPARTMENT OF JUSTICE	FAA CRUZMOD	HUD MIDLIS SUPPORT	CMSA UMPS SUPPORT	AMERICAN ASSOCIATION OF MOTOR VEHICLES ADMINISTRATORS
REQUIREMENTS ANALYSIS	X	X	X	X	X	X	X		X	X	X	X
FEASIBILITY STUDY/COST BENEFIT ANALYSIS		X	X		X	X	X	X	X			
CONCEPTUAL AND DETAILED DESIGN	X	X	X	X	X	X	X		X	X	X	X
ONLINE INTERACTIVE SYSTEMS	X	X	X	X	X	X	X	X	X	X	X	
SYSTEM DEVELOPMENT	X		X	X	X	X	X			X	X	X
DBMS	X	X	X	X	X	X	X	X		X	X	X
TESTING	X		X	X	X	X	X	X	X	X	X	X
DOCUMENTATION	X		X	X	X	X	X	X	X	X	X	X
SCIENTIFIC APPLICATIONS	X	X							X		X	
USER TRAINING	X		X		X	X	X		X	X	X	X
NRC EXPERIENCE	X											
DATA GENERAL	X		X	X	X	X						

EXHIBIT 6-3. CORPORATE EXPERIENCE SUMMARY

6.3 CORPORATE FACILITIES AND EQUIPMENT

FACILITIES

Washington, D.C., (Corporate Headquarters, ASG) - 13,000 sq. ft.
Sagamore, Massachusetts (TSG) - 1,500 sq. ft.
Arlington, Virginia (ASG Computer Center) - 1, 700 sq. ft.

COMPUTERS

WANG VS 80
Hewlett-Packard 250
Apple II+ (3) IBM-PC
Dasher 400 Terminals
DEC Writer II
WANG Terminals
Corvis Hard Disk Drive
OMNINET

TITLE: **IMS/IDAS SUPPORT SERVICES**

CLIENT: U.S. Nuclear Regulatory Commission
Office of Resource Management

Wilson Hill is providing the Nuclear Regulatory Commission with a team to conduct operations and maintenance support for the Intermediate Dose Assessment System (IDAS) and the Information Management System (IMS).

The Intermediate Dose Assessment System, which is currently installed and operational, is an automated analytical tool that assists the Office of Inspection and Enforcement (IE) in assessing and making recommendations regarding actions necessary to protect the health and safety of the public, and to estimate the consequences of an incident at a nuclear power facility. The system currently consists of models that provide for DOSE calculations, transport and dispersion projections, and source term analysis. A graphic subsystem is also used to provide a graphical representation of the results.

The Information Management System, of which IDAS will become one functional module upon IMS implementation, is currently in the development stages. The IMS system is needed to ensure that adequate and appropriate information is available to each of the component teams of the NRC emergency response organization. This system will manage the flow of information in the NRC Operations (OPS) Center. IMS will provide an efficient information resource during normal operations, suport for an effective emergency response by channeling appropriate information to each participant, and archival information for review. IMS will ultimately be an integration of computer-aided tools such as IDAS and will execute on concurrent computer systems.

The IMS/IDAS system must offer operational readiness and integrity on a 24 hour a day - every day - basis. Because of the around-the-clock time frame and the importance and reliance placed on the system, the NRC requires support to perform all ADF duties related to the operation maintenance and upgrades to the IMS/IDAS hardware/software.

Wilson Hill personnel are providing support in three task areas:

- ADP Systems Management
- IMS/IDAS Applications Software Procedures
- Data General Systems Software

Under ADP Systems Management, the Wilson Hill systems coordinator is responsible for the integrity and control of system hardware, software and system utilization. Specifically, the coordinator is responsible for:

- monitoring and changing access control during and after incident modes and whenver needed for system integrity;
- assigning and terminating NRC users access to the system via Data General (DG) utilities and maintaining current user access lists used for mailing data to and contacting users as necessary;
- supporting NRC users in the use of the DG system and related DG software;
- supporting NRC users in the use of IMS/IDAS software and related hardware (e.g., graphics terminals);
- maintaining a DG and IMS/IDAS documents library and issuing upgrades, when required, to all cognizant personnel;
- managing systems/applications programming, testing, implementation, documentation, and integration of documentation into systems and user libraries;
- monitoring all systems operations/programming and implementing changes;
- training of NRC usrs in user aspects of IMS/IDAS and related hardware/software;
- supporting modeling personnel as to all special IMS/IDAS data base and file access routines.

