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U.S. Department
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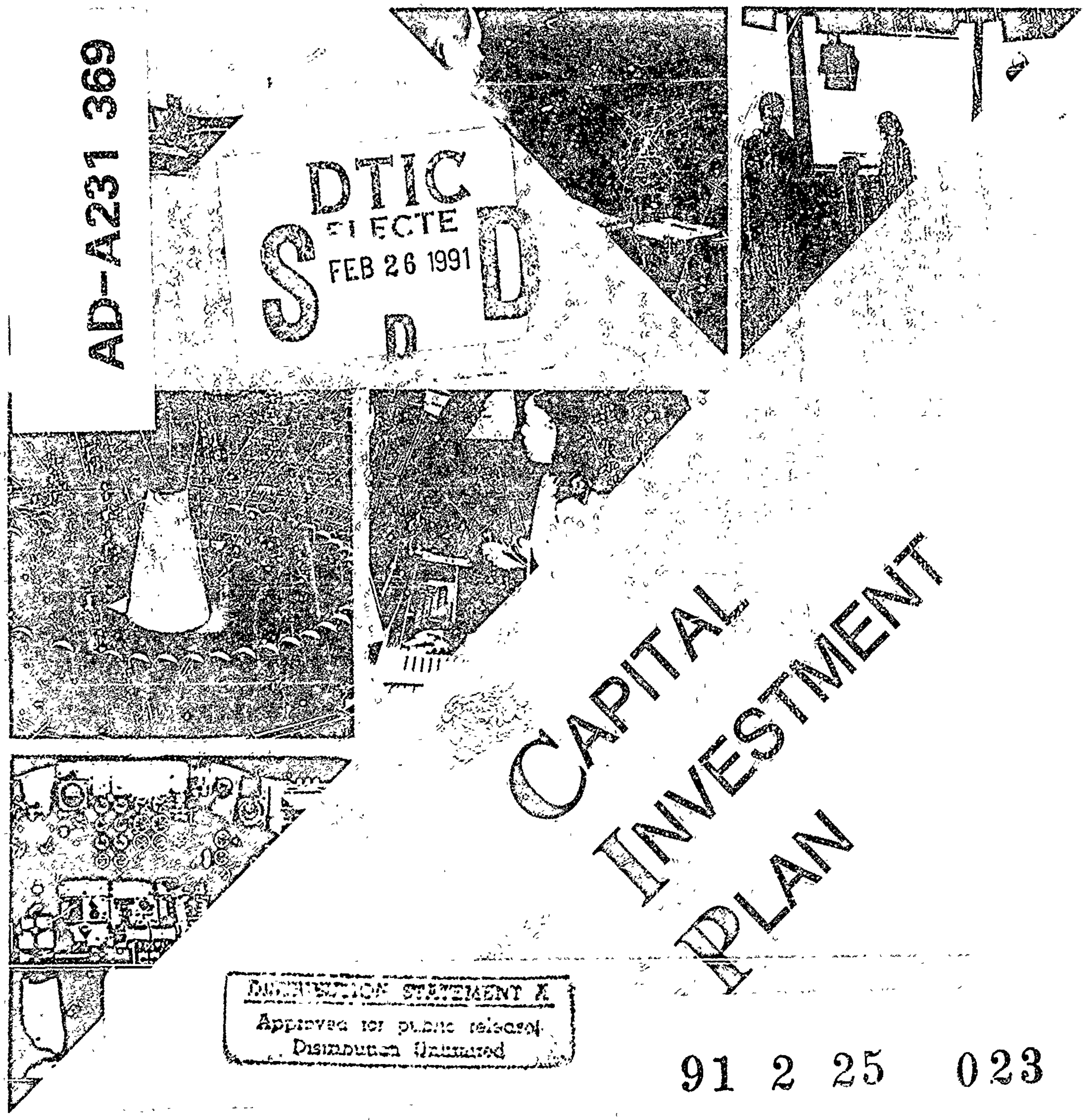
Aviation System



CAPITAL INVESTMENT PLAN

December 1990

Report of the Federal Aviation Administration to the U.S. Congress pursuant to Section 504 (b) (1) of the Airport and Airway Improvement Act of 1982 (Title V, P.L. 97-248).

DOT/FAA-TR-91-0053

U.S. Department of Transportation
Federal Aviation Administration

Office of the Administrator

800 Independence Ave., S.W.
Washington, D.C. 20591

As our Nation's air transportation system grows in response to domestic and international demand, the Federal Aviation Administration (FAA) is challenged to modernize and expand its operations to meet the needs of the 1990's and beyond. To meet this challenge, the FAA has developed the Aviation System Capital Investment Plan (CIP).

The CIP replaces the National Airspace System (NAS) Plan. This new document not only encompasses the remaining projects of the original NAS Plan, but also contains projects that are required to update and maintain America's aviation control system. Moreover, it clearly distinguishes between near-term planning for those projects to which we are firmly committed and have well-established strategies and far-term planning for those projects which require further definition prior to full commitment. The CIP simplifies the presentation of our needs and facilitates a better understanding of our goals and objectives.

The CIP describes the aviation system capital planning process and infrastructure improvements for system enhancement and modernization necessary to meet the changing demands of the user community. It supports the FAA Strategic Plan which is consistent with the Secretary of Transportation's National Transportation Policy.

Capital investment in aviation must remain a continuing dynamic process that evolves as user needs change and technology advances. For this reason, the CIP is flexible and practical; it preserves the basic foundation, but it can accommodate future change. As aviation continues to grow, the CIP will adapt to new requirements, technology, and procedures to maintain the safe and efficient use of the national airspace into the 21st century.

James B. Busey
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Administrator

TABLE OF CONTENTS

		Page
TABLE OF CONTENTS		i
LIST OF FIGURES AND TABLES		viii
EXECUTIVE SUMMARY		ES-1
CHAPTER 1 - INTRODUCTION		1-0-1
Assumptions		1-0-6
Goals		1-0-6
Demand on the System		1-0-7
Return on Investment		1-0-10
National Airspace System Description		1-0-13
Project Overview		1-0-29
CHAPTER 2 - ORIGINAL NAS PLAN		2-0-1
Section 1 - En Route		
21-02	Flight Data Entry and Printout Devices	2-1-1
21-03	Direct Access Radar Channel (DARC) System	2-1-2
21-04	EARTS Enhancements	2-1-4
21-05	Oceanic Display and Planning System (ODAPS)	2-1-6
21-06	Traffic Management System (TMS)	2-1-8
21-09	Conflict Resolution Advisory (CRA) Function	2-1-10
21-11	Voice Switching and Control System (VSCS)	2-1-12
21-12	Advanced Automation System (AAS)	2-1-14
21-13	Automated En Route Air Traffic Control (AERA)	2-1-16
21-15	Area Control Facilities (ACF)	2-1-18
21-16	Offshore Flight Data Processing System (OFDPS)	2-1-20
Section 2 - Terminal		
22-06	ARTS IIA Enhancements	2-2-1
22-09	ARTS IIA Interface with Mode S/ASR-9	2-2-2
22-11	Multichannel Voice Recorders	2-2-3
22-12	Tower Communications System (TCS)	2-2-4
22-13	ATCT/TRACON Establishment, Replacement, and Modernization	2-2-5
22-16	Bright Radar Indicator Tower Equipment (BRITE)	2-2-6
22-18	Sustain the New York TRACON	2-2-7
Section 3 - Flight Service and Weather		
23-01	Flight Service Automation System (FSAS)	2-3-1a
23-02	Central Weather Processor (CWP)	2-3-2
23-04	Weather Message Switching Center (WMSC) Replacement	2-3-4
23-05	Aeronautical Data Link	2-3-6
23-09	Automated Weather Observing System (AWOS)	2-3-8
23-12	Low-Level Wind Shear Alert System (LLWAS)	2-3-10
23-13	Integrated Communications Switching System (ICSS)	2-3-12

Section 4 - Ground-to-Air

24-02	Communications Facilities Consolidation/Network	2-4-1
24-03	VORTAC	2-4-2
24-07	Microwave Landing System (MLS) - First Procurement, Design Phase, and Production Phase I	2-4-4
24-08	Runway Visual Range (RVR)	2-4-6
24-09	Visual Navaids	2-4-7
24-10	Approach Lighting System Improvement Program (ALSIP)	2-4-8
24-11	Direction Finder (DF)	2-4-9
24-12	Mode S	2-4-10
24-13	Terminal Radar (ASR) Program	2-4-12
24-14	Airport Surface Detection Equipment (ASDE-3) Radar	2-4-14
24-15	Long Range Radar Program	2-4-15
24-16	Weather Radar Program	2-4-16
24-17	LORAN-C Systems	2-4-18
24-18	Terminal Doppler Weather Radar (TDWR) System	2-4-20

Section 5 - Interfacility Communications

25-02	Data Multiplexing Network (DMN)	2-5-1a
25-03	RML Replacement and Expansion	2-5-2
25-07	National Airspace Data Interchange Network (NADIN) II	2-5-4
25-08	Radio Control Equipment (RCE)	2-5-6

Section 6 - Maintenance and Operations

26-01	Remote Maintenance Monitoring System (RMMS)	2-6-1a
26-02	Computer Based Instruction (CBI)	2-6-2
26-04	Maintenance Control Center (MCC)	2-6-4
26-05	Large Airport Cable Loop Systems	2-6-6
26-07	Power Systems	2-6-8
26-08	Modernize and Improve FAA Buildings and Equipment	2-6-10
26-09	ARTCC Plant Modernization	2-6-12
26-10	Acquisition of Flight Service Facilities	2-6-14
26-12	Aircraft and Related Equipment	2-6-16
26-13	System Engineering and Integration Contract (SEIC)	2-6-18
26-14	National Radio Communications System (NARACS)	2-6-20
26-15	NAS Spectrum Engineering	2-6-22
26-16	General Support	2-6-24
26-17	System Support Laboratory	2-6-26
26-18	General Support Laboratory	2-6-28
26-19	Technical Support Services	2-6-30

CHAPTER 3 - GROWTH 3-0-1

Section 1 - En Route

(No En Route Projects Contained in This Chapter) 3-1-1

Section 2 - Terminal

32-06	Expand Automated Radar Terminal System (ARTS) IIA Capacity and Provide Mode C Intruder (MCI) Capability	3-2-1
32-13	Airport Traffic Control Tower (ATCT) Establishment	3-2-2

32-16 Establish/Expand Digital Bright Radar Indicator Tower Equipment (DBRITE) 3-2-3
32-20 Expand Automated Radar Terminal System (ARTS) IIIA Capacity and Provide Mode C Intruder (MCI) Capability 3-2-4
32-21 New Airport Facilities, Denver, Colorado 3-2-6
32-22 Dallas/Fort Worth Metroplex 3-2-8
32-24 Establish New Chicago Terminal Radar Approach Control (TRACON) Facility 3-2-9
32-25 New Austin Airport 3-2-10
32-26 Southern California Terminal Airspace Realignment (STAR)/Southern California TRACON (SCT) 3-2-11
32-27 DOD/FAA Air Traffic Control Facility Transfer/Modernization 3-2-12
32-29 Establish Additional Radar Positions 3-2-13
32-31 Base Buildings for Airport Traffic Control Towers (ATCT) 3-2-14
32-32 New Airport and Other Facility Planning 3-2-15

