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Fact Sheet for Congressional Requesters

April 1990

AIR TRAFFIC CONTROL

Status of FAA's Effort to Modernize the System

GAO/RCED-90-146FS

GAO

United States
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Resources, Community, and
Economic Development Division

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The Honorable Frank R. Lautenberg
Chairman, Subcommittee on Transportation
and Related Agencies
Committee on Appropriations
United States Senate

The Honorable William Lehman
Chairman, Subcommittee on Transportation
Committee on Appropriations
House of Representatives

This fact sheet responds to your December 15, 1989 request that we provide information on the status of the Federal Aviation Administration's (FAA) air traffic control (ATC) modernization program. This program, characterized at its inception in 1981 as the National Airspace System (NAS) Plan, is aimed at achieving a significantly safer and more efficient air traffic control system while constraining costs incurred by the government and airspace users. It is meant to integrate various improvements such as replacing computers, increasing automation, consolidating facilities and upgrading navigational aids. As agreed with both of your offices, this fact sheet provides information on (1) the overall status of the program in terms of projects completed and funds allocated, and (2) the projected cost and schedule of the program's 12 major systems as of January 1990.

In summary, we found that FAA has completed 28 projects, or about 32 percent of all NAS Plan projects. However, because most of these completed projects have comparatively lower costs than those being developed, they represent only 4 percent of total NAS Plan costs. Furthermore, project delays in the 12 major systems have continued. One of the longest is that projected for the Mode S surveillance and communication system--a 20-month additional delay in first-site implementation.

2-1/2 years between the 1983 and 1987 NAS Plans.[1] Delays in first-site implementation--when the first system becomes operational in the field--ranged from 1 to 4 years. These delays have continued--eight of the 12 major systems we reviewed experienced a delay of at least 200 days during the past year. For example, the scheduled milestones for the first-site implementation of the Mode S surveillance and communication system has been delayed about 20 months, from March 1990 to November 1991. Additionally, FAA anticipates a 13-month delay in delivery of Initial Sector Suite System air traffic controller consoles, the second phase of the $4.4 billion Advanced Automation System. According to the latest monthly progress report, future phases of the Advanced Automation System, such as the replacement of the air traffic control software, may also be delayed pending completion of discussions between FAA and the vendor. Other major projects experiencing significant delays include the Voice Switching and Control System and the Microwave Landing System. Section II of this fact sheet provides cost and schedule data on FAA's major systems.

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We obtained the information in this fact sheet by analyzing data from various sources. Cost and schedule information on individual systems were obtained from Project Management Status Reports prepared for the FAA by its Systems Engineering and Integration Contractor. Information on the number of NAS Plan projects in various stages of progress was obtained through interviews with contractor officials and analyses performed by the contractor for FAA. We obtained information on the overall cost of ATC modernization, as well as its appropriations and obligations, by analyzing various financial reports provided by FAA and the contractor. Our work was conducted between October 1989 and March 1990.

As you know, the information in this fact sheet was developed during our ongoing review of FAA's modernization program, which is being performed at the request of both of your Subcommittees and is in a series of reports and testimonies addressing this subject. This fact sheet will supplement our statement on FAA's fiscal year 1991 appropriations request to be separately delivered in testimony before both Subcommittees this spring.

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[1]Air Traffic Control: Continued Improvements Needed in FAA's Management of the NAS Plan (GAO/RCED-89-7, Nov. 10, 1988).