Tasks involving IMS/IDAS Applications Software Procedures include:

- installing, modifying, and testing IMS/IDAS software;
- receiving, installing, and/or modifying IMS/IDAS data files and data bases

- supporting modeling personnel in modifying their respective models in relation to unique IDAS system calls; modifyng new/revised software received from various sources with unique IDAS system calls;

- creating test data bases;

- non-model related programming as required to support the NRC OPS CENTER mission in relationship to the IMS/IDAS;

- IMS/IDAS system and user documentation upgrades affected by software and procedural changes.

Data General system software tasks involve: FORTRAN, F77, BASIC, SED, SPEED, INTEGRATED CEO, TRENDVIEW, CLI, ASSEMBLER, SYSTEM UTILITIES (e.g., FED, SORT), AOS/VS, INFOS II, SWAT, and various system/user CLI macros. Specific activities include:

- installation new DG software and upgrades (new releases) of existing DG software as required;

- developing and running test procedures to ensure that DG software installations and upgrades do not have a negative impact on IMS/IDAS or system performance in any way;

- interfacing with DG software support group to report software bugs and problems and determining the proper resolution;

- documenting system macros and operational procedures and all related upgrades;

- designing and installing system macros as required to affect a more efficient systems operations for users and systems operations; macros of this type include but are not limited to backup and recovery procedures, system UP, DOWN, hardware recovery procedures, user assist procedures, etc.;

- support in the testing of all new or upgraded software or when deemed required.

TITLE: DISPOSAL AUTOMATED INFORMATION SYSTEM (DAISY)

CLIENT: Department of Defense
Defense Logistics Agency

In a major technical support contract with the Defense Logistics Agency, Wilson Hill has made extensive use of Strategic Systems Planning (SSP) and Structured Analysis Techniques (SAT) to gather, depict and analyze Defense Property Disposal System activity and data requirements in a logical manner.

Automated tools are being used to aid in the development of an integrated data base design and data dictionary. These tools permit extensive modeling of user views of data, logical designs, user vocabularies, and many other factors which impact successful system implementation.

The Defense Property Disposal System (DPDS) is a worldwide organization with five regional offices responsible for managing over 200 Property Disposal Offices (DPDOs) and their offsite branches (OSB). Each DPDO has the responsibilities typically associated with inventory handling, plus the responsibilities unique to handling a great variety of excess property, i.e., classification, special handling, etc. Additionally, each DPDO is directly involved in the sale of scrap and useable surplus property and in promoting the reutilization of excess property throughout DOD and other authorized users.

The current automated information systems in support of DPDS are resident on two different computer systems operated by the Defense Logistics Services Center and several data entry and other systems in the field, and cannot, therefore, be satisfactorily integrated or upgraded to meet DPDS needs. Wilson Hill is providing technical support for all systems engineering and technical analyses necessary to synthesize and document the Defense Property Disposal Service (DPDS) requirements for an integrated, automated information system (AIS) to meet its current and projected operational and management needs.

Wilson Hill has produced a Management and Functional Requirements (MFR) document, a System Decision Paper (SDP), a Baseline Functional Specification (BFS), and an SAIS Applicability Analysis report. DLA Life Cycle Management (LCM) documentation procedures (based on DoD 7935) were used throughout this project.

During this effort, Wilson Hill has reviewed DPDS Mission Element Needs (MENS), relevant policies and instructions, and the mission and responsibilities statement for DPDS. The resulting Management and Functional Requirements (MFR) document defined the functional requirements to be fulfilled by DAISY.

Wilson Hill then defined and assessed alternative means of meeting DPDS automation objectives and analyzing the cost and benefits implicit in the implementation approaches in a System Decision Paper for Milestone I (SDP-I) of the system life cycle. This document was used to advise the Director, DLA on various alternatives available and approximate costs and benefits for each. The SDP-I was used by the Director to approve an operational concept and to authorize subsequent project efforts.

Subsequent tasks involved the translation of the Management and Functional Requirements (MFR) and the key decisions made as a result of the SDP-I into the Baseline Functional Specification (BFS). The purpose of the BFS is to provide a bridge between the MFR and SDP-I documents and the Functional Description (FD) document to be prepared during the ADP design process in Milestone II of the System Life Cycle. The BFS partitions the system into logical applications and subsystems. Associated information needs are grouped into logical data bases. System contraints, performance requirements and design standards have been included.

Wilson Hill then conducted an analysis and assessment of current DLA standard software systems which have potential for meeting DPDS functional requirements. Based on this analysis, Wilson Hill will develop design alternatives utilizing Standard System Software to satisfy the DAISY requirements.

In addition Wilson Hill was tasked to incorporate a new function - that of administering and operating the Contractor Inventory Redistribution System (CIRS) - into the DAISY LCM documentation. This was accomplished employing standard system change control procedures.

