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ENGINEERING AND DEVELOPMENT PROGRAM PLAN FLIGHT SERVICE SYSTEM

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16. Abstract

The Flight Service System Engineering and Development Program Plan describes the program required to design, develop, and implement a modernized and automated Flight Service System capable of satisfying the forecast 1990 demand for services. Program objective, approach, development activities, expected results, and resource requirements are set forth. The modernized Flight Service System supports the basic concept of fewer facilities and self-briefing described in the OST/FAA study, "A Proposal for the Future of Flight Service Stations."

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EXECUTIVE SUMMARY

INTRODUCTION

The purpose of this document is to describe in more detail than the FAA NAS 10-Year Plan the Engineering and Development program required to determine, specify, procure, evaluate, and implement a modernized Flight Service System. This modernized system supports the basic concept (self-briefing) described in the OST/FAA study, "A Proposal for the Future of Flight Service Stations." The implementation of this concept will result in significant cost savings in that staffing levels may be held constant or gradually decrease. That is, the flight service specialist will, in most cases, not be a "middleman" in providing weather briefing and flight plan filing services. The users will have direct access to the information they need. In addition, those services which continue to require specialist intervention will be supported by automation to make them as efficient and effective as possible.

THE PROBLEM

The present system has evolved from four sites in 1920 to 283 geographically dispersed stations today. This network of stations evolved along historically significant air routes based on the technology available at the time. Major strides in navigation and communications technology have been made in the last 20 years that have changed the air route structure such that these once significant routes are no longer the patterns of greatest general aviation activity. During this same 20-year period few changes or improvements have been made to the system.

As a consequence of this system evolution, there are wide disparities in the size and productivity of individual stations, with some stations not fully utilizing their personnel while others are continuously overburdened. Productivity variations as great as four to one in the number of services per man year exist today. The large number of stations has fragmented the demand for services to the point where it is impossible to increase productivity in the many small stations. At the other end of the spectrum, the national demand for services is increasing and the brunt of this activity is being carried by the specialist in a relatively small number of strategically located stations. This demand for services is forecast to triple by 1990.

In addition, the advanced technology in the computer and communications fields has not been used to improve the quality of service to the user or to replace obsolete equipment and procedures in the stations.

In summary, the present Flight Service System can be characterized as a manual, geographically dispersed, labor intensive operation with outmoded equipment and facilities, and faced with an increasing demand for improved services.

Three-Phase Modernization Program

To correct this problem, a new Flight Service System has been designed which is a refinement of the concept presented in the OST/FAA study. Subsequent additional analyses have all indicated that the most cost-effective system should consist of a relatively small number of sites called Flight Service Hubs, with emphasis on direct user access to weather and aeronautical data and direct flight plan filing. All services provided by the system will emanate from these hubs through the use of the telephone system and automation equipment. This evolution in system configuration and methods of service delivery will be accomplished through a three-phase modernization program. The three phases of the program are Near Term, Intermediate Term, and Long Term. Implementation of these phases will take place at approximately 1976-1980, 1980-1985, and 1983-1986, respectively.

The Near Term Phase is focused in areas that can provide immediate improvements to the existing flight service stations. They consist of improvements in service to the user and specialist while at the same time are not dependent on the deployment of the automation equipment. The areas specifically addressed include mass weather dissemination and flight service station productivity.

In the Intermediate Phase of the program, current plans call for deployment of automation equipment that will provide the automation aids for the flight service specialist and allow initial direct user access. This automation base is called the Baseline System.

In the Long Term Phase of the program, additional capabilities will be added to the Baseline System. This expansion of capability is centered on two subsystems: a computer-generated voice response system and a family of direct user access devices. These improvements to the Baseline System are called enhancements and when implemented the system will be referred to as the Enhanced System.

Engineering and Development Objectives

In order to accomplish the necessary activities required to implement the modernized flight service system concept, a substantial engineering and development program is needed. This Engineering and Development Program Plan provides a framework for those activities and as such describes the necessary accomplishments required during the various phases of development of the new system. These accomplishments have been set forth as E&D objectives and highlight the key areas of effort contained within the program structure.

1. Develop improvements to the current system that will increase safety and service to users and specialist productivity prior to implementation of the modernized Flight Service System.

2. Develop and implement a prototype facility at the Washington ARTCC to provide information on the quality and effectiveness of service using the concept of performing functions of several separate flight service stations at a single site.

3. Develop a modular system design for a new national configuration of flight service facilities that will allow an orderly transition from the current system to an automated system.

4. Apply automation techniques to each flight service function where cost-benefit analysis or safety provides justification.

5. Develop the capability of providing increased safety and more efficient and improved service or products to the user.

6. Provide direct user access to the modernized Flight Service System for preflight weather briefing and flight plan filing.

7. Develop improved weather dissemination products and delivery systems.

Technical Program

The activities encompassed by the Flight Service System program are divided among a number of subprograms to facilitate technical administration and accomplishment of E&D objectives. Numerous projects are contained within each subprogram. The technical plan for required developments within each project is presented in section 5.0. In general, the subprogram structure reflected in this plan is directed to the development of the modernized Flight Service System; however, in response to overall Master Plan program requirements, activities are included for near term improvements and transition from the present system to the new system according to the respective time phases previously noted. Many activities will be conducted to provide for the development required for specific projects. Selected major activity areas are listed below in their approximate order of accomplishment:

- Near Term improvement data packages
- Baseline Reliability, Maintainability, Availability (RMA) specification
- Flight Service System staffing strategy
- Aviation Weather and NOTAM System (AWANS) operational test and evaluation
- Baseline System specification and contract
- Implementation support
- Continued development and support facilities - NAFEC

Resource Requirements

The estimated R&D costs to accomplish the Engineering and Development program described in this plan are presented in section 6.0. Estimates of associated F&E costs for implementation of the new system are not contained in this document but can be found in the February 1976 edition of the Master Plan for the Flight Service System Modernization Program.

The funding summary shown in the following table presents the total R&D costs for resources required to support the Flight Service System development subprograms.

ESTIMATED FUNDING REQUIREMENTS FOR
FLIGHT SERVICE STATION SUBPROGRAMS*
(DOLLARS IN MILLIONS)

SUBPROGRAM	FY-76	FY-77	FY-78	FY-79	FY-80
NEAR TERM IMPROVEMENT (131-440)	.3	.3	.2	0	0
SYSTEM ENGINEERING (132-440)	1.5	.8	.6	.5	.1
BASELINE SYSTEM DEVELOPMENT (132-441)	1.2	.9	.9	1.1	.3
SYSTEM ENHANCEMENTS (132-442)	2.1	3.2	3.5	3.4	1.6
TOTALS	5.1	5.2	5.2	5.0	2.0

*These funding estimates include funding requirements for both in-house and contractor support.

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1.0 INTRODUCTION

During recent years, concern developed in regard to the future of the present Flight Service Station System. This concern was prompted by a number of aspects:

- The high cost of operating the present, predominately manual system.
- Higher costs expected of this system were expanded to satisfy the growing demand for flight services.
- Attendant derogation of safety to be expected from a lesser expansion of system capacity.
- The growing need to improve the overall availability and quality of services being provided to the general aviation community.

A number of studies have addressed this concern. The OST/FAA Study, "A Proposal for the Future of Flight Service Stations", published in August 1973, proposed a new system concept featuring consolidation, automation and direct user access. The automated system concept was comprised of a central processing facility, hub stations and self-service stations which would serve as the primary contact between the system and its users. This proposed concept would satisfy the need for increasing quantity and quality of services and would provide sufficient system capacity for projected growth while operating at a significantly reduced cost per service.

In order to develop and implement such a concept, a Flight Service System Modernization Program has been established with an overall objective of ensuring that the modernized system will adequately meet forecast user demand at a minimal cost per service unit. Current detailed analyses have developed a realistic goal for the program: to achieve, by 1990, an annualized system cost less than half of the projected cost required were the present system expanded and operated to satisfy the 1990 forecast demand for flight services. Numerous engineering and development activities are required in order to determine, specify, procure, evaluate, and implement a modernized Flight Service System. The purpose of this document is to describe a plan for these activities.

2.0 BACKGROUND, REQUIREMENTS, AND APPROACH

2.1 Present System

The FAA currently maintains a system of approximately 283 manned Flight Service Stations and International Flight Service Stations within the contiguous United States. The system is designed to provide a broad spectrum of services which are needed to support the air traffic control (ATC) and air navigation systems, and the users of the National Airspace System (NAS), and to provide safety and efficiency in air commerce.

The flight service station is an operational air traffic facility providing services to both IFR and VFR pilots operating general aviation, civil air carrier, and military aircraft. The prime functions of the flight service station directly relate to airspace system support, aviation weather acquisition and distribution, and flight assistance services. In accomplishing its mission, each facility assumes responsibility for a specified flight information area encompassing numerous airports, navigational aids, and specific airspace.

The flight service stations act as the backbone of the ATC flight information system. As such, they process over 80 percent of IFR flight plans filed manually (Air carriers prefile in bulk over 30 percent of all IFR flight plans), operate the entire VFR flight plan program, act as prime data source for the National Flight Data Center (NFDC), and originate Notices to Airmen (NOTAM) concerning the operational status of NAS airports and facilities as well as special alert bulletins.

Additionally, flight service stations act as one of the main focal points for aviation weather data acquisition and dissemination. Surface weather observations are performed at over 200 existing facilities. Raw observation data, once compiled, is subsequently distributed to meteorological processors and directly to users on a national telecommunications system. Processed data such as National Oceanic and Atmospheric Administration (NOAA) forecasts are then relayed to both direct and indirect users via the same communications system.

Flight assistance services are provided in all phases of flight. Specialized preflight briefings which are attuned to the needs of the individual pilot are conducted both in person and by telephone. These briefings provide the pilot with the latest information regarding weather, navigational facility status, and general flying conditions to be expected along the planned routes of travel. When actual or forecast weather conditions indicate that VFR flight conditions are doubtful, flight service personnel must advise pilots whose flights will be affected that VFR flight is not recommended. On extended

flights, other flight service stations may be contacted by radio to obtain further information. Other general and/or route-oriented briefings are provided in some locations by Pilot Automatic Telephone Weather Answering Service (PATWAS), Transcribed Weather Broadcast (TWEB), and PBS (Public Broadcasting System) television.

The flight service station communications capability has continued to be of importance in maintaining the safety of the National Airspace System. Inflight briefings are conducted as a matter of routine. Traffic control information is relayed to aircraft unable to contact an ARTCC, flight assistance is provided to lost or disoriented pilots, and airport advisories are provided by stations located at airports not equipped with a control tower. These services benefit all the various users of the system.

Additional responsibilities specifically assigned to the flight service stations include providing special flight services to VFR aircraft in mountain, lake , swamp, and oceanic areas and acting as point of coordination during search and rescue operations of downed airmen.

2.2 Problem Statement

The present Flight Service System resulted from evolutionary growth and a changing mission. From four radio communication sites in 1920 to over 450 radio relay sites in 1950 to 283 flight service stations today, the changes in the system reflect major changes in navigation and communications technology and in the ATC system. Unfortunately, these changes are reflected in the form of residual and obsolete pieces of previous systems, as there have been few changes or improvements to the Flight Service System in the past 25 years.

As a consequence of the geographical location problems, there are wide disparities in the size and productivity of individual stations, with some stations not fully utilizing their personnel while others are greatly overworked. Furthermore, functions are often poorly organized within and among the stations and there is often a lack of system and human factors considerations in station design. All of this, of course, contributes to a situation of generally declining morale among flight service specialists.

From the hardware standpoint, much of the equipment now in use is deteriorating and/or obsolete. Although advanced technology has been successfully utilized to automate the enroute and terminal elements of the ATC system, none of this available technology has been applied to flight service stations. Users are becoming increasingly impatient with the resultant gradual service deterioration. Past studies have highlighted these same interrelated problems, but lack of agreement on how to deal with them has resulted in only patchwork responses.

The present system and configuration do not satisfy the demand for services. The number of flight services provided in fiscal year 1974 reached an all-time high of 56.2 million. Extended forecasts based on this number predict that these total flight services will increase to 179 million by 1990. While this total demand for flight services is growing, the current system is not fully able to meet even the present demand. In the face of steadily increasing demand, the total system staffing level over the past several years has been virtually constant. Although the deficiencies of the system are obvious, the problem is quite complex, with interrelated political, economical, social, and technical implications. The present system problem can be summarized as a compilation of several interrelated problem areas. The basic elements of the problem, a manual, labor-intensive operation with outmoded, nonstandard equipment and facilities, and an increasing demand for improved services, should not be addressed individually, but as a composite problem.

2.3 Program Requirements

Requirements for the Flight Service System program have evolved over a period of time. Many "Request for R&D Effort" (Form 9550's) have been on the books in the past to improve various areas of flight service station operation but emerging and growing inadequacies of the total system to meet the demand and the spiraling cost associated with its awkward structure have placed the total statement of requirements virtually beyond the scope of a simplified 9550. Recognizing the growing urgency of the problem, the Department of Transportation formed a joint Office of the Secretary of Transportation (OST)/Federal Aviation Administration (FAA) Flight Service Station Evaluation Team (FSSET). The team was specifically directed to (1) perform, with appropriate contractual assistance, an in depth analysis of existing and future flight service station functions in order to determine the future role of the Flight Service System, and (2) analyze and develop recommendations on the best technical configuration for the future system and an optimal geographical distribution for the provision of necessary flight services. This analysis was to give top priority to develop more automation and fewer manned facilities. (The results of the analysis are summarized and documented in a DOT report dated August 1973, entitled "A Proposal for the Future of Flight Service Stations".)