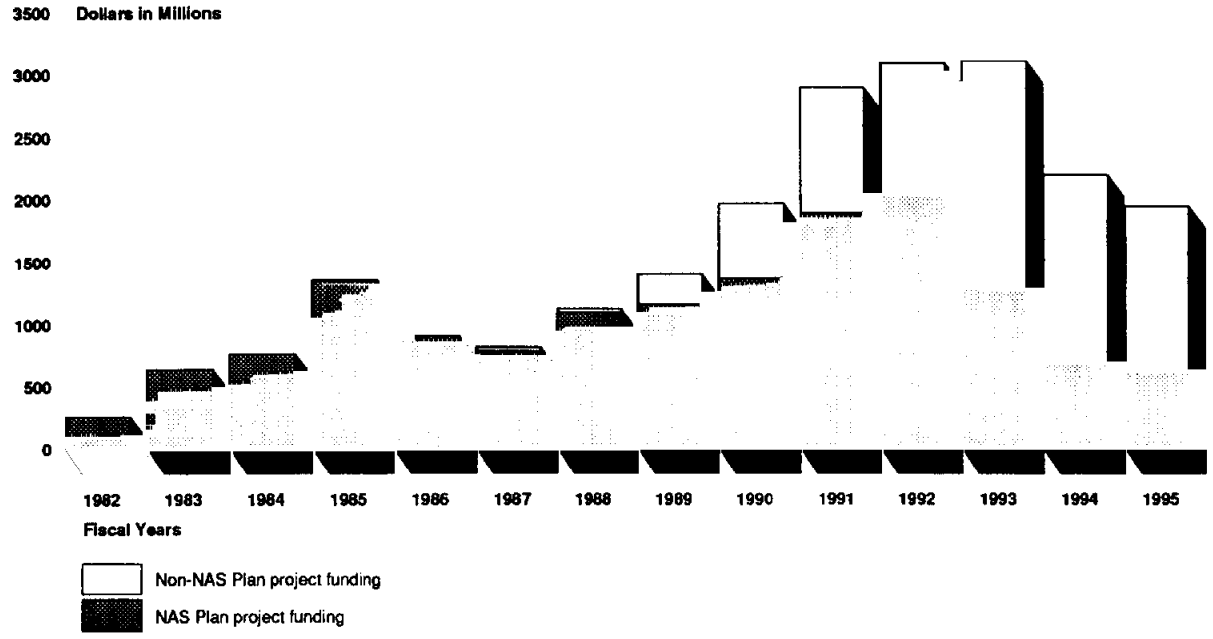
CONTENTS

FIGURE

ABBREVIATIONS

AAS	Advanced Automation System
ARSR-4	Air Route Surveillance Radar
ARTCC	Air Route Traffic Control Center
ASOS	Automated Surface Observing System
ASR-9	Airport Surveillance Radar
ATC	Air Traffic Control
AWOS	Automated Weather Observing System
CWP	Central Weather Processor
F&E	Facilities and Equipment
FAA	Federal Aviation Administration
FSAS	Flight Service Automation System
MLS	Microwave Landing System
MWP	Meteorological Weather Processor
NAS	National Airspace System
RCL	Radio Communications Links
RWP	Real Time Weather Processor
SEIC	Systems Engineering and Integration Contractor
TDWR	Terminal Doppler Weather Radar
VSCS	Voice Switching and Control System

Figure 1.2: F&E Funding for NAS Plan and Non-NAS Plan Projects



FAA's progress in modernizing the Air Traffic Control (ATC) system can be measured both in terms of (1) the number of projects complete, and (2) the amount of F&E funds appropriated and obligated.

Most NAS Plan Projects Are in Production But Few Are Complete

FAA states that over 95 percent of the original NAS Plan projects are under contract. However, we recently testified that establishment of contracts is not an accurate description of when modernization will occur in the field.[1] Although funding for these projects will begin to decrease in fiscal year 1993, many NAS Plan projects will not be complete until much later. For example, F&E funding for the most expensive NAS Plan project, the Advanced Automation System, will peak in fiscal year 1993. However, the entire project, which will enhance both en route and terminal ATC systems, will not be operational in the field until at least the year 2000.

Martin Marietta, FAA's Systems Engineering and Integration Contractor (SEIC), classifies NAS Plan projects in four stages of progress:

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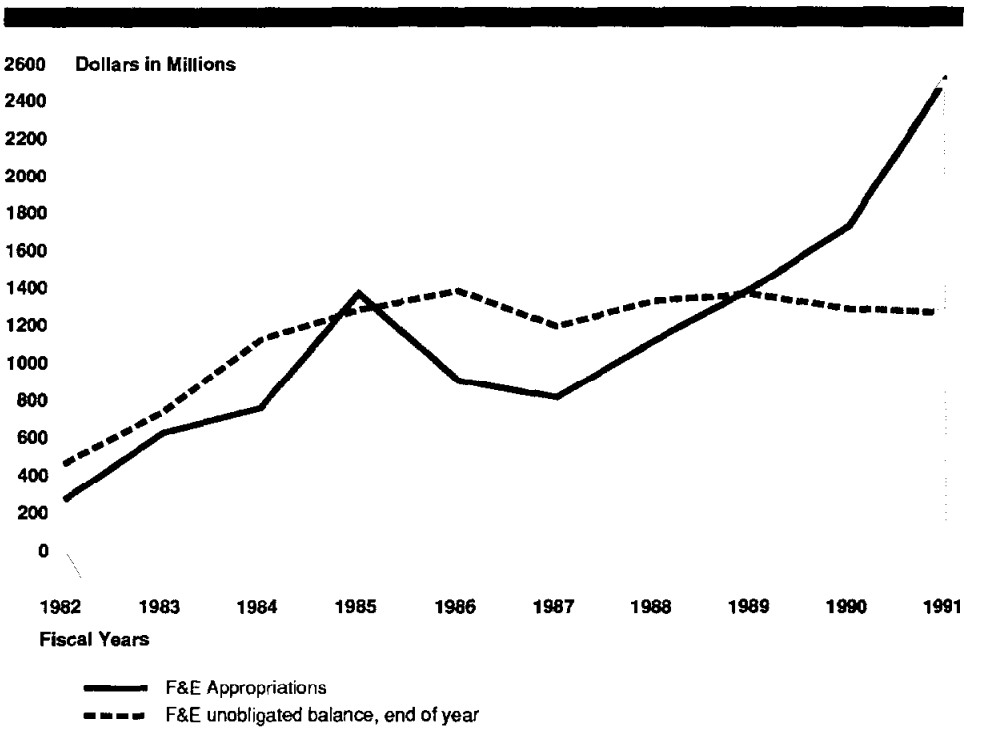
[1] FAA Appropriation Issues (GAO/T-RCED-89-20, Apr. 4, 1989).

year 1982. For fiscal years 1982 through 1989, the Congress appropriated $7.2 billion for FAA's F&E account. Because F&E funds are available to FAA for 5 years under the full funding concept,[2] obligations lag behind appropriations. As a result, an unobligated balance exists in the F&E account. Through the end of fiscal year 1989, FAA had obligated approximately $5.8 billion of the $7.2 billion appropriated, creating an unobligated balance of $1.4 billion in the F&E account. The unobligated balance included funds appropriated for fiscal years 1986 through 1989.