TITLE: TASKS PERFORMED FOR DATA MANAGEMENT SUPPORT OF THE FAA/AMS-300 MISSION

CLIENT: U. S. Department of Transportation
Federal Aviation Administration

In an ongoing task order contract, Wilson Hill is providing technical support to the Federal Aviation Administration in defining data management systems requirements. Tasks conducted by Wilson Hill are summarized below. Details of specific tasks are contained on the following pages.

- Developed the necessary documentation to support the required analysis and management briefing and approvals to proceed with the design and implementation of the System Plans And Programs Division System (18)

- Developed the statement of requirements report necessary for approving an automated data system for the Procedures Division and the Executive Staff (23)

- Determined and documented requirements, prepared detailed system design specifications, developed programs, wrote user documentation, and provided user training in five regional offices in support of the implementation of the Regional Airport Improvement Program (21)

- Developed documentation required for approving the use of DNA-4 on the Data General Eclipse MV/8000 computer, using the Interim Grants System and RUS as reference systems. Work included an evaluation of the performance of DNA-4 compared to the System 2000 Interim Grants System and the Oracle Evaluation test data base (20)

- Developed and implemented ADP computer programs and provided necessary documentation to support organizational studies for possible tower closings (25)

- Performed program development, converted and entered data, and provided documentation to support modifications to the Error Analysis And Evaluation System. Modifications were designed to increase efficiency and decrease response times; allow the printing of data shown on the screens currently, and modify the system to allow for an increase in volume of data by a factor of ten (24)

- Modifications were made to the Airspace Rules Information System to improve records tracking capabilities (22)

- Provided expertise in programming, system testing, installation, and documentation to support the Administrator's Correspondence Control and Information System, the Airspace Rules Processing and Reporting System, the Air Traffic Rules Processing System, and the Air Traffic Problems and Analysis System on WANG VS 80 and 100 minicomputers. Documentation included user manuals, operational procedures and program maintenance manuals. These systems were designed and implemented by Wilson Hill under earlier contracts. (26)

- Developed seven reports to count the population and households within a 20 - mile radius of airports that are included in the National Plan of Integrated Airport Systems. (27)

- Performed an evaluation study to determine the advisibility of using the Oracle database management system on the Data General Eclipse MV/8000 computer, using the Interim Grants System and RUS as reference systems. (17)

- Designed, implemented, and documented the Air Traffic Rules Processing System by developing a word processing/data processing interface which lists all current air traffic rules, track status of rule waivers and exemptions and maintains an historical record of past rules. All data is accessable to word processing and can be edited or up-dated on line. This effort included preparing a test plan and ensuring accuracy of test results.(16)

- Completed the feasibility study and requirements analysis necessary to proceed with automation of the Airspace Rules Branch office operations. Designed and implemented the system which produced the FAA annual Advisory Circular, a compilation of airspace rules and regulations. All document editing is accomplished through a word processing interface with the system. Now rules can be updated in word processing and automatically recorded in data processing which maintains a history and cross reference on each rule. (15)

- Determined the current and future voice, data and office automation telecommunications requirments for the Mike Monroney Aeronautical Center in Oklahoma City for the next 10 years. This included data gathering, questionnaire development, analysis and documentation of current and future requirmeents. (32)

- Performed a functional requirements analysis study to determine areas and methods of potential improvement in the Airport Grants Management Program. Improvements were effected through the automation of the data collection and reporting process on an in-house computer (Data General Eclipse MV/8000). Wilson Hill designed an automated system with accompanying specifications to satisfy these requirements. (14)

- Performed a functional requirements study to determine areas and methods of potential improvement in airport inspection procedures through the automation of the data collection and reporting process of the Airport Certificiation/Safety Programs. (13)

- Conducted a major study to identify alternative computer hardware and telecommunication configurations to support the FAA's administrative management information system requirements from 1985 through 2000. This included a transition plan and a sensitivity analysis. (12)

- Assisted with the selection of a vendor for timesharing resources. Developed the complete RFP solicitation document, benchmarked system requirements and advised the evaluation team. (10)

- Supplemented 83-101(32) by performing a station survey of the existing voice and data telecommunications equipment. Data gathering, questionnaire development, data analysis and documentation were included in this task. (50)

- Performed a cost benefit analysis of the feasible system/network alternatives for satisfying the current and future voice/data telecommunications requirements as documented under 83-101(32). This included the identification of feasible alternatives and a

cost/benefit analysis of each alternative considered including a sensitivity analysis, return on investment (RCI) and transition impact. (42)

- Conduct a requirements analysis of the current and future voice, data and office automation telecommunications requirements for the FAA Metropolitan Washington Airports at Washington National Airport and Dulles International Airport for the next ten years. This analysis includes data gathering, questionnaire development, data analysis and the documentation of all requirements. (38 and 44)

83-101-17

TITLE: **EVALUATION STUDY OF ORACLE DATABASE MANAGEMENT SYSTEM**

CLIENT: The United States Department of Transportation
Federal Aviation Administration

Wilson Hill Associates provided support to the Federal Aviation Administration by performing an evaluation study to determine the advisibility of using the Oracle database management system on the Data General Eclipse MV/8000 computer, using the Interim Grants System and RUS as reference systems.