This study clearly stated the urgent need for Flight Service System modernization and recommended and proposed a totally new system concept to replace the existing system. The OST/FAA study has become essentially a statement of requirement for the program. Its validated flight service functional requirements and proposed automation system concept have become cornerstones of the modernized program.

Additional guidance and direction was also received in a letter, dated March 27, 1973, from AOP-1/AAT-1 to AED-1, requesting the engineering services to develop technical standards for constructing and equipping an automated Flight Service System along the general concept proposed by the OST/FAA team. The letter expressed an interest that those standards developed be applied, at least in part, to satisfy an interim need in a transitional system which may be feasible prior to implementation of a fully automated concept. It is important to note that both the letter and the study have recognized that the development plan must address the priority of urgently needed near term improvements prior to the availability of automation.

The most recent direction has been given the program in the form of a General Notice, by Acting Administrator Dow on May 27, 1975. This GENOT directed that a prototype facility will be established at the Leesburg ARTCC and will provide information on the quality and effectiveness of service using the concept of performing functions of several separate flight service stations at a single site.

2.4 Functional Requirements

A functional analysis was conducted in support of the OST/FAA study to determine which functions were necessary and appropriate for the future Flight Service System to perform. The results of this analysis were confirmed by a joint FAA service group in December 1974. The group also recommended the transfer of military flight services as discussed below. Actions have been initiated for transfer or elimination of certain functions but none have been completed.

Activities to consider other recommendations will be initiated, and will continue as the modernization program progresses. The functional requirements, analyzed in Volume III of the OST/FAA study, are:

CONTINUE	TRANSFER/ELIMINATE
Pilot Weather Briefs	VFR Flight Plans
Emergency Assistance	Airport Advisory Service
IFR Flight Plan Filing	Airman Exams
Processing of NOTAMS	Surface Weather Observations
Relaying of ATC Messages	Military Flight Services (not in OST/FAA Study)
Processing PIREPS (Pilot Reports)	
NAVAID Monitoring	
Handling Enroute VFR Communications	

The status on action to transfer/eliminate certain functional requirements is noted below:

- Eliminate VFR flight plans. A proposed change in policy was issued in the Federal Register on May 22, 1975, requesting comments by August 28, 1975, on a proposal to eliminate VFR flight plans except in certain areas. Comments have been reviewed. The resulting action is that a recommendation is being sent to the administrator to withdraw the proposal to eliminate VFR flight plans. The public response largely supports their retention.

- Eliminate issuing airport advisories. No action has been taken to date. FAA Advisory Circular 90-42A established recommended procedures for non-tower airports. Airport advisories will be eliminated as a function in the modernized system; therefore, the noted procedures will apply automatically to airports where flight service stations are decommissioned.

- Eliminate administering airman examination function from the station. The number of stations which administer airman examinations has been reduced significantly. FAA Regional Directors will continue to reduce the number of air traffic facilities authorized to provide airman written test services in accordance with guidelines contained in FAA Order 8440.4C. Administering Airman examination is considered eliminated as a function of the modernized system.

- Eliminate surface weather observation function from the flight service stations. Provisions will be necessary to transfer the function for the station as existing stations are decommissioned. The function can be transferred to control towers, the National Weather Service, an operational automated system, or contract observers, as appropriate, at each individual location. Every effort must be made to assure that the quality of the observations is maintained. An automated aviation weather observation system is being developed under the Weather Program. (See Paragraph 7.12).

- Transfer the function of providing military flight services. Currently flight service stations receive and forward many military flight plans. It is envisioned that this function will be eliminated from the specialist's workload by providing the military with direct access to the National Airspace System thus minimizing normal interfaces between military bases and specialists. Discussions, planning and coordination with the Department of Defense are necessary and underway.

2.5 Approach - Resolving the Problem

The Problem Statement points out the need for flight service improvements such that both current and future user demands can be satisfied and projected increased operational cost of the manual system can be offset. However, the magnitude and complexity of such improvements, if totally implemented at one time, would cause a rapid and radical change in system operating technique. From a developmental, operational, and safety point of view, such a change is unacceptable. Therefore, an evolutionary approach for modernizing the system has been adopted.

The approach is:

- To provide near term, immediate improvements to existing station facilities and operations.
- Develop/implement automation for the specialist and re-configure for consolidation.
- Broaden the automation capabilities to provide for direct user access to aviation weather and flight data products.

Each of these aspects will be considered a distinct phase of the program for purposes of development, implementation and transition. Hereafter in this plan, these phases will be referred to as Near Term Improvements, Baseline System (Intermediate Term) and Enhanced System (Long Term). Implementation of these phases will take place at approximately 1976-1980, 1980-1985, and 1983-1986, respectively.

Near Term Improvements

Since it will require a few years to have a Baseline System in operation, immediate or near term improvements to the existing system are considered essential. This includes on the one extreme, immediate physical improvements to certain stations, to the other extreme of providing modern display equipment for the specialist if cost effective. Additionally, increased Pilot Automatic Telephone Weather Answering Service (PATWAS) and Transcribed Weather Broadcast (TWEB) availability, quality and coverage, Enroute Flight Advisory Service (EFAS) implementation, etc., are planned. The hours of operation at selected Flight Service Stations will be reduced on a case-by-case basis. Positions made surplus by this action may be retained and rescheduled at those facilities or relocated to others which are understaffed. While these improvements are essentially independent of automation per se, they will be planned in consonance with the development of the Baseline/Enhanced system. All near term improvements will be accomplished on a case-by-case basis when demonstrated to be cost effective.

Baseline System (Intermediate Term)

The Baseline System is planned to provide the first automation for the specialist and consists of 20 Hub facilities collocated with existing ARTCCs and an Aviation Weather Processor. This system design is similar to the basic OST/FAA concept, but is to be refined by subsequent configuration analysis, requirements definitions, and user data to be gathered from operational tests of two prototype systems. The first functional prototype system, Aviation Weather and NOTAM System (AWANS), is located in the Atlanta Flight Service Station and is providing information on specialist automation. The second functional prototype, at the Washington ARTCC, will provide information on the quality and effectiveness of service using the concept of performing functions of several separate flight service stations at a single site. As services provided by the Hubs become more accessible and increasingly utilized by the various users, the workload at existing stations will decrease. Gradual consolidation of these flight service stations will then begin on a case-by-case basis.

Enhanced System (Long Term)

The Enhanced System will provide an increase in the automation capability of the Baseline System. Physically, the Flight Service System will still consist of 20 hubs and a weather processor; however, expanded automation capability and additional features will enable users to directly access the aviation weather data base. This will enable preflight users of the system to brief themselves and file, cancel, or amend flight plan data; all without the aid of a specialist. This phase of the program, essential for meeting projected 1990 demands at a reasonable cost per service, is consistent with the OST/FAA proposed concept of operations and will, in the long run, enable completion of most, if not all, of the flight service station consolidation.

3.0 PURPOSE, SCOPE AND OBJECTIVES

3.1 Purpose

The purpose of the Flight Service System Engineering and Development Plan is to describe the engineering and development activities necessary to provide a modernized system which will satisfy the goal of the total Modernization Program.

3.2 Scope

This plan will delineate engineering and developments encompassed directly for and in support of: the collection, assembly, reformatting, dissemination, processing, and display of weather products for specialists/pilot utilization; the acceptance and processing of flight plans; and all items necessary to improve and continue (where applicable) the remaining flight service functions of mass weather dissemination, inflight assistance, search and rescue, emergency services and NAVAID monitoring. In addition, the plan will note areas where development activities will be required to support system implementation and transition after prime responsibility for the effort is transferred from R&D to the operational services.

3.3 E&D Objectives

The Flight Service System Modernization Program objectives previously noted in the Introduction state that the modernized system will meet forecast demands at a minimal cost per service. E&D objectives describe the necessary accomplishments required during the various phases of the engineering and development of the new system. These E&D objectives listed below highlight the key areas of effort.

1. DEVELOP IMPROVEMENTS TO THE CURRENT SYSTEM THAT WILL INCREASE SAFETY AND SERVICE TO USERS AND SPECIALIST PRODUCTIVITY PRIOR TO IMPLEMENTATION OF THE AUTOMATED SYSTEM.

2. DEVELOP AND IMPLEMENT A PROTOTYPE FACILITY AT THE WASHINGTON ARTCC TO PROVIDE INFORMATION ON THE QUALITY AND EFFECTIVENESS OF SERVICE USING THE CONCEPT OF PERFORMING FUNCTIONS OF SEVERAL SEPARATE FLIGHT SERVICE STATIONS AT A SINGLE SITE.

3. DEVELOP A MODULAR SYSTEM DESIGN FOR A NEW NATIONAL CONFIGURATION OF FLIGHT SERVICE FACILITIES THAT WILL ALLOW AN ORDERLY TRANSITION FROM THE CURRENT SYSTEM TO AN AUTOMATED SYSTEM.

4. APPLY AUTOMATION TECHNIQUES TO EACH FLIGHT SERVICE FUNCTION WHERE COST/BENEFIT ANALYSIS OR SAFETY PROVIDES JUSTIFICATION.

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5. DEVELOP THE CAPABILITY OF PROVIDING INCREASED SAFETY AND MORE EFFICIENT AND IMPROVED SERVICE/PRODUCTS TO THE USER.

6. PROVIDE DIRECT USER ACCESS TO THE AUTOMATED SYSTEM FOR PREFLIGHT WEATHER BRIEFING AND FLIGHT PLAN FILING.

7. DEVELOP IMPROVED WEATHER DISSEMINATION PRODUCTS AND DELIVERY SYSTEMS.

4.0 MODERNIZATION CONCEPT - THE FLIGHT SERVICE SYSTEM

4.1 Purpose

This section describes the Baseline and Enhanced Flight Service System. It is noted that the Baseline System provides the means for transitioning to the Enhanced System which is necessary to satisfy 1990 forecast demands for service without undue increase in personnel and the associated labor costs.

4.2 Baseline System

The Baseline System consists of two major components. These are an Aviation Weather Processor (AWP) and 20 Flight Service Hubs collocated with ARTCCs. An overall block diagram of the Aviation Weather Processor and one Flight Service Hub is shown in Figure 4-1. This system provides automation for the specialist and a direct access capability for user owned and military terminals.

4.2.1 Aviation Weather Processor

The function of the AWP is to interface with the Weather Message Switching Center (WMSC), format the data, develop a weather and aeronautical data base, and distribute it to the computer systems located in the Hubs. This national weather data base is assembled at the AWP where both alphanumeric and graphic data are tailored for flight service briefing purposes. Interactive terminals are provided at the AWP for alterations to the data base as required. In addition to its primary task of data base generation and maintenance, the AWP computer and its software operating system provide sufficient capacity and facilities for their own software maintenance. The location of the AWP has not yet been determined. The subject will be addressed in a future joint study by ARD/AAT/AAF and WMSC personnel.

4.2.2 Flight Service Hubs

The Hubs are the operational focal points for the new system. They are constructed to eventually house all personnel relocated from flight service stations and provide required space for operations, support, processing, communications, facilities remoting, and maintenance equipment. The Baseline Hub is initially equipped with the necessary items to provide automation for specialists, provide support for user owned and military terminals, and handle time phased consolidation.

The processor within each Hub aids the specialist by allowing him to retrieve weather data and enter flight plans using an alphanumeric/graphic display and associated keyboard. Weather radar data is received from selected National Weather Service and/or ARTCC radars for instant call-up on individual or common monitoring displays.

