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ADS PILOT PROGRAM PLAN

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1.1 INTRODUCTION

Enormous amounts of data have been and are being gathered by researchers and scientists to answer questions about the Earth and its environment. The Applications Data Service (ADS) is a system based on an electronic data communications network which will permit scientists to share the data stored in data bases at universities and at government and private installations. It is designed to allow users to readily locate and access high quality, timely data from multiple sources. This document, the ADS Pilot Program Plan, describes the ADS Pilot program objectives and the current plans for accomplishing those objectives. The program is dynamic and the Plan will change in response to new needs and technological advances as the ADS evolves through the 1980's.

The ADS Pilot Program Plan is organized into four sections. Section 1 provides an overview of the ADS Pilot program, including major program objectives and the implementation approach. Section 2 defines the Standards Program which is the cornerstone in the development of the ADS system. The ADS concept is demonstrated through pilot programs which are described in Section 3.

1.2 MOTIVATION FOR THE ADS PILOT PROGRAM

The prime motivation for the ADS system is the development of data management techniques to meet the requirements of multidisciplinary and multimission investigations. These investigations, commonly known as correlative research, use data from many sources for a wide range of applications in a variety disciplines. For example, atmospheric and earth scientists are presently collecting data, both space-derived and conventional, for

research in such diverse areas as pollution monitoring and control, water resources management, energy resources exploration, and natural disaster warning. To meet the requirements of a broadly based user community, mechanisms to provide efficient access to and utilization of these data are needed. ADS is that mechanism.

The problems of data location, data access, and data integration are obstacles to the wide use of applications data. The purpose of ADS is to remove these obstacles and to facilitate correlative research by providing visible, easily accessible and standardized methods of processing, storing and distributing applications data. These services will play an important role in the future as the number of users and the volume of data increases.

1.3 DATA SYSTEM CONCEPT

The present OSTA data system includes many independent systems which are used to support mission and science processing requirements. They can be categorized into three basic system types: flight program data systems, discipline user data systems, and archives. In the future, these systems will be integrated in a manner so that they can share data and resources. In addition, policies will be established and new technologies utilized to assure quality, timely data production and availability. The integrating force for these systems is the ADS. A brief description and examples of the three types of systems is provided below.

Flight program data systems are developed to support the specific requirements of a unique mission. According to the overall OSTA Data System concept, the flight programs have full responsibility for producing standardized, high-quality, timely data for the science community and for delivering these data to designated archives. In the ADS era, flight programs will adhere to ADS-developed standards and can use the ADS networking services.

Discipline user data systems are specifically designed as data analysis tools for the science community. Data systems are either research or information-processing oriented, but both types of discipline data systems are well-suited to the ADS purpose of accommodating and improving multi-disciplinary research. The information extraction function of the discipline user data systems provides a test bed for algorithms and model development and for data integration capabilities. The information processing element demonstrates services required by the user community.

Archives, the third type of data system, provide "ready" retrieval of large data quantities. Under the overall OSTA Data System concept, the archives primarily store Level 1A data, georeferenced, calibrated data, which is convertible back to Level 0 data. These archives will offer up-to-date catalogs and on-line ordering services employing ADS standards for interfacing and message format. Both NASA and non-NASA archives are being considered for ADS interfaces, including the EROS Data Center (EDC) and the National Space Science Data Center (NSSDC).

The ADS services provide the key elements for support of correlative research in the present OSTA data system environment. Through standard interfaces and operating guidelines the now diverse processing systems can be integrated to support the sharing of data and resources necessary to meet multi-disciplinary needs.

1.4 PROGRAM OBJECTIVES

The integration of an overall OSTA Data System depends upon the successful development of the ADS concept because ADS represents the binding force among the three types of data systems which support the OSTA functions.The data produced or retained at these facilities will be cataloged, accessed, and dispersed through the services of ADS. When fully developed, the ADS Program Office will be responsible for:

- Developing and maintaining data and communication standards;

- Providing an electronic communications network which interfaces with all the types of OSTA data systems;
- Providing complete cataloging, archiving, and accessing capabilities; and
- Providing data integration services in the future.

A more detailed description of each area is presented below. Figure 1.1 illustrates a potential architectural configuration for ADS.

STANDARDS

The data systems which will utilize the ADS are of widely varying size, configuration and capacity and provide different functions and end products. The initial step therefore toward sharing data and resources is the development of standards for all areas to facilitate data exchange and data handling.

Standards governing the areas of data formats, system interfaces, and data catalogs will enable these diverse systems to locate and access data bases efficiently. A more detailed discussion of the standards to be defined, their integration and their implementation is presented in Section 2.

NETWORKING

To connect the geographically dispersed data bases and data users a communications network will be developed which uses the commercial networks. The network will provide users with access to conventional and remotely sensed data sources through data transmission links among the data bases and their users. Also available via the network will be select user services, including complete interactive catalog services, inter-user communications, Service Center assistance, and, possibly, electronic mail capabilities.

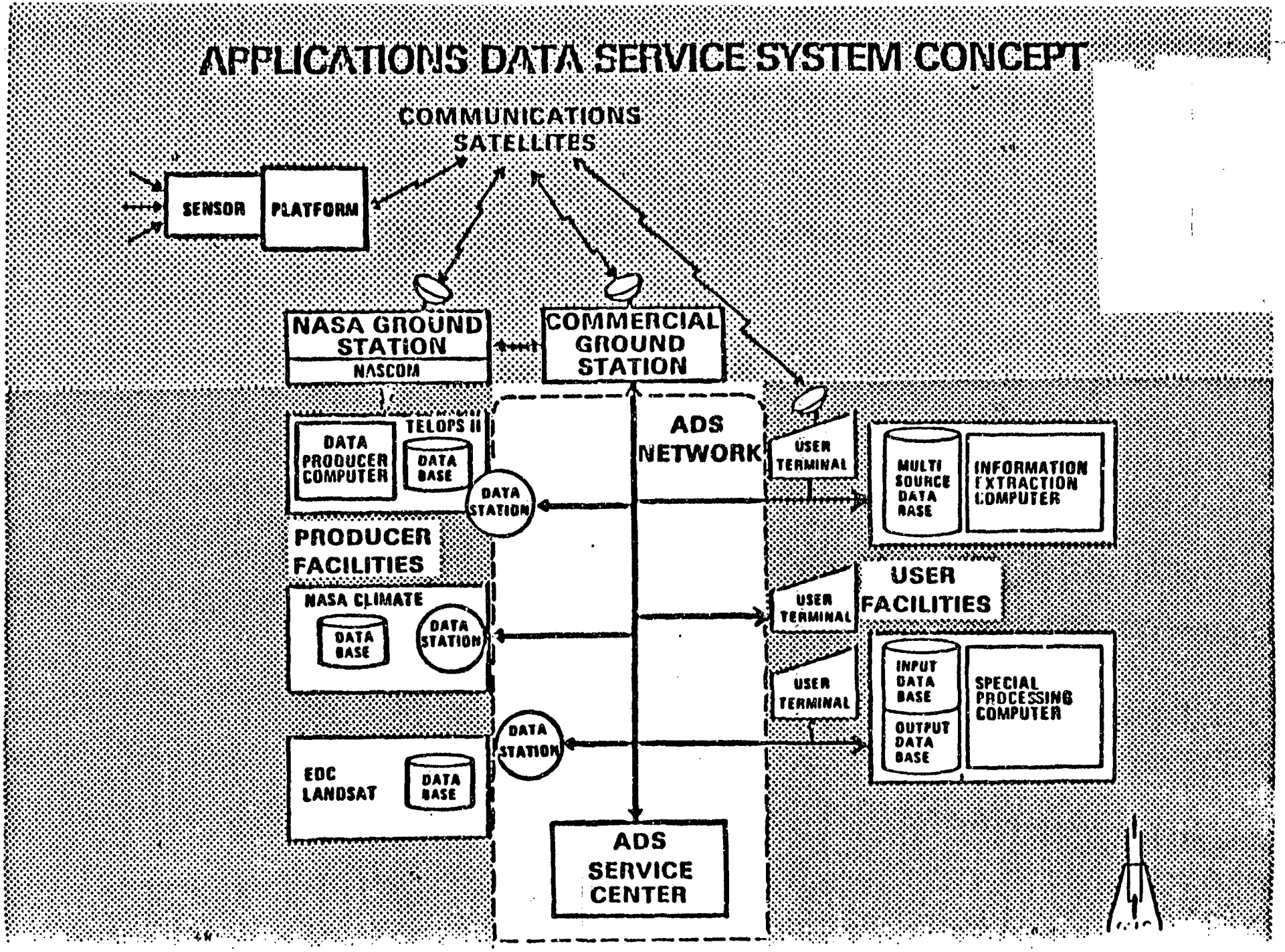

Figure 1.1. Applications Data Service (ADS) System Concept

CATALOGING

Central to the services provided by ADS will be comprehensive directory/ cataloging capabilities and access to distributed archives. Catalogs may exist in a central facility along with archives but more often will be distributed throughout the ADS network in the various data repositories and user facilities. Access to the catalogs and archives will be provided by an electronic network. The inventories and catalogs provide comprehensive information about data sets, including descriptions of processing algorithms, data validation and quality, guidance and restrictions on data use, and detailed product descriptions.

DATA INTEGRATION

An important service provided by the ultimate ADS is the integration and registration of Level 1 data. For example, data integration services include such processes as geolocation of imagery data, selection of scale, and geometric transformations.

The growing importance of correlative research will create a demand for more and complex data integration services. To bring the state-of-the-art to a practical level and to meet the increasing need for these services, OSTA sponsors on-going programs in data integration technology development. As algorithms mature, selected ones will be integrated into ADS and provided as a service.

1.5 HISTORY OF THE ADS PILOT PROGRAM

The first activity in support of the ADS Pilot program was the ADS Feasibility Study initiated in February 1979 to develop an overall OSTA data systems concept. The objectives of the study were two-fold. The first purpose was to define and validate the ADS concept based on current and projected programmatic requirements. And second, using that concept, the

Study would provide an understanding of the feasibility of an OSTA ADS capability by the mid-1980's.

These efforts culminated in the OSTA Data Systems Planning Workshop held at Wallops Flight Center, Wallops Island, Virginia in October 1979. Sponsored by OSTA and conducted by Goddard Space Flight Center's ADS Study Office, it brought together representatives of the application and data systems disciplines to review their data requirements and to further develop the OSTA data system concept.

The Workshop was set up to review the study reports and to derive requirements for the OSTA data system. The requirements were based on the policy goal established by the working group, namely, the availability of timely, quality, readily usable data products to the user community. The evaluation focused on the direction and progress of the efforts to meet the user needs and resulted in the identification of past problem areas and recommendations for action.