Figure 1.3 shows the direct relationship between F&E appropriations and the unobligated balance. During the early 1980s, the unobligated balance increased as appropriated amounts grew. When appropriations decreased in fiscal years 1986 and 1987 so did the unobligated balance, although not until the second year.

Figure 1.3: Changes in F&E Appropriations and Unobligated Balances



F&E Appropriations figure for fiscal year 1991 represents FAA's Congressional budget request.

F&E unobligated balances for fiscal years 1990 and 1991 are estimates.

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[2]Under the full funding concept, all the monies needed to procure and install a given number of systems are requested in the first year although they may not all be used until the 5 years have elapsed.

SECTION 2
MAJOR SYSTEM SCHEDULES AND COSTS

The Department of Transportation has designated 12 of FAA's original NAS Plan projects as major system acquisitions because of either their high cost or critical need. Table 2.1 provides implementation milestones for NAS Plan sites on the 11 active major acquisitions,[1] as well as the Air Route Traffic Control Center (ARTCC) modernization project. We included the latter project because it represents a significant portion of the total cost of the NAS Plan and much of its work is needed to begin the implementation of the Advanced Automation System (AAS). As noted in the table, all of the major systems in the 1983 Plan have experienced a major schedule slippage since the Plan was published.[2] These delays have continued during the past year. In addition, 8 of the 12 systems have experienced a delay of at least 200 days between January 1989 and January 1990.

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[1]The Host Computer project was completed in 1988.

[2]According to the Manager of the NAS Program Management Staff, the milestones in the 1981 NAS Plan were determined without an adequate understanding of the difficulties that the NAS effort entailed. FAA believes the milestones in the 1983 Plan were better defined and represent a more reasonable baseline from which to measure progress.

MAJOR PROJECT MILESTONES HAVE BEEN DELAYED

Tables 2.2 through 2.25 provide more detailed information on changes in milestones during the last year for these 12 projects. We selected milestones that were representative of the various phases of FAA's procurement process. As noted in the tables, 11 of the 12 projects have experienced slippage in at least one of their milestones between January 1989 and January 1990. FAA project officials attributed delays to various reasons, as noted in the tables. Also, in terms of funding for these major systems, much of their estimated cost is based on future changes. As shown in tables 2.2 through 2.25, through fiscal year 1990, more than half of the total F&E cost needs to be appropriated for 7 of the 12 projects we reviewed. FAA has obligated more than half of the total estimated F&E costs for 4 of the 12 projects through fiscal year 1989.

Advanced Automation System (Vendor: IBM)

The Advanced Automation System (AAS) is a total system concept that includes computer hardware and software as well as improved controller workstations at air traffic control (ATC) facilities. FAA believes that implementation of the AAS will increase controller productivity, improve ATC system reliability, and provide increased capacity to meet growing demand.

The AAS will be implemented in five separate phases. The first phase is the replacement of the Peripheral Adapter Module Replacement Item, which will provide enhanced ability to interface with radars. The second phase of AAS, the Initial Sector Suite System (ISSS), will replace controller work stations at en route air traffic control facilities with color displays. The third phase, the Terminal Advanced Automation System, will consist of computer hardware and software deployed to en route facilities to replace a number of terminal facilities. The Area Control Computer Complex, the fourth phase, will allow the consolidation of the remaining terminal functions at the en route facilities. Parallel to its deployment, the Tower Control Computer Complex will revamp hardware and software at airport towers. This is the final phase of the project.

FAA anticipates a 13-month slip in the delivery of the ISSS. This delay is not yet reflected in the schedules listed below. Furthermore, delays to other phases may also occur pending the outcome of ongoing discussions between FAA and IBM.

Tower Control Computer Complex			
Critical design review	03/28/90	09/28/90	184
Delivery to first operational site	06/13/94	09/30/94	109
First commissioning	01/05/95	08/31/95	238
Last commissioning	11/30/99	12/29/00	394

[a]actual completion dates

Table 2.3: Program Funding History for Advanced Automation System

(Dollars in Millions)

Total estimated F&E costs	$4,430.9
F&E funds appropriated through fiscal year 1990	939.2
F&E funds appropriated through fiscal year 1989	574.2
F&E funds obligated through fiscal year 1989	559.4
F&E funds requested in fiscal year 1991	556.3

Air Route Surveillance Radar (Vendor: Westinghouse Electric Co.)

The Air Route Surveillance Radar (ARSR-4) is a long range search radar. These radars provide air traffic controllers with their primary source of data for monitoring en route aircraft. The ARSR-4s will also be able to detect hazardous weather conditions at long distances. The FAA project manager attributed schedule delays to a change in quantity requirements and a subsequent delay in the contract award. Subsequent milestones were not updated until this year to reflect these changes.