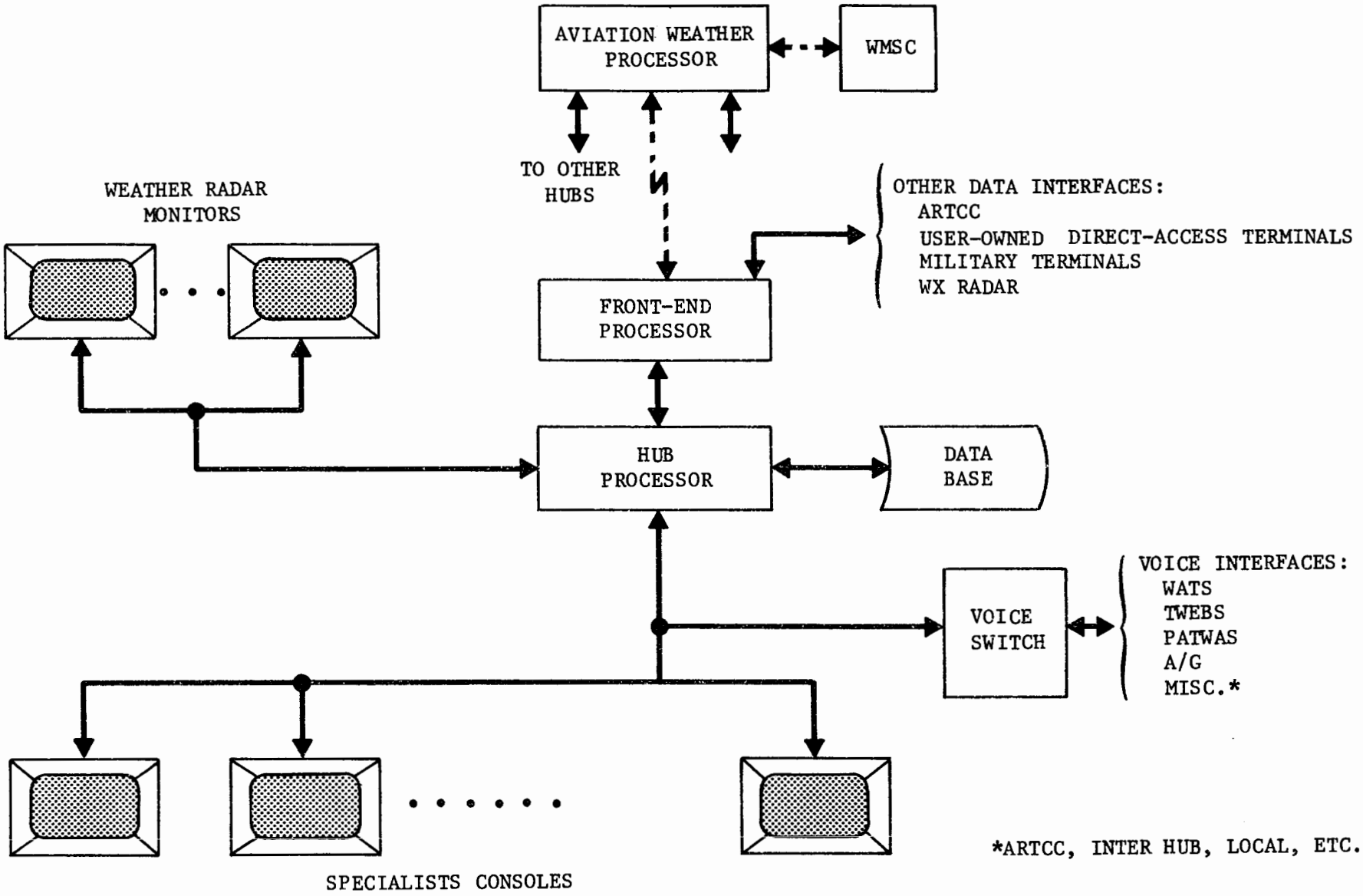


FIGURE 4-1
AVIATION WEATHER PROCESSOR AND BASELINE FLIGHT SERVICE HUB

In the Baseline configuration, the specialist handles all requests for preflight briefings except those accommodated through the use of private terminals. These specialist requests consist of both telephone and air/ground inquiries for weather briefings and flight plan filings. Telephone access to the specialists for these services is primarily provided by toll-free Wide Area Telecommunications Service (WATS). Complementary service through the use of local and/or foreign exchange lines is also utilized where cost effective. The specialist efficiently responds to these requests utilizing the capability to retrieve specific weather reports as well as detailed route-oriented briefings from the data base. The specialist may also enter IFR, VFR, and DVFR flight plans directly from his keyboard. The Hub computer then forwards IFR flight plans to the appropriate ARTCC and VFR/DVFR flight plans to the destination Hub. The specialist can handle military flight plans from bases where it is not practical to install remote terminals and can enter weather observations, NOTAMS, or PIREPS for addition to the aviation weather data base.

A "Fast File" system for rapid filing of flight plans is being considered for use in the Baseline Hubs. This system, developed, tested, and proposed for implementation during the Near Term, provides a dedicated access line for direct flight plan entry to a recorder. Subsequently, a support position takes the flight plan data from the recorder and enters it into the system as his workload permits.

Enroute Flight Advisory Service (EFAS), planned for implementation completion during the Near Term, is continued with designated positions located at Flight Service System Hubs.

Standardized interfaces and procedures will be published and maintained to provide the capability for users to access the data base with privately owned terminals. Pilots using one of these terminals can obtain a weather briefing and file, amend or cancel a flight plan. Flight plan information from these remote terminals will initially be routed through a flight data position rather than direct, automated entry into the 9020 center computer. Additional features, such as hard copy availability at the terminal, are an option the user can personally select when he procures a terminal. This plan anticipates no charges for this service; however, users may absorb any communications cost required for access. Safeguards are taken to protect the data base from any sabotage attempts or spurious/erroneous entries from these terminals.

PATWAS in the Baseline System contains improved route-oriented text with recorders located in high demand areas. There are several route directions per area with one recording per direction for each location. The update of PATWAS recordings are computer prompted but manually edited and recorded by a specialist. TWEB recordings also contain improved text and are similarly produced.

4.3 Enhanced System

The Enhanced System consists of additions and improvements to the Baseline System capability. Direct user access features will be expanded with additional remote terminal capability and the introduction of automated voice response equipment. Specialist capabilities will be improved and system operation such as remote terminal direct flight plan entry into the 9020, will be enhanced. This expansion of both availability and capability of the automation techniques enables further consolidation of facilities by satisfying the increasing demand through direct access techniques. The descriptions which follow are categorized by system elements; however, they primarily address the new features of enhancements with the understanding that all baseline capabilities previously described are sustained or enhanced. The AWP continues to perform its baseline system functions and is adaptable to the enhancements developed including an AWP backup capability. This includes any data requirements for the voice response systems utilized by specialists and/or pilots.

4.3.1 Flight Service Hubs

In the Enhanced System, the Hub processor capability is expanded to accommodate a Voice Response System (VRS), and remote terminal equipment while continuing to provide the specialist automation available in the Baseline System. Staffing, consoles, etc., are expanded in the hubs until consolidation is completed. Air/ground communications, NAVAID status monitoring and DF operations, previously divided between hubs and non-consolidated stations, are relocated and totally accommodated at hub facilities. Further automation is provided for monitoring NAVAIDS, processing DF data and automatic generation/distribution of TWEB/PATWAS messages. In addition, telephone requests to specialists for weather briefings can, through appropriate keyboard entries, be transferred such that the voice response system provides the pilot with the desired weather information. The Aviation Weather Processor and one Enhanced Flight Service Hub are depicted in Figure 4-2.

4.3.2 Direct VRS Briefings

The capability is provided for pilots to directly access the aviation weather data base utilizing a "touch-tone" (TM) type of telephone. The capability is "interactive" in that the pilot can specifically request various types of information.

This information, such as local weather, route-oriented weather or selected weather reports, is retrieved from the hub weather data base and spoken to the pilot by the voice response system. Specialist assistance is normally not required but is available if needed.

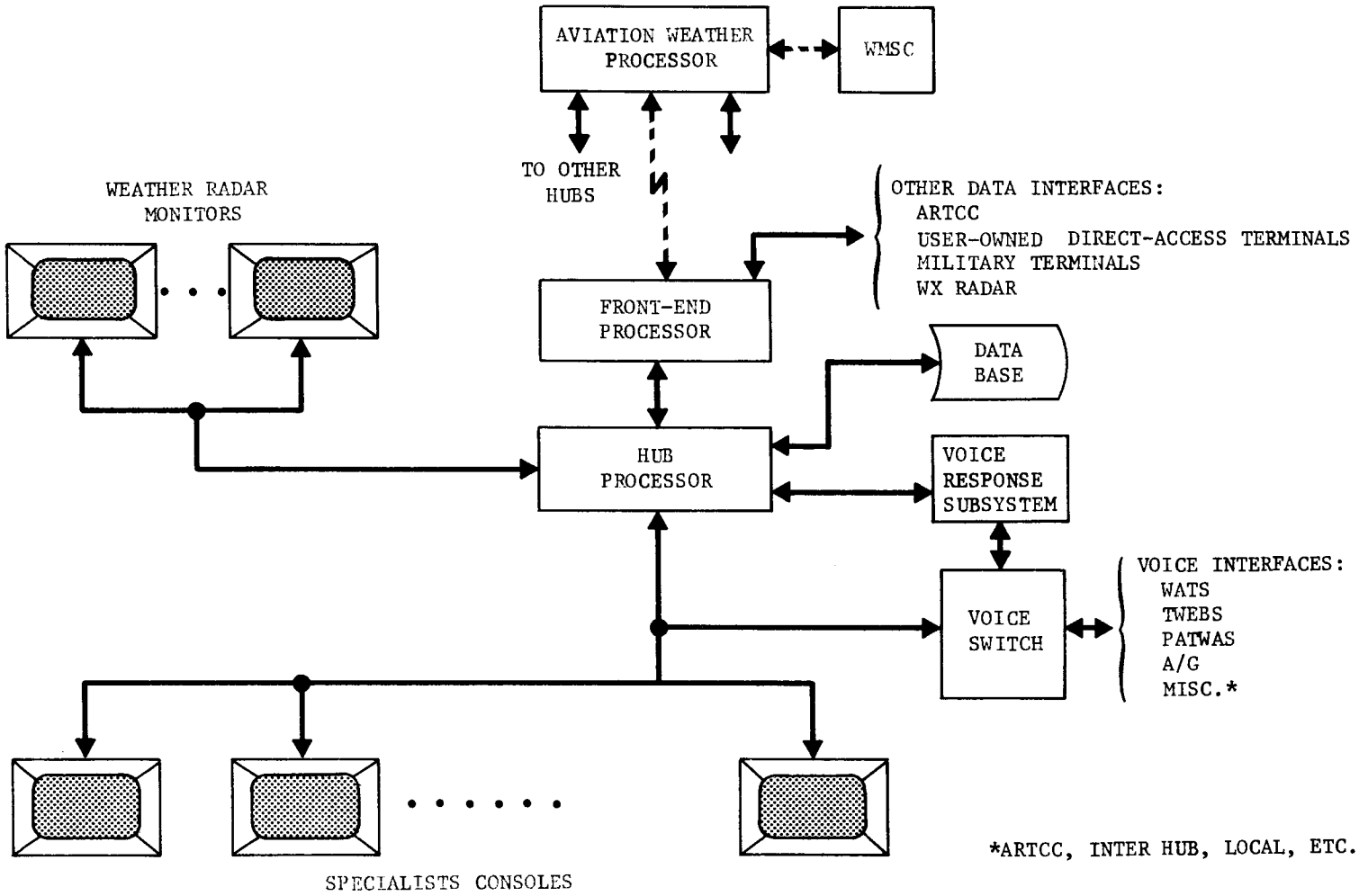


FIGURE 4-2
AVIATION WEATHER PROCESSOR AND ENHANCED FLIGHT SERVICE HUB

Although this "interactive" capability requires a "touch-tone" (TM) type of telephone (Dual Tone - Multi-Frequency - DTMF), rotary dial phones augmented with a DTMF pad or personally owned terminal devices may be used. Access to this capability is provided through the use of toll-free telephone service. Weather information is still provided on PATWAS recordings which are also generated by the VRS. However, they do not require or allow "interactive" participation by the pilot and as such, do not require the use of a DTMF telephone. The capability is also provided for specialists to utilize the VRS to assist in their briefings. They will be able to talk to pilots, switch them to the VRS for appropriate data, and connect again with the pilots if required to augment the brief or file flight data.

4.4 Automated System Capabilities

Table 4-1 depicts the capabilities of the present, Near Term, Baseline, and Enhanced Systems. It should be noted that all essential services are retained and that increasing demand is accommodated by direct user access techniques which reduce the workload of the specialists.

TABLE 4-1

CAPABILITY VS SYSTEM DESIGN FOR
THE FSS MODERNIZATION PROGRAM

FUNCTIONAL CAPABILITY	FUNCTIONAL CAPABILITY PROVIDED FROM: PRESENT SYSTEM	NEAR TERM SYSTEM	BASELINE SYSTEM	ENHANCED SYSTEM
SPECIALIST CAPABILITY				
1. Provide Wx Briefings/Flight Plan Filing (cancellation) via:				
Telephone - Local Lines. Fx Lines	X	X	X	X
- WATS Network			X	X
Walk-in	X	X		
Air/ground	X	X	X	X
2. Generate PATWAS Recordings	X	X	X	*
Improved, Route-Oriented Text		X	X *	X *
3. Generate TWEB Recordings	X	X	X	*
Improved Text		X	X *	X *
4. NAVAID Status Monitoring (NOTAMS)	X	X	X	X
5. Fully Implemented EFAS		X	X	X
6. Balance of Functional Requirements				
Such as: Emergency Service, Flight following, etc.	X	X	X	X
AUTOMATED FUNCTIONS				
1. Generate PATWAS Text			X	X
2. Generate TWEBS Text			X	X
3. Remote Briefing Terminal			X	X
User Owned/Military Installations			X	X
Expanded Accessability				X
Weather Briefings			X	X
File/Cancel Flight Plan			X	X
4. Automated Voice Response System (VRS)				
Generate PATWAS Recordings				X
TWEB Direct Drive				X
Pilot Direct Access - Wx Briefing				X
Pilot/Specialist/VRS - Wx Briefing				X

* MANUALLY PERFORMABLE IN A BACK-UP MODE.

5.0 TECHNICAL PROGRAM

5.1 Program Structure

The activities encompassed by the Flight Service System Program are divided among two program elements and a number of subprograms to facilitate technical administration and accomplishment of the various efforts. In general, the subprogram structure reflected in this plan, Table 5-1, is directed to the development of a modernized Flight Service System. Included also are activities to transition from the present manual system to a fully automated one. The allocation of activities within the resultant framework provides for emphasis along the following lines:

a. Engineering and test of various hardware and station improvements at selected sites in order to produce an immediate increase in service provided to users and increase specialist productivity. These activities are covered by Subprogram 131-440, "Near Term Improvements."

b. Initial planning, analysis, and definition efforts leading to establishment of functional, engineering, and interface requirements for the automated system. These activities are covered by Subprogram 132-440, "System Analysis."

c. Engineering and development of the initial hardware and software system to allow for the acceptance, processing, distribution, and display of weather data and aeronautical information required to provide pilot briefings and allow flight plan filing. This type of activity is covered by Subprogram 132-441, "Baseline System Development."

d. Engineering and development of the hardware and software expansion of the baseline system to improve system capacity, to provide direct user access, and to provide interface with other future weather and communications systems. This type of activity is covered by Subprogram 132-442, "System Enhancements."

Subsequent paragraphs provide descriptions of each subprogram and associated projects.