The problems with data from past and current missions which concern the user groups are poor quality, unusability and inaccessibility. Among the recommendations from the Workshop was that sufficient resources be made available to rectify the problems of past data. The implementation of the ADS system is one way to prevent these problems from reoccurring in the future. To that end, the workshop participants made a number of recommendations. For the purpose of this ADS Pilot Program Plan, the six most significant recommendations are the following:

First, OSTA should proceed with the ADS system for commonly required data and services necessary to meet the needs of the users. Second, an evolutionary, phased development approach should be pursued using the pilot programs to demonstrate proof of concept. Third, the development of standards for data handling, data catalogs and data access should be developed in conjunction with the pilot program. Fourth, the OSTA data system

concept and the operating policies should be further defined. Fifth, the creation of OSTA data archives should be pursued. And finally, the cooperative liaison with both internal NASA groups and external organizations should be developed.

The first three recommendations are of prime importance and form the basis for the ADS Pilot Program as it is presently configured. A top level description of the phased development approach is presented in the next subsection. The ADS Standards Program and the structure and implementation of the pilot programs are discussed in detail in sections 3, and 4, respectively.

1.6 ADS PILOT PROGRAM ORGANIZATION AND SCHEDULE

In response to the workshop and study recommendations, the development of the ADS Pilot Program is a phased process whereby concepts are first developed and implemented on a smaller scale to provide proof-of-concept. In the first phase, feasibility studies were initiated to scope the overall task and provide insight into the program development. The study phase is complete and the evolution of the operational system will now proceed through three phases which are key to its development.

Two of the phases, the Standards Definition and Pilot Program, are distinct, but developed and implemented in parallel. As part of the Pilot Program, ADS user capabilities such as catalog structures, data access mechanisms, and archive formats are defined. Successful implementation of these and other services depends heavily on the standards defined for each service. Thus the definition of standards for the common ADS elements of the pilot programs is essential to satisfy the goals of system and user intercommunication. The last phase, full-scale system implementation, evolves from the demonstration of the ADS concepts through the pilot programs as additional users and more services are added.

The NASA field centers are responsible for developing the individual pilot programs. These activities were begun in 1980 and will mature into a model of the ADS by the end of FY83 and a model of the OSTA Data System by the end of FY85. The ADS Program Office at Goddard Space Flight Center (GSFC) is responsible for the standards development and the full-scale ADS planning and implementation. NASA Headquarters, Data Systems Branch is responsible for the integration of the elements to assure convergence into a total program and to initiate coordination with external agencies.

1.7 PROGRAM SCOPE

The philosophy within the ADS Pilot Program is to work very closely with OSTA data users and producers. Only through joint participation with flight and discipline programs throughout all ADS phases can effective new capabilities, responsive to user needs, evolve. Therefore, pilot participants include OSTA programs such as AgRISTARS, ODUS, VAS, and UARS.

Inclusion of OSTA programs addresses only part of the problem since over 50 percent of data required by the OSTA users originate from the National Oceanic and Atmospheric Administration (NOAA), the United States Department of Interior (USDI), and other sources. In addition, plans or activities similar to ADS exist within external institutions. Therefore, joint standards and pilot activities are planned with organizations such as the National Bureau of Standards (NBS), NOAA and NASA Office of Space Science (OSS).

By implementing and pilot testing candidate federal/international standards in cooperation with NBS, the future compatibility of ADS and external organizations can be maximized. By forming a joint test bed within the Atmospheres Pilot with similar NOAA pilots, independent yet compatible full-scale systems can evolve in parallel. Full-scale ADS activities can focus on developing capabilities to access NASA data and, by easily interfacing with a similarly mature NOAA system, can support user access to

existing NOAA catalogs/data as well. Similarly, Atmospheres pilot activity with the OSS Origin of Plasmas in the Earth's Neighborhood (OPEN) program and the Gravsat program will evolve compatible Upper Atmospheric Research Satellite (UARS)/OPEN standards and systems.

SECTION 2. THE ADS STANDARDS PROGRAM

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2.1 MOTIVATION

Requirements for access to and integration of multiple sources of data in support of correlative research are increasing. Applications scientists from most disciplines will routinely require access to data from a wide range of sources, both space-derived and conventional. Currently, these data sources are highly customized to the needs of the prime users. Individual data producers, as well as the users, frequently develop their own systems, accessing protocols, and end-product formats. This diversity limits the researchers' data retrieval and data integration opportunities. A major step in improving data availability will be the implementation of the ADS because it will drive the development of compatible data formats, data handling and processing systems. A large part of the success of ADS is dependent upon the successful implementation of standards, therefore, carefully designed guidelines must be developed for systems interfaces and data formats. The establishment of standards to allow the interconnection of systems and the routine exchange of data will improve the range and quality of data products readily available to the OSTA data user. These capabilities will make correlative research practical on a broader scale.

2.2 STANDARDS PROGRAM OBJECTIVES

The Standards Program objectives will first focus on cooperatively establishing and testing standards for all aspects of the ADS system through the pilots. Secondly, a mechanism will be developed to maintain the latest version of the standards, review configuration change suggestions, make updates as necessary, inform the user community, and support them in their implementation. In particular, during the pilot implementation phase

modifications to the standards are expected as experience demonstrates needed changes.

A third objective of the Standards Program will be to provide an OSTA focal point for coordination with external data system standards organizations and activities. Coordination with data producing agencies such as National Oceanic and Atmospheric Administration (NOAA) is important to assure future compatible interface with and access to the science data they collect. In addition, coordination with organizations such as the National Bureau of Standards (NBS), the American National Standards Institute (ANSI) and the International Standards Organization (ISO) is critical to maximize compatibility with future mandated federal/international standards. These three objectives are further developed in subsections 2.4 through 2.6.

2.3 PROGRAM SCOPE AND APPROACH

Although the standards which are developed will apply only to the OSTA data systems, close coordination with non-OSTA agencies and organizations is necessary to ensure compatibility. The Standards Program will support, not mandate, the development and implementation of standards in that they will be defined through the cooperation of the disciplines and programs which they will be supporting and the external organizations. The first steps in evolving the standards must include identifying requirements and collecting and evaluating existing standards presently in place or under development. Only then can candidate standards for implementation be collected or defined as necessary.

Within OSTA, through inter-pilot collaboration and inputs from other programs and external agencies, standards will be evolved. These standards will be detailed in a document which can be amended to include modifications and enhancements. To avoid redundancy and to reduce the costs of modifying existing systems, critical standards will be developed in the early stages of the pilots. The pilots will function as a test bed for the completeness and usability of candidate standards as they are produced.

This proof-of-concept experience will provide a strong foundation for developing a set of system interface and accessing protocol standards which will meet the needs of the users. As the pilot programs are interconnected via commercial network services and phase into an operating network, a usable, proven set of data standards will be available to the rest of the user community.

2.4 STANDARDS DEFINITION AND TESTING

Standards for the OSTA data systems will be defined through an evolutionary process. Initially standards which are presently in place or under development will be evaluated and adopted if appropriate. Specifically, the work of NBS and ANSI will be very useful in assuring compatibility in certain arenas. For example, Standard X.25 has been developed through the cooperation of federal agencies and private corporations as a standard communications network protocol and will be used to build the ADS network to interconnect the pilots. In other areas such as georeferenced data formats for satellite imagery or ADS user interface languages, OSTA-unique standards and guidelines must be defined.

As stated previously, standards and guidelines activities are concentrated on the special needs required to integrate future OSTA data systems and enable data access, data sharing and data integration to support correlative research. Although ongoing requirements are incomplete, the following candidate areas have been identified for standards adoption/definition.

- catalogs - description of data sets and related system resources such as directories which are accessible to other systems and users.

- data structure and coding - description of data set organization and attributes, georeferencing and other ancillary information, data coding and exchange formats.

- data quality - preparation of data, processing steps and algorithms applied to the data, standard levels of data, and data status information.

- system interconnection protocols - development of formalized procedures to be used to transfer data to other systems and users.

- software engineering - software documentation, including the software development techniques, validation and use.

Refinement, prioritization and/or expansion of this list will occur as requirements and initial pilot activities are completed. Nearterm prioritization will be driven by requirements of the Pilots plus key next-generation OSTA programs such as NOSS or UARS.

The pilot test beds will function as practical demonstrations for candidate system standards as they are identified and defined. Each pilot will implement applicable standards and evaluate their effectiveness in the pilot environment, as one element of its ongoing Pilot Demonstration activity (See Section 3.5).

Evaluation results and recommendations will be fed back into the Standards Program planning for review and action. Only after thorough and successful pilot testing will a candidate be declared an OSTA standard. This is essential to maintain Program integrity as well as meet the Program goal of producing standards which are clearly defined and accepted by the data user and producer communities.

2.5 STANDARDS IMPLEMENTATION MAINTENANCE AND CONTROL

Some standards defined within this Program will be implemented by the ADS and related Data System Branch programs. In many cases, however, the intent is for new flight and discipline programs to implement them as a

part of their normal system development. Thus the Standards Program will support three types of activities:

- NASA OSTA policy and procedures for guiding the Standards Program and applying standards to OSTA data systems will be developed by Headquarters, with Center support, for approval by OSTA.

- A mechanism will be established and operated within the Standards Program to support flight and discipline projects in understanding, interpreting and implementing defined standards. It is anticipated that this will include, in addition to development and dissemination of user handbooks explaining "how to", establishment of a Standards Engineering Support Group to provide consultation to flight project managers.

- Systems and Procedures necessary for the day-to-day operation of the Standards Program will be developed and used. These will include tools and procedures for modification, documentation, dissemination, maintenance, and configuration control of the standards. These activities require establishment and support of a Standards Data Base for maintaining the up-to-date versions of the standards, a Standards Handbook to define and document current standards, and a Standards Control Board for handling requests for modifications to existing standards and development of new standards.

The above will be defined and established in parallel with early standards definition activity, and completion and initial operation will be coincident with initial standards release.

2.6 STANDARDS COORDINATION (EXTERNAL)

Extensive coordination is required with non-NASA data producers and national and international standards organizations as well as with the internal OSTA flight and discipline projects supported by the ADS

Standards Program. External agencies, such as NOAA and U.S. Geological Survey (USGS) are large producers of data used by the OSTA science community. These agencies presently use their own data formats and cataloging mechanisms. It is essential that they are included in the data standards development and participate in the evaluation of the standards implemented through the pilot programs. Other agencies including NBS, ANSI, and ISO have been actively working on the development of data standards which should be evaluated and included as OSTA standards where appropriate. Additionally, internal NASA organizations, such as the OSTDS Aerospace Data Standards Office and the OAST NEEDS Program, have been developing standards for specialized data systems or telecommunications systems. Coordination with all these organizations during the standards activity is needed to avoid duplication of work and to ensure ultimate compatibility with external systems.