Table 2.4: Schedule Changes of Critical Milestone Dates for Air Route Surveillance Radar

Milestone activity	Milestone dates as of Jan.89	Jan.90	Change in days
Contract awarded	07/22/88[a]	07/22/88[a]	0
Critical design review	08/28/89	06/29/90	305

Table 2.6: Schedule Changes of Critical Milestone Dates for Air Route Traffic Control Center Plant Modernization

Milestone activity	Milestone dates as of Jan. 89	Jan. 90	Change in days
Design engineering completed	01/29/93	01/31/94	367
Construction and modernization completed	01/31/94	08/14/97	1291

Table 2.7: Program Funding History for Air Route Traffic Control Center Plant Modernization

(Dollars in Millions)

Total estimated F&E costs	$332.0
F&E funds appropriated through fiscal year 1990	99.2
F&E funds appropriated through fiscal year 1989	63.0
F&E funds obligated through fiscal year 1989	43.0
F&E funds requested in fiscal year 1991	46.2

Airport Surveillance Radar (Vendor: Westinghouse Electric Co.)

The Airport Surveillance Radar (ASR-9) is a short range, highly accurate system for monitoring aircraft movement and position within a radius of 60 miles from the airport terminal. Air traffic controllers use the ASR-9 position data to keep aircraft safely separated and control their movements into and out of the airport. According to a project official, the radar delivered to the first site did not meet hardware or software specifications, resulting in delayed implementation dates. As of January 1990, three ASR-9s were operational.

Table 2.8: Schedule of Critical Milestone Dates for Airport Surveillance Radar

Milestone activity	Milestone dates as of Jan.89	Jan.90	Change in days
Contract awarded	10/01/83[a]	10/01/83[a]	0
Critical design review	09/28/84[a]	09/28/84[a]	0

Table 2.10: Schedule Changes of Critical Milestone Dates for Automated Weather Observing System

Milestone activity	Milestone dates as of Jan.89	Jan.90	Change in days
AWOS			
Contract awarded	08/30/88[a]	08/30/88[a]	0
Delivery to first operational site	06/07/89	05/03/89[a]	-35
Shakedown test	06/26/89	03/03/89[a]	-115
First implementation	06/30/89	05/24/89[a]	-37
Last implementation	02/28/91	03/29/91	29
[a]actual completion dates			
ASOS			
Contract awarded	06/29/90	08/06/90	38
Critical design review	05/14/89	06/13/89[a]	30
First implementation	01/31/91	11/29/90	-63
Last implementation	08/31/94	02/28/94	-184

Table 2.11: Program Funding History for Automated Weather Observing System

(Dollars in Millions)

Total estimated F&E costs	$189.5
F&E funds appropriated through fiscal year 1990	72.6
F&E funds appropriated through fiscal year 1989	62.6
F&E funds obligated through fiscal year 1989	43.5
F&E funds requested in fiscal year 1991	36.6

Table 2.13: Program Funding History for Central Weather Processor

(Dollars in Millions)

Total estimated F&E costs	$134.9
F&E funds appropriated through fiscal year 1990	61.5
F&E funds appropriated through fiscal year 1989	52.8
F&E funds obligated through fiscal year 1989	46.6
F&E funds requested in fiscal year 1991	10.0

Flight Service Automation System (Vendor: E-Systems Inc.)

The Flight Service Automation System (FSAS) allows pilots to receive automated weather data prior to take off. This system eliminates much of the time previously spent in conversation with a flight specialist. It will also provide improved access to the FAA system that notifies pilots of very recent information concerning changes to any aspect of the National Airspace System. As noted below, the schedule for the Model 1 Full Capacity system is generally on target.

Table 2.14: Schedule Changes of Critical Milestone Dates for Flight Service Automation System

Milestone activity	Milestone dates as of Jan.89	Jan.90	Change in days
Contractor turn on	07/31/87[a]	07/31/87[a]	0
Critical design review	09/30/88[a]	09/30/88[a]	0
Delivery to first operational site	04/18/90	04/18/90	0
Shakedown test	04/16/90	06/02/90	47
First implementation	05/31/90	07/15/90	45
Last implementation	04/18/94	04/18/94	0

[a]actual completion dates

Table 2.17: Program Funding History for Microwave Landing System

(Dollars in Millions)

Total estimated F&E costs	$1112.8
F&E funds appropriated through fiscal year 1990	166.3
F&E funds appropriated through fiscal year 1989	154.9
F&E funds obligated through fiscal year 1989	121.5
F&E funds requested in fiscal year 1991	35.2

Mode S (Vendors: UNISYS and Westinghouse Electric Co.)

Mode S employs a system of sensors and ground-based antennae to exchange information between aircraft and air traffic control facilities. Because Mode S addresses individual aircraft separately, signal interference is reduced and a clear message channel is established between aircraft and ground installations. Aircraft equipped with new Mode S avionics will also be able to directly obtain weather information now available only through controllers. FAA project officials attributed delays in the Mode S to hardware and software development problems encountered by the contractor. FAA plans to procure additional Mode S systems. Their cost is not included in the F&E funding estimates below.