Section 3 - Flight Service and Weather

33-01 Direct User Access Terminal (DUAT) Service Geographic Expansion 3-3-1
33-08 Hazardous In-Flight Weather Advisory Service (HIWAS) Expansion 3-3-2

Section 4 - Ground-to-Air

34-04 Establish Locator Outer Markers (LOM) 3-4-1
34-06 Instrument Landing System (ILS) 3-4-2
34-07 Microwave Landing System (MLS) - Production Phase II 3-4-4
34-08 Runway Visual Range (RVR) Establishment 3-4-5
34-09 Establish Visual Navaids for New Qualifiers 3-4-6
34-12 Air Traffic Control Beacon Interrogator (ATCBI) Establishment 3-4-7
34-13 Terminal Radar Digitizing, Replacement, and Establishment 3-4-8
34-14 Additional Airport Surface Detection Equipment (ASDE) Establishment 3-4-9
34-20 Surveillance System Enhancements 3-4-10
34-22 Oceanic Satellite Communications 3-4-11
34-23 Communications Facilities Expansion 3-4-12

Section 5 - Interfacility Communications

35-07 National Airspace Data Interchange Network (NADIN) II Continuation 3-5-1
35-20 Interfacility Data Transfer System for Edwards AFB RAPCON 3-5-2

Section 6 - Maintenance and Operations

36-13 Capital Investment Plan (CIP) System Engineering and Program Management Support 3-6-1
36-20 ARTCC/ACF Support Space 3-6-2
36-23 NAS In-Plant Contract Support Services (NAS/IPCSS) 3-6-3
36-24 NAS Regional/Center Logistics Support Services 3-6-4

CHAPTER 4 - INFRASTRUCTURE REPLENISHMENT 4-0-1

Section 1 - En Route

41-21 En Route Software Development Support 4-1-1
41-22 Relocate Air Traffic System Command Center (ATSCC) 4-1-2

Section 2 - Terminal

42-13 Airport Traffic Control Tower (ATCT)/Terminal Radar Approach Control (TRACON) Modernization 4-2-1
42-14 Airport Traffic Control Tower (ATCT)/Terminal Radar Approach Control (TRACON) Replacement 4-2-2
42-20 Airport Traffic Control Tower (ATCT) System Intra-Connectivity 4-2-4
42-21 Terminal Software Development 4-2-6
42-22 Sustain/Consolidate San Juan Facilities 4-2-7
42-24 Replacement of Controller Chairs 4-2-8

Section 3 - Flight Service and Weather

43-01 Replace Regional Interim Weather Graphics with National Graphic Weather Display System (GWDS) 4-3-1
43-03 Provide Flight Service Automation System (FSAS) Power Conditioning Systems 4-3-2
43-04 Flight Service Automation System (FSAS) Computer Replacement 4-3-3
43-09 Upgrade Commercial Automated Weather Observing System (AWOS) 4-3-4
43-12 Upgrade Low-Level Wind Shear Alert System (LLWAS) to Expanded Network Configuration 4-3-5
43-13 Digital Altimeter Setting Indicator (DASI) Replacement 4-3-6
43-14 Integrated Communications Switching System (ICSS) Logistics Support 4-3-7
43-20 Automated Flight Service Station (AFSS) Support Space 4-3-8

Section 4 - Ground-to-Air

44-03 Air/Ground Communications Radio Frequency Interference (RFI) Elimination 4-4-1
44-04 Air/Ground Radio Replacement 4-4-2
44-05 Interim Backup Emergency Communications (BUEC) Improvement 4-4-3
44-07 Emergency Transceiver Replacement 4-4-4
44-08 Radio Control Equipment (RCE) Enhancements 4-4-5
44-12 Low-Power TACAN Antennas 4-4-6
44-14 Sustain VOR/VORTAC 4-4-7
44-20 AN/GRN-27 Instrument Landing System (ILS) Replacement 4-4-8
44-21 Wilcox CAT II/III Instrument Landing System (ILS) Replacement 4-4-9
44-22 Replace Mark 1A, 1B, and 1C Instrument Landing System (ILS) 4-4-10
44-24 ILS and Visual Navaids Engineering and Sparing 4-4-11
44-29 Runway Visual Range (RVR) Replacement 4-4-12
44-30 Sustain Distance Measuring Equipment (DME) 4-4-13
44-31 Replace Type FA9964 Direction Finder 4-4-14
44-32 Sustain Nondirectional Beacon (NDB) 4-4-15
44-33 Approach Lighting System Improvement Program (ALSIP) Continuation 4-4-16
44-35 LORAN-C Monitors 4-4-17
44-39 Relocate Air Route Surveillance Radar (ARSR) 4-4-18
44-40 Long Range Radar Improvements 4-4-19
44-42 Long Range Radar Radome Replacement 4-4-20
44-43 Radar Pedestal Vibration Analysis 4-4-21
44-45 Air Traffic Control Radar Beacon System (ATCRBS) Relocation 4-4-22
44-46 Air Traffic Control Beacon Interrogator (ATCBI) Replacement 4-4-23
44-48 AN/FPS-117 Beacon Improvement 4-4-24
44-60 Sustain/Relocate Airport Surveillance Radar (ASR) 4-4-25

Section 5 - Interfacility Communications

45-02 Data Multiplexing Network (DMN) Continuation 4-5-1
45-05 Expansion/Reconfiguration of Low Density Radio Communications Link (LDRCL) 4-5-2
45-06 Expansion/Reconfiguration of Routing and Circuit Restoral (RCR) 4-5-3
45-20 Critical Telecommunications Support 4-5-4
45-21 Satellite Communication Circuits System 4-5-6
45-24 Establish Alaskan NAS Interfacility Communications System (ANICS) Satellite Network 4-5-8

Section 6 - Maintenance and Operations

46-01 Sustain Remote Maintenance Monitoring System (RMMS) 4-6-1
46-04 Maintenance Control Center (MCC) Enhancement 4-6-2
46-05 Large Airport Cable Loop Systems Sustained Support 4-6-3
46-07 Power Systems Sustained Support 4-6-4
46-08 Modernize and Improve FAA Buildings and Equipment Sustained Support 4-6-6
46-09 Sustain ARTCC/ACF Facilities 4-6-7
46-16 Continued General Support 4-6-8
46-22 Fuel Storage Tanks 4-6-9
46-23 Environmental Cleanup 4-6-10
46-26 Airport Traffic Control Tower (ATCT) Safety Upgrades 4-6-11
46-28 National Airspace System (NAS) Recovery Communications (RCOM) 4-6-12
46-30 Interim Support Plan (ISP) 4-6-14

CHAPTER 5 - SUPPORTABILITY 5-0-1

Section 1 - En Route

(No En Route Projects Contained in This Chapter) 5-1-1

Section 2 - Terminal

52-21 ARTS IIIA Peripheral Adapter Module (PAM) Modernization 5-2-1

Section 3 - Flight Service and Weather

(No Flight Service and Weather Projects Contained in This Chapter) .... 5-3-1 omitted

Section 4 - Ground-to-Air

(No Ground-to-Air Projects Contained in This Chapter) .... 5-4-1 omitted

Section 5 - Interfacility Communications

(No Interfacility Communications Projects Contained in This Chapter) .... 5-5-1 omitted

Section 6 - Maintenance and Operations 5-6-1

56-02 Computer Based Instruction (CBI) Expansion 5-6-2
56-11 Aircraft Fleet Modernization 5-6-4
56-12 Aircraft and Related Equipment Program 5-6-5
56-13 Aircraft Flight Simulators 5-6-6
56-15 NAS Spectrum Engineering Sustained Support 5-6-8
56-17 System Support Laboratory Sustained Support 5-6-10
56-18 General Support Laboratory Sustained Support 5-6-11
56-19 FAA Technical Center Building and Plant Support 5-6-12
56-22 Human Resource Management 5-6-14
56-23 Instrument Approach Procedures Automation (IAPA) 5-6-16
56-24 Airmen and Aircraft Registry Modernization 5-6-18
56-25 Computer Aided Engineering Graphics (CAEG) Enhancement 5-6-20
56-26 Frequency Interference Support/Resolution 5-6-21
56-27 Test Equipment Replacement 5-6-22
56-28 Computer Resources Nucleus (CORN) 5-6-23
56-29 On-Site Simulation-Based Training Systems 5-6-24
56-30 Aeronautical Center Training and Support Facilities 5-6-26
56-33 Aeronautical Center Lease 5-6-27
56-35 National Airspace System Training 5-6-28
56-37 Logistics Support Systems and Facilities 5-6-29
56-41 Development of an Enhanced Radar Analysis Tool 5-6-30
56-47 Transition Engineering Support 5-6-32
56-51 Aviation Safety Analysis System (ASAS) 5-6-33
56-53 Refurbish AN/FPS-20 Radars 5-6-34
56-54 Provide FAA Housing 5-6-35
56-55 Independent Operational Test and Evaluation Oversight 5-6-36
56-56 NAS Management Automation Program (NASMAP) 5-6-38
56-58 National Airspace Integrated Logistics Support (NAILS) 5-6-40

CHAPTER 6 - NEW CAPABILITIES 6-0-1

Section 1 - En Route

61-06 Local Flow Management Enhancements (LFME) 6-1-1
61-20 Dynamic Ocean Track System (DOTS) 6-1-2

Section 2 - Terminal

62-01 Terminal Intrusion Function (TIF) 6-2-1
62-20 Terminal ATC Automation (TATCA) 6-2-2
62-21 Airport Surface Traffic Automation (ASTA) 6-2-4
62-22 National Airspace Management Facility (NAMFAC) 6-2-6
62-23 Airport Movement Area Safety System (AMASS) 6-2-8

Section 3 - Flight Service and Weather

63-02 Central Weather Processor (CWP) Interfaces 6-3-1
63-05 Aeronautical Data Link Communications and Applications 6-3-2
63-12 Low-Level Wind Shear Alert System (LLWAS) Enhancements 6-3-4
63-21 Integrated Terminal Weather System (ITWS) 6-3-6
63-22 Aviation Weather Products Generator (AWPG) 6-3-8

Section 4 - Ground-to-Air

64-05 Global Positioning System (GPS) Monitors 6-4-1
64-13 Airport Surveillance Radar (ASR-9) Modification for Low-Altitude Wind Shear Detection 6-4-2
64-16 Weather Enhancements 6-4-3
64-17 LORAN Offshore Flight Following (LOFF) 6-4-4
64-20 National Implementation of the "Imaging" Aid for Dependent Converging Runway Approaches 6-4-5
64-27 Landing Monitor for Closely Spaced Parallel Runways 6-4-6
64-28 Improve Capacity of Closely Spaced Parallel Runways 6-4-8
64-29 ATC Applications of Automatic Dependent Surveillance (ADS) 6-4-9

Section 5 - Interfacility Communications

65-03 Network Management and Control Equipment (NMCE) 6-5-1
65-07 Conversion of NADIN IA Message Network Users to the NADIN II Packet Switched Network 6-5-2
65-22 Aeronautical Telecommunications Network (ATN) 6-5-3

Section 6 - Maintenance and Operations

66-20 FAA National Simulation Laboratory (NSL) 6-6-1

GLOSSARY OF ACRONYMS A-1

INACTIVE PROJECTS B-1

ALPHABETICAL INDEX OF PROJECT TITLES C-1

LIST OF FIGURES

Fig. 1-1.	1990 CIP "To Go" Benefits by Category	1-0-10
Fig. 1-2.	Capital Investment Plan Benefit Streams (Primary Benefit)	1-0-11
Fig. 1-3.	CIP Chapter and Section Layout	1-0-29
Fig. 1-4.	Project Schedule Description	1-0-30
Fig. 3-1.	Projected Airports with over 50,000 Hours Annual Delay in 1997	3-0-3
Fig. 3-2	Military Airfields Available for Civil Use	3-0-5
Fig. 3-3.	Estimated Construction of Major New Runways	3-0-8

LIST OF TABLES

Table 1-1.	Total National Airspace System Activity	1-0-8
Table 3-1.	Airports Currently Experiencing Capacity Problems	3-0-1
Table 3-2.	Additional Airports Forecasted to Have Capacity Problems by the Year 2000	3-0-2
Table 3-3.	Planned DOD to FAA ATC Operations Transfer	3-0-4

EXECUTIVE SUMMARY

This is the Federal Aviation Administration's (FAA) first annual Aviation System Capital Investment Plan (CIP). The CIP describes the policies and strategies that the FAA will pursue in addressing key concerns of the National Airspace System (NAS). The Plan addresses safety, efficiency, traffic demands, aging equipment and facilities, and airspace use It creates a foundation for evolution of the existing NAS through use of new technologies and development of new products obtained from continuing research.