Joint pilot activity with NBS is planned. This would entail the implementation and evaluation of candidate federal and international standards, with NBS cooperation, within the Pilots to assure their implementability and responsiveness. Presently planned joint atmospheric pilot activity with NOAA and OSS (UARS/OPEN) will provide a forum for joint standards definition, implementation and test. The Standards Program will provide coordination and will participate actively with other standards working groups such as the OSS User Data Systems Working Group and similar OSTDS teams.

2.7 STANDARDS PROGRAM MANAGEMENT

The Data Systems Branch of OSTA has programmatic responsibility for the Standards Program. With Center support, headquarters establishes program goals, plans, policy and budgetary levels and acts as a focal point for initiating external agency involvement. GSFC, under the ADS Project Manager, is responsible for the execution of all portions of the Standards Program, including definition, operation and coordination.

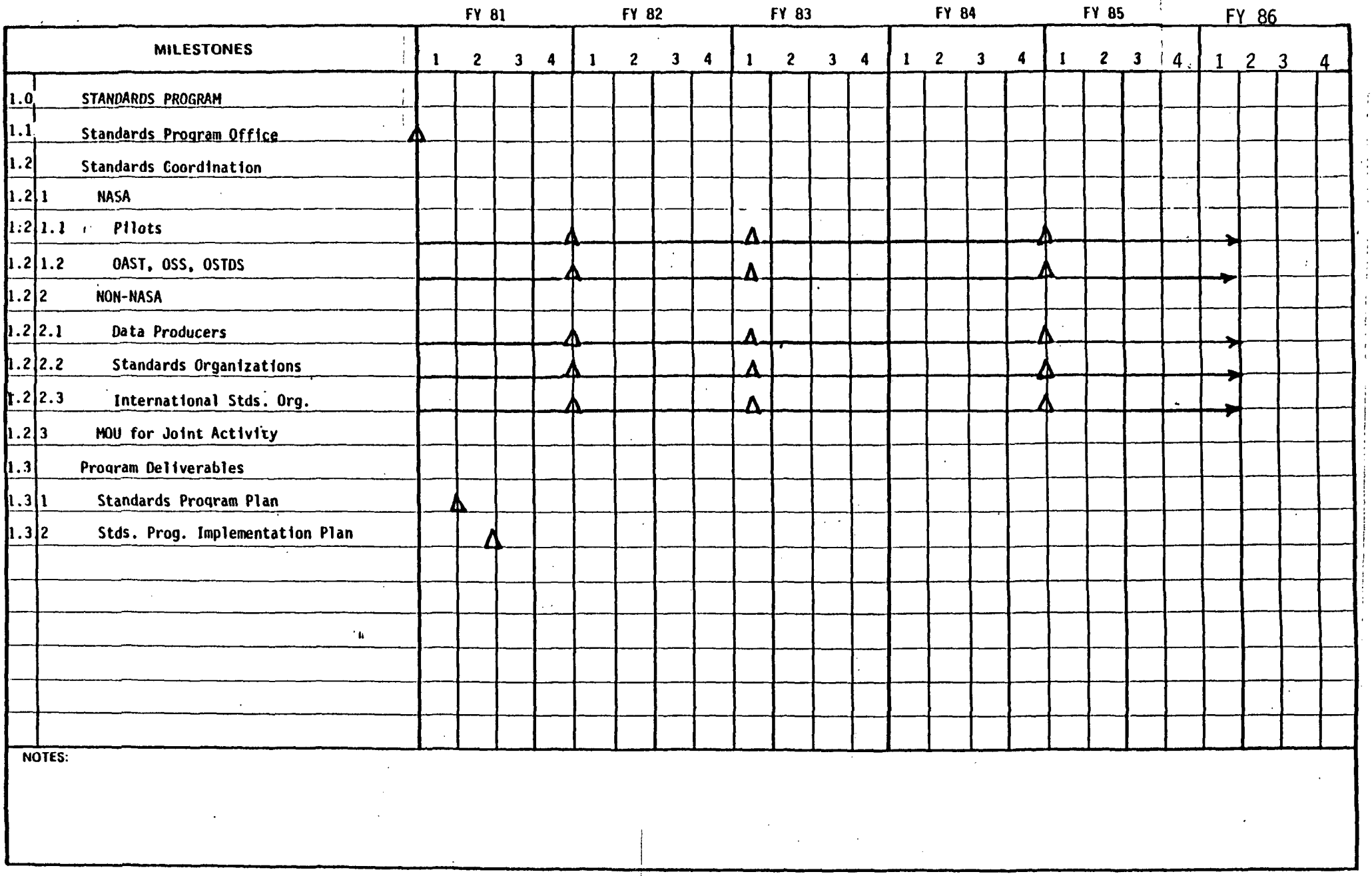
Implementation and evaluation of candidate standards will be accomplished through the Pilot Projects under the direction of the ADS Program Manager; pilot managers will have responsibility for such implementation and for incorporating evaluation results and recommendations into the Standards Program.

Nearterm program activities and funding levels are controlled via RTOP 656-13-XX. Longer term activities (two to five years) are controlled by the following two documents.

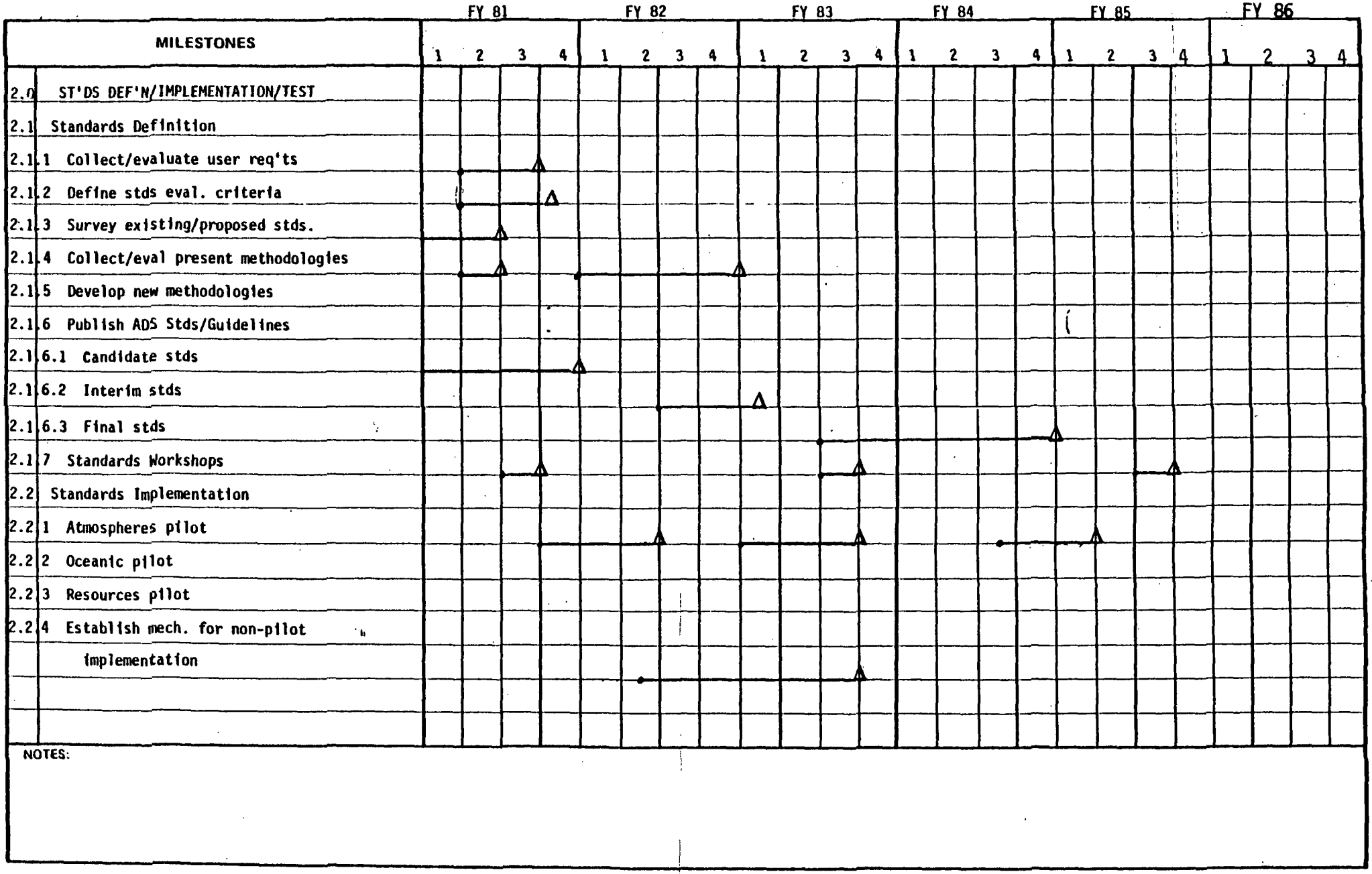
- Integrated ADS/Pilot Program Plan, prepared by Headquarters with Center support
- Standards Program Implementation Plan, prepared by the GSFC ADS Project for Headquarters concurrence.