5.2 Near Term Improvements (Subprogram 131-440)

The goal of this subprogram is to increase current safety and station productivity and user service prior to implementation of the automated system. In order to accomplish this objective, two types of test facilities will be established wherein proposed improvements will be evaluated in order to determine their effectiveness from both environmental and operational standpoints prior to their widespread implementation

ENGINEERING AND DEVELOPMENT PROGRAM STRUCTURE

13 PROGRAM - FLIGHT SERVICE SYSTEM

131 Sustaining Engineering

- 131-440 Near Term Improvements
  - 131-440-104 Mass Weather Dissemination
  - 131-440-204 Productivity Improvements

132 System Development

- 132-440 System Analysis
  - 132-440-104 Requirement Analysis
  - 132-440-204 System Configuration Design
  - 132-440-304 Leesburg Prototype
- 132-441 Baseline System Development
  - 132-441-104 Aviation Weather and NOTAM System (AWANS)
  - 132-441-204 Baseline System Design
- 132-442 System Enhancements
  - 132-442-104 Automated User Access
  - 132-442-204 Operational Product Enhancements

TABLE 5-1

into other field facilities. The aforementioned facilities include, but are not limited to:

a. A near term improvement laboratory at NAFEC which will simulate the operations area of a fully operational flight service station.

b. On-site test facilities at selected operational flight service stations where near term improvements will be tested and evaluated under operational field conditions.

Each project within the subprogram will be conducted as a quick response effort to accommodate the expediency required and will provide the standardized designs for field implementation.

The principal projects included in the subprogram are described in the following subparagraphs.

5.2.1 Improved Mass Weather Dissemination (131-440-104)

Today's system for mass dissemination of aviation weather information consists of some 48 telephone accessed FAA and NWS PATWAS recording outlets and approximately 104 radio broadcasts from L/MF and VOR TWEB facilities. During times of greatest need, the users normally experience busy signals and must continuously redial in attempting to receive weather information. The work force required to keep these recordings updated is excessive and updating of recordings has a low priority in the station. Efforts in the past to provide for some user selectivity via quadrantized or route-oriented PATWAS recordings accessed by separate dedicated telephone numbers have provided partial solutions and show great potential. More recordings, however, require additional manpower for preparation. The main thrust is to satisfy some specialist briefing demand by providing a national system which is characterized by improved accessibility (more outlets and lines per outlet), improved usability (standard formats and more frequent updates) and improved selectivity (additional route and/or quadrant oriented recordings).

This project will consist of the following general activities:

1. Development of standard PATWAS and TWEB products and formats.

2. Development, test, and evaluation of PATWAS and TWEB outlets at field facilities.

3. Development, test, and evaluation of an Automatic Message Dissemination for updating several remote PATWAS and TWEB satellites from a single facility.

4. Design of a national mass dissemination system configuration.

The primary outputs from the activities will be:

1. A standard PATWAS and TWEB format.

2. National Mass Dissemination Plan, Design, and Configuration.

3. Hardware and service specifications for mass dissemination outlets and distribution centers procurement.

4. Procurement and implementation plans.

As part of the developmental activity, the FAA, in conjunction with National Weather Service, is conducting an operational test and evaluation of route-oriented PATWAS including separate recordings for local, northbound and south/westbound general aviation activity. This includes studies directed toward the improvement of weather products for PATWAS presentation in the New York City area. The specialized weather products and PATWAS announcement recordings are being developed by National Weather Service personnel.

An additional activity under this project will include the design and development of a standardized national system for the preparation and dissemination of both PATWAS and TWEB weather announcements. The effort will be accomplished in conjunction with a working group of the interagency Subcommittee/Aviation Meteorological Services (SC/AMS).

In order to develop these improvements, "before" and "after" user surveys will be conducted to determine the format and content of weather products to be incorporated into the future PATWAS and TWEB.

State-of-the-art recording equipment will be procured with the capability of random-access updating of the recordings by message element as opposed to the current method which requires total recording update when even minor changes or deletions are required. The recording hardware will also possess the capability for automatic message recomposition when message elements are updated. A storage, retrieval, and display subsystem will be utilized to retrieve the recording text from the WMSC computers in the format and order in which the recording will be made. In conjunction with the characteristics mentioned above, this will provide for currency of information and minimize the amount of time required for the recording preparation process. A synchronous entry capability incorporated into the announcement subsystem will provide each caller with a briefing which begins with the most pertinent information presented first. All present systems provide "barge-in" access wherein callers barge into the recording at that point where the recording is when the call arrives. This synchronous entry feature will assign the required priority to the more critical and useful weather products, thereby lending value to a national standard format

while decreasing "line-hold" time. Decreased line-hold time, in turn, provides either more capacity from the same number of incoming telephone trunk circuits or fewer lines and consequently less line costs for the same demand served.

More selectivity implies more recordings and more recordings imply increased staff to keep them updated more frequently. However, the various PATWAS and TWEB products have great commonality. If the consolidation and integration of these many PATWAS and TWEB outlets could be accomplished at a few update facilities, then considerable gains in efficiencies result. Therefore, this plan contains efforts which will demonstrate this capability on a regional basis at the Chicago FS station where 7 PATWAS and 19 TWEB recordings will be generated and updated from a single, multi-position facility. Incorporating this consolidation/integration concept on a national basis would result in a national system which consists of 8 update/development facilities, 70 PATWAS, and 150 TWEB outlets.

The total effort will provide for an operational test and evaluation of new and improved weather products, increased accessibility to these products, more prompt updating, less human effort required for recording preparation, and improved presentation via equipment improvements. This project has as its goal the establishment of the design requirements and development of a national mass dissemination system which minimizes the working effort required for the generation and updating of the recording media. Proof testing and verification of the system concept and performance will be accomplished prior to acquisition and implementation.

5.2.2 Productivity Improvements (131-440-204)

The present Flight Service System equipment is obsolete, and the physical layout must inefficiently conform to leased space availability. Internal data distribution is presently accomplished via the manual passing of paper and scribbled note and, at times, shouting across the room. This method is distracting to specialists conversing on telephones and air/ground radio, and often results in the loss of important weather data.

One area of this effort will address problems concerning the internal distribution of weather and aeronautical data between flight service station positions.

Various low cost state-of-the-art techniques and equipments will be evaluated to improve the data distribution situation. Techniques including closed-curcuit TV, random access projectors, and microfilm devices will be evaluated in the laboratory and at an operational site.

The task of improving the distribution of Service A weather within the flight service station will include feasibility tests to validate that the capabilities of proposed equipment provide satisfactory data retrieval and automatic update capability to the specialist at the operating position. This test will also consist of an evaluation of the system's capability to provide route-oriented briefings and its ability to facilitate data transfer; i.e., PIREPS, etc., to the requesting position. Upon successful completion of the feasibility test, an improved system consistent with the design capabilities demonstrated will be implemented at a flight service station where system integration testing and evaluation will be conducted. Concurrently, a system will be procured and implemented at the NAFEC test laboratory facility, where it will undergo tests and evaluation to determine its compatibility with other equipments and improvements included in the Near Term Improvement Program.

The task of developing a standardized enroute flight advisory service (EFAS) console will include an on-site survey of the existing active EFAS locations to establish the "real-life" requirements of the system. This effort will precede the development of several prototype console configurations at NAFEC which will undergo test and evaluation. Through this effort, a determination will be made of the adequacy of the built-in human factors elements and the capabilities of the console configurations to depict the information necessary to service the system requirements. An initial survey of these requirements includes the capability to observe and interpret graphic weather information, live weather radar, static graphic and textual material, and alphanumeric weather information. On completion of a successful laboratory test and evaluation, a prototype console will be implemented into a flight service station where a field operational test and evaluation will be conducted. The successful completion of this series of tests will result in the development of a standardized EFAS console specification.

A second area of productivity improvements will encompass the study, analysis, test, and evaluation of techniques which will substantiate a reduction of manual support positions within a flight service station. Those tasks to which this effort will be addressed include Service B flight plan data entry and dissemination improvements, establishment of dynamic and static information retrieval systems, and internal processing of pilot reports.

The task of improvements to the present flight plan distribution system will be initiated under the feasibility test facility program previously described. This test will study the salient features of a system providing real-time flight plan entry into the National Airspace System to replace the current teletypewriters. Evaluation of this capability in an operational flight service station test facility will follow the successful completion of the feasibility study. Concurrent implementation into the NAFEC laboratory will also follow the successful study.

This activity will develop a plan whereby preselected weather facsimile network (Fax Chart) information and pertinent static graphic and textual information will be transmitted from a centralized area to the flight service specialist's position. A prototype system will be incorporated in the near term improvement laboratory. All subsystems having attained a preestablished degree of success will be implemented in the near term improvement laboratory facility.

A near term improvement laboratory has been established at NAFEC and will provide a prototype test bed capability wherein all systems developed as part of the near term improvement activities may be installed, tested, and evaluated for their compatibility and adaptability as improvements to the existing Flight Service System. To accomplish this, the laboratory facility at NAFEC will be configured so as to depict as near as possible an improved version of a typical near term flight service station operations area, complete with standardized specialist consoles, the latest state-of-the-art observation and display devices, and all other equipments required to simulate the proposed near term improvements. Within this integrated environment, additional testing and evaluation of off-the-shelf equipment and techniques can be conducted. The output of this effort will be the establishment of design criteria and equipment standards to enhance the effectiveness of the flight service specialist in the present Flight Service System. NAFEC will develop, monitor, and provide the technical guidance and staffing for the laboratory facility. A final report of all test activities, improvements, recommendations, and resulting flight service specialist evaluations will conclude NAFEC's input to this task.

5.3 System Analysis (Subprogram 132-440)

This subprogram provides for the definition of the functional and operational requirements of the automated Flight Service System environment and develops system configuration design characteristics responsive to those requirements. Analysis of the system requirements and characteristics further provides identification and guidance pertinent to the development activities that need to be accomplished in other subprograms and projects. The end items developed within this subprogram provide the basis upon which the system design will be developed.

The principal projects included in the subprogram are described in the following subparagraphs.

5.3.1 Requirements Analysis (132-440-104)

The Flight Service System mission is based primarily upon the broad requirements currently stated in the Federal Aviation Act of 1958. The Flight Service System provides for many of the diverse supporting

activities and functions required to comply with the stated statutory requirements.

The broad major functions performed by the Flight Service System are:

a. Weather and NOTAM data collection and dissemination

b. ATC support activities

c. Emergency assistance service

The purpose of this project is to analyze the broad functional areas of flight service responsibility, validate specific requirements, and determine from those requirements essential system characteristics which must be provided in order that the developed system will be responsive both to the specialist and to the aviation community. Not only will flight service functions be validated, but quantitative performance requirements will also be developed. Various technical criteria will be defined such as data handling response time, line speeds, throughput, data storage sizing, processor sizing, reliability and maintainability factors, etc. This development of technical criteria is necessary for configuration analysis and subsequent system development. Interface requirements of the modernized system to the other NAS elements will be defined.

5.3.2 System Configuration Design (132-440-204)

The tasks under this project are designed to analyze the specific system characteristics which will be responsive to the functional requirements. These analyses will include hub communications requirements (frequency spectrum compatibility analyses, evaluation/optimization of coverage, etc.) pilot self-briefing terminal (PSBT) usage impact, hub workloads and required staffing, system reliability, staffing and data requirements, ARTCC/Flight Service Hub joint use, and requirements of other systems which interface the Flight Service System.

Alternate configurations which provide a range of characteristics in the key areas of cost and capability have been and will continue to be analyzed. The limitations, advantages, and disadvantages of each configuration will be studied and the optimum characteristics will be recommended for inclusion in the Flight Service System design. Areas in need of additional analyses will be identified.

5.3.3 Leesburg Prototype (132-440-304)

The principal objective of this project is to demonstrate the concept of performing the functions of several facilities at a single site. This project will be accomplished in several phases. The first phase will be to relocate the Washington Flight Service Station into existing space in the Washington ARTCC. Included as a part of the relocation will be the installation of a leased Meteorological and Aeronautical

Presentation System (MAPS) as an interim system with initial alphanumeric display capability.

The second phase will be to remote the functions of several adjacent flight service stations into the relocated Washington station. The third phase will be to replace the MAPS with an automated system identical to the Atlanta AWANS.

5.4 Baseline System Development (Subprogram 132-441)

The national automation of flight services will be accomplished in two phases: (1) a baseline automation system which will serve to automate the specialist functions and (2) an upgraded system which will incorporate user automation into the baseline system. This subprogram provides for the design, fabrication, and test of the baseline system.

Efficient handling of aeronautical information as it progresses through the Flight Service System requires corresponding efficiency in the acquisition, distribution, and updating of that information. Currently the acquisition, distribution, and display and updating of weather and flight planning information are largely the result of a manual process in which the information is transferred between facilities by voice, teletype, and facsimile communications and, in turn, is copied, posted, and updated by hand. Further, user access to the current system is on a "one-to-one" basis with operations personnel via the telephone and walk-in briefings. As the pace of operations within the system increases, the absence of automated capabilities to aid in data management will seriously degrade the level of service provided to the flying public. The objective of the effort under this subprogram is to develop an initial level of automation; i.e., baseline system, which is capable of modular expansion to include user demand increases, user access methods, and functional improvements.

In the interest of expediting acquisition of an automated capability, the initial automation will be centered on the flight service specialist. With the operational deployment of a functional prototype (Aviation Weather and NOTAM System - AWANS, at the Atlanta Flight Service Station), this initial automation capability; i.e., baseline system, on a national scale offers a low risk step to a fully automated system which would ultimately add automated user access devices in addition to the basic specialist automation. The principal projects under this subprogram are described in the following subparagraphs.

5.4.1 Aviation Weather and NOTAM System (AWANS) (132-441-104)

The AWANS was designed and developed as an experimental model to introduce automation to flight service specialist functions. The testing of the AWANS, currently being conducted in an operational environment at the Atlanta Flight Service Station, has two primary objectives: (1) to determine the improvement in the timeliness and usability of the information available to the specialist and to the ultimate user, the pilot,

and (2) to determine the improvement in the productivity of the specialist as a result of providing all required information necessary for the conduct of a briefing at the specialist's position.