In this effort, Wilson Hill staff conducted the following:

- Wrote a program to extract data from the Interim Grants System database in a format compatible with the data loading feature of Oracle.
- Designed data tables for the Oracle data base and loaded the extracted data into them.
- Loaded test sample RUS data.
- Exercised the Oracle capabilities, including interactive and batch processing, ad-hoc queries, reiterative queries, screen processing, ad-hoc reporting, and processing in a multi-user environment.
- Provided an Evaluation Report on the performance of Oracle compared to the current S2K Interim Grants System. This evaluation was made based on exercising the criteria for evaluation against identical S2K and Oracle data bases.
- Included in the Evaluation Report the performance of Oracle compared to the current RUS system.
- Acquired and loaded Oracle DBMS on FAA Headquarters Data General Eclipse MV/8000 for a 90 day test period.

TITLE: REQUIREMENTS ANALYSIS AND DESIGN OF HEADQUARTERS GRANTS MANAGEMENT SYSTEM

CLIENT: The United States Department of Transportation
Federal Aviation Administration

Wilson Hill provided support to the Federal Aviation Administration by performing a functional requirements analysis study to determine areas and methods of potential improvement in the airport grants management program. Improvements were effected through the automation of the data collection and reporting process on an in-house computer (Data General Eclipse MV/8000). Wilson Hill designed an automated system to satisfy these requirements.

In this effort, Wilson Hill staff conducted the following:

- Reviewed and analyzed existing reporting requirements and procedures to determine current and future data requirements by headquarters
- Conducted interviews with FAA personnel to determine the applicability of interfacing the grants management data system with other systems (both automated and non-automated) within FAA and DOT
- Produced a Statement of Requirements
- Produced a systems design to meet these requirements including a statement of cost and time estimates necessary to implement the system.

83-101-13

TITLE: REQUIREMENTS REPORT FOR AN AUTOMATED AIRPORTS CERTIFICATION SAFETY SYSTEM

CLIENT: U.S. Department of Transportation
Federal Aviation Administration

Providing support to the Federal Aviation Administration (FAA), Wilson Hill is performing a functional requirements study to determine areas and methods of potential improvement in airport inspection procedures through the automation of the data collection and reporting process of the Airport Certification/Safety Programs.

Specific tasks include:

- Conducting a review and analysis of existing reporting requirements and procedures to determine current and future data requirements by headquarters and regional personnel.

- Determining the applicability of interfaces of Airport Certification/Safety data with other systems within FAA.

- Evaluating alternative courses of action and producing a statement of requirements which includes cost and time estimates necessary to develop a system proposal to automate the data collecting and reporting procedures of the Airport Certification, Compliance, and GA Safety programs, and the scheduling of FAA-performed Airport Data inspections.

TITLE: **OFFICE AUTOMATION STUDY FOR THE AIRSPACE RULES BRANCH**

CLIENT: The United States Department of Transportation
Federal Aviation Administration

Wilson Hill Associates is providing office automation support to the Airspace Rules Branch of the Federal Aviation Administration. Prior to automation, the branch maintained 5,684 papercopy rules which governed the use of airspace around airports and designated flight paths. Each year, the office manually compiled and produced a voluminous issue of the Federal Register listing the rules and rule changes.

Wilson Hill Associates completed the feasibility study and requirements analysis necessary to proceed with the automation of the Airspace Rules Branch office operations. WHA then designed and implemented the system which:

- Monitors a list of all rules and rule changes
- Has an on-line cross reference capability
- Automatically produces the "boiler plate" portions of the paper work required for a proposed rule change
- Generates management reports
- Cuts processing time by 70%-80% from the manual system

The automated system produces the FAA annual Advisory Circular, a compilation of airspace rules and regulations. All document editing is accomplished through a word processing interface with the system. Now, rules can be updated in word processing and automatically recorded in data processing which maintains a history and cross reference on each rule.

TITLE: **SYSTEMS ANALYSIS, DESIGN AND PROGRAMMING SUPPORT FOR CENTRAL SYSTEMS**

CLIENT: United States Department of Justice
Office of Information Technology

Wilson Hill provided technical support to the Justice Department's (DOJ) Office of Information Technology in the following areas on a task order basis: distributed data base systems, mini and micro computer systems, office automation systems, and data base management systems.