2.8 MILESTONES

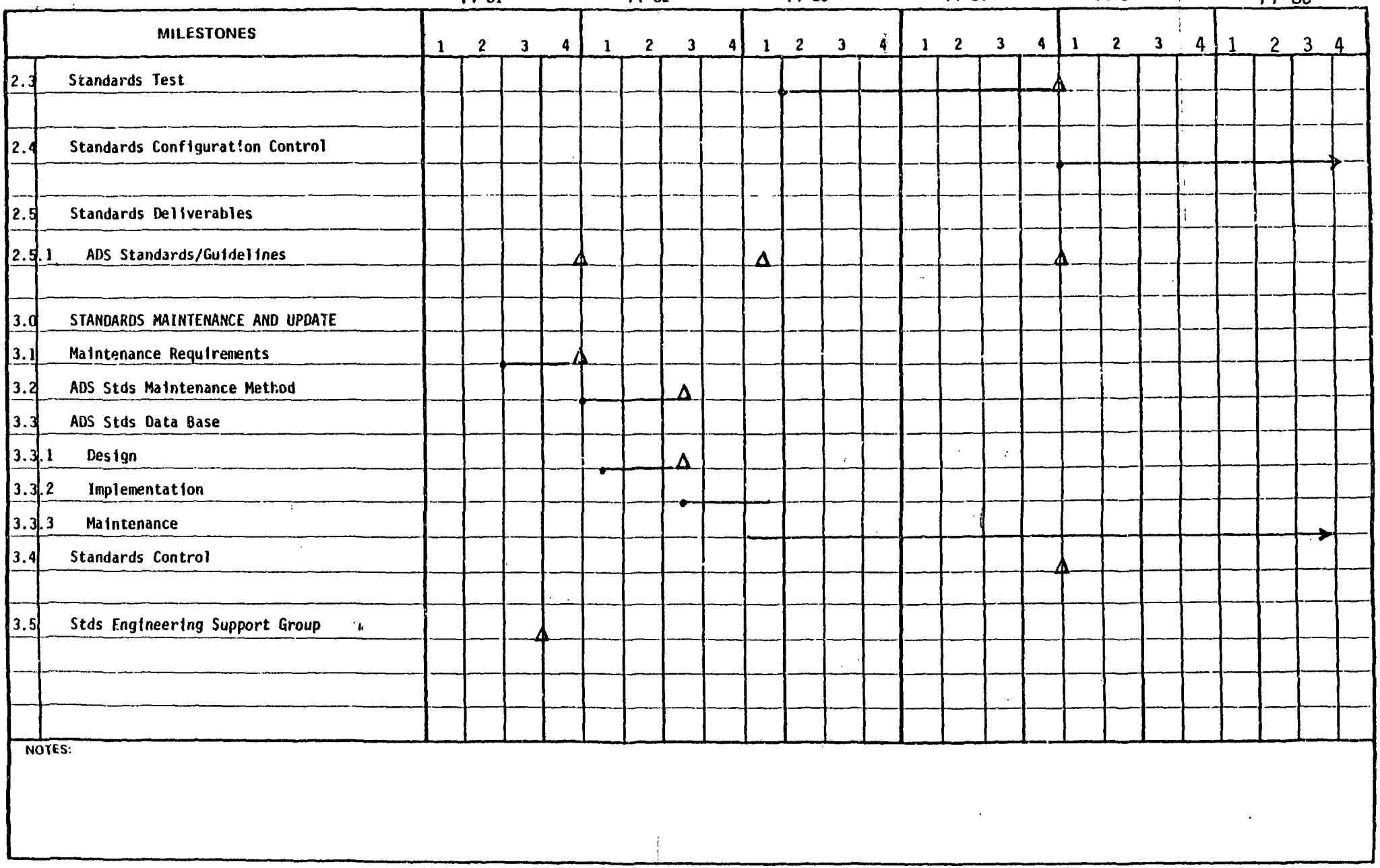
The major milestones for the Standards Program are provided in Figure 2-1.



MILESTONE CHARTS FOR STANDARDS PROGRAM (page 1 of 3)



MILESTONE CHARTS FOR STANDARDS PROGRAM (page 2 of 3)



MILESTONE CHARTS FOR STANDARDS PROGRAM (page 3 of 3)

SECTION 3. PILOT DEMONSTRATIONS/SYSTEMS

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3.1 MOTIVATION

Over the past one and a half years, problems with existing data systems as well as requirements for future systems have been explored. As a part of this activity, an "OSTA Data Systems Planning Workshop" was held at Wallops Flight Center in October, 1979. Based on the requirements identified at that Workshop, OSTA Data System concepts as discussed in Section 1 were derived for use as a basis for long term planning. Following the workshop, feasibility studies of these concepts and particularly of their integrating element, the Applications Data Service (ADS), were performed.

There were two basic observations made by workshop participants and reinforced by subsequent study results.

a. The "OSTA data system problem" is extremely broad and complex, much more so than originally envisioned. This stems not only from the poor state of many existing data sets/systems but also from the extreme heterogeneity of applications users, data, data systems and data systems management.

b. Technical feasibility of many aspects of an ultimate ADS or integrated OSTA Data System depends upon the application of new or emerging technology in areas such as hi-bandwidth data networks, optical disc storage devices or transportable integration software.

These observations led to a strong recommendation by the workshop and feasibility study teams to evolve an OSTA Data System through development of ADS type capabilities in a very orderly manner, such that each level is fully tested through the pilot program prior to full scale implementation.

Both recommended the establishment of pilot test beds composed of representative OSTA users and systems, in which to implement and evaluate ADS and other advanced data handling capabilities. The pilots were selected to demonstrate concept utility, to establish functional requirements and priorities, to support evaluation of alternative technical approaches as well as new technological and commercial services, and to establish a cost/performance baseline for new concepts and techniques.

3.2 TECHNICAL OBJECTIVES AND APPROACH

In response to Workshop and Study recommendations, the OSTA Data Systems Branch has initiated a continuing Pilot activity with the following objectives.

a. To establish, jointly with discipline programs and users, data systems pilots within the disciplines of atmospheres, oceans and resources.

b. To demonstrate and evaluate, utilizing the Pilot test beds, new data systems capabilities required by multiple programs.

At the present time the development of independent atmospheric, oceanic and resources pilot test beds have been initiated at GSFC, JPL and JSC respectively. All three projects, will work together to evolve common interface and data exchange standards to support future data system connectivity. The particular emphasis of each pilot as well as the nature and pace of associated development is dependent upon the discipline and the needs and maturity of its users and systems. For example, since the atmospheric community is quite advanced in data handling and has a number of sophisticated existing and planned data systems, emphasis will be on integrating those systems across program boundaries through the implementation of data and interface standards plus networking capabilities. In contrast, there presently exists no system within NASA for dedicated support of oceanic research. Hence, early oceanic pilot emphasis will be on establishment of a basic user data base and processing system at JPL. Only

in phase two will interconnection with other facilities be initiated to enable data sharing.

For each pilot, capabilities will evolve in an orderly manner such that as new capabilities become available they will be formally evaluated by joint discipline user data system teams with results fed into the OSTA Data System ADS, and follow-on Pilot planning. Initial demonstrations will begin in early FY81. By the end of FY83, the interconnected pilots will provide a working model and demonstration of an ADS catalog and data/resources sharing network. Participants will include a cross-section sample of OSTA's heterogeneous users and systems as well as its multi-agency management interfaces (i.e., NOAA). By the end of FY85, the model will be representative of the OSTA Data System concept, including demonstrable active archival and limited ADS data integration capabilities. Demonstrations and their evaluations are discussed more thoroughly in Section 3.5. Thus, the integrated pilot or model is a base from which a full scale OSTA Data System including ADS and other advanced capabilities, will evolve; but, demonstration and evaluation results determine how and at what pace such evolution will occur.

3.3 EXTERNAL COORDINATION

A large portion of Applications-required data as well as a majority of pplications research users are from outside NASA. Thus the interface with external organizations, particularly NOAA, is critical to ADS and overall OSTA Data System planning success. The dependence upon external data and data systems is a key ADS feasibility issue. Hence demonstration of procedures to establish and use appropriate inter-agency management interfaces has been identified as a critical area for the Pilots. Presently, requirements for systems similar to ADS exist within NOAA and other federal agencies. Therefore, ADS plans to establish joint data catalog and access pilot activities with these Agencies, as well as other key external organizations. Such cooperative pilot activity coupled with joint standards

definition will allow these systems to compatibly evolve in parallel allowing for later interconnection and operation.

The procedure by which external coordination is accomplished depends upon the organization and agency's role within a pilot. External participants may be classified as either data users or data producers. Where the agency is a user or a participating member of a joint agency discipline project, ADS will work through the established NASA interface within the discipline program office to establish initial contacts, requirements, and agreements. Where, however, the external agency role is as a data producer the Data Systems Branch through the ADS Program will establish a direct interface and a jointly managed and funded activity. Memoranda of Understandings (MOU's) between NASA and external agencies will establish specific terms of inter-agency responsibilities, both technically and managerially. After headquarters level MOU's have been approved by the Associate Administrator of OSTA, the associated NASA Center will coordinate and implement pilot capabilities.

External coordination presently planned for particular pilots is discussed with the associated pilot in Section 3.x.

3.4 ORGANIZATION AND MANAGEMENT

The Data Systems Branch of OSTA has programmatic responsibility for the Pilot Program. With Center support, the Data Systems Branch establishes program goals, plans and budgetary levels and acts as a focal point for initiating external agency involvement. Within the Branch, the headquarters ADS Program Manager integrates multi-center plans and monitors Center progress to assure convergence of the three pilot activities into an integrated NASA-wide data system.

Associated with each pilot is a Center Pilot Project Manager who is responsible to the Headquarters ADS Program Manager for system implementation,

and inter-pilot coordination and for the conduct of capability demonstrations/evaluations and evaluations. The implementation and evaluation of each pilot will be managed by the following Centers:

- GSFC Atmospheres Pilot, Pilot Interconnection
- JPL Oceanic Pilot
- JSC Resources Pilot

The pilot project organization chart is shown for the three Centers as well as Headquarters in Figure 3.1.

Funding of nearterm pilot activities is controlled under RTOP 656-13-XX. Longer term (two- to five-year) activities will be controlled by the following three documents.

a. ADS Pilot Program Plan, prepared by Headquarters with Center support.

b. Pilot System Implementation Plan, prepared by each Center for Headquarters concurrence.

c. Pilot Demonstration Implementation Plan, prepared by each Center for Headquarters concurrence.

A Pilot Coordination Team will be established and will meet quarterly to review and exchange information on the pilots, standards and long range ADS activity. Chaired by the ADS Program Manager, membership will include Center and Headquarters managers for each of those activities. Discipline program managers supported by the pilot will be included in Headquarters review of the pilot status and controlling documentation.