Table 2.18: Schedule Changes of Critical Milestone Dates for Mode S

Milestone activity	Milestone dates as of Jan.89	Jan.90	Change in days
Contract awarded	10/05/84[a]	10/05/84[a]	0
Critical design review	12/17/86[a]	12/17/86[a]	0
Delivery to first operational site	05/25/89	07/08/91	774
Shakedown test	03/02/90	06/05/91	460
First implementation	03/05/90	11/28/91	633
Last implementation	08/05/92	02/26/95	935

[a]actual completion dates

Table 2.21: Program Funding History for Radio Communications Links

(Dollars in Millions)

Total estimated F&E costs	$281.3
F&E funds appropriated through fiscal year 1990	259.6
F&E funds appropriated through fiscal year 1989	244.6
F&E funds obligated through fiscal year 1989	177.0
F&E funds requested in fiscal year 1991	21.0

Terminal Doppler Weather Radar (Vendor: Raytheon Co.)

The Terminal Doppler Weather Radar (TDWR) is designed to detect wind shear and microbursts around airports. The FAA is planning to procure 47 TDWRs to function as the primary ground-based wind shear warning system. FAA originally included funds for an additional purchase of TDWRs under a contract option in its previous project estimates. However, FAA has eliminated the funding for the additional systems, lowering the total project cost. The FAA project manager told us that the production contract was awarded before the results of operational tests were complete. When testing results required changes to system software, FAA granted the contractor a 3-month delay for system delivery to the first operational site, which, in turn, affected subsequent milestones.

Table 2.22: Schedule Changes of Critical Milestone Dates for Terminal Doppler Weather Radar

Milestone activity	Milestone dates as of Jan.89	Jan.90	Change in Days
Contract awarded	11/02/88[a]	11/02/88[a]	0
Critical design review	07/20/90	11/06/89[a]	-256
Delivery to first operational site	08/29/92	12/02/92	95
Shakedown test	08/21/92	01/29/93	161
First implementation	01/04/93	03/31/93	86
Last implementation	12/29/95	03/31/96	93

[a]actual completion dates

Table 2.25: Program Funding History for Voice Switching and Control System

(Dollars in Millions)

Total estimated F&E costs	$892.4
F&E funds appropriated through fiscal year 1990	235.7
F&E funds appropriations through fiscal year 1989	63.5
F&E funds obligated through fiscal year 1989	60.1
F&E funds requested in fiscal year 1991	185.1

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Table 2.23: Program Funding History for Terminal Doppler Weather Radar

(Dollars in Millions)

Total estimated F&E costs	$348.6
F&E funds appropriated through fiscal year 1990	211.1
F&E funds appropriated through fiscal year 1989	104.1
F&E funds obligated through fiscal year 1989	95.9
F&E funds requested in fiscal year 1991	83.7

Voice Switching and Control System

The Voice Switching and Control System (VSCS) integrates the various communications systems--intercom, interphone, and air-ground--which are needed to monitor and control en route and terminal air traffic. Use of the VSCS will enhance voice communications and facilitate switching of communications between controllers and pilots. FAA anticipates achieving the dual benefits of increased productivity and lower costs since the system will be owned rather than leased as in the past. The schedule listed below is currently under review.

Table 2.24: Schedule Changes of Critical Milestone Dates for Voice Switching and Control System

Milestone activity	Milestone dates as of Jan.89	Jan.90	Change in days
Contract awarded	09/11/89	11/29/89	79
Critical design review	10/31/89	03/29/90	149
Delivery to first operational site	01/14/91	08/29/91	227
Shakedown test	06/18/90	08/29/91	437
First implementation	10/18/91	05/29/92	224
Last implementation	12/17/93	03/29/94	102

Table 2.19: Program Funding History for Mode S

(Dollars in Millions)

Total estimated F&E funds	$495.3
F&E funds appropriated through fiscal year 1990	328.5
F&E funds appropriated through fiscal year 1989	304.7
F&E funds obligated through fiscal year 1989	276.7
F&E funds requested in fiscal year 1991	37.0

Radio Communications Links (Vendor: AT&T Technologies)

FAA intends to install Radio Communications Links (RCL) to replace and upgrade existing Radio Microwave Link communications lines used to transmit voice and radar data nationwide. The desired objectives of this replacement are to provide reliable transmission of data, improved system availability, and reduced costs for interfacility communications. In addition, the RCL replacement will provide the system flexibility to meet the requirements of the NAS plan and facility consolidation.

Table 2.20: Schedule Changes of Critical Milestone Dates for Radio Communications Links

Milestone activity	Milestone dates as of Jan.89	Jan.90	Change in days
Contract awarded	05/03/85[a]	05/03/85[a]	0
Delivery to first operational site	01/06/86[a]	01/06/86[a]	0
First implementation	05/07/86[a]	05/07/86[a]	0
Last implementation	12/31/91	12/31/91	0

[a]actual completion dates

Table 2.15: Program Funding History for Flight Service Automation System

(Dollars in Millions)

Total estimated F&E costs	$474.3
F&E funds appropriated through fiscal year 1990	425.7
F&E funds appropriated through fiscal year 1989	414.7
F&E funds obligated through fiscal year 1989	352.5
F&E funds requested in fiscal year 1991	47.8

Microwave Landing System (Vendor: Hazeltine Corp.)