For the Drug Enforcement Administration (DEA), Wilson Hill developed specifications for the Drug Theft System. The Drug Theft System is an automated information system developed by the Strategic Intelligence Section to provide for the capture and summarization of data regarding the theft or loss of controlled substances as reported by DEA registrants. The reporting of such data is required by the Controlled Substances Act. The processing for the Theft System and other systems nearly exceeded the processing capacity for the existing hardware. For this reason, as well as the general obsolescence of the system itself, the Statistical Services Section phased out its operation and replaced it with a comparable theft system at the Justice Data Center. (01)

Wilson Hill conducted a conversion of the theft system from HP9867 to Amdahl V6/V7. This system will serve as an interim system, having the same capabilities as the existing system, until a new, more comprehensive theft system can be developed.

Wilson Hill conducted similar work for the U.S. Marshals Service (USMS). The USMS District Workplan and Headquarters Reserve Tracking System currently operates with FOCUS software on the Amdahl V6/V7 mainframe at the Justice Data Center. The performance of the system had been excessive in operation expense, inadequate in its ability to compile and compare certain data types and unreliable in transmission of data.

In supporting the USMS, Wilson Hill conducted a conversion of that system to one operating on an IBM PC-XT written in RBASE. The conversion involved system analysis and design, development, installation, and user acceptance. The converted system will allow USMS users to:

- consolidate data bases from remote PCs to a HQ-based PC.

- produce form letters (and mailing labels or envelopes) for the purpose of responding to transactions entered on the system by District work plan or reserve managers. (02)

In other work for the USMS, Wilson Hill performed a requirements analysis of the records storage and retrieval needs of the USMS to determine a feasible microfilm system(s) developed to support the Service. Wilson Hill then developed a plan for a microfilm storage and retrieval system based on the findings of the requirements analysis. The plan detailed volume of material to be filmed by type of material; methodology for transportation of records and film; methodology for indexing records; and equipment requirements, both Headquarters and field. (03)

TITLE: **MODIFICATION AND ENHANCEMENT OF THE FAA/AEE FUEL CONSERVATION AIR TRAFFIC ROUTE EVALUATION MODEL (CRUZMOD)**

CLIENT: U.S. Department of Transportation
Federal Aviation Administration

The Fuel Conservation Air Traffic Route Evaluation Model (CRUZMOD) is an operational model running on an Apple IIe micro computer that estimates fuel burnt by a variety of aircraft flying user selected routes and altitudes. This model uses wind and temperature data collected by weather balloons and extracted from a computerized data base via automatic dial up and extraction routines.

Wilson Hill provided technical expertise to improve both the model's operation and the accessability of the model to the user. Work to improve user interface included: revision of routines to allow an untutored user to use the routine with little or no reference to the Instruction Manual; development of routines to improve the use of graphically displayed weather maps; and modifications to increase the time alloted the user to correct errors.

To decrease the execution time and disk storage requirements, Wilson Hill evaluated software such as Applesoft Basic, machine language and assembly language, compiled integer basic routines and programs, and commercially available Apple II software packages and included them in the system when appropriate.

Wilson Hill also reduced the complexity of specific instructions in the Instruction Manual to enhance error-prevention, fuel burn accuracy, and user efficiency. In addition, a 48" x 6" digitizer was installed to obtain flight information from large geographic and route maps.

All changes to the CRUZMOD system were documented in the user manual and program manual.

TITLE: **DEVELOPMENT OF SECTION 8 MIS AND MULTIFAMILY INSURED AND DIRECT LOAN INFORMATION SYSTEM (MIDLIS)**

CLIENT: The United States Department of Housing and Urban Development

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Wilson Hill developed Section 8 MIS and Multifamily Insured and Direct Loan Information System (MIDLIS) Documentation and MIDLIS Training Materials for the Department of Housing and Urban Development (HUD). In addition, technical support was provided on several large on-going tasks.

MIDLIS is a System 2000 based application, implemented as a two-tiered, multiple-data base system providing support to HUD Headquarters and regional offices nationwide. The system contains status and scheduling information tracking the processing of loan applications and supporting the inspection of insured properties.