Long range advances in automation, communication, and satellite services that are being researched and developed will facilitate more automated control concepts, remove fixed-routing constraints, provide high levels of civil aviation system safety, and facilitate operations of future generations of aircraft. A sound planning process will provide the flexibility to capture the opportunities that new technologies provide and use these new technologies to achieve the FAA's mission. (25)

This CIP supports the FAA's Strategic Plan, which is consistent with the Secretary of Transportation's National Transportation Policy. The CIP has been coordinated with several related plans, including the Research, Engineering, and Development Plan.

The CIP has several major changes from its predecessor, the original NAS Plan, since it represents a change in the focus of NAS capital investment A principal change is the recognition that support and upgrade of the almost 25,000 NAS facilities is a continuing process, not a singular effort ending in a final end-state system. Most of the new projects in the CIP represent logical extensions of ongoing projects or address today's needs. Future requirements of the air traffic control system are being formulated with all users in the aviation community. As the requirements are determined, new projects will be created, submitted for validation and funding, added to the CIP, entered into the approval cycle and processed to completion.

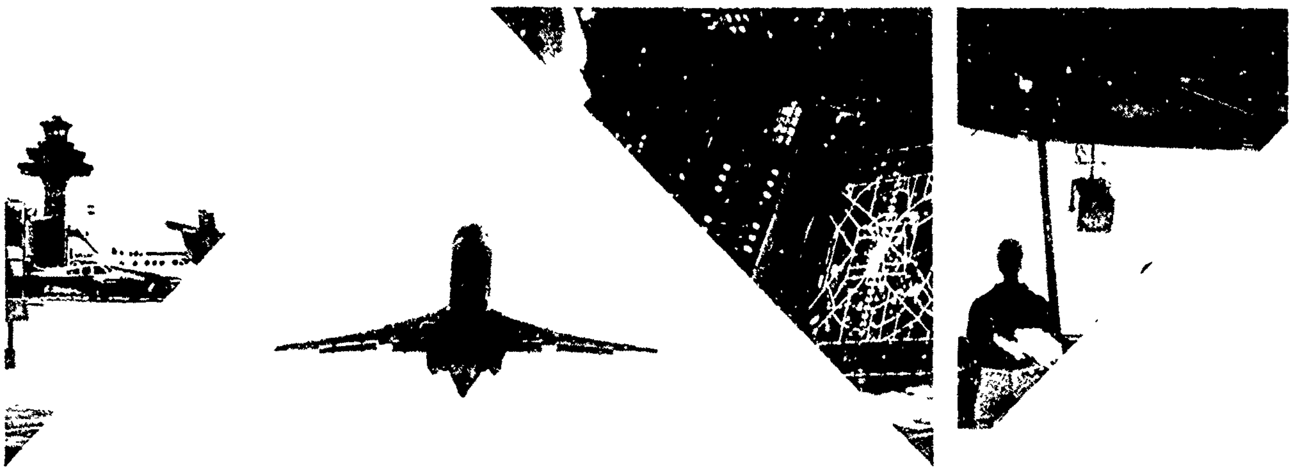
The contents of the CIP are presented in six chapters. The **Introduction** chapter provides a summary of the overall Plan, including a system description, demand on the system, return on investment, and project overview. A key goal of the Secretary of Transportation's National Transportation Policy is the completion of the NAS Plan. To meet and document this goal, the **Original NAS Plan** chapter presents all remaining original projects. The **Growth** chapter describes those requirements that expand, relocate, or consolidate existing facilities/ equipment. The **Infrastructure Replenishment** chapter covers additional items identified since development of the original NAS Plan. This chapter presents projects that refurbish structures, replace obsolete equipment, or relocate facilities to maintain service, improve effectiveness, or reduce cost. The **Supportability** chapter describes projects that support logistics, provide for personnel training, and manage the information and human resource aspects of NAS modernization. The last chapter, **New Capabilities**, addresses new projects which, if implemented, are expected to add significant new capabilities to the NAS.

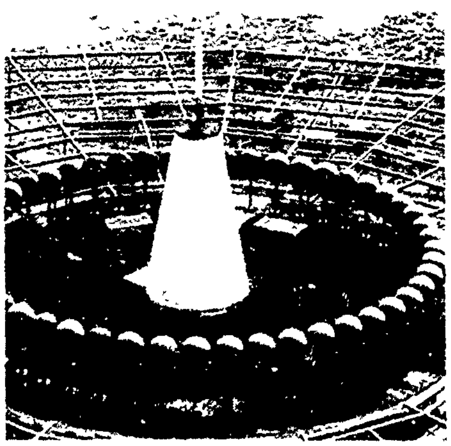
Implementation of the projects described in this CIP will provide the near-term improvements and the far-term capabilities that will ensure the FAA meets its goal of providing for the safe and efficient use of the nation's airspace.

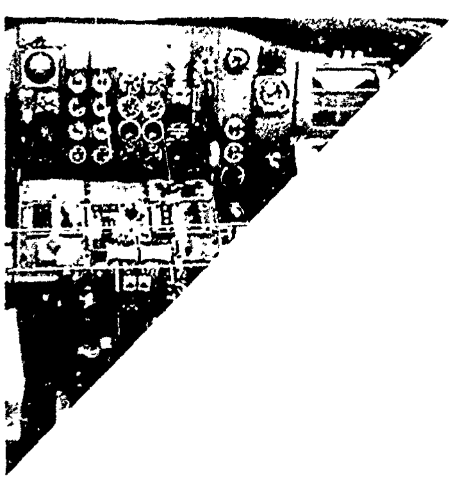
* Aviation safety, * Civil aviation.

Chapter 1: Introduction

The Introduction chapter provides a summary of the overall Plan, including a system description, demand on the system, return on investment, and project overview.







Chapter 1	Page Numbers
Introduction	(1-0-1 thru 1-0-5)
Assumptions	(1-0-6)
Goals	(1-0-6)
Demand on the System	(1-0-7 thru 1-0-9)
Return on Investment	(1-0-10 thru 1-0-12)
NAS Description	(1-0-13 thru 1-0-28)
Project Overview	(1-0-29 thru 1-0-30)

CHAPTER 1

INTRODUCTION

BACKGROUND

Through the cooperative and dedicated efforts of the Federal Aviation Administration (FAA) and the aviation community, the National Airspace System (NAS) has compiled an outstanding record of operational safety and efficiency. Prior to the 1980's, improvements in technology or innovations in operational procedures were implemented in a manner that principally remedied localized problems. System evolution also produced a varying mixture of equipment. As a result, the 1980's system was expensive to operate and maintain, expansion capability was limited, and adaptability to changing requirements was difficult.

It became obvious that a plan was needed to implement NAS improvements which met stated goals and objectives. The National Airspace System Plan for Facilities, Equipment and Associated Development, first issued in 1981 and revised annually through 1989, satisfied the need to define the orderly and rational evolution of the system. But, with deregulation of the airline industry and the widespread use of hubbing, aviation grew tremendously in terms of flights receiving air traffic control services and passengers enplaned. This growth, changes in airspace regulation, and new technologies have caused a need to revise current planning for NAS improvements.

Thus, the FAA developed the 1990 Aviation System Capital Investment Plan (CIP). This new plan makes the approach to air traffic modernization more precise, flexible, understandable, and dynamic. It distinguishes among near-term (1991-1995), mid-term (1996-2000), and far-term (2001-2005) planning. A new format to the original NAS Plan was necessary, so the CIP now includes the following six chapters:

- **Introduction** - A summary that includes mission, goal and assumption statements, demand on the system, and return on the investment.
- **Original NAS Plan** - Preservation of the original NAS Plan projects representing $15.8 billion.
- **Growth** - Projects that expand, relocate, or consolidate existing facilities/capabilities in response to changing demand on the system.
- **Infrastructure Replenishment** - Projects identified since the original NAS Plan that refurbish structures, replace obsolete equipment, or relocate facilities to maintain service, improve effectiveness, and/or reduce cost.
- **Supportability** - Capital improvement projects that support logistics, provide spares, train personnel, and manage the human resource aspect of modernizing the NAS.
- **New Capabilities** - Projects identified since the original NAS Plan which, if implemented, are expected to add significant new capabilities to the system.

More than 25 percent of the original NAS Plan projects have been completed and most of the remainder are in the production/implementation phase. The contents of the CIP reflect these achievements and the FAA's current best judgment on future actions required to modernize and maintain the NAS.

The CIP provides near-term improvements to solve immediate problems. These improvements are taking place as part of an orderly, planned evolution. On the horizon is a modern, automated network of facilities and equipment in which the latest levels of available technology are integrated into a coordinated system for air traffic control and air navigation. The results will be the replacement of outdated electronic equipment and the addition of equipment to meet current and future needs for existing services. NAS modernization will ensure safe and efficient transportation for all who use and depend upon the NAS, and provide the foundation for sustained improvement.

System planning and design include the military air traffic control facilities that provide services within the NAS to civil and military aircraft. The FAA will continue to provide unique services for military aircraft and be responsive to national defense requirements.

TOTAL SYSTEMS APPROACH

The design and implementation of the modernized NAS are major engineering tasks that require a sustained, comprehensive systems engineering approach to performance requirements, design specifications, and systems integration.

This CIP expands the role of the systems approach from system design and acquisition to total NAS implementation and support. Under this new role there will be increased demands placed upon those responsible for the system engineering and management of the NAS.