In addition to demonstrating the basic feasibility of automation for the specialist, this task will determine the operational and performance requirements of the baseline system. The AWANS serves as the functional prototype for the baseline system, and hence provides the means to accomplish this task. The task will include a one-year live operational and performance evaluation which will serve to (1) document the operational requirements for the baseline system, (2) provide the means to set definitive bounds on the baseline equipment performance specifications, and (3) enable the assessment of hardware/software design and configuration concepts on an operational system.

5.4.2 Baseline System Design (132-441-204)

The Baseline System Design task will develop the hardware/software procurement specification for the baseline system and provide for the acquisition, installation, checkout, and evaluation of the first production system.

One of the major efforts to be accomplished, prior to completion of the specification, will be to perform a sizing study to establish the bounds of AWP and hub processor capabilities. The processor throughput capability and storage capacity must be sized such that sufficient processing capability exists to handle planned enhancements (see paragraph 5.5, System Enhancements) in the 1983-1990 time frame. Another major effort required for the specification development will be the determination of the total software requirements. This effort will entail determining the functional and performance requirements for the operational and nonoperational software programs. Included would be the identification of software subsystem parameters, estimation of program and data table memory allocation, organization of file structures, and conversion of established operational requirements into functional software requirements. The specification preparation effort will also include developing the technical requirements for each of the hardware subsystems (i.e., Data Processing Subsystem, Data Entry and Display Subsystem, and the Communications Subsystem) and the necessary hardware/software interface requirements to enable integration of the subsystems. The technical requirements will consist of functional and performance characteristics, mechanical requirements, and the maintenance requirements.

During the acquisition phase of the Baseline System Design project, criteria will be developed to be used for the evaluation of contractor proposals and an evaluation of the system design and configuration will be conducted. The evaluation criteria developed will include suitable benchmark tests to allow preliminary testing of proposed software programs. This portion of the Baseline System Design will also include selection of the contractor, the monitoring of system development, and the required monitoring of factory testing.

The contractor selected to provide the Baseline System is a "turn-key" contractor in that he is responsible for fabrication, test(s), and installation of all Baseline hardware and software. He fabricates a total of twenty operational, plus two additional, baseline systems. One of these additional systems is installed at NAFEC to provide initial system testing and for operational system support for the twenty operational facilities; the second is installed at the Aeronautical Center in Oklahoma City for training specialists and maintenance personnel. In terms of delivery, the NAFEC system is delivered first, the system for the Aeronautical Center is delivered second, and the first operational Hub site is delivered third. The additional nineteen operational systems are then fabricated, installed, and tested. The last Hub; i.e., number 20, is expected to become operational in 1985.

5.5 System Enhancements (Subprogram 132-442)

The enhanced system will provide an increase in the automation capability of the baseline system. Physically, the system will still consist of hubs and a weather processor; however, increased automation capability and additional features will enable users expanded direct access to the aviation weather data base. This phase of the program, essential for meeting projected 1990 demands at a reasonable cost per service, is consistent with the OST/FAA proposed concept of operations and will, in the long run, enable completion of the Flight Service System consolidation.

This subprogram identifies the necessary development required to accomplish the Flight Service System enhancements. The initial projects included in the subprogram are described in the following subparagraphs.

5.5.1 Automated User Access (132-442-104)

Pilot access to the system through the use of automated devices is critically nccessary to meet future demands and reduce system costs. Whether or not the user employs a complex terminal or a simple remote terminal such as a telephone, basic means are required (1) for entering the request for information into the system, and (2) for receiving information from the system. These remote terminals allow the pilot to query a master aviation weather data base, receive the preliminary and/or preflight briefing of weather and aviation data, and then file the flight plan directly through the hub processing facility, without the intervention of a specialist. Within the scope of this project, various terminals will be investigated, the aviation weather data base will be expanded, and a processor will be acquired for the purpose of software development and test support. Development efforts will be continued on a voice response system (VRS) and graphic display techniques.

Laboratory/operational test facilities will be utilized to develop and evaluate potential direct access devices. Specifically, a developmental laboratory has been established at the Transportation Systems Center (TSC) and operational data will be obtained through deployments of field test enhancement items.

All of the information gathered in this subprogram; i.e., tests, evaluations, analyses, etc., will be utilized to specifically define what it is enhancements will provide, how they will work, and in detail, what will be required to support them. These items will be assembled into an engineering requirement (ER) for subsequent contracting for enhancement software development and hardware specifications. The development approach provides for the selected contractor of the baseline system production to also accomplish the work necessary for enhancement development delineated in the ER noted previously.

The following subjects comprise the major development areas within the Automated User Access Subprogram.

PSBT Terminals

Investigation, development, and test of various terminal equipment and techniques are required to improve the design characteristics for pilot self-briefing terminals (PSBTs). Field experiments have been previously accomplished to evaluate pilot acceptance of the automated concept and to gather comments and suggestions as to the content, format, method of presentation, and general hardware characteristics, etc. from the users for utilization in later designs. This project will expand upon the previous work accomplished, particularly in the areas of data retrieval formats for effective presentation to the user and graphic display requirements and techniques. Color displays and various auxiliary devices will be tested and the general problem of PSBT security will be addressed. Additional field tests and demonstrations are planned to evaluate the newly developed concepts. The effort will result in a detailed requirement and specification for the PSBT.

Data Base and Information Retrieval

In the baseline and enhanced systems, an aviation weather processor (AWP) will assemble, reformat, maintain, and disseminate the national aviation weather data base while the various hub facilities will perform the data retrieval process to facilitate the availability of selected weather information. Past tests and demonstrations of direct access terminals utilized a limited data base and a commercial time share system for data retrieval. This project will provide for the acquisition of a dedicated processor and development of a complete weather data base expanding the coverage and capabilities of the previous system and

resulting in the capability to specify in the engineering requirement previosly noted necessities of the enhancement data base software. Emphasis is also placed on development of the retrieval programs for the PSBT. This project will initiate independent approached for data retrieval such that the most efficient and effective techniques can be specified. Additional effort will also be directed at defining the hub processing requirements relative to flight plan filing from direct access terminals.

Graphics

Graphics are considered extremely helpful, if not essential, for specialist access to the weather data base, and particularly for the PSBT. Weather pictures can greatly reduce the alphanumeric data (text) required to provide complete weather information while at the same time pictures appear to enable the user to more rapidly and completely absorb the information. Specialist graphics will be provided in the baseline system at the hub facilities; thus, graphics generation will be basically defined. However, the PSBTs have unique requirements that are somewhat contradictory in nature: (1) by definition, PSBTs must be inexpensive and cannot afford elaborate or expensive storage and refresh devices, (2) PSBTs are remote interactive terminals which require a rapid response time to be operationally successful. In order to meet these requirements, graphics data must be considerably compacted and inexpensive storage devices must be utilized in the terminal. By performing tests, this project will analyze, determine, and evaluate various graphics generation, transmission, conversion and display techniques, and will develop new technologies for data storage and display. Test and evaluation of color graphics displays and associated data requirements will also be conducted.

Voice Response System

One of the most accessible methods of providing the user direct interface with the weather data base is accomplished with the use of an automatic voice response system. The concept planned for the enhanced system, and described in section 2, employs several methods of telephone access for users: (1) direct access with interactive data entry via "touch-tone" (TM) service; (2) access through a specialist for "touch-tone" (TM) and non-"touch-tone" (TM) and specialist/VRS combination service; (3) access to non-interactive VRS data from any phone through the use of conventional PATWAS service. The actual techniques of voice generation will be investigated with both the synthetic speech and recorded speech techniques considered.

Data base vocabulary definition, storage requirements, access time specifications, briefing contents, and presentation formats will be evaluated and determined. Initial tasks will be directed at the fundamental areas of script, text, and format definition with subsequent efforts to develop an evaluation/demonstration system.

A future task to consider the application of voice recognition techniques as a method of data entry for telephone inquiries is anticipated; however, since the technology is not yet operationally feasible, no such capabilities are currently part of the automated system.

Portable Terminals

Remote pilot access to the automated system may not necessarily be limited to PSBTs or the standard telephone. Portable terminals, varying greatly in capability, are commercially available and have potential for use with interactive automated systems. Generally, the communications interface is affected via the telephone, but additional features provide capabilities ranging from visual displays to hard copy printers. This project will develop and evaluate concepts of portable remote terminals and determine their effectiveness and adequacy pertinent to flight service self-briefing requirements.

Enhancement Testing

Testing of enhancement items will occur during early development stages at selected demonstration sites. Further extensive testing will take place at the developing contractor's facility to assure that the baseline system can be expanded to incorporate all the enhancement items that have been developed. (The enhancements will be developed concurrently with the assembly of the baseline system by the same contractor to assure compatibility of required hardware and software.)

Longer-term engineering and development activities necessary to realize future upgraded system capabilities will involve numerous tests and are widely varied in purpose, scope, and nature. Some tests may be oriented toward determining feasibility of a concept; others to the performance of a component, subsystem or system; and still others to operational and technical performance of advanced features, interfaces with related systems, etc. To provide this capability, an enhancement test bed will be established at NAFEC to facilitate testing where accessibility to related systems, greater controllability of test variables, and/or more extensive instrumentation and supporting facilities are required.

a. Development and checkout of future flight service system hardware and software interfaces with other systems as well as between the various flight service subsystems.

b. Integration of proposed upgrading features and operational/technical assessment under realistic but controlled conditions.

c. Conduct of live test operations with instrumented test aircraft.

To allow accomplishment of the above, the enhancement test bed at NAFEC will include appropriate hardware/software modules and ancillary items necessary to enable representations and testing of the various capability levels, configurations and interfaces applicable to various system environments. The efforts covered by this project are oriented toward establishing, maintaining and updating this facility, and providing associated operating services to support accomplishment of the Flight Service System development tasks under this and other subprograms.

5.5.2 Operational Products Enhancement (132-442-204)

Currently, the weather reporting, forecasting, and aeronautical data products -NOTAMS, flow control, etc. - have evolved over the years and generally are not compatible with computer processing for easy readability and data reduction. This is particularly true for direct access by the pilot.

The prime thrust of this effort will be to effect the necessary coordination with other services within the FAA and other agencies to submit recommended changes to report formats. This will allow computer processing of the data to the degree needed to present a safe, acceptable, and cost-effective briefing to the pilot and to the specialist for his use in briefing a pilot. Inherently encompassed within this prime area is the resultant processable data for automatically generated computer VRS efforts. Initially, this will be basically an in-house effort, but later will expand to contractual developments through interagency agreements.

Efforts in this area include:

- Definition of changes required in alphanumeric products and negotiations with NWS and other users to affect these changes (In-house effort).

- Definition of graphic product requirements and formats for direct user access and negotiation with NWS/NMC (National Weather Service/ National Meteorological Center) to generate those products. An alternative exists to generate the "new" products from current existing products, but using FAA personnel. (In-house effort.)

- Definition of aeronautical data formats and in-house negotiation to affect those changes as well as other formats for interface with the diverse element of the NAS (Joint-use in-house effort).

- Definition of redundancies in abbreviations/location identifiers, and development of a real-time system to reduce and eventually eliminate the redundancies (Contractual).

- Definition of interfaces and formats with the new NWS AFOS (Automation of Field Operations and Services) system (In-house efforts and interagency agreements).

- Negotiation with the U. S. Air Force Global Weather Central (AFGWC) and NWS for input of new products--basically neph (cloud forecasts) analysis forecasts in a grid format and other parameters available in the AFGWC grid data base. (In-house efforts and interagency agreements).

- Initiate efforts to define long-range products and formats feasible for use in processing all weather and aeronautical data on a grid data retrieval basis and develop the necessary meteorological computer programs to generate the data if the definition phase proves it to be feasible (In-house, interagency agreements, and contracts).

6. RESOURCES, SCHEDULES, MILESTONES, AND END ITEMS

This section summarizes the estimated funding and scheduling requirements to support the development projects described in section 5 of this plan. In this initial plan release, the funding estimates do not account for actual budget limitations and priorities and will not necessarily correlate with the actual FAA engineering and development budget for any given fiscal period. Subsequent updates to this program plan will attempt to minimize any differences. Both the project schedules and the actual expenditures will depend upon the availability of estimated funds as well as the expeditious processing of procurement actions to obtain contractor support.

In addition, this section provides milestones and end items for each project within the respective subprograms.

6.1 Resources

The funding summary shown in Table 6-1 represents the yearly level of expenditures (R&D appropriations only) necessary to carry out the development program according to the schedules given in Tables 6-3 through 6-6. The funding shown for SRDS personnel assumes a cost of $32,000 per man-year effort. The funding estimates shown in Table 6-2 present total costs for all resources required to support the various flight service subprograms. These estimates include costs for the following:

a. Program management by FAA/SRDS personnel

b. NAFEC support (personnel, facilities, and services)

c. TSC support (personnel, facilities, and services)

d. System engineering contractor support

6.2 Schedules

Tables 6-3 through 6-6 graphically describe the time required to complete the development cycle for major tasks under each of the flight service subprograms. Each development task has been divided into the following major categories:

a. Concept Design and Development - This area includes design studies and analyses, modeling and sizing, and preparation of specifications for hardware/software test vehicles needed to test the design.

b. Test and Evaluation - This area covers the preparation of test plans/procedures, obtaining necessary hardware/software support and the planning, conduct, and reporting of validation tests.