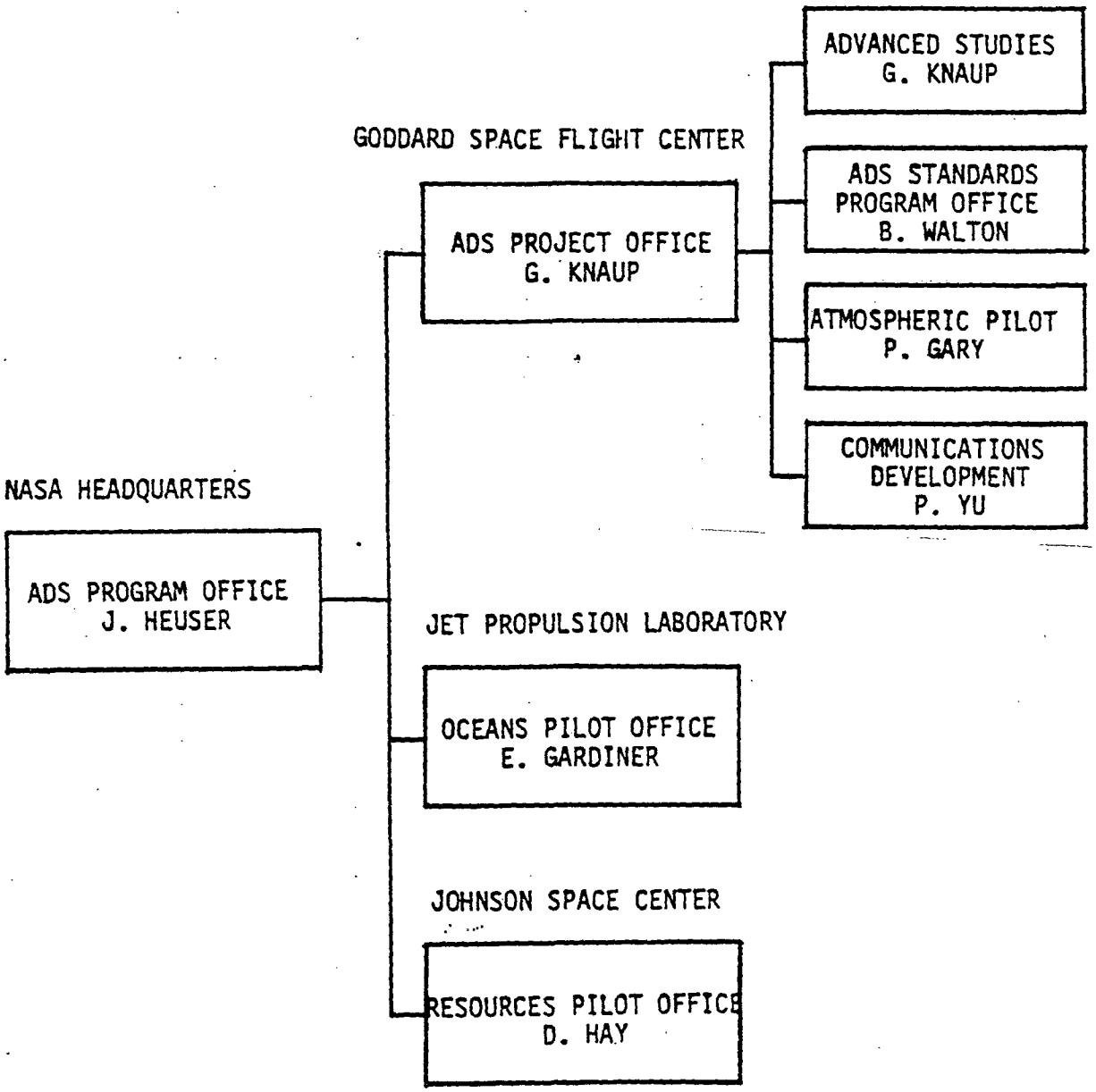

FIGURE 3.1 ADS PILOT PROGRAM ORGANIZATION

3.5 CAPABILITY DEMONSTRATION AND EVALUATION

Presently planned demonstrations may be characterized as one of three types.

a. Concept demonstration
b. Transportable tool demonstration
c. New technology demonstration

Concept demonstration refers to data system capabilities closely associated with the ADS or OSTA Data System concepts. When a number of these specific capabilities have been implemented, the relevant concepts are thereby demonstrated. For instance, when data standards, cataloged data sets, and low-bandwidth network capabilities have been implemented, the concept of electronic catalog query can be demonstrated. Then, additional capabilities can be added to demonstrate the concept of electronic data dissemination. Eventually, as capabilities and the number of participants increase, an OSTA model of the ADS will take form for broader demonstrations and evaluations.

Transportable tools include support software packages such as catalog creation tools or a transportable applications executive which performs common processing functions required by multiple user or project systems. Successful demonstration and subsequent use of such tools will minimize software development duplication and costs and promote application package and data exchange.

New technology demonstrations include the prototype applications and evaluations of advanced technology or new techniques which have been identified in the previous year's study activity as critical to ADS or OSTA Data System technical feasibility. Such technologies and techniques have been pioneered elsewhere and will be applied in the pilot programs to demonstrate their value in a real world environment. Examples of such demonstrations include pilot use of optical disc storage devices and high-bandwidth fiber optic network.

Evaluation criteria for these three types of capabilities vary. Capabilities can be assessed in terms of their effectiveness within the OSTA's programmatic environment. New technology is generally assessed in terms of its ability to accomplish a job, frequently for the first time. Where a capability such as high-bandwidth networking falls into both categories, it is evaluated from both points of view. The Pilots demonstrate it can be done technically and then demonstrate how it must be done practically to support OSTA-type users.

Specific planned demonstrations for the above three capabilities are shown in Figure 3.2 along with a schedule of their performance dates. It should be noted that funding and development for a particular capability generally precede the actual demonstration date. Figure 3.3 shows the role of each center for each specific demonstrable capability. For instance, the cataloging capability as developed by GSFC will be applied to the Atmospheres, Oceanic and Resources pilot implementation by GSFC, JPL and JSC respectively.

Each pilot project will establish an evaluation team, composed of discipline users and pilot implementers and chaired by the pilot project scientist. This team will be responsible for evaluating capabilities during the demonstration period. Evaluation criteria and detailed demonstration schedules will be outlined in the Pilot Demonstration Implementation Plan. Where capabilities are implemented in more than one pilot, a lead center will be chosen to establish evaluation criteria, and coordinate the evaluation activity. At least once per year, all evaluation teams will hold a seminar workshop where evaluation results will be shared and integrated. Recommendations stemming from this workshop will be factored into future Data Systems Branch planning activities.

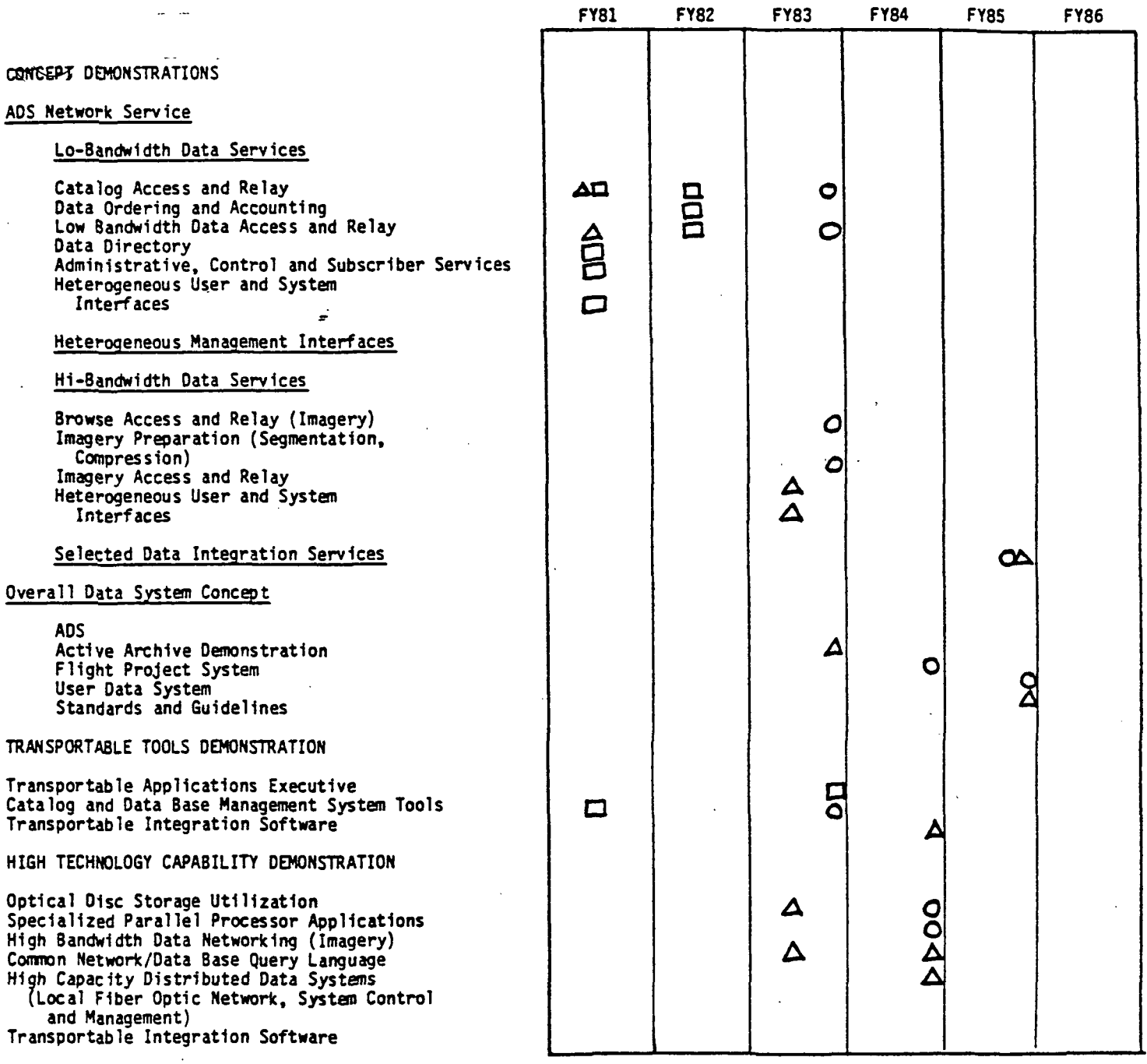

Figure 3.2 Schedule of Demonstrations

	INITIAL DEVELOPMENT	APPLICATION TO ATMOSPHERES	OCEANS	RESOURCES
CONCEPT DEMONSTRATIONS				
ADS Network Service				
Lo-Bandwidth Data Services				
Catalog Access and Relay	GSFC	GSFC	JPL	JSC
Data Ordering and Accounting	GSFC	GSFC	JPL	JSC
Low Bandwidth Data Access and Relay	GSFC	GSFC	JPL	JSC
Data Directory	GSFC	GSFC	JPL	JSC
Administrative, Control and Subscriber Services	GSFC	GSFC	GSFC	GSFC
Heterogeneous User and System Interfaces	GSFC	GSFC	JPL	JSC
Heterogeneous Management Interfaces	GSFC	GSFC	JPL	JSC
Hi-Bandwidth Data Services				
Browse Access and Relay (Imagery)	JPL	GSFC	JPL	JSC
Imagery Preparation (Segmentation, Compression)	JPL	GSFC	JPL	JSC
Imagery Access and Relay	GSFC	GSFC	JPL	JSC
Administrative, Control and Subscriber Services	GSFC	GSFC	GSFC	GSFC
Heterogeneous User and System Interfaces	GSFC	GSFC	JPL	JSC
Selected Data Integration Services	ALL	GSFC	JPL	JSC
Overall Data System Concept				
ADS	GSFC	GSFC	JPL	JSC
Active Archive Demonstration				
Flight Project System				
User Data System				
Standards and Guidelines	GSFC	GSFC	JPL	JSC
TRANSPORTABLE TOOLS DEMONSTRATION				
Transportable Applications Executive	GSFC	GSFC	JPL	JSC
Catalog and Data Base Management System Tools	GSFC	GSFC	JPL	JSC
Transportable Integration Software	GSFC	GSFC	JPL	JSC
HIGH TECHNOLOGY CAPABILITY DEMONSTRATION				
Optical Disc Storage Utilization	GSFC	GSFC	JPL	JSC
Specialized Parallel Processor Applications	GSFC	GSFC	JPL	JSC
High Bandwidth Data Networking (Imagery)	GSFC	GSFC	JPL	JSC
Common Network/Data Base Query Language	GSFC	GSFC	JPL	JSC
High Capacity Distributed Data Systems (Local Fiber Optic Network, System Control and Management)	GSFC	GSFC	JPL	JSC
Transportable Integration Software	GSFC	GSFC	JPL	JSC

Figure 3.3 Role of Centers for Demonstrations

3.6 PILOTS

The Atmospheres, Oceanic and Resources pilots, developed jointly with discipline users, will provide a "useful" capability as well as a test bed to evaluate and refine ADS concepts. In particular, each test bed is important for demonstrating advanced data handling capabilities for future flight program data systems. Finally, upon interconnection, the pilots will provide a base upon which a future OSTA Data System, including an ADS, can evolve.