Wilson Hill's efforts involved:

- Project Planning
- Analysis and definition of system requirements
- Data Requirements Documentation Update
- System/Subsystem Specifications Development
- Test Plan and Test Analysis Report
- System Implementation Plan
- Design, development and implementation of automated systems
- Design, development and implementation of teleprocessing systems
- Maintenance and Modification of automated systems
- Training Plan and Training Lesson Plans
- Terminal Operations Handbook
- Program Maintenance Manual
- System 2000 Report Writer Course Development
- ADP Analysis and Programming Functions (As Required)

TITLE: **UTPS SOFTWARE MAINTENANCE AND DEVELOPMENT PROJECT - TRANSIT NETWORK ANALYSIS**

CLIENT: U.S. Department of Transportation
Urban Mass Transportation Administration

The Urban Mass Transportation Administration (UMTA) is continually developing improved multimodal transportation planning software and procedures. The Office of Planning Methods and Support (PMS), in cooperation with the Federal Highway Administration, creates and distributes an expanding package of planning tools called the Urban Transportation Planning System (UTPS). A major component of this system is a computer-based package which can be used in any community to evaluate existing or planned transportation systems and/or improvements. UTPS is currently improving transportation planning methodology by incorporating the best available means of quantitative analysis.

Wilson Hill assisted UMTA by providing software maintenance and enhancement services for the transit area of UTPS. The software support services are diverse and include:

- Support of the mainframe UTPS programs through:
  - Fast response analysis, recommendation, and repair of software malfunctions reported by UMTA and UTPS users
  - Enhancements to FORTRAN programs to improve the operational procedures (user interface), expand program facilities (incorporate new functions) or improve operational efficiency through the introduction of improved program structure or improved mathematical algorithms
  - Integration and validation of new programs for use within UTPS.
- Development of software tools, programs, and procedures in support of the mainframe UTPS programs on microcomputers. This work was accomplished using Pascal on various micros hosting the UCSD Pascal based Universal Operating System. Efforts to date include:

- -- Development of a generalized interactive Screen Editor
- -- Development of a generalized interactive structured Pascal File Editor
- -- Development of a data management system for the storage and retrieval of matrices and vectors
- -- Development of several front end preprocessors for data intensive UTPS programs.

- General software development support for ongoing UTPS software development projects. Efforts in this area include:
  - -- Authoring the initial draft of the UTPS microcomputer programming standards
  - -- Evaluation of commercial and UMTA funded software products
  - -- Consultation with contractors and universities involved with UMTA funded development efforts.

The efforts under this contract were continued and expanded under Wilson Hill project #83-107.

81-502

TITLE: **TECHNICAL SUPPORT FOR THE INTERNATIONAL REGISTRATION INFORMATION SYSTEM**

CLIENT: The American Association of Motor Vehicle Administrators

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The American Association of Motor Vehicle Administrators (AAMVA) is responsible to the Federal Highway Administration (FHWA) for performing the registration functions of the International Registration Plan. This includes obtaining and administering the software services for the design, implementation and operation of Version II of the International Registration Information System (IRIS).

As a subcontractor, Wilson Hill was selected to write the program specifications for the EDIT and FEE functions of IRIS as well as the programming, testing, documentation and training associated with these functions using IDMS and ANSI COBOL. All specifications and documentation were written using Federal Information Processing Standards Publication 38. In addition, Wilson Hill was responsible for writing detailed specifications for all the input/output (I/O) modules used by IRIS application programs. Following the completion of the specifications, Wilson Hill coded and tested the I/O modules.

TITLE: **OFFICE AUTOMATION FOR THE AIR TRAFFIC RULES PROCESSING SYSTEM**

CLIENT: The United States Department of Transportation
Federal Aviation Administration

The Air Traffic Rules Branch of the Federal Aviation Administration is responsible for formulating and promulgating air traffic policies including procedures, rules and standards. The Branch oversees exemptions from air traffic rules and authorizes special flights into normally prohibited areas. All air traffic rules, waivers, directives and restrictions were maintained in papercopy. The cross referencing, maintenance of historical rules/records, and tracking were cumbersome manual procedures. Wilson Hill Associates automated this system by developing a word processing/data processing interface which lists all current air traffic rules, tracks status of rule waivers and exemptions and maintains an historical record of past rules. All data is accessable to word processing and can be edited or up-dated on-line.

Wilson Hill Associates designed and implemented this system. Initially a feasibility study was conducted, followed by a requirements analysis. Based upon these findings, a system design proposal was developed by Wilson Hill and submitted to FAA management.

The analysis yielded the following results:

- Identification of input/output requirements
- Data element description
- User impact/interface
- Description of current operating procedures
- Benefits rendered by automation

The system proposal/design included:

- Description of input/output formats
- Program specification/function
- Overview of processing function of system
- Description of current manual system
- Automated system requirements (hardware/software)

The final system as designed and implemented by Wilson Hill has a word processing/data processing interface and complete search capabilities. Branch specialists can search the database for a particular air traffic rule or set of rules by using a "Soundex"-like search system based on a number of rule characteristics such as region, date and subject.