TABLE 6-1

SUMMARY OF FUNDING REQUIREMENTS (R&D)
FOR FLIGHT SERVICE MODERNIZATION PROGRAM
(DOLLARS IN MILLIONS)

FLIGHT SERVICE SYSTEM R&D RESOURCE REQUIREMENTS	FY-76*	FY-77	FY-78	FY-79	FY-80
SRDS IN-HOUSE PERSONNEL					
ARD-440	.7	.7	.7	.7	.7
OTHER ARD (INCLUDING 400, 100, 200, 300, 60)	.2	.2	.2	.1	0
NAFEC PERSONNEL, FACILITIES AND SERVICES	.4	.3	.3	.3	.3
TSC PERSONNEL, FACILITIES AND SERVICES	.8	.6	.6	.5	0
SYSTEMS ENGINEERING & DEVELOPMENT CONTRACTOR SUPPORT	3.0	3.4	3.4	3.4	1.0
TOTALS	5.1	5.2	5.2	5.0	2.0

*Includes Fifth Quarter

Funding estimates reflect planned program milestones subject to availability of funds. Current year estimates are consistent with fiscal program.

TABLE 6-2

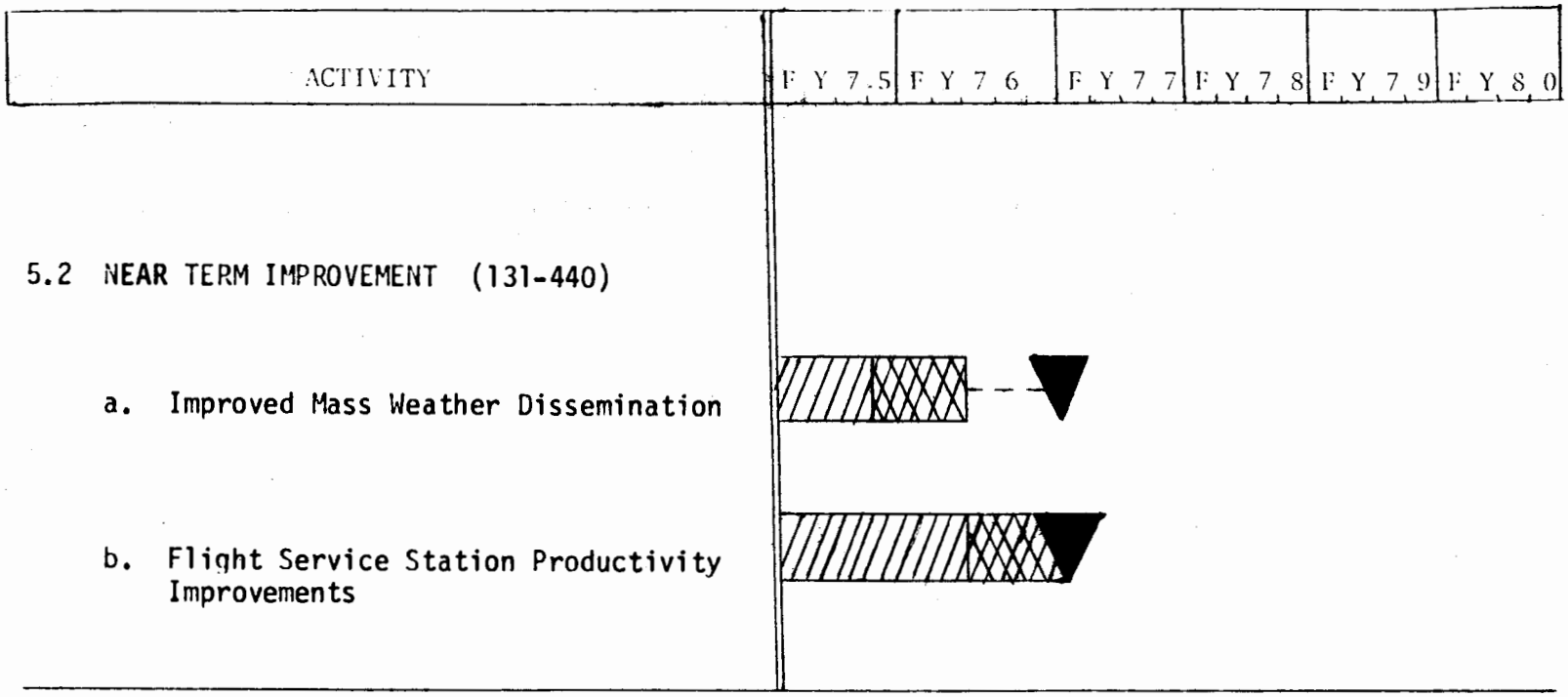
ESTIMATED FUNDING REQUIREMENTS FOR
FLIGHT SERVICE STATION SUBPROGRAMS*
(DOLLARS IN MILLIONS)

SUBPROGRAM	FY-76	FY-77	FY-78	FY-79	FY-80
NEAR TERM IMPROVEMENT (131-440)	.3	.3	.2	0	0
SYSTEM ENGINEERING (132-440)	1.5	.8	.6	.5	.1
BASELINE SYSTEM DEVELOPMENT (132-441)	1.2	.9	.9	1.1	.3
SYSTEM ENHANCEMENTS (132-442)	2.1	3.2	3.5	3.4	1.6
TOTALS	5.1	5.2	5.2	5.0	2.0

*These funding estimates include funding requirements for both in-house and contractor support.

TABLE 6-3

Development Schedule
Near Term Improvement Subprogram



LEGEND

CONCEPT DESIGN AND DEVELOPMENT

TEST AND EVALUATION

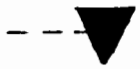
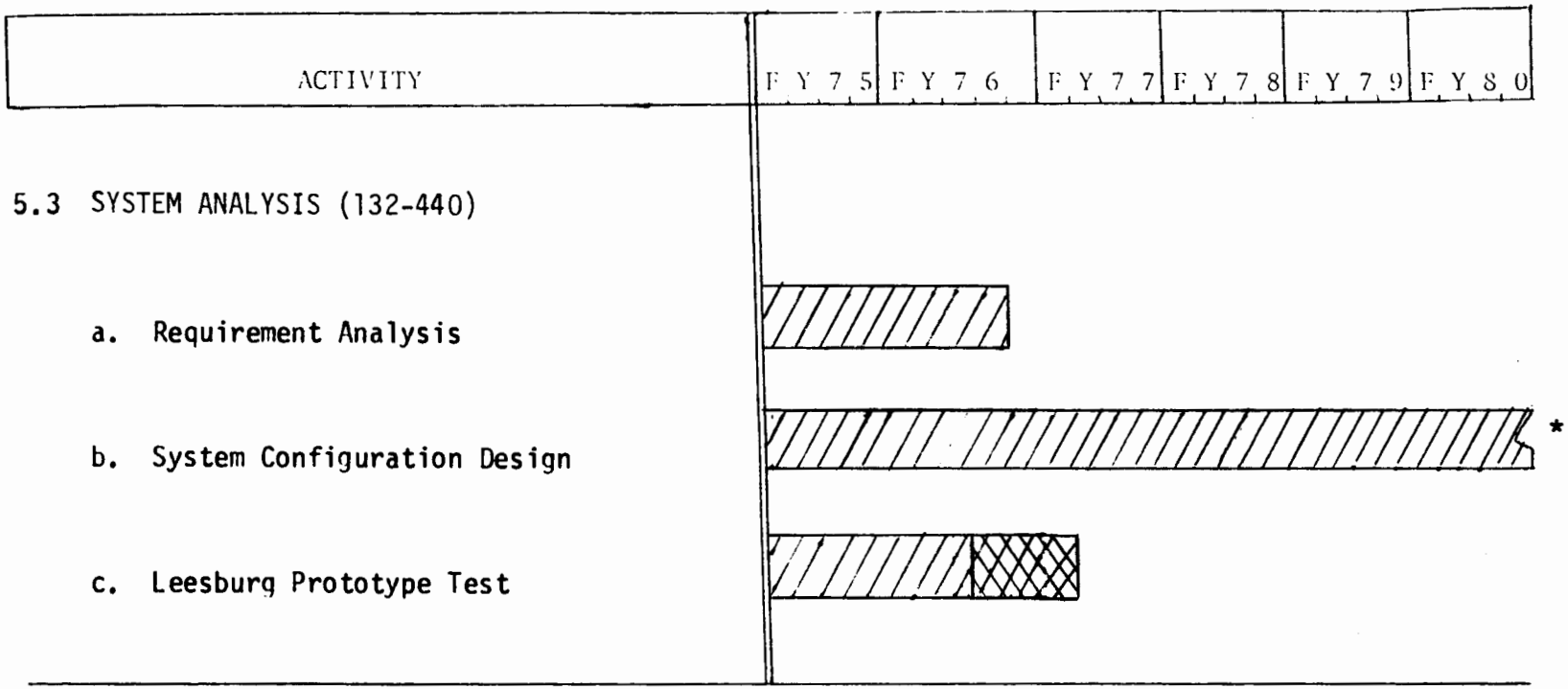