SYSTEMS APPROACH TO PROJECT DEVELOPMENT AND IMPLEMENTATION

This CIP is based on a total systems approach that relates the needs of the user community to technical opportunities, human factors, and operational considerations. The systematic implementation of the projects defined in this CIP will result in improved safety and efficiency, while accommodating spiraling demands at constrained cost. It will support a more complex system with reduced FAA personnel and create a foundation for continued evolution which uses newer technologies and capabilities. The CIP also recognizes that continuing upgrades/enhancements are necessary to meet the needs of the NAS users.

The development of a CIP project is a multi-step process that begins with the identification of mission needs and requirements. Projections of required services, future technology, and forecasts of traffic demand are considered in the formulation of new requirements. Requirements and acquisition offices throughout the FAA annually submit proposed requirements which include a mission need statement, project narrative, Facilities and Equipment (F&E) requirements, and schedules which will be used to determine if the project will be included in the CIP.

All new requirements are screened. Alternatives to provide these requirements are proposed, analyzed, and evaluated. Proposed system functional and performance capabilities, resources required, life-cycle costs, and time required to develop and procure are included in the assessment of alternatives. A joint team from within and outside of the responsible development organization reviews the alternatives and recommends new projects.

Proposed new projects are then reviewed through the FAA associate administrator level for initial approval. The CIP executive committee, a multi-disciplined team composed of representatives of FAA organizations and the Office of the Administrator (AOA-1), reviews the proposed projects to determine if they will be included in the CIP. These new projects are identified in the CIP as being in the planning stage of the formal FAA project approval process. The write-ups and schedules for these new projects are subject to change.

Successful completion of the CIP projects requires intensive management attention and the application of disciplined system engineering and management principles. The FAA has established the organization, procedures, and processes to monitor and control the technical and financial aspects of the total NAS program. These controls include cost, schedule, risk analysis, benefits analysis, and configuration management.

A Deployment Readiness Review (DRR) process ensures that a project has met the development requirements, accomplished all testing, established training needs, resolved deployment critical issues, and has sufficient logistical support. This DRR process provides a final quality assurance assessment of each CIP project prior to field deployment.

FAA MISSION, POLICY, AND STRATEGIC PLANNING

Modernization of the NAS will be accomplished within a framework of Agency policies and goals. The planning framework for the FAA includes its mission, the policies and strategies in the FAA Strategic Plan and Secretary of Transportation's National Transportation Policy.

The CIP reflects the continual planning process needed to update the NAS. The project schedules in chapter 2 cover a 25 year period (Original NAS Plan) whereas the new chapters 3 through 6, cover a 20 year period. Within each project schedule, a 15 year forward looking window is provided. The first five years represent a schedule which is based on a corresponding multiyear FAA funding plan. The second five year period and the third five year period represent mid-term and far-term planning estimates respectively. Each year the CIP will roll forward one year to reflect the continual updating process.

MISSION

The FAA's mission comes from its statutory mandate, particularly the Federal Aviation Act of 1958. The mission is summarized as follows

- To serve the nation by providing a safe, secure and efficient aviation system which contributes to national security and promotion of U.S. aviation.

NATIONAL TRANSPORTATION POLICY

As part of the DOT, the FAA's capital investments are affected by the Secretary's National Transportation Policy. For example, the document makes it Department policy to complete the products contained in the original NAS Plan. It also pledges to spend the Aviation Trust Fund balance in a fiscally responsible manner for transportation purposes.

The National Transportation Policy is organized around six key policy themes:

- Maintain and expand the nation's transportation system.
- Foster a sound financial base for transportation.
- Keep the transportation industry strong and competitive.
- Ensure that the transportation system supports public safety and national security.
- Protect the environment and the quality of life.
- Advance U.S. transportation technology and expertise.

Each theme contains numerous statements of policy. Among the most important for FAA capital planning, paraphrased slightly for brevity, are.

- Focus federal resources on transportation facilities of national significance.
- Give priority to maintaining needed transportation infrastructure.
- Manage facilities and equipment, such as the air traffic control system, to maximize efficiency and use of system capacity, and ensure that existing facilities are used to the best advantage.
- Ensure that increased system capacity is provided without compromising safety.
- Minimize federal, state, and local barriers to allow private investment in transportation.
- Continue efforts to increase private sector involvement in transportation where practical and in the public interest, including airports and air traffic control towers at low-activity airports.
- Continue to fund reliever airports and support facilities, and provide flight services to general aviation in ways that are both cost effective and responsive to user needs.
- Improve access to international air transportation for U.S. communities.
- Work with the Department of Defense to identify and update an integrated, multimodal, strategic transportation network.
- Foster research, evaluation, and demonstration of promising new transportation technology.
- Support national efforts for environmental protection.

FAA STRATEGIC PLANNING

The FAA's strategic planning, culminating in the FAA Strategic Plan, provides a foundation of policies and strategies. This CIP represents a major plan to achieve the FAA Strategic Plan policy of providing an air traffic system for the next century. Other policies and strategies the CIP will directly support include:

- Aviation Safety and Security Policy: Maintain the highest level of aviation safety and security possible consistent with human factors, technology, and economic constraints, and provide leadership which anticipates and provides solutions to potential safety problems.
- Capacity and Access Policy: Pursue optimization of airspace use and airport systems.
  - Implement effective capital investment programs for expanding airspace and airport capacity to accommodate growth and provide flexibility for future innovation.

- Preserve and enhance the capacity and access to existing airspace and airports, using effective management techniques and advanced technology.

- Human Factors Policy: Ensure that the role of the human in both present and future aviation systems is recognized.

  - Ensure that automation and the application of technology to aviation takes full account of the human element in the system.

- Management of the Agency Policy: Accomplish the Agency's mission by effectively managing the FAA's human, financial, materiel and information resources. Strategies include:

  - Productivity: Provide management systems that emphasize and achieve maximum productivity and quality in organizational and system performance.

  - Culture: Work toward building an FAA culture that nurtures individual achievement as well as organizational objectives.

The CIP also supports planning policies and strategies in other issue areas, including the environment and international operations.

LINKAGE TO OTHER PLANS

The FAA's capital investment planning is linked to other FAA plans. Research and development, for example, leads to decisions to invest capital in certain new technologies. The relationship between the FAA's Plan for Research, Engineering, and Development (R,E,&D) and the CIP is important. Successful research projects will lead to CIP projects, and the directions taken by the CIP will influence R,E,&D Plan research requirements.

The National Plan for Integrated Airport Systems (NPIAS), November 1987, and the Airport Capacity Enhancement Plan, May 1989, ADA 189 499, generate CIP requirements. While the FAA does not directly build, expand, or enhance airports, it does provide support through funding the airport improvement program and through construction of airport traffic control towers, radars, and other facilities and equipment. Many projects in this CIP are aimed at increasing airport capacity and efficiency.

The Airport Capacity Enhancement Plan plays a major role in the FAA's effort to increase airport capacity and efficiency without compromising the safety of passengers or the environment. The plan identifies the cause and extent of capacity and delay problems currently associated with the U.S. air system, projects the effects of increased air traffic on airport capacity over the next decade, and outlines various planned and ongoing FAA projects intended to reduce capacity-related problems.

The CIP supports or provides requirements for other plans. For example, the CIP reflects capital investment projects needed to achieve the goals of the NAS Human Resource Management (HRM) Transition Plan. This HRM plan directly addresses training and preparing FAA employees for the new technologies and systems being built in the CIP. FAA-wide coordination is accomplished for planners to agree on the requirements and schedules.

The National Airspace Integrated Logistics Support (NAILS) Master Plan, July 1986, ADA 221 225, establishes a formal mechanism to ensure that predeployment supportability planning is included in all major NAS projects involving subsystem acquisition, modification, or research and development.

These plans may be purchased from National Technical Information Service, Springfield, Virginia 22161.

BENEFITS FOR SYSTEM USERS

As a result of the planned actions, users will benefit from the following improvements:

- Increased safety through collision avoidance systems and improved weather information.

- Reduced delays.

- Reduced fuel use.

- Increased flexibility in routing.

Although no additional equipment will be required for most new services, users will need to purchase certain avionics related to Traffic Alert and Collision Avoidance System (TCAS), Mode S data link, Microwave Landing System (MLS), Global Positioning System (GPS), and 25 kHz communications in order to take full advantage of these investments. The cost of these avionics will be borne by the user.

The following new requirements are anticipated to permit full participation in the system.

- The Instrument Landing System (ILS) will be supplemented with, and subsequently replaced by MLS. Supplemental airborne equipment will be needed to use this new service, and in some cases, a number of aircraft may need to carry both ILS/MLS avionics during the transition.

- It is expected that pilots who wish to receive full Air Traffic Control (ATC) service in all controlled airspace will need 720-channel 25 kHz VHF communications capability in their aircraft.

BENEFITS FOR FAA PERSONNEL

The CIP efforts will not only result in increased safety, user efficiency, and significant economies, but will also result in increased job satisfaction for FAA personnel. Both adequate capital resources and the personal commitment of field, center, regional, and headquarters employees are essential for the successful implementation of this Plan. The individual involvement of ATC specialists and Airway Facility (AF) technicians is necessary for optimum operating systems. Flight Standards inspectors and certification personnel must also be involved in the development of systems that impact their specialized areas. FAA personnel should expect implementation of the CIP to enhance job satisfaction by replacing processes based on obsolete technology and routine repetitive manual tasks with processes supported by automation and the latest technology.

Some of the more notable benefits for ATC specialists are:

- Improved traffic flow planning and management, resulting in a more balanced workload.

- Reliable equipment which minimizes the stress of equipment failure.

- Easier access to more timely data, allowing for improved service to the flying public.

- More emphasis on human factors/ergonomics of new systems.

- Local computer based training which will reduce the need for training away from the home facility, especially in Air Traffic and Airway Facilities specialties.

- Improved real-time simulation capability for training purposes.

- More precise definition of individual job specifications, leading to improved interaction and information transfer between team members.

- Automation of certain procedures to reduce workload.

- Enhanced displays with color and improved weather data.

The more significant benefits for technicians in Airway Facilities are:

- Upgrading of individual skills to match the current technology.

- Improving analytical tools for more effective diagnosis and repair.

- Automating maintenance/monitoring techniques to reduce workload.

- Improving field communications capability.

- Emphasizing human factors engineering for less staffing-intensive maintenance.

Benefits for Avionics and Operations Inspectors, Flight Inspectors, Flight Procedures specialists and Aircraft Certification personnel are:

- Development of standardized training for MLS and Long Range Navigation (LORAN-C) systems.

- Local computer based training which will reduce the need for training away from the home facility.

ASSUMPTIONS

This Plan is based on the following assumptions:

- All segments of aviation including air carrier, commuter, and general aviation will continue to grow during the next 20 years.
- System limitations on any class of users' right-of-access to the system should be imposed only when no other recourse is available to ensure the common good.
- Specific equipment may be required aboard aircraft operating in designated airspace.
- Users' preferences for routes, runways, approaches, altitudes, etc., may not be honored if they will cause delays to other users or impair the safety of the system.
- No change to the system will be permitted that will reduce safety or increase risk. Mid-air collision protection, including a backup ground independent airborne separation device, TCAS, will be available.
- Few new, large, commercial-service airports are anticipated. Therefore, additional capacity will be achieved primarily through technological advances, refinements in ATC procedures, and airport surface improvements. Noise abatement procedures may affect all of these assumptions.
- ATC services within the NAS will continue to be provided by a mix of civil and military air traffic control facilities. Many military air traffic control facilities will provide service to civilian and military aircraft alike.