82-105-13

TITLE: DEVELOP DETAILED SPECIFICATIONS AND A SYSTEM DESIGN FOR THE AIRPORT IMPROVEMENT PROGRAM

CLIENT: The United States Department of Transportation
Federal Aviation Administration

Wilson Hill Associates prepared an automated system design for the Office of the Associate Administrator for Airports (ARP) within the Federal Aviation Administration (FAA). This Office is responsible for the overall identification, planning, development and safety of the nation's system of airports.

This system design was the logical result of the findings of a previous study conducted by Wilson Hill Associates to identify the data, information and functional requirements of the Capital Improvement Program and of a Project Tracking capability within the Airport Improvement Program (82-105-7).

The automated system addresses the portion of the overall Airports Program that deals with administering and tracking federal grants to support airport planning and development from the planning stage through development and final competition. Although the system will be centrally administered and guided by headquarters, it was designed primarily to facilitate the accomplishment of day-to-day operational and management responsibilities delegated to, and accomplished in, the FAA regional field offices and Airport District Offices (ADO). The system was designed for a Data General MV/8000. Included in the design were the following:

- Identification of input data and sources
- Identification of output products
- Identification of edit/validation logic
- Description of file/data base organization
- Description of processing steps and specific programs
- Preparation of an implementation plan with time schedules and cost estimates.

The system incorporates the current automated reporting system of the Southern and Southwest Regions into one consolidated overall design which expands the functional and operational versatility of the current systems.

Additional capabilities provided by the system include:

- Extensive modeling options for funds projection and allocation
- Extensive project tracking and monitoring capabilities
- Trend analysis reports
- Computer generation and transmission of commonly required FAA standard forms
- Online data entry to a regionally maintained and regionally accessible data base, with automatic transmission capabilities to Washington headquarters
- Modular design to allow for flexibility of use and for future development.

TITLE: **MAINTENANCE SUPPPORT FOR OPERATIONAL SYSTEMS**

CLIENT: U. S. Department of Transportation
Federal Aviation Administration

Wilson Hill has provided extensive support to the Federal Aviation Administration for the development of the following automated systems:

- Administrator's Correspondence Control and Information System (ACCIS)
- Airspace Rules Processing and Reporting System (ARPRS)
- Air Traffic Rules Processing System
- Air Traffic Problems and Analysis System.

Under earlier contract work Wilson Hill designed, developed and implemented each of these systems. Wilson Hill is now providing expertise in programming, system testing, installation, and documentation to support these operational systems on WANG VS 80 and VS 100 systems.

82-111

TITLE: DESIGN AND DEVELOPMENT OF THE HARDWARE PROBLEMS AND SPARE PARTS INVENTORY SYSTEM FOR OVERSEAS WANG MINICOMPUTER SYSTEMS

CLIENT: U.S. Department of State

Wilson Hill Associates assisted the Department of State in the development of two computer based systems. The Hardware Problems system is an application which tracks the location of all WANG hardware and peripheral equipment describing the date, time, and type of any hardware failure. The Spare Parts Inventory System tracks all WANG spare parts, lists defective parts, maintains parts inventory and provides a record of part shipments for all State Department WANG equipment overseas.

Information for the systems is entered through the use of four data entry screens that are displayed on the user's terminal. In addition to creating and maintaining the Problems/Inventory records, system users can produce a number of reports utilizing selected information from the records.

Wilson Hill personnel developed the required programs, conducted system testing, provided system documentation and wrote the user's manual.

TITLE: PROGRAM ACCOUNTING AND MANAGEMENT ATTAINMENT REPORTING SYSTEM REGIONAL DATA BASE SUBSYSTEM

CLIENT: The United States Department of Agriculture/Forest Service

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The Forest Service developed a service-wide system, the Program Accounting and Management Attainment Reporting System (PAMARS) to plan, budget, evaluate, and revise all of its programs for State and private forestry, research, and national forest system management. PAMARS was designed to assist management in the implementation of the Resources Planning Act and Land Management Planning goals and objectives. PAMARS is a methodology that incorporates work planning, financial and accomplishment reporting into a systematic process which results in financial and accomplishment information usable by all management levels.

PAMARS consists of four subsystems: Financial Subsystem; Data Base Subsystem; Attainment Reporting Subsystem; and Work Planning Subsystem. In this project, Wilson Hill provided support for the Data Base Subsystem.

In this effort Wilson Hill reviewed the reporting requirements of Regional offices as they relate to the Financial and Attainment data available quarterly from NFC, and review the requests for reports desired from questionnaire material obtained in 1980.

Project staff designed an interface with System 2000 to provide the user with a selection list of criteria for extraction and summation. The system will then construct S2K commands from the choices given, and extract the proper data. Wilson Hill Associates also designed a report selection interface to allow users to specify row and column headers and format for their extracted data; prepared Warnier Orr program specifications, coded and tested subsystem programs; and provided a user manual.