SPECIFICATION

TABLE 6-4

Development Schedule
System Analysis Subprogram



LEGEND

CONCEPT DESIGN AND DEVELOPMENT

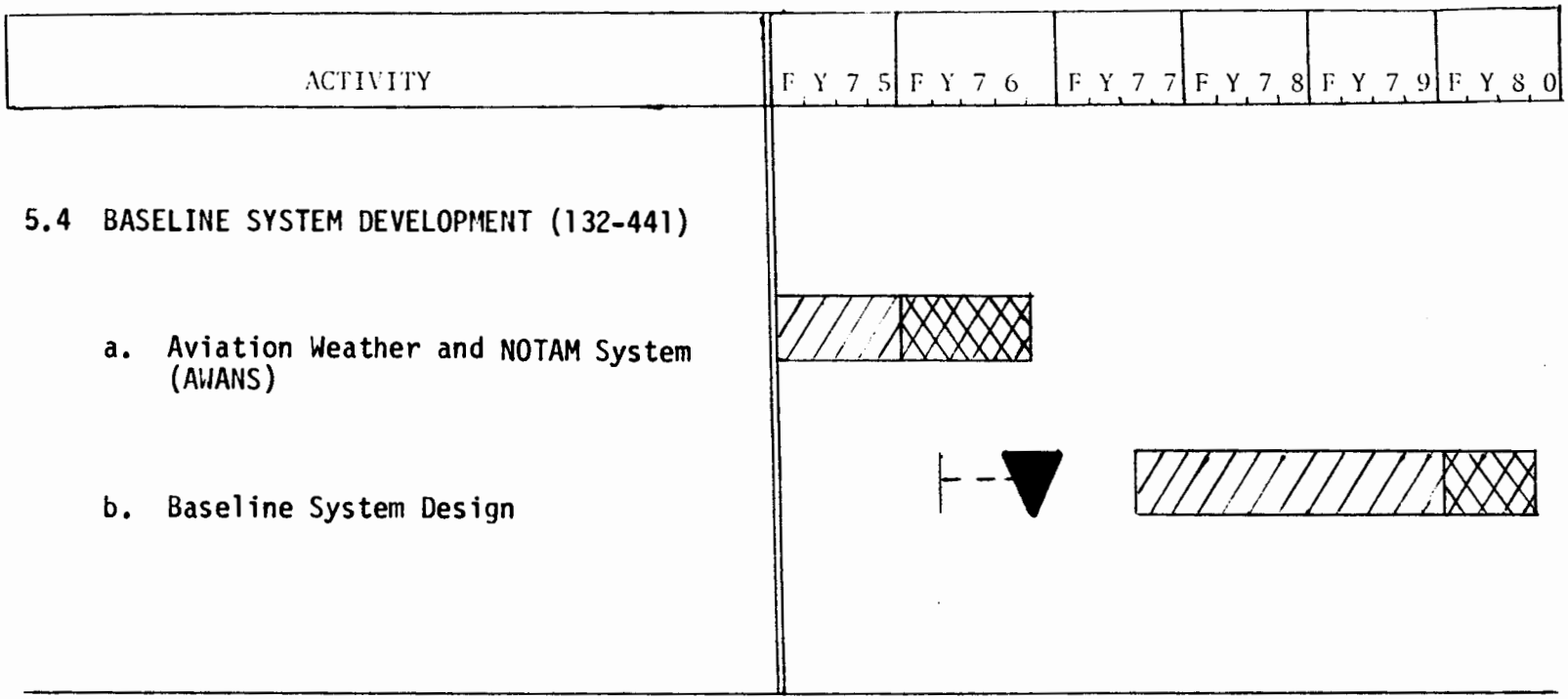
TEST AND EVALUATION

SPECIFICATION

* Continuing Effort

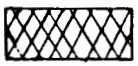
TABLE 6-5

Development Schedule
Baseline System Development Subprogram



LEGEND

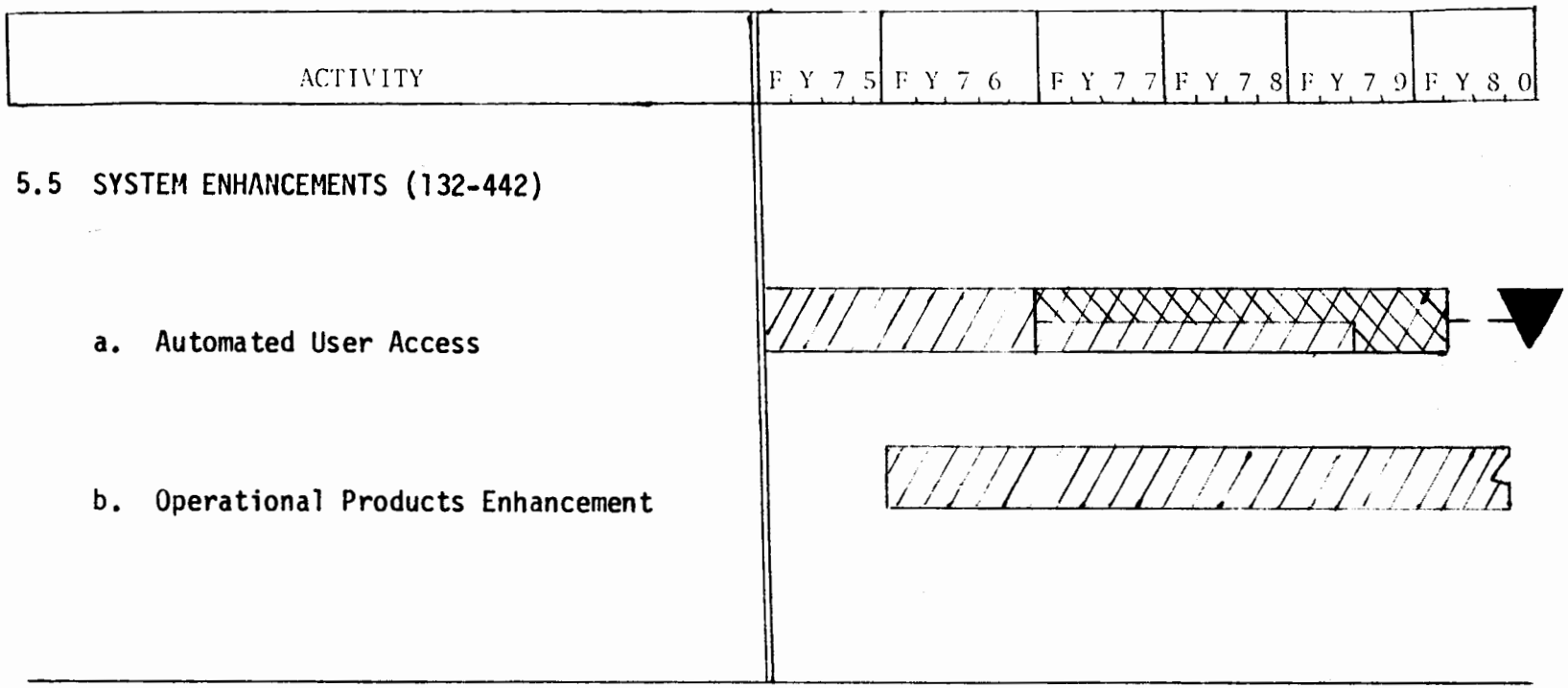
CONCEPT DESIGN AND DEVELOPMENT


TEST AND EVALUATION

SPECIFICATION

TABLE 6-6

Development Schedule
System Enhancements Subprogram



LEGEND

CONCEPT DESIGN AND DEVELOPMENT

TEST AND EVALUATION

SPECIFICATION

* Continuing Effort

c. Implementation Initiation - This area includes the preparation of production specifications for both hardware and software, and providing continuity in transitioning from development to implementation.

6.3 Milestones and End Items

Tables 6-7 through 6-10 summarize the major milestones of the respective subprograms with a listing of end items. These milestones and end items are not intended to be all-inclusive, but are indicative of currently identified essentials necessary for accomplishment in order to meet both E&D and program objectives.

SUBPROGRAM 131-440 NEAR TERM IMPROVEMENTS

OBJECTIVE:	INCREASE CURRENT FLIGHT SERVICE STATION PRODUCTIVITY AND USER SERVICE PRIOR TO IMPLEMENTATION OF THE AUTOMATED FLIGHT SERVICE SYSTEM.	
MAJOR MILESTONES:	EFAS CONSOLE PRODUCTION SPEC	5/76
	FSS MAPS PROCUREMENT SPECS	5/76
	PATWAS/TWEB USER SURVEY (NWS/AOPA/FAA REPORT)	6/76
	NYC PATWAS TEST COMPLETE	7/76
END ITEMS:	EFAS DATA PACKAGE	
	MAPS DATA PACKAGE	
	NATIONAL CONFIGURATION MASS WEATHER DATA PACKAGE	
	NEAR TERM EQUIPMENT SPECS	

TABLE 6-7

SUBPROGRAM 132-440 SYSTEM ANALYSIS

OBJECTIVE: DEFINE THE FLIGHT SERVICE SYSTEM FUNCTIONS AND DESIGN A SYSTEM CONFIGURATION THAT WILL MINIMIZE SYSTEM COSTS AND ALLOW IMPLEMENTATION IN AN ORDERLY MANNER.

MAJOR MILESTONES:

SYSTEM RMA SPEC (RADC)	5/76
EMERGENCY SERVICE ANALYSIS (NAFEC)	8/76
LEESBURG OPERATIONAL WITH AWANS	3/77
JOINT USE DESIGN COMPLETE	12/77

END ITEMS:

BASELINE RMA SPECIFICATION
FSS CONFIGURATION ANALYSIS REPORT
FSS STAFFING STRATEGY REPORT
JOINT USE DESIGN REPORT
LEESBURG PROTOTYPE EVALUATION REPORT

TABLE 6-8

SUBPROGRAM 132-441 BASELINE SYSTEM DEVELOPMENT

OBJECTIVE:	DEVELOP THE REQUIREMENTS AND PROCUREMENT SPECIFICATION FOR THE HARDWARE/SOFTWARE OF THE BASELINE SYSTEM	
MAJOR MILESTONES:	HARDWARE/SOFTWARE TECHNICAL REQUIREMENTS DEFINITION	1/76
	BASELINE SYSTEM SPECIFICATION	8/76
	BASELINE CONTRACT AWARD	6/77
	FIRST OPERATIONAL SYSTEM INSTALLED	5/80
END ITEMS:	AWANS OPERATIONAL TEST AND EVALUATION REPORT	
	SYSTEM SIZING STUDY REPORT	
	BASELINE SYSTEM SPECIFICATION	
	BASELINE SYSTEM CONTRACT	

TABLE 6-9

SUBPROGRAM 132-442 SYSTEM ENHANCEMENTS

OBJECTIVE:	PROVIDE ADDITIONS AND IMPROVEMENTS TO THE BASELINE SYSTEM CAPABILITY	
MAJOR MILESTONES:	DEFINITION OF AVIATION WEATHER PRODUCTS FOR ENHANCED SYSTEM	9/76
	DIRECT USER ACCESS DEVELOPMENT SYSTEM	12/76
	ENHANCEMENTS DEVELOPMENT CONTRACT AWARD	6/77
	PROCUREMENT SPECIFICATION FOR ENHANCEMENTS	9/80
END ITEMS:	ENHANCEMENT SOFTWARE DEVELOPED	
	ENHANCEMENT HARDWARE SPECIFICATION	
	TEST/DEVELOPMENT TEST BED FACILITY - NAFEC	

TABLE 6-10

7. INTERFACE AND COORDINATION WITH OTHER PROGRAMS

7.1 Introduction

The FAA engineering and development effort is distributed among 21 programs. The purpose of this program structure is to facilitate top management review and direction of the total E&D effort and to permit simultaneous promulgation of a total effort comprised of the efforts undertaken under the individual programs.

The Flight Service System Program is one of the 21 Engineering and Development (E&D) Programs established by the FAA. This section discusses the interface between the Flight Service System program and other E&D programs within the FAA as well as related development programs in other Governmental agencies.

Development activities in FAA E&D programs are described in the respective program plans. As development proceeds in each of these programs, interface implications need to be understood at as early a point in time as possible. As the various programs progress across all related areas, the appropriate sections of this plan will be updated and enlarged to reflect more accurately the development requirements for the Flight Service Program to be interfaced with other development programs.

The following subsections identify and describe activities included in other FAA E&D programs which have interface or design implications on development activities included in the Flight Service System program. Development programs from other agencies are listed and noted, as appropriate, following the FAA E&D programs.

7.2 Program 01 - System

This program sets the overall plan, development objectives, and technical guidance for the total air traffic control system so that development plans and activities for the various program areas will be consistent and development products will result in orderly system implementation. Currently, no subprogram of the 01 Program is specifically involved with the flight service problem. However, because the flight service subsystem is directly related to many other FAA subsystems, extensive coordination and planning are required especially in the areas of specifying and controlling the necessary subsystem interfaces. The 01 Program also has the capability to assess the impact of the modernized Flight Service System on the total system and determine any necessary changes in the mainstream design guidelines which potentially may have bearing on other design and development efforts.

7.3 Program 02 - Radar

The radar program is directed toward improving the performance of the in-service radar systems and investigating improvements with advanced radar technology with respect to current and future requirements. The operational requirements associated with the flight service program demand coordination between the flight service and the Radar 02 Program particularly in the area of upcoming radar capabilities and improved probability of detection for small aircraft. The automated Flight Service System will, for the purposes of emergency services, initially automate remoted direction finding (DF) equipment; however, with additional radar sitings, improved detection capabilities, and expanded beacon utilization, future emergency location data will largely be provided by radar sources. In order to facilitate the use of ATC radars in conjunction with DFs for emergency services, the flight service program must be kept abreast of planned radar developments. The relationship of these programs is not direct nor is one development effort dependent on the other; however, coordination and exchange of technical plans and progress are important to assure that the most cost-effective techniques or mix of techniques for acquiring rapid and accurate emergency location data is continually evaluated as radar capabilities are expanded and flight service modernization progresses.

7.4 Program 03 - Air Traffic Control Radar Beacon System

This program includes development of techniques and modifications to realize improvements in performance of in-service and subsequent production versions of beacon ground interrogation and receiving equipment and associated aircraft avionics. The program also includes design and development of the new Discrete Address Beacon System (DABS) and associated avionics. The flight service program has no direct relationship with the 03 Program. The interface is one primarily of exchange of technical information and status as related to the continued development of the DABS project. This development, when eventually implemented will provide a capability of data communication with an aircraft which potentially could be expanded beyond direct ATC utilization for transmission of flight service data, such as weather information, flight plan data, NOTAMS, etc.

7.5 Program 04 - Navigation

This program includes the development of ground station and associated aircraft avionic improvements to increase the precision and flexibility of aerial navigation by electronic means. The Flight Service System currently monitors navaids and is responsible to disseminate NOTAMS on the majority of navaids. The modernized Flight Service System Program will considerably change the location of flight service facilities and the capabilities available at those facilities, particularly in the area of monitoring and controlling remoted equipment. Data processors combined with modern communications will be available at flight service hubs and

are anticipated to be utilized for Navaid status monitoring. Coordination is essential between modernized, low maintenance Navaid developments, (i.e. Second Generation - VORTAC) under the 04 Program and the flight service program in order that common types of hardware and software, where possible, can be specified. Future assignment of responsibility for user notification of Navaid status is anticipated to remain under the flight service umbrella, but is largely dependent on the designs and developments of both programs.

7.6 Program 06 - Communications

This program includes activities to provide a communication system which will meet the need for fast, accurate, and reliable communications from aircraft-to-ground and ground-to-ground FAA facilities. The major system under the 06 Program is known as the Integrated National Airspace Communications System (INACS). The overall design objective of the INACS is to provide an integrated system to support NAS and Upgraded Third Generation operational requirements; that is transparent to user characteristics; that is flexible, versatile, expandable; and that effectively reduces projected communications annual leased circuit and equipment costs. Advanced methods of combining and switching voice and data communications into cost-effective routing and distribution schemes are planned to reduce transmission facility and equipment costs. In addition, improvements will be made in air/ground communications, and air/ground data link development will be continued.

The Flight Service Program has a direct relationship with the communications program. The new Flight Service System requires air/ground voice, ground/ground voice, and ground/ground data communications. The concept is bound together via a responsive communications system. The INACS of the 06 Program could provide the required capabilities. Continuing coordination is essential in order that the system communications requirements are provided by Program 06. In addition, the Flight Service Program requires that the 06 Program promote standardization of the monitoring and control necessary for operation of remote communications and navaid facilities.

To the extent that the communications switching and control system efforts will result in devices to be located in the flight service hubs, the nature, use, and physical aspects of the devices are pertinent to and must be coordinated with facility configuration and position layout efforts carried out under the Flight Service System Program.

7.7 Program 07 - Landing Systems

This program includes efforts to improve the performance of conventional instrument landing systems to achieve Category I, II, and III capabilities at a large number of the more difficult sites. Also included are design

and development of the new Microwave Instrument Landing System and associated avionics. Potential relationships between the landing systems and the Flight Service Program include station monitoring required of the control facility and the possibility of flight service data being uplinked to aircraft as MLS auxiliary data bypassing both controller and specialist. Currently, coordination is required to consist only of adequate information exchange such that the program managers remain cognizant of the respective design concepts.

7.8 Program 10 - Oceanic

This program includes developments to improve oceanic air traffic control communications and automation. The relationship between the Flight Service Program and the Oceanic Program is primarily one of liaison, conducted in the interest of assuring compatibility in the areas of flight plans, flight plan filing, and flight following, areas which may undergo substantial change in the Flight Service System.

7.9 Program 11 - Flow Control

Central Flow Control is being developed as part of the Air Traffic Systems Command Center and will assume responsibility for providing en route traffic flow control on a national scale. Information necessary to discharge this responsibility includes knowledge of continental weather, the current status of the total ATC system, knowledge of the current capabilities and demand for services on the various parts of the ATC system, and current flight plan information. Interface and coordination between the Flow Control and the Flight Service Program are essential. Improved weather products and capabilities developed under the program will be available for utilization by Flow Control and subsequent Flow Control data must be acquired and incorporated in the Flight Service System data base. Interfacing of flight plans filed will likely be facilitated through the enroute centers. However, since the interface requirements pertinent to the Flow Control Program appear to involve more information transfer than just through the enroute centers, direct liaison will be effected for coordination of general concepts, requirements, and end objectives.

7.10 Program 12 - Enroute Control

This program includes development efforts to substantially increase the capabilities and upgrade performance of the enroute control system. Additional functional capabilities will be provided to the National Airspace System (NAS) Stage A, including an improved man-machine interface design and higher levels of automation for conflict alert, local flow control, enroute metering, and RNAV.