The Microwave Landing System (MLS) is designed to guide aircraft to safe landings in conditions of reduced visibility. The MLS's ability to guide approaching aircraft from a wider angle than permitted by the Instrument Landing System currently in use may allow aircraft to follow a variety of approach paths, including curved approaches. FAA contends that this added flexibility could help increase an airport's capacity to accept landing aircraft and help to alleviate some of the undesirable noise effects of approaching aircraft. All schedule data for the MLS first buy is currently on hold because FAA sent a termination letter to the contractor in August 1989. Plans for a second buy of MLSs have also been delayed pending the results of demonstration program that will validate agency projections of benefits.

Table 2.16: Schedule Changes of Critical Milestone Dates for First Buy of Microwave Landing System

Milestone activity	Milestone dates as of Jan.89	Jan.90	Change in days
Contract awarded	01/12/84[a]	01/12/84[a]	0
Critical design review	09/12/85[a]	09/12/85[a]	0
Delivery to first operational site	04/09/88[a]	04/09/88[a]	0
Shakedown test	11/14/88	05/04/90	536
First implementation	03/04/88	05/15/90	802
Last implementation	06/29/90	08/31/92	794

[a]actual completion dates

Central Weather Processor (Vendors: NASA, Harris Corp. (MWP))

The Central Weather Processor (CWP) is designed to collect, synthesize, and disseminate weather data from various sources and produce data that are tailored to users' specific needs. This program is comprised of two components: the Meteorologist Weather Processor (MWP), and the Real Time Weather Processor (RWP). The MWP is an off-the-shelf commercial service, while the RWP is expected to provide added capabilities. FAA's CWP project office attributed delays in the MWP to (1) a need to go through a deployment readiness review that it did not originally plan, and (2) minor technical changes made by higher organization levels during the review process.

Table 2.12: Schedule Changes of Critical Milestone Dates for Central Weather Processor

Milestone activity	Milestone dates as of Jan.89	Jan.90	Change in days
MWP			
Contract awarded	06/01/89	09/29/89[a]	120
Delivery to first operational site	10/02/89	06/29/90	270
Shakedown test	03/12/90	08/15/90	156
First implementation	11/01/89	09/28/90	331
Last implementation	02/01/90	04/30/91	453
RWP			
Contract awarded	04/30/93	04/30/93	0
Critical design review	05/23/94	05/23/94	0
Delivery to first operational site	01/06/95	01/06/95	0
Shakedown test	02/17/95	02/17/95	0
First implementation	03/16/95	03/16/95	0
Last implementation	06/24/96	06/24/96	0

[a]actual completion date

Delivery to first operational site	06/27/88[a]	06/27/88[a]	0
Shakedown test complete	06/14/88	03/18/89[a]	277
First implementation	06/30/88	05/02/89[a]	306
Last implementation	12/31/90	06/30/92	547

[a]actual completion dates

Table 2.9: Program Funding History for Airport Surveillance Radar

(Dollars in Millions)

Total estimated F&E costs	$700.8
F&E funds appropriated through fiscal year 1990	630.3
F&E funds appropriated through fiscal year 1989	620.8
F&E funds obligated through fiscal year 1989	435.3
F&E funds requested in fiscal year 1991	47.4

Automated Weather Observing System (Vendor: Qualimetrics Inc.)

The Automated Weather Observing System (AWOS) is primarily intended to fulfill an immediate need at non-towered airports. At some towered airports, the system will be used to replace the current system of human observers. Utilizing a computer synthesized voice, the system will provide information directly to pilots on nine different critical airport weather elements.

The AWOS program also includes FAA funds that the National Weather Service uses for procuring Automated Surface Observing Systems (ASOS). The ASOS system collects weather information, which is transmitted to the AWOS and provided to pilots in a timely manner. The ASOS system will be installed at both towered and non-towered facilities. ASOS systems will provide a similar function to AWOS at different sites.

Delivery to first operational site	09/30/91	05/29/92	242
First implementation	09/30/92	06/30/93	273
Last implementation	09/29/94	09/05/95	341

[a]actual completion dates

Table 2.5: Program Funding History for Air Route Surveillance Radar

(Dollars in Millions)

Total estimated F&E costs	$349.4
F&E funds appropriated through fiscal year 1990	131.6
F&E funds appropriated through fiscal year 1989	92.6
F&E funds obligated through fiscal year 1989	45.0
F&E funds requested in fiscal year 1991	75.2

Air Route Traffic Control Center Plant Modernization

Modernization of Air Route Traffic Control Centers (ARTCC) is needed to house the Advanced Automation System. The current facilities lack essential space and power requirements to accommodate the AAS and other projects. The total F&E funding shown below does not include $574 million in ARTCC modernization funding included in other F&E projects, which, when included, raises the total funding needed to $906 million. The majority of these additional funds are included in the Advanced Automation System project. Although standardization of ARTCCs is desired, some latitude for site specific exemptions has been included in the project plan. In the 1983 NAS Plan, the program addressed only modernization of the ARTCCs. The 1989 Plan includes both modernization and expansion of the facilities to support components of the AAS. FAA's project manager attributes schedule delays to a lack of funds, construction problems, and other unanticipated problems characteristic of building rehabilitations. According to the project manager, the modernization project may not provide adequate space for the total number of Initial Sector Suites at some sites. This could eventually increase total costs of the project.