GOALS

The central goal of this CIP is to provide for the safe and efficient use of the nation's airspace while minimizing constraints on its use by establishing facilities and services that will optimize benefits to users. Goals include:

- Providing a safe and secure aviation infrastructure consistent with human factors, technology, and economic constraints.
- Providing capability for growth and flexibility for future innovation through implementation of new capabilities while minimizing user constraints and protecting the environment.
- Preserving and enhancing the existing infrastructure to protect the investment already made in the NAS.
- Providing capital investment projects necessary to support the NAS.
- Providing a work environment that supports NAS human resources, provides adequate training, and encourages individual achievements.
- Developing a single, integrated NAS which best meets the needs of both military and civil aviation.

DEMAND ON THE SYSTEM

The continuing growth in aircraft operations, diversity of operations, number of aircraft, and sophistication of aircraft will place unprecedented demands on the NAS from now through the turn of the century. The CIP has been developed to prepare the NAS for these new developments. The safe and efficient operation of the NAS will require improved services, new facilities for system expansion, orderly replacement of aging facilities, and adequate airport capacity.

Despite its high level of safety, the NAS is not without difficulties. Problems of expanding capacity at congested airports, provision of more direct routings, and accommodation of greater numbers of sophisticated aircraft must be dealt with effectively.

GENERAL SYSTEM DEMAND

Forecasts indicate that demand in terms of aviation activity will increase in the next two decades. Table 1-1 shows the growth anticipated in aviation demand for the years 1990, 1995, 2000, and 2005.

AIRCRAFT OPERATIONS AND PASSENGER ENPLANEMENTS

Aircraft operations, including takeoffs and landings at all towered and nontowered airports, are anticipated to grow by 40 percent between 1990 and 2005, with itinerant operations increasing 46 percent. Itinerant operations refer to those aircraft departing to or arriving from an area outside an airport's local operating area.

Instrument operations represent a separation service provided to aircraft while conducting flight in accordance with instrument flight rules (IFR). In the terminal area, IFR separation services are provided either by the Air Route Traffic Control Center (ARTCC) or terminal approach facility, and are expected to increase by 38 percent. Operations at military airports are expected to increase seven percent during this time. En route service into, out, and over the terminal areas is provided by the ARTCC and is expected to increase by 34 percent. Flight Service Station (FSS) operations, including pilot briefings, flight plan origination, and aircraft radio contacts will increase by seven percent. Domestic enplanements include all enplanements for the activity indicated, regardless of airport type. Air carrier domestic enplanements are expected to increase by 97 percent and commuter enplanements by 146 percent.

AIRCRAFT HOURS, FLEET, AND PILOTS

Air carrier hours flown are forecast to increase 34 percent, general aviation hours flown to increase 23 percent, and military hours flown to increase three percent. The number of air carrier aircraft will increase by 27 percent, commuter aircraft by 33 percent, general aviation aircraft by five percent, and the helicopter fleet by 73 percent (Table 1-1).

The mix of the general aviation fleet will be altered during this period. The single-engine piston fleet, which normally operates on Visual Flight Rules (VFR) below 12,000 feet, will decrease from 166,000 to 162,000 aircraft. The more sophisticated twin-engine and turbine-powered aircraft will comprise the fastest growing segment of the general aviation fixed-wing fleet, increasing from 33,000 to 39,000 aircraft. The number of pilots will increase by 15 percent, and those with instrument ratings will grow by 17 percent.

Table 1-1. Total National Airspace System Activity

	1990	1995	2000	2005	Percent Growth 1990 - 2005
NPIAS Airports *	3320	3560	3800	4100	23.5
Airport Operations (millions)					
Aircraft Operations	143.9	165.0	183.8	201.7	40.2
Itinerant Operations	84.6	99.0	111.3	123.2	45.6
Instrument Operations	46.4	53.4	58.6	63.8	37.5
Towered Airport Operations	62.8	70.9	78.0	84.5	34.6
Military Airport Operations	28.6	29.6	30.5	30.5	6.6
ARTCC Operations (millions)					
IFR Aircraft Handled	37.8	42.8	46.9	50.6	33.9
ACF Approach Control Operations**	----	----	58.6	63.8	----
FSS Service (millions)					
Flight Plans, Radio Contacts, Briefings	44.9	45.8	47.1	48.1	7.1
Hours Flown (millions)					
Air Carrier	10.6	12.1	13.1	14.2	34.0
General Aviation	34.0	37.0	39.9	41.8	22.9
Military	6.0	6.1	6.2	6.2	3.3
Domestic Enplanements (Revenue Passenger) (millions)					
Air Carrier	430.6	529.6	645.3	849.1	97.2
Commuter	34.9	49.5	67.3	86.0	146.4
Aircraft Fleet (thousands)					
Air Carrier	4.1	4.5	4.8	5.2	26.8
Commuter***	1.8	2.0	2.2	2.4	33.3
Total General Aviation	212.9	218.2	221.7	224.4	5.4
Civil Helicopter***	7.0	8.6	10.3	12.1	72.9
Total Military	19.1	18.1	18.0	18.0	(5.8)
Military Helicopter***	7.4	6.0	6.0	6.0	(18.9)
Pilots (thousands)					
Instrument Rated	278.7	297.0	312.0	325.0	16.6
Total Pilots	704.3	747.2	779.6	811.0	15.1

* Aircraft operations forecasts are based on the existing airports included in the National Plan of Integrated Airport Systems (NPIAS).

** Approach control operations conducted for area control facilities equal the number of instrument operations conducted by towers.

*** Civil helicopter and commuter fleets are included in the Total General Aviation Fleet. The military helicopter fleet is included in total military fleet.

MILITARY AVIATION REQUIREMENTS

Support for military requirements places special demands on the NAS. The FAA provides approach control services for over half of the 233 military airfields in the United States. The military services provide and operate 53 radar approach controls, 91 ground control approach facilities, and 200 control towers in support of military flying operations. Within their area of assigned responsibility, these facilities provide ATC services to the public which are equivalent to services provided by FAA facilities. The Department of Defense operates over 19,000 aircraft within the NAS, flying approximately six million hours per year. Air refueling activity, air drop missions, and large scale joint exercises require close coordination with civil traffic flows. The increased speed, range, and special capabilities of military flight operations places a high demand on the NAS.

AIRPORTS IN THE UNITED STATES

There are about 17,300 landing areas in the United States, of which over 5,700 are open to the public.

The nation's most important civil airports are included in the National Plan of Integrated Airport Systems (NPIAS) prepared biannually by the FAA, consistent with the Airport and Airway Improvement Act of 1982, as amended by the Airport and Airway Safety and Capacity Improvement Act of 1987. The NPIAS includes the type and estimated costs of eligible airport development work in coordination with the CIP necessary to provide a safe, efficient system of public-use airports.

AIRPORT OPERATIONS

Today, civil airports handle about 144 million aircraft operations and enplane over 460 million passengers. They accommodate over 217,000 aircraft annually.

Airport activity will increase substantially by the year 2005. Accommodating this additional demand will be more difficult in the future than it has been in the past. Although most airports will have adequate capacity through the turn of the century, many of our key metropolitan areas are now congested and many more are expected to become congested before the turn of the century. In many metropolitan areas, there is little or no reserve capacity and the potential for expansion is limited. Though only a relatively small percentage of airports are involved, they handle a disproportionately high percentage of scheduled passengers. Today, the 31 largest commercial airports enplane approximately 70 percent of all passengers.

FUTURE REQUIREMENTS

Facilities and equipment, both federally and locally provided, will be needed in response to increases in demand, provision of new or improved services, and growth in number of airports.

Airports that do not meet FAA benefit/cost criteria for approach guidance or air traffic control services may be provided facilities through non-federal sources. Additionally, airports which meet FAA benefit/cost criteria for air traffic control services may be more economically staffed through contract services.

RETURN ON INVESTMENT

CAPABILITY

In the NAS of the future, safety will be improved by reducing system errors. Flight paths desired by airspace users will be accepted on a regular basis. The growing demand of flight operations will be accommodated with a minimum of constraint and with the highest practical fuel efficiency. Dynamic flow management will reduce airborne delays.

EQUIPMENT BASE

Automation, navigation, surveillance, and landing system equipment will employ up-to-date technology. Like functions will utilize like equipment. A national network of facilities based on actual demand patterns and maintenance requirements will be in place. An efficient communications network will support individual facilities.

PERSONNEL, COMPENSATION, BENEFITS, AND TRAVEL

Individual projects that are submitted in the budget include all costs such as equipment, land acquisition, site preparation, and construction. Facilities and Equipment (F&E) and contractor installation manpower are not included in these costs. When the project is scheduled for field installation, the necessary funds for F&E and contractor installation manpower are provided from a separate annual account designated Personnel, Compensation, Benefits, and Travel (P,C,B,&T). This account is funded under Activity 8 of the F&E Budget.

CONSOLIDATION

Fewer major manned control facilities will be required. Remote facilities will also be consolidated. Unique facilities as well as unique equipment types will be eliminated. The consolidation of facilities will reduce overhead costs. The logical grouping of compatible services using standardized communications, computer, and display elements (where practicable) will achieve efficiency and economy.

CAPITAL INVESTMENT PLAN BENEFITS

The completion of the original NAS Plan process will bring about operational cost efficiencies and productivity gains. The continuing successful implementation of that plan will be ensured via additional projects identified under the newly developed broad categories of growth, infrastructure replenishment, supportability, and new capabilities.

The FAA continually seeks ways to increase productivity, reduce workload, improve safety, and enhance fuel efficiency. Implementation of the CIP will offset the FAA costs required to meet increasing demands of air traffic growth in a system which would be otherwise inadequate to handle them. These offsetting effects will have a significant return on investment to the FAA. Users of the system will benefit from improvements in flight services, more efficient routing, reduced delay, and greater safety.

A breakout by percentage of the benefits for the users and FAA is shown in Figure 1-1. These quantified benefits will be realized in the form of savings in passenger time, reductions in user operating costs, safety improvements, and work force productivity gains.