The Flight Service Program must interface with the enroute centers in several functional areas and generally must work together to effect smooth, efficient processing of flight plans and flight information into the system. Digital interfaces will be provided for flight plan information exchange. Because of the direct communications relationship between the pilot and the ATC facility, it is also necessary for the control facility to have weather data pertinent to operations of the aircraft immediately available for relay. Thus, products of the Flight Service System accessed through remote terminals will be available for center utilization as required. Some interaction on future emergency services is also anticipated and must be defined. Joint efforts will be necessary to define the basic interface requirements, data flow, formats, and technical interfaces. The relationship between these programs is considered direct and interactive; therefore, it is essential that there be continuing liaison among all appropriate activities in each program with detailed coordination of activities having direct interface.

7.11 Program 14 - Terminal Tower Control

This program includes development efforts to provide a family of automated systems, appropriate for the different sizes and types of terminal and tower facilities, and to provide interfaces with other segments of the ATC system to meet the requirements of future air traffic loads. The Flight Service Program interface with the Terminal Tower Control Program primarily involves the transfer of VFR flight plans, weather, and NOTAM information. Some emergency services coordination is also anticipated. The relationship of the Flight Service and 14 Program is considered direct and interactive and, similar to the center coordination, interfaces must be defined and data flow, formats, and associated hardware must be determined.

7.12 Program 15 - Weather

This program includes efforts to improve detection, accuracy of prediction and dissemination of weather information tailored to the needs of pilots and the ATC system. The Flight Service Program revolves around weather data, weather products, and the communication of weather-related information to user pilots. Within the new concept, weather products as received from the NWS will be developed for specialist and pilot presentation; however, the Weather Program is continually working in the area of improving basic weather forecast and products which the NWS produces. In addition, the Weather Program is developing an automated system of weather acquisition devices known as the Aviation Automated Weather Observation System (AV-AWOS). The AV-AWOS will become integral to the Flight Service System by providing automated weather observations at flight service station locations to be decommissioned following automation and consolidation. AV-AWOS will not only replace the previously taken manual observations, but will improve

the quality and availability of pertinent weather data to pilots for utilization during critical portions of flight.

The Flight Service Program is expecting the development of AV-AWOS to provide the automated, cost-effective solution for required weather observations. Implementation of the Flight Service System is not dependent on AV-AWOS in that contracted weather observations can be arranged where required at decommissioned flight service stations; however, implementation of AV-AWOS equipment is highly desirable. Coordination to effectively interface the AV-AWOS equipment with the modernized system and the National Weather Service has been initiated and will continue on an expanded basis as the program progresses and specific criteria such as locations, required dissemination of AV-AWOS data, etc., are developed.

7.13 Program 16 - Technology

This program includes initial investigations of new computer and input/output techniques and assessment of promising technological advancements that appear to have applicability in meeting FAA's engineering requirements. Also included are exploratory human factor efforts to improve man/machine relationships and interfaces in applications of concern to the FAA. As confidence in a particular technique or innovation is advanced to a point where its potential and applicability to specific activities in a particular program are established, responsibility for future application effort is shifted to that program.

The Flight Service Program will maintain coordination with the Technology Program, particularly in the area of controller-computer interface. The flight service specialist must interface with the hub processors and development and application of improved displays, color displays, and improved data entry systems are essential for effective system development. In addition, advanced computer hardware and software designs developed by the Technology Program must be evaluated for applicability to Flight Service System processor designs.

7.14 Program 21 - Support

This program is comprised of E&D efforts in a variety of areas considered, in general, to be of a supporting nature. Provisions are made to upgrade those areas which are not directly accommodated under any other program in a manner consistent with the requirements levied on the system as a whole. Several categories of effort under the Support Program that require periodic coordination and information exchange with respect to possible future impact on the Flight Service System Program include:

- Radio Frequency spectrum management and allocation pertinent to flight service station reconfiguration and coverage.

- Electrical power system design activities.

- Improved reliability and maintainability of equipment and systems.

- Agency standard developments to provide reliability engineering support and standardization for equipment procurements.

7.15 Interagency Program Coordination

The modernization of the Flight Service System developing under the 13 Program is deeply involved in the assembling, structuring, and dissemination of weather information. Automated weather programs are currently being developed in a total of three Federal Departments being comprised of four different, but closely related, systems. The programs of concern are listed below along with the responsible department and developing agency:

- AFOS - "Automation of Field Operations and Services"
  U.S. Department of Commerce
  National Oceanic and Atmospheric Administration (NOAA)
  National Weather Service (NWS)

- NEDS - "Naval Environmental Display Stations"
  Department of Defense
  U.S. Navy

- MBWS - "Modernized Base Weather Station"
  Department of Defense
  U.S. Air Force

- Modernized Flight Service System
  Department of Transportation
  Federal Aviation Administration

An interagency plan for the formal coordination of the participant programs listed above is currently being established under the Department of Commerce to assure compatibility of the various automation systems, particularly in the area of data format and display. The Flight Service Program has a direct and dependent relationship with the NWS AFOS program since the NWS provides the base of weather data utilized in the system. Relationships with the other programs are indirect; however, complete exchange of technical data as well as general concepts in all areas is necessary as the general purpose and application of each of the systems is very similar.

8. IMPLEMENTATION AND TRANSITION CONSIDERATIONS

This section summarizes the implementation approach for the modernized system primarily to explain the magnitude of the effort and to establish the overall relationship of the E&D effort with respect to the implementation phases of the program. The assignment of the appropriate organization to assume the program management responsibility will change as the program progresses. ARD will manage and direct the total effort required to define, develop, acquire, install, test and turn over to the user the first article production baseline system following completion by ORD. ATF will assume responsibility of Program Manager from that point forward in the program. ARD subsequent to that transfer of responsibility will continue to provide whatever support is required and will continue development for system enhancements.

For purposes of this discussion, "implementation" refers to those areas concerned with site selection and preparation, construction, procurement of the equipment to be installed at the various sites and the installation, testing, and commissioning of the facility; "transition" refers to the areas related to the changeover of actual operations from the existing system to the modernized system.

Implementation and transition will occur in both the baseline and enhanced phases. For each phase, a number of specific activities are discussed; these include program activities and time (schedule) relationships. The following paragraphs generally describe the approach to be taken for these activities. It should be noted again that the role of ARD for the implementation phase of the program is support only and responsibility for the program belongs to ATF.

The baseline system implementation and transition is accomplished so as not to disrupt or degrade current Flight Service System operations. Noninterference can be achieved through a plan which provides that each hub be completed; i.e., building(s) modified or constructed, equipment installed, tested, commissioned, etc., prior to the termination of current operations at any existing station site. After the initial Baseline System is installed, consolidation of present Flight Service System activities and functions into the Hubs will begin and will continue on a Hub by Hub basis. This approach differs from that contained in the OST/FAA study which proposed 30 station closures per year for 5 years prior to implementation of an automation capability. The services provided today by approximately 283 station facilities will essentially be assumed by the 20 automated hubs. The objective of this implementation and transition approach is to transfer the services provided by these existing stations in a smooth evolutionary manner.

Specific constraints on the implementation and transition processes are:

a. Preflight and inflight services to users cannot be interrupted.

b. When required, the staff relocation will be accomplished in an orderly and economic manner with long lead time and staff reductions, if required, will be accomplished through normal attrition.

Figure 8-1 shows the timing relationship between elements of the implementation and transition process.

In addition to providing the entire baseline system, the baseline contractor, during the development cycle is also responsible for devleloping the initial enhancements to the baseline system. Primarily, these enhancements consist of an automated VRS and a family of remote direct user access terminals.

Upon completion of the developmental period, the contractor will have completed enhancement software development and defined specifications for all enhancements equipment. At this time, specification packages, etc. are turned over to AAF. RFPs for enhancement hardware will then be assembled. Procurements will be competitively released for enhancements on an item-by-item basis. It should be noted that the FAA is not committing itself to deployment of any terminals at this time other than for experimentation and demonstration purposes. Operational deployment of terminals by the FAA will be subject to a future policy decision.

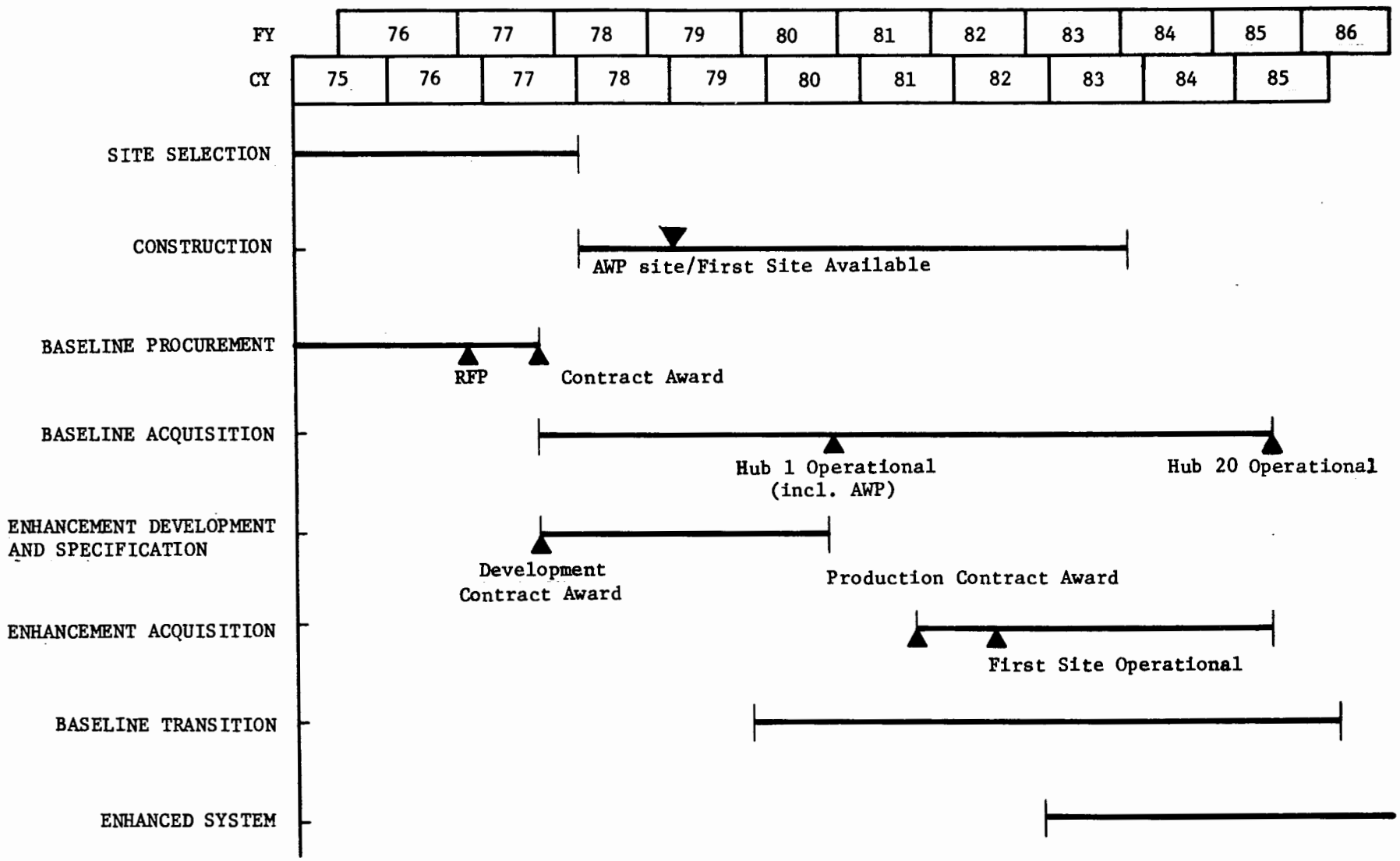


Figure 8-1
SYSTEM IMPLEMENTATION AND TRANSITION SCHEDULE

APPENDIX GLOSSARY FOR THE FLIGHT SERVICE SYSTEM E&D PLAN

NOTE:

All terms and references within the Flight Service System E&D Plan Glossary are with respect to domestic flight service within the contiguous 48 states, except where context or specific reference indicates otherwise.

BASELINE FLIGHT SERVICE SYSTEM - BASELINE SYSTEM

Initial system configuration characterized by 20 hubs, an Aviation Weather Processor, automation of specialist operations, and a limited access capability for user-owned Direct Access Devices.

ENHANCED FLIGHT SERVICE SYSTEM - ENHANCED SYSTEM

Long term system configuration characterized by baseline features plus a voice response system and full Direct Access Device Capability.

FLIGHT SERVICE

Flight information advisory services including pilot briefing service, flight plan service, aviation weather service (collection and dissemination), Enroute Flight Advisory Service, Navaid monitoring, and emergency services.

FLIGHT SERVICE HUB - HUB

One of the 20 new manned Baseline and/or Enhanced Flight Service System facilities providing automation support to specialists and direct user access services.

FLIGHT SERVICE STATION - STATION

One of the approximately 300 existing manned Air Traffic facilities within the present Flight Service System.

FLIGHT SERVICE SYSTEM

The subsystem of the National Airspace System that is primarily responsible for providing flight services to the aviation user community.

FLIGHT SERVICE SYSTEM ENGINEERING & DEVELOPMENT PROGRAM

The E&D program supporting the Flight Service System Modernization Program, documented in "E&D Program Plan for Flight Service System" Draft, November 1975, FAA-ED-13-1A.

FLIGHT SERVICE SYSTEM MODERNIZATION PROGRAM

Agency program to effect all planned improvements, consolidation, specialist automation, and Direct Access Device capability for the Flight Service System.

TOTAL STAFFING STANDARD FLIGHT SERVICES

A weighted sum of flight plans originated, pilot briefs and aircraft contacted used to calculate primary services staffing allowance.