Table 2.2: Schedule Changes of Critical Milestone Dates for Advanced Automation System

Milestone activity	Milestone dates as of Jan.89	Jan.90	Change in days
Contract awarded	07/25/88[a]	07/25/88[a]	0
Peripheral Adapter Module Replacement Item			
Delivery to first operational site	11/21/90	06/28/91	219
First implementation	05/22/91	12/31/91	223
Last implementation	02/22/93	09/30/93	220
Initial Sector Suite System			
Critical design review	09/16/88	04/20/89[a]	216
Delivery to first operational site	03/31/92	10/30/92	213
First implementation	08/11/93	03/31/94	232
Last implementation	05/12/95	12/29/95	231
Terminal Advanced Automation System			
Delivery to first operational site	02/10/94	09/30/94	232
First implementation	01/20/95	08/31/95	223
Last implementation	10/10/96	05/30/97	232
Area Control Computer Complex			
Critical design review	08/07/89	08/31/90	389
Delivery to first operational site	08/10/94	05/31/95	294
First implementation	02/12/96	09/30/96	231
Last implementation	01/13/98	08/31/98	230

Table 2.1: Project Costs and NAS Plan Implementation Milestones For Major System Acquisitions

(Dollars in Millions)

System name	Total F&E cost	Year of first-site implementation		Year of last-site implementation	
		1983 plan	1989 plan	1983 plan	1989 plan
Advanced Automation System (AAS)	$4,430.9	1990	1994	1994	2000
Air Route Surveillance Radar (ARSR-4)	349.4	1985	1988	1995	1996
Air Route Traffic Control Center (ARTCC) Modernization	332.0	1985	1984	1987	1997
Airport Surveillance Radar (ASR-9)	700.8	1985	1989	1992	1993
Automated Weather Observing System (AWOS)	189.5	1986	1989	1990	1994
Central Weather Processor (CWP)	134.9	1990	1990	1991	1996
Flight Service Automation System (FSAS)	474.3	1984	1986	1989	1994
Microwave Landing System (MLS)	1,112.8	1985	1988	1999	2004
Mode S	495.3	1986	1992	1993	2000
Radio Communication Links (RCL)	281.3	1985	1986	1989	1993
Terminal Doppler Weather Radar (TDWR)	348.6	-	1993	-	1996
Voice Switching and Control System (VSCS)	892.4	1989	1993	1992	1995

Source: FAA National Airspace System Plans issued in 1983 and 1989.

Note: NAS Plan milestones listed in this table may differ from dates in subsequent tables because the former were last updated in September 1989.

FAA received increased F&E appropriations in fiscal year 1990 and expects a further increase in fiscal year 1991. However, it plans to keep the unobligated balance at about the current level by removing some projects from full funding and increasing obligation rates. It is premature to speculate whether FAA will achieve its goal; however FAA has already altered its obligation plans for fiscal year 1990. At the time it delivered its fiscal year 1990 budget request to the Congress, FAA planned to obligate during the first year of the appropriation about 78 percent of the $2 billion it sought. This is a much higher rate than traditionally obligated, an amount which has ranged from about 37 to 60 percent over the last 5 years (see table 1.2). FAA has altered its plans, however, and now expects to obligate, in the first year, about 65 percent of the $1.7 billion the Congress appropriated for fiscal year 1990.

Table 1.2: Trends in First Year Obligation Rates

(Dollars in Thousands)

Fiscal year	Appropriation	Obligations in first year	
		Amount	Percentage
1985	$1,358,000	$723,314	53.3
1986	937,780	347,648	37.1
1987	804,584	479,255	59.6
1988	1,108,056	516,260	46.6
1989	1,384,184	662,964	47.9

-- projects in the requirements definition phase, in which systems are still being developed before contract award;

-- projects in development or production, for which a contract has been awarded for development of either prototype or final system;

-- projects in implementation, for which at least one system has been delivered to a field site; and

-- projects completed, for which all systems are operational in the field.

Table 1.1 shows the number of NAS Plan projects in each stage, as well as the percentage of total cost they represent. As noted in the table, most of the NAS Plan is in implementation, both in terms of cost and number of projects. Although approximately 32 percent of the NAS Plan projects are now complete, they account for only about 4 percent of the FAA's $15.8 billion estimated NAS Plan cost.

Table 1.1: NAS Plan Project Status

(Dollars in Billions)

Stage of progress	Number of projects	Percent of total	Estimated cost	Percent of total
Requirements definition	3	3.4	$ 0.3	1.7
Development/production	15	16.9	7.1	45.1
Implementation	43	48.3	7.8	49.2
Completed	28	31.5	0.6	4.0
Total	89	100.0[a]	$15.8[b]	100.0

[a]Percentages do not add to total due to rounding.

[b]This is the total cost FAA estimates for the original NAS Plan projects. There are additional modernization projects that need to be undertaken. Their inclusion raises total ATC modernization costs to approximately $27 billion.