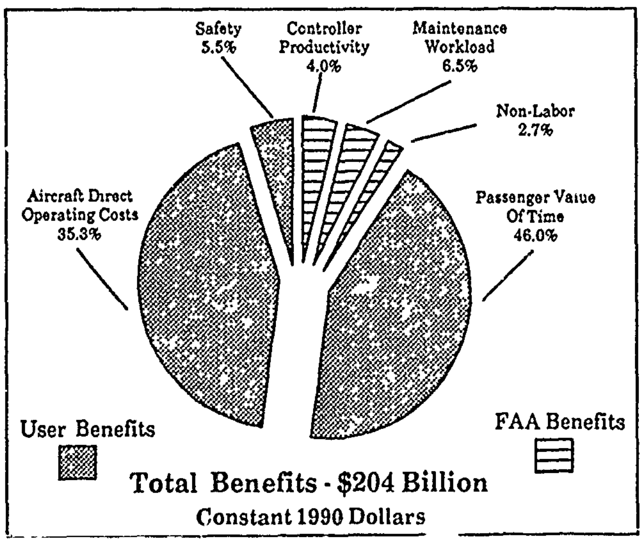
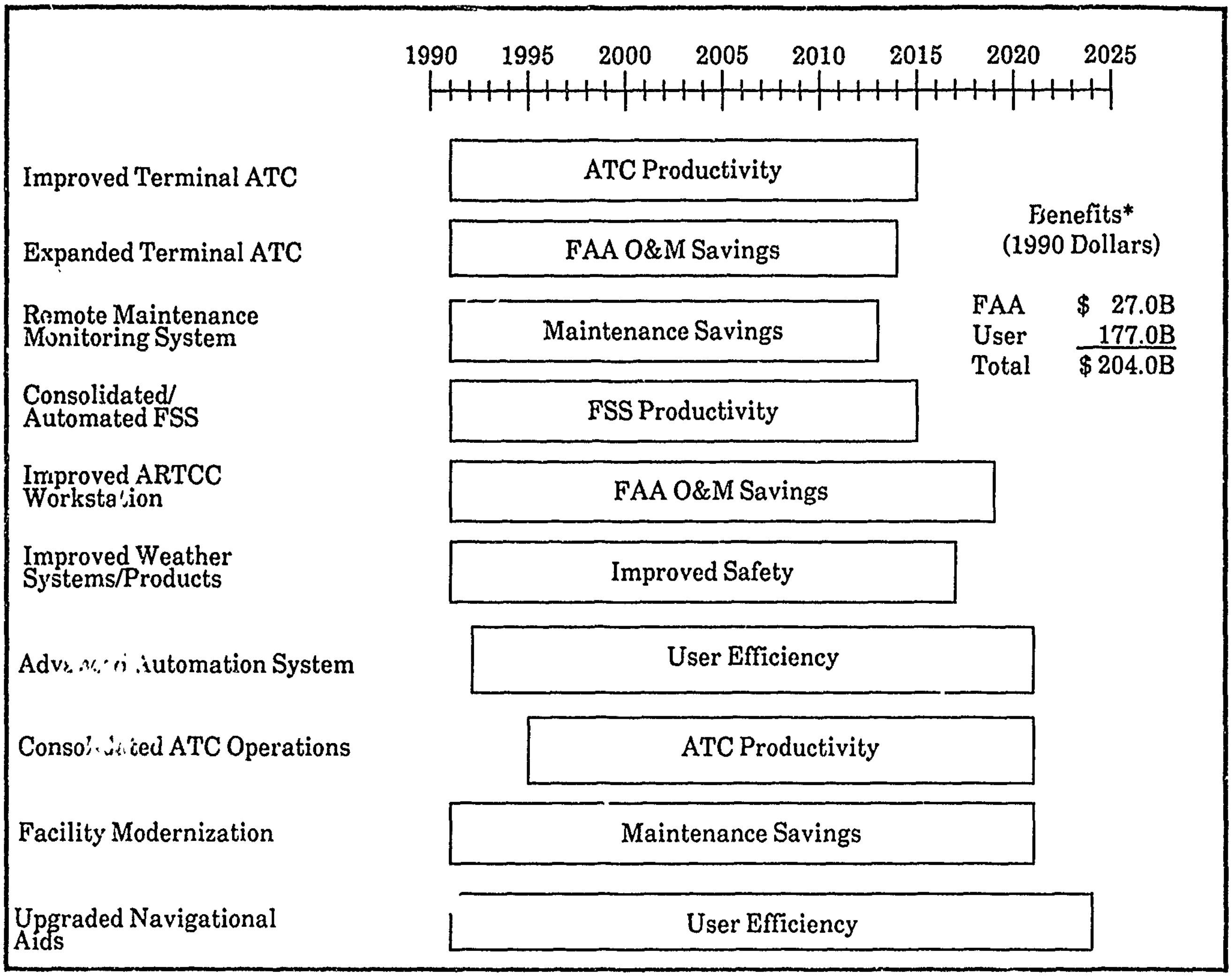


Figure 1-1. 1990 CIP "To Go" Benefits By Category



* These benefits, driven by the projects included in the CIP and their schedules, are subject to change.

Figure 1-2. Capital Investment Plan Benefit Streams (Primary Benefit)

The benefits, shown in Figure 1-2 as bars through time, begin in fiscal year 1991. Each system shown in Figure 1-2 is being developed in a currently ongoing project, or will be developed by a project scheduled to begin before fiscal year 1995.

The value of the benefits resulting from all projects is estimated to be $204 billion constant 1990 dollars. Of that, about $30 billion will continue to be accrued from delivered systems by completed projects and from stand-alone systems delivered through fiscal year 1990 by partially completed projects. Some of these completed, closed out, or partially completed projects include: Phase I of the Traffic Management System, which is providing significant flow control efficiencies; ARTCC modern Host computer, which is providing much needed capacity, and many other ongoing projects that replace expensive-to-maintain ATC equipment.

Further economic benefits will be quantified as many of the newly identified projects are added to the CIP each year and analyzed in detail.

Complementing the economic value, the CIP will bring technical modernization and sophistication to the ATC system infrastructure, making it expandable, more flexible and responsive to operators and users, including operational preferences in human engineered ATC automation.

MAJOR CONTRIBUTORS

The Advanced Automation System (AAS), Automated En Route Air Traffic Control (AERA), and related projects such as the Voice Switching and Control System (VSCS), Mode S, Central Weather Processor (CWP), and improvements in traffic management collectively account for the majority of airspace system user efficiency benefits. Supporting these hardware and software resources are the surveillance capabilities provided by the Mode S and an improved radar network which will provide more accurate and comprehensive positional data for improved traffic management and control. Weather projects which contribute improved sensor detection and real-time information dissemination capabilities are other contributors to delay reductions. MLS and AAS/AERA will reduce procedural restrictions on aircraft operating in and out of terminal and en route airspace.

Besides delay reductions, NAS users will experience enhanced operational efficiencies through the greater availability of user preferred routes and altitudes. AAS and AERA are the primary sources of these benefits. Together, these projects reduce the need for the procedural altitude and route restrictions currently needed to ensure safe aircraft separation, and result in time savings for passengers and aircraft operations, with accompanying reductions in fuel and other aircraft operation costs.

The MLS project will maintain the United States NAS safety record in the terminal environment by meeting the growth in demand for precision approach aids at newly qualifying runways by the year 2005.

Other projects that make substantial contributions are those that improve aircraft surveillance and provide enhanced weather detection and information distribution. Mode S and Air Route Surveillance Radar (ARSR-4) are among the projects that increase the likelihood that conflict situations will be identified and corrected before aircraft are placed at risk. Projects such as the Automated Weather Observing System (AWOS), Next Generation Weather Radar (NEXRAD), and Terminal Doppler Weather Radar (TDWR) monitor weather conditions and provide controllers and pilots, via the Aeronautical Data Link, with hazardous weather advisories and real-time weather reports.

A substantial number of projects in the infrastructure replenishment and supportability categories will ensure that these systems continue to provide the services for which they were designed to operate efficiently and reliably throughout their life cycles.

BENEFITS TO THE FAA

The productivity of ATC personnel will be improved by projects which generate previously unavailable information, or automate routine functions that currently require controller or traffic management attention. Ergonomic factors, such as color displays, are being designed into the projects and will also contribute to productivity and safety. Finally, consolidation of ATC facilities is expected to reduce some of the coordination workload associated with operations involving adjacent facilities.

Airway Facilities maintenance costs will be reduced through improved reliability and maintainability inherent in new or modernized hardware/software and improved maintenance diagnostics that are designed into such facilities. These developments will result in lower AF staffing requirements, reductions in diagnostic and repair equipment requirements, and elimination of parts inventories required to support equipment that is no longer in production.

NATIONAL AIRSPACE SYSTEM DESCRIPTION

This description presents a functional overview of the NAS at a national level, regional level, and local level. Three time periods are presented: near-term which includes 1991 to 1995; mid-term from 1996 to 2000; and far-term from 2001 to 2005 and beyond. Interrelationships among these functions are discussed since the objectives of one function can impose requirements on other functions. Programs and projects contributing to this future system are also contained in the FAA Plan for Research, Engineering, and Development.

SYSTEM OVERVIEW

The CIP will produce a system with the following major characteristics:

- The system will be available to all classes of users, subject only to safety requirements.
- There will be increased emphasis on national traffic management to minimize flow restrictions.
- The separation assurance function will remain with the ground-based ATC work force.
- Increased automation will be emphasized in the NAS to increase safety, capacity, and efficiency.
- The present analog/digital telecommunications system will evolve to a predominantly digital system.
- Surveillance will be provided by an integrated ground-based system for U.S. airspace and a satellite-based automatic dependent surveillance system for oceanic areas.
- While making the transition to a satellite-based, Global Positioning System (GPS) and Microwave Landing System (MLS), navigation services will be available from the existing VHF Omnidirectional Range/Distance Measuring Equipment (VOR/DME), Tactical Air Navigation (TACAN), Long Range Navigation (LORAN-C), and Instrument Landing System (ILS).
- Significant new aviation weather products will be available.
- Dramatic improvements in system capacity are possible through the application of new technology, designed around the needs and capabilities of users and operators.
- The system will continue to be predominantly owned, operated, and maintained by the FAA. The Department of Defense will continue to provide services within the system.

NAS - A USER PERSPECTIVE

The principal aviation user groups include air carriers, general aviation, and the military. Each of these groups have unique and sometimes conflicting needs. Despite these differences, all user groups generally agree on the need for extended communications, navigation, and surveillance services, and improvements in weather services. All users want the flexibility to operate safely with minimum constraints in all navigable airspace. Access to airspace and airports should be constrained only if it disrupts the safe, orderly, and expeditious flow of air traffic.

The air carriers generally employ large, expensive, jet aircraft equipped with sophisticated avionics. Schedule reliability is very important. The special needs of this group include the ability to fly preferred, minimum-operating-cost routes on a routine basis. Delays must be minimized and system capacity maximized to accommodate projected growth. All weather operations and increased airport capacities are required to achieve reliable, timely service. En route air traffic control services are required up to 70,000 feet over U.S. domestic and oceanic airspace.

General aviation includes many user groups ranging from personal transportation to business aviation. Aircraft capabilities vary widely as do the avionics equipage. Flight planning assistance and improved weather services must be readily available and easy to use. Avionics for communications, navigation, and surveillance should be minimized and usable in most airspace. Navigation services should be available in mountainous, remote, and low-altitude areas. Helicopter users require services to near-the-ground in most airspace and in most weather conditions. In addition, helicopters operate best through special corridors and landing areas specifically designed to meet their capability.

A large majority of military missions operating within the NAS are for personnel training and emergency evacuation. These missions include high-speed and at times unusual maneuvers at all altitudes in domestic and oceanic airspace. Access to civil airspace and airports is required by aircraft with military avionics. Special use airspace, normally used for these missions, will be available as a function of time-of-day, route, and altitude.

The planned improvements to the NAS described in this CIP are aimed at increasing capacity, maintaining safety, and minimizing delay for all users of the system. Many projects included in the CIP will achieve these goals in the face of projected increases in traffic demand. New technologies will provide the means to resolve existing system limitations and provide new services and capabilities designed to respond directly to the users' needs.