Although the three pilots share the objectives and approach discussed above, each is unique. Each is led by a different NASA center and has its core in a different geographic region of the United States. Most importantly, each has a well-defined community of users and each user community exhibits a uniform level of maturity. Hence each pilot represents a homogeneous community of users.

For example, the Atmospheres community employs numerous existing and planned systems which represent the most mature capabilities of any of the three disciplines. Therefore, the Atmospheres pilot is based on these existing and planned systems and emphasizes their integration through the implementation of standards and ADS network interconnections. GSFC, within this pilot, initiates the development and testing of most of the new "commonly required" capabilities discussed in the previous section and leads all data system inter-connection activities. The Oceanic and Resources pilots, each representing considerably newer remote sensing communities, will apply and evaluate the new capabilities within their unique multi-discipline environments. Their role is critical in that it will validate the concept across discipline boundaries. In addition, they will develop processing capabilities and conduct demonstrations that have direct application in their discipline community.

As noted above, the Atmospheres pilot emphasizes the integration of existing and planned climate, weather, severe storm and Upper Atmospheric

Research systems. The Oceanic pilot is however at the other end of the spectrum; for oceans, no basic system exists within NASA. Therefore, initially JPL will develop a basic oceans user support system. In Phase II of their activity, this user node will be interconnected to other facilities to enable data sharing. The following sections discuss each of the three test beds in detail, identifying their participants, thrusts, key developments and milestones.

3.7 ATMOSPHERES PILOT

INTRODUCTION

Multi-source data are critical to the effectiveness of correlative weather, climate or severe storm research. Effective data sharing among those programs can enhance the results of each. Such sharing, however, is a challenge due to the heterogeneous nature of the various data sets and systems involved. Hence the nearterm thrust of the Atmospheres pilot is to integrate selected systems through the implementation and demonstration of transportable tools, data exchange standards and a data dissemination service. This pilot becomes the test bed for ADS capability development since it represents a community whose systems are already in place and operational and therefore able to adequately define and test an ADS. In future years, it also represents an essential element for demonstration of active archival and other capabilities associated with the OSTA Data System concept.

PARTICIPANTS

Participating discipline programs include climate, severe storm research, global weather and, eventually, upper atmospheric research. The initial test bed is focused on the GSFC and the University of Wisconsin data systems and their associated users. As the pilot matures two basic clusters of systems will evolve: a local network of GSFC systems, plus a distributed network in which the GSFC cluster is one node.

The local network provides a technical test bed, under NASA control, for initially developing and testing capabilities and for training data systems personnel. Most new or technologically challenging capabilities will be implemented there first. The local network will continue to expand, including six to ten nodes by the end of FY83. Starting in 1982, however, emphasis will shift to the establishment of additional remote interconnections. Addition of the remote nodes is necessary not only to provide access to valuable data but also for legitimate experience and tests involving long distance data networking. More importantly perhaps, addition of those nodes provides the heterogeneous management interface required to test the administrative feasibility of developing or operating an ADS or OSTA Data System. Systems presently being interconnected include three GSFC systems plus the University of Wisconsin VAS demonstration system.

Candidate participants are summarized in Figure 3.4; they are labeled by year, according to when they will become a working node on the network. Dates for initiation of coordination and interface development will precede the data for entry into the network. Details regarding the significance of each participant are provided in Figure 3.5.

Joint activities will lead to the interconnection of ADS with NOAA pilot systems in EDIS and NESS (e.g., CSIS/PROFS, IDAMS). In addition, interconnections will be made as well as to the other two pilots to systems at other centers, such as the Langley Research Center ERBE system and the Marshall Space Flight Center Archival Mass Memory (AMM). By the end of 1983, the number of nodes associated with the Atmospheres pilot will have grown from three to at least five. By the end of 1985 the highly distributed Upper Atmospheric Research Satellite and Origin of Plasmas in the Earth's Neighborhood (OPEN) systems also will be a part of the network, bringing the number of remote nodes up to 15 to 20.

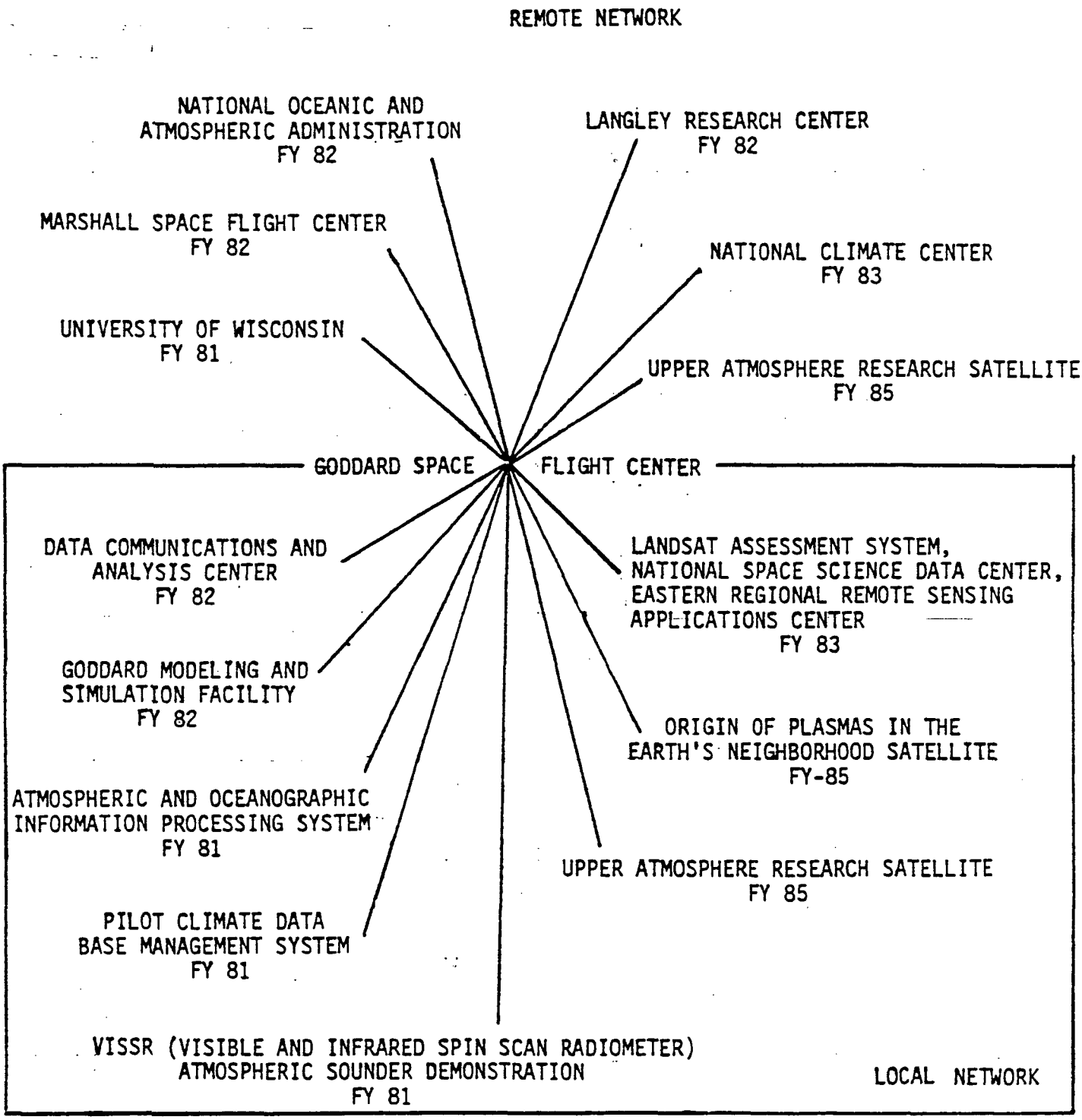

FIGURE 3.4 CANDIDATE SYSTEMS FOR THE ATMOSPHERES PILOT

Atmospheric and Oceanographic Information Processing System (AOIPS)

AOIPS is a user information extraction system which provides interactive image processing capabilities for scientists supporting severe storm and local weather research investigations.

Pilot Climate Data Base Management System (PCDBMS)

PCDBMS provides catalog, archival and distribution functions for climate data from a variety of sources, both conventional and space-derived.

VISSR (Visible and Infrared Spin Scan Radiometer) Atmospheric Sounder Demonstration (VAS Demo)

The VAS demo at GSFC demonstrated geosynchronous atmospheric sounding techniques through near real-time data production of the VAS data from GOES-D. The system includes archival facilities for VAS data.

Goddard Modeling and Simulation Facility (GMSF)

The GMSF utilizes large-scale mainframe computers to support research and development activities in the data processing, information extraction, and modeling arenas.

Data Communication and Analysis Center (DCAC)

The DCAC is a facility used for preparing data for processing at the GMSF and for analyzing the results.

Landsat Assessment System (LAS)

LAS was developed to assess the quality of Landsat-D data and to provide an archive of six months of data. Although oriented toward Earth resources, LAS offers an opportunity to apply the ADS networking technology to a VAX facility at GSFC.

National Space Science Data Center (NSSDC)

NSSDC offers an extensive data library and archive facility for space science data used by all disciplines. This data is readily available to all users on the ADS network.

Figure 3.5 Description of Candidate Participants in the Atmospheres Pilot Networks (Sheet 1 of 3)

Eastern Regional Remote Sensing Applications Center (ERRSAC)

ERRSAC provides a data directory, browse facility, and on-line access to the Earth Resources Observation System (EROS) data center. Primarily Earth resources data is archived at EROS but ERRSAC is included as an element of the Atmospheres Pilot as an extension of the network demonstrations and the inclusion of HP equipment.

Upper Atmosphere Research Satellite (UARS)

UARS is one of two flight projects initially developed under the OSTA Data System concept. A network provides users with remote access to a central repository and the computing facility.

Origin of Plasmas in the Earth's Neighborhood (OPEN)

OPEN is another flight project which is being developed under the OSTA Data System concept. It offers an archive and a central data handling facility for the spacecraft data and, through the ADS, user services and access to related data.

University of Wisconsin (U of W)

The University of Wisconsin is participating in the Atmospheres Pilot as a remote partner in the VAS demonstration activities. It provides archive facilities for VAS data and supports research activities in the development of storm system models.