82-105-T

TITLE: TECHNICAL SUPPORT FOR THE DEVELOPMENT OF AUTOMATED SYSTEMS ON DATA GENERAL AND WANG VS MINICOMPUTERS

CLIENT: The United States Department of Transportation
Federal Aviation Administration

Wilson Hill Associates prepared an automated system design for the Airport Improvement Program (AIP) for the Office of the Associate Administrator for Airports (ARP) within the Federal Aviation Administration (FAA). This Office is responsible for the overall identification, planning, development and safety of the nation's system of airports. The automated system addresses the portion of the overall Airports Program that deals with administering and tracking federal grants to support airport planning and development from the planning stage through development and final competition. Although the system will be centrally administered and guided by headquarters it was designed primarily to facilitate the accomplishment of day-to-day operational and management responsibilities delegated to, and accomplished in, the FAA regional field offices and Airport District Offices. The system was designed for a Data General MV/8000.

Wilson Hill also supported the ARP in its effort to plan and develop the national system of airports. Wilson Hill Associates was tasked to analyze data and prepare a requirements definition and information flow for the functional requirements of the Capital Improvement Program (CIP) and for Project Tracking capabilities within the AIP.

For the Airspace Rules Processing and Reporting System, (ARPRS) Wilson Hill supported system automation by designing, developing and implementing the system on a WANG VS.

Under another task order for ARPRS, Wilson Hill conducted analyses, developed specifications, and programmed, tested, installed, and documented system changes to improve the system's automatic processing features, extend its accessibility, and improve its report capabilities. Wilson Hill also developed an on-line teaching aid and provided training to FAA users in system operation and word processing on the WANG VS. Continuing work begun under a previous contract

for the FAA, Wilson Hill conducted interviews with FAA personnel, performed systems analysis, and developed system documentation to support recommendations that the FAA proceed with the design and implementation of the automated Air Traffic Rules Information Processing System (ATRIPS). When ATRIPS was approved by FAA, Wilson Hill proceeded with the development of ADP documentation for a system proposal and design and prepared detailed design specifications for ATRIPS.

TITLE: **CRASH3 RESEARCH AND DEVELOPMENT**

CLIENT: The United States Department of Transportation
National Highway Traffic Safety Administration

CRASH3 is a large, interactive computer program designed to be used on a timesharing computer system. Coded in FORTRAN, the CRASH3 program is designed to produce estimates of the speeds and energies present in a vehicular collision, based upon evidence collected from the damaged vehicles and from the scene of the accident. Two basic algorithms are used to analyze the collision data in CRASH3, one based on the amount of vehicle crushing damage which occurred, and the other relying on data descriptive of the vehicles' trajectory at the accident scene.

Wilson Hill assisted NHTSA in an effort to expand, correct, and refine the present modes of analysis incorporated in the CRASH3 system. Improved modeling techniques, better empirical data, and additional algorithms were developed to improve the reliability and validity of CRASH3 produced speed and energy estimates for vehicular collisions. The accuracy of results obtainable from the damage calculations was improved. Damage test cases were used to develop new empirical coefficients for the damage analysis; and revised computational procedures for oblique collisions and restitution effects were tested.

The time history trajectory simulation option was tested against measured data from staged collisions to access its validity and identify weaknesses of the procedure. The results of these tests were used to critique the existing trajectory model and to develop and test improvements to it. New capabilities were added to CRASH3 via the integration of new subroutines into the current program. The added logic allowed special cases to be processed which had, until then, not been acceptable to the CRASH3 format.

TITLE: **DEVELOPMENT OF SOFTWARE PACKAGE UTILIZING THE FAA FUEL BURN EQUATION**

CLIENT: U.S. Department of Transportation
Federal Aviation Administration

This project developed a simple to use model to evaluate the impact on air quality of various pollution sources at airports. The FAA models for fuel burn evaluation and emissions from accelerating aircraft (SIMPLEX A) were used in developing the models for aircraft sources.

Wilson Hill Associates supported this effort by creating an interactive, computer-based system which uses FAA-supplied fuel burn and pollution algorithms and has the following characteristics:

- Interactive prompting for operator entry of takeoff roll scenario.
- A natural, interactive, user language for defining scenarios.
- Allow, at user discretion, the entry of either specific or grid matrix receptor sites.
- Output consists of a table of grid points.
- Structure software design employed in order that modules may be updated, deleted, and added to allow for future expansion and feasibility.

Wilson Hill also participated in the review of the completed system, made enhancements to the system, and wrote an instruction manual to guide the user through all steps necessary to run the program and to describe the program's capabilities.

The system was developed for use with the Apple II computer and the BASIC programming language. A digitizer was used to input the graphical data required.