Some new NAS elements (MLS, GPS, LORAN-C, data link, satellite systems, and oceanic systems) will be implemented based on internationally accepted standards. This will minimize avionic requirements for the international carrier, reduce the training burden on international pilots, and reduce the potential for human error resulting from the need to maintain proficiency on several similar systems. It will also lower the cost of avionic suites by providing an international market. An excellent example of this approach to standardization is the present work in International Civil Aviation Organization (ICAO) on the Global Navigation Satellite System (GNSS).

Increases in airport and airspace capacity will be obtained through the application of new technologies. The capability will be developed that provides arrival and departure rates for IFR operations that approach the rates achieved during visual conditions. These capabilities include applications of MLS, coupled with automation aids for controllers that will increase runway acceptance rates during poor visibility conditions. Improved weather forecasts of hazardous conditions will reduce the need for aircraft to avoid large segments of suspect airspace. Detection and tracking of wake vortices will permit reduction of take off and landing separation criteria established to accommodate the potential existence of a hazardous vortex condition.

In addition to solutions for these present problems, several new services are planned. Data link applications are being implemented. The Mode S data link distribution of routine ATC messages will become commonplace and will reduce congestion on voice frequencies. Data link will also make graphical weather products available in the cockpit. Increased capacity on oceanic routes will result from a reduction in separation standards made available by an Automatic Dependent Surveillance (ADS) system coupled with a Traffic Alert and Collision Avoidance System (TCAS). Prior to flight, direct access to weather information and improved flight plan filing will be accomplished through the Direct User Access Terminal (DUAT). In-flight weather will be provided through data link services and will also be broadcast using the FAA Automated Weather Observing System (AWOS) and the National Weather Service Automated Surface Observing System (ASOS). Navigation in mountainous and remote regions and down to the ground will be improved through the use of GPS and LORAN-C, eventually expanding opportunities for nonprecision approaches.

The Advanced Automation System (AAS) and Automated En Route ATC (AERA) will allow controllers to grant clearances for more user-preferred routes. Centralized and automated capabilities for planning, network monitoring and control, and national logistics support will increase the availability of ATC systems to all users of the NAS.

The projected increase in demand for ATC services by the user community requires the implementation of several changes to the NAS in order to maintain the existing level of system safety and the quality of service. These changes will inherently increase system capacity while reducing delay, but many of these improvements will tend to be offset by the increased number of ATC operations. Thus, from the users perspective, little change might be seen. These changes will be achieved through:

- Automation projects (e.g., AAS and AERA) allowing controllers to safely handle more aircraft and satisfy the increased demand for service.

- Improved runway capacity achieved through the implementation of "visualization schemes" and special approach monitoring (surveillance) systems.

- Several telecommunications projects resulting in more reliable ground-to-air and ground-to-ground communications and enhancing the quality of existing services to all users.

- Improved surveillance of aircraft and weather through such projects as the Airport Surveillance Radar (ASR-9) and the Air Route Surveillance Radar (ARSR-4), providing the ability to maintain current safety levels in the face of increased ATC operations.

- An upgrade of the VOR navigation system to solid-state equipment and the conversion to Doppler VOR where necessary, resulting in higher unit availability and maintenance of the integrity of the signals in space. These projects will maintain the current structure of the navigation system.

- Enhancements to national flow control through the implementation of more efficient planning methods that include more accurate and reliable weather forecasts, accommodating increases in demand.

- Projects including building renovations and the procurement of essential items enhancing the upkeep and maintenance of the existing ATC system infrastructure, contributing to the ability to continue providing high levels of service to the users of the NAS.

NAS FUNCTIONAL AREAS

For purposes of this top-level description of the NAS, six basic functional areas have been selected that will provide capabilities at a high level of safety and at an acceptable cost to the user and the government. These major system functions are highly related.

- Automation - Those subsystems that provide assistance to system operators to satisfy airspace user needs for service including the accommodation of increasing demand, desire for user preferred routes/altitudes, and delivery of improved weather services.

- Telecommunications - The subsystems that provide the capability for the air/ground and ground/ground voice and data communications, and the interfacility communication of information such as aircraft surveillance data.

- Surveillance - Those subsystems that provide the positional data of aircraft in U.S. airspace, on the airport surface, and over the ocean.

- Navigation and Landing - Those subsystems that provide pilots with accurate knowledge of their aircraft position so that they can properly navigate the aircraft in all weather conditions.

- Weather - The subsystems that provide both pilot and controller with the meteorological information necessary to ensure safe and efficient aircraft and system operation. This includes knowledge of weather phenomena, such as severe weather, wind shear, clear air turbulence, microbursts, wake vortex, winds aloft, precipitation, and icing.

- Maintenance and Operations - The subsystems that ensure high quality service and provide continued operation of the various system elements through monitoring, control, maintenance, and testing of hardware and software components.

Detailed descriptions of the planned near-, mid-, and far-term system enhancements are presented on a functional basis in the following sections. The evolution of the NAS will improve operations nationally, regionally, and in local geographic areas. Mid- and far-term enhancements are not completely defined at this time, and in some cases alternatives exist for accomplishing the objectives. The term "regional," as used in this document, refers to an area larger than a local area but smaller than a national level. It does not refer to an FAA regional area.

NAS - NATIONAL-LEVEL DESCRIPTION

Automation, telecommunications, surveillance, navigation, weather, and maintenance and operations functions all have elements that define the NAS architecture at the national level.

Twenty-three Area Control Facilities (ACFs) will provide arrival, departure, and en route control functions resulting in more effective air traffic control. ACF establishment activities consist of relocation and consolidation of TRACONs and the necessary remoting of radar interfaces and communications. The FAA is planning for the establishment of new large TRACONs at such major locations as Los Angeles, Dallas/Fort Worth, and Chicago. These facilities would provide ATC operations in these high activity terminal areas.

The NAS controls departure and arrival rates at all airports through the Central Flow Control Function (CFCF) of the Air Traffic System Command Center (ATSCC). Automation capability will provide improved efficiency, reduced delays, enhanced and expanded user services, and additional responsiveness to user requirements. Near-term enhancements will be derived from an improved Traffic Management System (TMS).

The new National Airspace Management Facility (NAMFAC) which is now in the early planning stage, will house the Modeling and Analysis Facility, National Weather Service Central Flow Weather Service Unit (CFWSU), Central Flow Control Function (CFCF), United States NOTAM System, National Flight Data Center, and the National Maintenance Control Center (NMCC).

In telecommunications, plans include the establishment of a modern voice and data transmission system, a National Airspace Data Interchange Network (NADIN II) for data switching, and Network Management and Control Equipment (NMCE) to monitor and control the communications networks. Standardized interfaces and protocols will be used to achieve greater interoperability and control.

By the year 2005, the NAS may have two sole-means navigation systems available: a satellite system based on GPS in combination with GLONASS, LORAN C, or other augmentation; and the VOR/DME/TACAN system. In the process of making a transition to a new satellite system the NAS will continue to provide services from the VOR/DME/TACAN system.

Replacement of the Weather Message Switching Center (WMSC) with state-of-the-art equipment and technology will provide a centralized FAA interface with the National Weather Service (NWS) and will be the source of NWS products for the NAS. NADIN II will be used to support the distribution of related weather data.

NAS - REGIONAL-LEVEL DESCRIPTION

Automation, telecommunications, surveillance, and maintenance and operations functions also have elements that define the NAS architecture at the regional level The AAS provides the automation backbone including both the Initial Sector Suite System (ISSS) and the Area Control Computer Complex (ACCC). AERA provides additional ATC capabilities. This regional automation function will interface with both the national Traffic Management System (TMS) and the local Terminal ATC Automation (TATCA) system. The Flight Service Automation Systems (FSAS) will enhance regional and local services for general aviation.

The regional components of telecommunications include the use of oceanic satellite communications and new air/ground radios and integration equipment that includes Radio Control Equipment (RCE) and Voice Switching and Control System (VSCS) located at each ACF. A new Data Link Processor (DLP) will be used to disseminate weather and ATC information to aircraft using the Aeronautical Telecommunications Network (ATN) and multiple data links, including the Mode S data link and satellites. There will be a single integrated surveillance system with the output of each surveillance sensor contributing to a common surveillance database supporting both en route and approach/departure control. Oceanic surveillance will be achieved by relaying aircraft navigational information (derived from on-board navigation systems) to the ground via a satellite telecommunications link.

NAS - LOCAL-LEVEL DESCRIPTION

The six basic functional elements also contribute to the NAS architecture at the local level. The AAS will have direct applicability to many local operations. AAS's Tower Control Computer Complex (TCCC) specifically supports the Airport Traffic Control Tower (ATCT) environment. Automation supports all Terminal Radar Approach Controls TRACONs prior to relocating to the ACF or MCF and ATCT-related projects, as well as the near-term Airport Movement Area Safety System (AMASS), the longer-term TATCA and the Airport Surface Traffic Automation (ASTA) project. Telecommunications improvements may include the Tower Communications System (TCS), local area networks used in the AAS, air/ground radios, and all equipment used to transmit voice and data at local facilities.

Surveillance enhancements at the local level include Airport Surface Detection Equipment (ASDE), Mode S-based surveillance, and possibly a small terminal sensor beacon-only radar for approach/departure surveillance at low activity airports. Special high data rate sensors and operational procedures are developed to accommodate closely spaced parallel runways. Navigation and landing at the local level includes the implementation of the MLS for precision approach and other navigation systems for nonprecision approaches.

The weather function encompasses a variety of local systems such as Low-Level Wind Shear Alert System (LLWAS), AWOS, Terminal Doppler Weather Radar (TDWR), and several potential improvements in weather products that include warnings of localized phenomena such as wind shear, thunderstorms, wake vortex, heavy snow, ground icing, and forecasts of short-term changes in ceiling and visibility at airports.

Maintenance and operations support is primarily regional and national but certain elements such as Computer Based Instruction (CBI), the FAA Technical Center laboratories, and FAA Aeronautical Center training facilities are considered to be local.

NAS - FUNCTIONAL DESCRIPTION

These six functional areas are separately discussed in the context of their evolution over three time periods: near-term, 1991 to 1995; mid-term, 1996 to 2000; and far-term, 2001 to 2005 and beyond. The systems discussed in this area have not necessarily completed all the approval steps for implementation.

Automation

The main objective of NAS automation is the development of hardware, software, and operational procedures to satisfy airspace user needs, increase productivity and enhance safety. Accommodation of increased demand, reduction in ATC-induced delay, increased provision of user-preferred routes/altitudes, and enhanced delivery of weather services will be achieved through the automation program. In addition, safety will be improved in specific areas. Prevention of runway incursions, provision of hazardous weather information, and detection of VFR aircraft in designated positive control airspace are areas that will receive special attention. Safety benefits will be derived from more orderly traffic flows, especially in the terminal area.

Current system information, extrapolated data, and future-time simulations will be used to plan and organize air traffic flows. This will take into account uncertainties in demand and capacity resulting from variables in wind, weather, traffic mix, flight times, and departure times. This process is focused on maximizing system capacity.