Marshall Space Flight Center (MSFC)

MSFC is the lead center in developing and maintaining the Data Base Management system (DBMS) and Archival Mass Memory (AMM). The ADS network will ultimately make these facilities available to discipline investigators.

Langley Research Center (LaRC)

LaRC will be supporting the Earth Radiation Budget Experiment (ERBE) data processing activities. The Atmospheres Pilot provides access to data sources and to archive and information extraction capabilities.

Figure 3.5 Description of Candidate Participants in the Atmospheres Pilot Networks (Sheet 2 of 3)

National Oceanic and Atmospheric Administration (NOAA)

NOAA provides support for the operational weather satellites. The Environmental Data and Information Service (EDIS) in Suitland, Maryland, is an extensive archive facility for all NOAA satellite data including TIROS, NOAA, GOES, NOSS and Operational Landsat. Information extraction and all levels of data processing are also performed there.

National Climate Center (NCC)

NCC provides archive facilities for all NOAA atmospheric data which is collected from ground and air-borne sources (not satellite data).

Upper Atmosphere Research Satellite (UARS)

Remote users on UARS are connected to the UARS central processing facility at GSFC through the ADS network as part of the distributed mission support concept.

Figure 3.5 Description of Candidate Participants in the Atmospheres Pilot Networks (Sheet 3 of 3)

CAPABILITIES

Demonstrated capabilities and associated schedules for the Atmospheres pilot were shown in Section 3.5. When these milestones are combined with the participating system chart and its associated dates, the direction and pace of the pilot evolution becomes clear.

FY81 development is focused on the implementation of basic catalog and low bandwidth data access and networking capabilities for a small group of local systems. Then as technical confidence is gained in the capabilities, the pilot will address in FY82 the administrative issues of interfacing and jointly implementing standards as well as a catalog and access network capability with NOAA and with the Office of Space Science (OSS). Both local and remote nodes will be expanded for a truer test of remote networking. In FY83, the capability is increased to include limited higher bandwidth (i.e., imagery) data access and delivery through the use of commercially available communication services. By the end of that year a mini-ADS will have evolved, been operated and evaluated in preparation for the initiation of a larger scale FY84 ADS implementation.

Additional high technology capabilities will be demonstrated in 1983, utilizing local elements of the test bed. For example, in support of the high-bandwidth data access capabilities work mentioned above, the Atmospheres pilot will exercise and evaluate high capacity optical disks for the storage and rapid retrieval of archived data.

By the end of 1984, the Pilot's local network capability will have evolved into a high-capacity (100-400 mbps) network of processors which can support resource as well as data sharing. In conjunction with high technology fiber optic links, control and management systems will have been developed to the point that the GSFC node may be treated as a single highly distributed system.

Development of resources sharing provides a link in the chain toward demonstration of an ADS data integration capability, scheduled for the end of FY85. By that time, ongoing research with transportable integration software will have matured and the demonstration could take one or more of the following forms: first, it may demonstrate selected services in a centralized service center; second it may demonstrate the concept of a program library, accessible on the network, from which transportable integration software packages may be retrieved; third, it may demonstrate access to one or more special-purpose user facilities, each providing one or a small group of such services. The pilot will support UARS and OPEN by providing standards and data access services, plus a basic network to integrate the highly distributed set of computers and remote terminals involved in the two programs. UARS is the first flight project influenced and guided by OSTA Data System managament and conceptual guidelines from the beginning. This flight support aspect of the pilot combines with the ADS element, the active archival demonstration system, and other elements of the pilots to form an OSTA Data System model.

DEVELOPMENTS

Interface or data station software and hardware implementation are associated with each new addition to the network. These interfaces implement the standards, provide required translations and most importantly bring the host system up to a "common level of capability" in terms of cataloging and data access.

In addition, software and hardware implementation are associated with each new capability level. For early levels, networks must be implemented or network services must be procured; user query languages must be established; standards must be implemented, and an administrative accounting control center must be established and operated. Such establishment includes development of support capabilities such as a directory, ordering and accounting services and system control procedures. During the early phases, the Transportable Applications Executive (TAE) and Data Base

Management System (DBMS) cataloging tools will be developed outside the pilot but will be used by the pilot for testing and evaluation.

Later capabilities require purchase of an optical disk, possibly an engineering model, and development of software required for its efficient utilization. Software and communication hardware, including fiber optic links, must be furnished by the pilot. In addition, the entire local net will be completed.

One area in which GSFC is one of multiple participants is in the development of integration services. Here, software is being developed in other elements of the Data Systems Branch for application to all three pilots.

Capabilities developed during the mid-1980's (1985 to 1986) will evolve the OSTA Data System. Developments in support of the UARS/OPEN demonstration include standards, remote site interfaces, data directory and catalogs, and a network.

3.8 OCEANIC PILOT

INTRODUCTION

Oceanic pilot activity is closely coupled with the nearterm priorities as well as longer term needs of the Oceans Program. Early oceanic pilot activities will focus on the installation of a user analysis data system at JPL, employing common transportable tools and software wherever possible. Upon its completion, this system will be interconnected to other key oceans research institutions via an ADS-type network based on that network already under development within the GSFC Atmospheres Pilot.

This system will provide selected researchers in the oceans remote sensing community with computerized access to satellite and conventional data sets. It will offer state of the art facilities for data communication, data management, cataloging, remote access, and data base sharing. The importance of this system to the Data Systems Branch lies in its ability to

demonstrate useful information system capabilities for the oceans community, rather than in its ability to support the development of advanced data concepts and techniques.

The Oceanic Data Utilization System(ODUS) is initially a study activity to investigate and evaluate user requirements produced by the ICEX, NOSS and TOPEX Science Working Groups. It will address requirements for data manipulation, management, display, integration and analysis of data from ocean inventory systems. ODUS will result in recommendations for needed capabilities to meet these user requirements.

OSTA plans to support NOSS and TOPEX in the mid-1980's; data from these missions, coupled with NOAA and in-situ data, provide an excellent resource for oceanic researchers. To define future research data system requirements, the Oceans Program has established a Data Systems Team of the NOSS User Working Group. Oceanic pilot implementers are represented on the team and team outputs will be used as guidance for longer-term pilot work. In particular, the team is expected to identify basic requirements, concepts and technology needs for an ODUS which is a NOSS-era data system for oceanic research support.

PARTICIPANTS

Initially, pilot work will be focused primarily at JPL, with advisory support from Scripps as well as other members of the ODUS Working Group (i.e, NCAR, GSFC, Scripps, WHOI). However as the basic JPL data sets and pilot system capabilities mature, other oceanic institutions will become active pilot participants. The initially planned external link will be with the GSFC pilot in FY82. By the end of FY83 data sharing links with four to six additional oceanic institutions are planned. However, specific institutions to be included as well as details concerning the interconnection have not been determined. Candidate systems are shown in Figure 3.6. Final network interconnections will be determined by Oceans

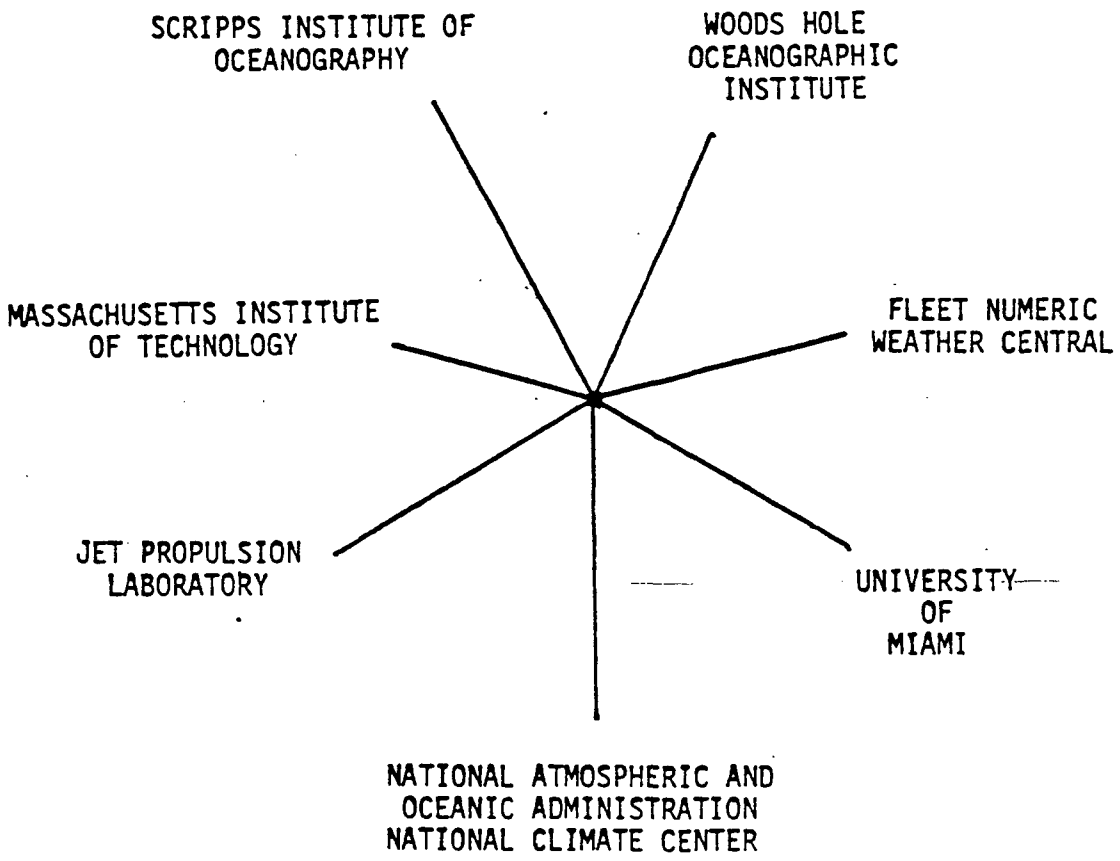

FIGURE 3.6 CANDIDATE SYSTEMS FOR OCEANIC PILOT

Program Office priorities, based upon the location of Principal Investigators selected for Seasat analysis participation. Participation will be expanded further, to meet ODUS-type requirements, as those requirements mature and influence Program priorities.

Initially the Oceans Program Office plans to issue an Announcement of Opportunity (AO) to the oceanic community during FY81 for use of Seasat and related data sets presently under preparation. The pilot system is the planned vehicle for user access and analysis of that data. The pilot will provide access to level 2 and 3 Seasat data plus JASIN data sets. As it matures, this data will be augmented with limited sets of TIROS/NOSS AVHRR, Nimbus CZCS, associated in-situ data and possibly some SEASAT SAR in order to "simulate" the NOSS-era data. Eventually an ODUS must handle active sets of NOSS, TOPEX and NOAA data as a key user system node of the OSTA Data System model (1986). It is anticipated that by that time, however, ODUS would access such data through a mature ADS. Early tests involving the access of active NOAA or project data will be accomplished through the GSFC pilot activities.