Changes in F&E Appropriations and Unobligated Balances Have Paralleled Each Other

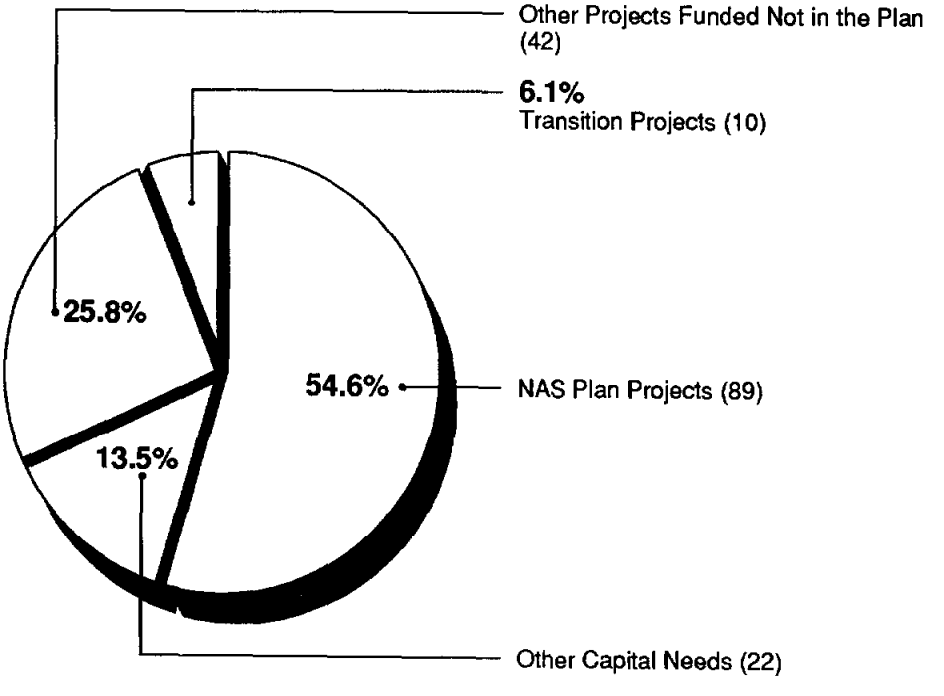
ATC modernization progress can also be measured in terms of the amount of F&E funding appropriated and obligated since fiscal

SECTION 1

INFORMATION ON THE OVERALL STATUS OF MODERNIZATION

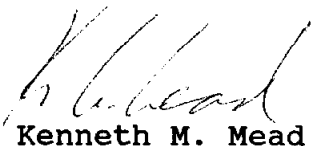
Although the 1981 NAS Plan was originally envisioned as a 10-year, $12-billion undertaking, it has grown in both length and cost. FAA now estimates the total modernization funding in the Facilities and Equipment (F&E) account for fiscal years 1982 through 2000 at approximately $27 billion (as measured in current year dollars), while it estimates the cost of the original NAS Plan projects at $15.8 billion. Figure 1.1 shows, as of September 1989, both the original NAS Plan projects and new categories of ATC modernization projects--which FAA classifies as "non-NAS"--as a percentage of the total number of F&E projects. The original NAS Plan projects account for about 55 percent of FAA's total modernization projects. Expressed in another way, estimated funding for projects FAA categorizes as "non-NAS" will begin to exceed funding for the original NAS Plan projects in fiscal year 1993, as shown in Figure 1.2.

Figure 1.1: NAS Plan and Other Projects as Percentages of the Total Modernization Effort



We are also providing copies of this fact sheet to the Secretary of Transportation, the FAA Administrator, and other interested parties. If you have questions about this fact sheet, please contact me at (202) 275-1000.

Major contributors to this report are listed in appendix I.



Kenneth M. Mead
Director, Transportation Issues

OVERALL STATUS OF MODERNIZATION

FAA has thus far measured its progress in modernizing the ATC system by (1) the number of projects it has completed and (2) the amount of funding it has received and used. We found many NAS Plan projects are in production but few are complete. About 32 percent of NAS Plan projects were complete as of January 1990. However, the cost of those completed projects represents only 4 percent of the total estimated cost of all NAS Plan projects. Section 1 contains more details on the total cost and scope of modernization.

Since the NAS Plan was initiated in 1981, two major changes have occurred. First, projects had to be added to the Plan and existing projects had to be modified in order to counter project delays and increased demand on the ATC system. Second, these additions increased the scope of what had to be acquired, more than doubling the initial NAS Plan cost estimate of $12 billion. As a result, the projects in the original NAS Plan now account for about 55 percent of the total number of estimated ATC modernization projects.

The agency's ATC modernization program is funded by Airport and Airway Trust Fund revenues through the Facilities and Equipment appropriation. Another measure of FAA's progress is the amount of Facilities and Equipment funds appropriated and obligated to date as compared to the total estimated modernization cost of $27 billion. Between fiscal year 1982 and the end of fiscal year 1989, FAA received about $7.2 billion in appropriations for ATC modernization. FAA obligated about $5.8 billion of those funds through the same time period, leaving it with an unobligated balance of $1.4 billion. Aware of the concerns associated with the level of appropriated yet unobligated funds, FAA has stated its intention to increase Facilities and Equipment spending rates in the next few years. Section 1 of this fact sheet provides further details on Facilities and Equipment appropriations and unobligated balances.

STATUS OF MAJOR SYSTEMS

All of the major modernization projects in the original NAS Plan have experienced significant schedule delays since the inception of the Plan. In November 1988, we reported that implementation milestones had slipped an average of about