CAPABILITIES

Initial Center activity focuses on bringing a group of existing systems up to a certain capability level and then integrating them. Within the Oceans Pilot, JPL must initially start at ground level to build a user support system. Using techniques and software previously developed for similar applications by GSFC and JPL, the Oceanic Pilot will establish a data base, a data base management system, catalogs, applications software and a user interface. Initial focus is on providing Seasat and related data sets to users along with analysis tools to manipulate them. This activity will implement a system which supports ADS standards, data bases, data catalogs, and data implementation tools from the start, and hence supports validation of the implementation of those tools in systems of the future.

As time progresses, data sets will be expanded to include data which simulates NOSS-era products (e.g., selected CZCS, AVHRR data), and tools will be developed to efficiently handle imagery and meet other anticipated ODUS needs.

By mid FY82, capability will be increased to include an initial network interface with the Atmospheres Pilot at GSFC, with access to associated user services, and data bases. Over the next year and a half, pilot development focus will have evolved from an initial user system node to the interconnection of that node with other oceans facilities to form a complete data sharing network. Based primarily on the techniques and experience gained by GSFC over the previous two years, JPL will establish interfaces with various oceans data systems and jointly conduct demonstrations and evaluations with user participation. Emphasis at that point will be on demonstrating a low-bandwidth networking capability. In addition, JPL will provide lead development work in the area of data compression for use in imagery browse functions. It will develop browse techniques and supporting software, for implementation and evaluation by all pilots.

New capabilities in FY84 will be oriented toward specialized high technology items of particular value to oceans. Those include advanced capabilities for active archiving, and for using an alternative optical disc storage system to that being assessed by GSFC. Other new capabilities include parallel processors, associated applications software for use in oceans data processing and analysis (i.e., SAR processing) and advanced data base management tools. Capability demonstrations in each of these areas represent culmination of a number of years of research and development within this pilot as well as in companion Data Systems Branch programs.

In FY85, integration services for oceans data will be demonstrated. Finally, the initial demonstration of ODUS, the first major user data system influenced and guided by ODS management and conceptual guidelines will be in FY86. The Oceanic Pilot will have supported ODUS by providing

guidelines, a test bed and a core from which to grow. ODUS, when coupled with UARS, ADS, the pilots and the active archival demonstration system, will form a true OSTA Data System model for the first time.

DEVELOPMENTS

The first major development in the Oceanic Pilot is for the basic Ocean Pilot User System, software and hardware. A VAX 11-780 computer with peripherals is being purchased during FY81; software is being transported from other pilots or developed for that system. As ODUS matures additional development requirements will evolve. For example, additional equipment and software may be required for image handling or for pilot interconnection to the existing JPL image processing facility.

Once the ODUS is in place, developments will center on the implementation of the interface and data stations associated with each user institution and system brought into the ocean pilot network; procurements will include hardware, software and network services. In particular, software or firmware will be developed to implement imagery compression and browse capabilities.

FY84 demonstrations, dependent upon high technology developments, will require the purchase of advanced hardware such as optical disks or parallel processors and development of associated software/firmware. Although most of this will be covered under separate Data Systems Branch funding, the implementation and demonstration of the new technology will be funded by the Data Systems Branch.

Development in direct support of ODUS will be determined as a result of the early ODUS requirements and design concepts. It will most likely involve the development of sophisticated user nodes which interface with the ADS for active data (e.g, NOSS, TOPEX, other), and which can integrate and analyze such data for oceans modeling. The specific role of the pilot and the ODUS in the development of that node is to be determined; it could be

an expansion of the Pilot or a separately procured system based upon pilot results. Funding for implementing ODUS will be provided by the Oceans Program.

3.9 RESOURCES PILOT

INTRODUCTION

The Resources Pilot, led by JSC, supports the AgRISTARS Program. AgRISTARS involves four federal agencies,eight projects and multiple geographically dispersed research institutions. Projects and researchers share requirements for multiple source data such as Landsat, in-situ crop statistics and meteorological data. In addition, some of these projects have a stringent requirement for data registration to .2 pixel over small geographical areas (sub Landsat frames). Therefore, an AgRISTARS Data Management Team, has been established; the pilot will work with them to define catalog structures across the program. As with the other pilots, it will enable electronic catalog/directory and data sharing between the projects. A catalog and ordering network will be extended later to include original data sources such as EDC as well as AgRISTARS internal projects. As with the Oceanic Pilot, the importance of the Resources Pilot is in its application to and validation of advanced data handling techniques in agriculture and land management. The singular area where the pilot provides significant original development and concept demonstration is in the area of transportable registration and integration software. Key early emphasis will be upon the development of transportable software for fine registration (i.e., less than .2 pixel) of Landsat segments. As the pilot matures, such capability will be expanded to address other data sources as well.

PARTICIPANTS

A Data Management Team has been established to provide a focal point for defining AgRISTARS program level data management functions. Members

include representatives from each of the eight AgRISTARS Projects plus representatives from U.S. Department of Agriculture (USDA), U.S. Department of Commerce (USDC) and NASA. When all participating data producers, project offices and contractor institutions are considered, AgRISTARS work spans over 100 distributed locations.

Pilot directory and cataloging activities support the Data Management Team and are expected to cross project and agency boundaries. Future data networking and integration activities primarily support the NASA elements of AgRISTARS, the FCPF and SR projects. Since data requirements of these two projects represent 80% of the total for all projects, these will provide an adequate pilot sample for new concept testing while maintaining a bounded problem.

Initial pilot development will be accomplished primarily on the JSC LACIE data system. Definition of this activity is in the early stages. Specific system participants as well as their role will be identified as pilot definition matures.

It is anticipated that initial directory implementation will involve two systems: the JSC system mentioned above, plus a USDA system in Orlando, Florida associated with the NOAA Yield Project. Directory contents will include data from all eight projects and remote access will be available to each of the eight as required. (Specific terminal numbers, location and complexity have not been determined.)

In FY82, the pilot will interface with the GSFC Atmospheres Pilot. By the end of FY83, two fully operational networks will have evolved.

The catalog network capability will be expanded to interface with data source catalogs of principal data producers and will support data location and electronic data ordering. This will include up to five interfaces

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to be selected from candidate systems including WMO, EDC, JAWF, Landsat IPF, etc.

Simultaneously a more complex data exchange network capability will evolve to interconnect principal research systems and facilities in support of SR and FCPF. Test bed candidates for network interface include several systems such as those at LARS, ERIM, GISS, Texas A&M, the Landsat Image Processing Facility (IPF) as well as additional remote terminal interfaces.

CAPABILITIES

Demonstrated capabilities and schedules associated with the Resources Pilot were shown in Section 3.4. Most Resources Pilot capabilities represent the implementation and testing of capabilities, originally pioneered elsewhere, applied to the AgRISTARS community. This community, however, presents some unique technical challenges due to its multi-agency nature as well as to its high resolution and registration requirements.

An initial pilot capability (FY81) will include a remotely accessible directory of all Program data. This development represents a critical demonstration for ADS due to the multi-agency nature of the data, users and interfaces. The master directory will provide pointers and indices into individual project data catalogs, as available. This capability will be implemented on the JSC IBM 4341 system, for SR and FCPF data utilizing transportable cataloging tools and pilot standards.

In FY82, a data provisioning capability will be demonstrated. Network and associated capabilities will be established with primary data sources to access their catalogs and order data. An automated capability for tracking internal data orders as well as data delivery status will be implemented. This tracking/accounting capability represents pioneering capability within the pilots.

During this same year, interconnection with the GSFC Atmospheres Pilot will permit access to the network Service Center and other Pilot data systems capabilities.

By the end of FY83, a data sharing network within SR/FCPF will have been established, interconnecting key project systems. Primary emphasis will be upon the exchange of low-bandwidth data. However special attention will be given to the interface with the Image Processing Facility for Landsat images. Alternative procedures and transportable software to access, segment, register, and store or forward images will be evaluated.

Throughout the pilot, new transportable tools such as TAE will be implemented and tested as they become available. Much of the research and initial tool development will be accomplished by related JSC activity. By 1984-85, transportable integration tools will have matured to demonstrate limited registraton of multi-source data.

DEVELOPMENTS

Software development will be associated with the directory, catalog and ordering system implementation. As catalog and processing systems are connected through networks, interface hardware and software as well as communication capability must be procured and developed. Specialized systems may be required for the Landsat data handling demonstration of FY82. Finally, transportable registration software will undergo extensive development.

These developments will generally be accomplished via contractor as well as in-house effort.

3.10 PILOT INTEGRATION

The land, sea and air are in fact closely coupled. Weather and climate are largely influenced by the oceans and in turn influence crop yield and productivity. Therefore the intent is to interconnect these pilots in the

1982 timeframe to form an inter-discipline network, a mini-ADS, and a basis for overall data system evaluation. At that time, an Atmospheres pilot user should be able to access any remote catalog or non-restricted data on the network, utilizing the same protocols and with the same interface as his local catalog data system.

As described earlier, the Atmospheres Pilot under GSFC will lead pilot interconnection efforts and will provide commonly required capabilities. Such capabilities like the Service Center or the Communication Control Center will be accessible by all pilots; capabilities will be evaluated by all.

OAOCO Information Center
Document Data Sheet
(DDS)

1. OAOCO Report No.	2. Other Report No.	3. Project Name
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4. Title and Subtitle	5. Project Manager
ADS Pilot Program Plan	F. Hawkins
	6. Report Date: February 1981

7. Author(s)	8. Contract or Grant No.
J. Clauson, J. Heuser (NASA HQ)	NAS W 3358

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OAO Corporation 50/50 Powder Mill Road Beltsville, Maryland 20705	Technical Report
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14. Supplementary Notes

The ADS Program PLan is a top-level programmatic document. It does not provide a detailed plan for the phased development of ADS. It does provide an overview of the present program and the short- and long-term goals.

15. Abstract (Author-generated)

The Applications Data Service (ADS) in a system based on an electronic data communications network which will permit scientists to share the data stored in data bases at universities and at government and private installations. To achieve this system, a phased approach was adopted which emphasizes an evolutionary development. Pilot programs, in three diverse disciplines, serve as test beds to develop the needed technology and to provide "proof of concept". When interconnected, the three Pilot Programs will be a "mini-ADS"; extension to other disciplines can proceed from there. Closely inter-related to these activities is the identification, development and enforcement of standards - for data formats, protocols, archives, and catalogs.

16. Key Words (Selected by Author(s))	17. SECURITY CLASSIF.
Applications Data Service ADS Standards Program Standardization Atmospheres Pilot Program Oceanic Pilot Program Resources Pilot Program	____ Unlimited ____ Limited ____ Proprietary ____ Confidential ____ Secret ____ Top Secret

DDS-Rev. 1, June 1980


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