Automation of the en route traffic planning and management functions will improve traffic flow efficiency, minimize delays, and be more responsive to user requests. User-preferred routes/altitudes will be accommodated unless separation standards would be violated. The en route system will deliver aircraft to the terminal area in a sequence that will permit a minimum of radar vectoring and increased airport acceptance rates.

The oceanic system will provide flexible routing, automatic dependent surveillance, and upgraded ATC automation.

In the terminal control area, the system will provide maximum runway use at major airports through precise sequencing and spacing of aircraft that accounts for wake vortex, hazardous weather, and fuel conservation. To minimize delays, airports with converging or parallel runways will operate during Instrument Meteorological Conditions (IMC) at capacity levels that approach those achieved during Visual Meteorological Conditions (VMC). These improvements will be achieved by feeding multiple runways with multiple aircraft streams during poor weather while maintaining safety of operation. Tower systems will accommodate airborne and ground movement of aircraft/vehicles through the use of integrated airport surveillance and weather inputs. Flight services will be expanded through improved infrastructure and additional weather products.

Underlying infrastructure programs such as the AAS will be established to provide required capacity, performance, reliability, and maintainability while providing the framework for enhanced functionality. Prototyping will include the extensive participation of field personnel to assist in the development of the automation functions and human factors considerations. Development of operational software modifications will extensively use analysis and modeling to provide in-depth understanding of the complex and interactive nature of the system. All activities will be accomplished to keep safety as the number one priority.

Near-Term Improvements (1991 to 1995)

Near-term improvements that will be realized by the flying public, pilots, and controllers are made possible by the initial implementation of AAS elements. The ARTCC Host computer Peripheral Adapter Module (PAM) will provide a capability to interface with additional radars and obtain higher data transmission rates. Delays caused by visibility could be reduced by providing the traffic controll[illegible] with automation aids that would permit approac[illegible] and landing on closely spaced, parallel runways. At some airports, special high data rate radars will be used to monitor closely spaced runways during adverse weather conditions to further reduce delays. Airspace will be more efficiently used through improved departure spacing, arrival sequencing, and en route spacing programs that better integrate local flow management and controller functions.

The proposed National Airspace Management Facility is designed to provide near-, mid-, and far-term improvements. These include improved data management, analysis, airspace use design, situation monitoring, and control algorithms to better manage traffic flows in the face of demand peaks and capacity reduction.

Safety will be improved by providing pilots and controllers with more accurate, timely information. This will be made possible through additional and improved ATC automation. In en route airspace, controlled aircraft can avoid conflict with the uncontrolled traffic if the uncontrolled aircraft are equipped with transponders and altitude encoders. If such a conflict is detected, the automation system will display suggestions to the controller for safe evasive maneuvers for the controlled aircraft.

Intruders into Terminal Control Areas (TCAs) will be detected and the controller alerted. Terminal conflict alert will be enhanced at the Automated Radar Terminal System (ARTS) IIIA/E sites. Beacon tracking, Minimum Safe Altitude Warning (MSAW), conflict alert, and a target training generator are implemented at the ARTS IIA sites. An ARTS II interface with Mode S and the ASR-9 will be provided. At the large airports, ASDE-3 radars will provide improved ability to control aircraft/vehicles on the airport surface in all weather conditions.

In the oceanic area, an enhanced Oceanic Display and Processing System (ODAPS) and the introduction of ADS will provide improved situation monitoring. In continental airspace, digital air/ground data link capabilities will permit reduced voice communications. Certain initial data link services include automatic transmission of predetermined ATC instructions and transfer of communication instructions. At selected airports, flight plan clearances will be delivered to the cockpit via data link. The Automatic Terminal Information Service (ATIS) will allow more efficient dissemination of airport area information via data link and voice communications. Airborne traffic alert and collision avoidance systems will serve as an extra safety feature to provide pilots with safe evasive maneuvers in the event of a predicted near collision.

Flight services will be expanded through additions to the infrastructure. The FSAS will allow enhanced regional and local services for general aviation. A Graphics Weather Display System (GWDS) and improvements to weather sensors and products will allow improved access to weather information. Use of data link will provide direct access to some weather products for equipped aircraft.

Mid-Term Improvements (1996 to 2000)

The infrastructure for a variety of system improvements will be realized with the implementation of the full AAS which includes the Area Control Computer Complex (ACCC). Automation system reliability and availability will be improved and controllers will have the tools to provide more efficient and effective service to the user. Implementation of the Initial Sector Suite System (ISSS) will provide the controller with color displays and electronic presentation of flight data. With AERA incorporated into the AAS, requests for more flexible and fuel efficient direct routes/altitudes can be accommodated. Controllers will be able to safely and efficiently handle increased traffic flows through the use of improved computer/human interface equipment and improved integration of flight plan, surveillance, and weather information on the sector suite displays. Previously implemented functions such as local traffic management and oceanic automation will be consolidated into the AAS.

In the en route airspace structure, automation will detect potential violations of separation standards and restricted airspace, adjust flow patterns, and generate alternative conflict resolutions for controller examination and selection. The ATN will allow direct data interchanges between those automation functions and the aircraft.

The TCCCs of the AAS will provide integrated displays of weather, airport surveillance, flight data, navigation monitoring, and other airport data. At the larger airports an airport movement area safety system will alert tower controllers of potential runway conflicts.

Enhancements to the NAMFAC will provide additional airspace system capacity through more effective national, regional, and local flow management. Reduced delays and increased capacity will be realized through efficient integration of NAMFAC capabilities with regional and local flow management.

Increased user demand for airspace capacity in oceanic airspace will be accommodated by building upon the infrastructure provided by the ODAPS and ADS. This oceanic function will be incorporated into the AAS during this timeframe. Airborne traffic alert and collision avoidance systems will also provide improved safety in oceanic airspace in a manner that supports reduced oceanic separation standards.

The terminal area and airport surface improvements described below will begin to appear in the mid-term period and will be fully realized in the far-term. In the terminal area, users may be provided more fuel efficient descents and more timely departures while controllers will be provided a dynamic time-based plan for sequencing flights. The planning software will use radar, flight plan, and weather data to provide accurate terminal airspace planning. It will account for local procedures, aircraft characteristics, wind, and changes in terminal conditions to provide spatial references to help synchronously feed multiple runways during IMC. It will also provide precise time-to-turn advisories for optimum spacing on final approach to increase runway capacity. In addition, a landing sequence will be derived that optimizes final spacing between aircraft based on wake vortex restrictions and speed differentials. Speed control advisories will also be generated to regulate the arrival flow and achieve the desired landing sequence. This information will be exchanged with aircraft via the ATN. Finally, departure and arrival dependencies will be synchronized to further improve capacity.

The ASTA system will provide surface surveillance based on ASDE-3, Mode S, and automation capabilities at major airports Real-time data on the location, movement, identity, and size of aircraft/vehicles on the airport surface will be provided to the tower. Automated tools will also be provided to monitor and control airport surface traffic flow including prevention of intersection collisions, issuance of taxi clearances with route and runway assignments, and establishment of runway departure queues. The system will enhance all weather operations, reduce controller workload, provide Mode S surveillance and data link on the airport surface, and allow safe high-capacity operations under all weather conditions.

Far-Term Improvements (2001 to 2005 and Beyond)

The next generation traffic management system will be an integrated system for the national, en route, and terminal levels of traffic management. It will cooperatively use data available as a result of mid-term improvements such as an ACCC environment, AERA 2, and TATCA. This system, in conjunction with en route and terminal automation, will prevent local and regional system overloads and maintain maximum throughput. The system will be predicated on safety, maximum throughput, and accommodation of user-preferences wherever possible.

In the en route airspace, improved weather products and a more dynamic control system will allow more flexible use of en route airspace and the accommodation of user-preferred routing and altitude assignments.

Further reductions in separation standards may be achieved in the oceanic airspace with the accurate and frequent position information available from the ADS and the use of on-board alert and collision avoidance systems as a safety backup.

Telecommunications

The major performance drivers for telecommunications are message quality, service availability, and restoral time requirements for critical, essential, and routine communications. Some form of diversity will be necessary to meet critical service requirements. Service diversity is achieved by having facility diversity or transmission diversity. The actual type of diversity selected will be a function of the criticality of the service, the nature of the communications, and the cost of implementation. In addition, there are a number of other key drivers including elimination of single points of failure, improved coverage requirements, projected communications traffic requirements, and lower life-cycle costs.

Near-Term Improvements (1991 to 1995)

Significant changes in the FAA communications system will occur as it evolves into a comprehensive integrated network. A key element of this evolution is the network design which accommodates NADIN, Radio Communications Link (RCL), RCE, and network management. The NADIN system will provide alternate routing capabilities to bypass failed or saturated areas.

In both the current and future NAS, vendor equipment and technologies will be made to operate automatically with each other. FAA unique NAS message protocols, based on national and international standards, will provide guidelines under which vendor independence, automation, and interoperability of the various NAS systems will be achieved.

The backbone RCL implementation will be completed. New solid-state RCE will improve system reliability and reduce maintenance and logistics costs. Low speed data circuits will be multiplexed on the Data Multiplexing Network (DMN).

The Alaskan NAS Interfacility Communications System (ANICS) will be established. Certain FAA Alaskan interfacility communications will be carried via satellites on FAA earth stations.

The airport telecommunications program for low and minimum activity airports will continue to replace the deteriorating and unreliable cables with new technology distribution systems. New voice switching communications equipment installation will have been completed at several facilities including VSCS at ARTCCs and TCS at some ATCTs and small TRACONs. This will limit leased equipment costs and allow greater flexibility in reconfiguration of ATC positions. The Integrated Communications Switching System (ICSS) will be used in Automated Flight Service Stations (AFSSs), ATCTs, and TRACONs. To help meet service diversity requirements for critical services, diverse communications routes will be provided using leased services. The Remote Communications Air/Ground (RCAG) facilities may be backed up by a modified Backup Emergency Communications (BUEC) system. Network Management and Control Equipment (NMCE) installation will begin.

Mid-Term Improvements (1996 to 2000)

In the mid-term, facility consolidation (AFSSs and ACFs) and services such as Mode S data link, AERA, satellite data link, and ADS impose increasing telecommunications requirements. The comprehensive communications network will accommodate these requirements. Full implementation of TCS will be completed as will enhancements to RCE and VSCS.

Installation of NMCE will continue at all ACFs and at one or more centralized locations. This will maintain the global system configuration at optimum capacity and efficiency, and reduce system restoral times at the network and circuit levels. In addition, reliable Mode S data link coverage can be achieved by overlapping coverage from two Mode S sites.

Far-Term Improvements (2001 to 2005 and Beyond)

At the highest level, the target telecommunications architecture for the years 2001 to 2005 will be met in a cost-effective manner. It is characterized as an improved air/ground voice communications with new data link service which will support an aircraft from gate of origin to gate of destination including the airport surface, terminal, en route, and oceanic airspace.

A new, universal Ultra High and Very High Frequency (UHF/VHF) tunable radio system will provide significantly improved availability, improved selectivity, and site-adaptive receiver sensitivity.

A communication data link will be available in all required areas although the transmission medium will vary. Mode S will be the data link of choice in en route and terminal airspace while oceanic data link capability will be provided via satellite. VHF and satellite capabilities will augment the en route and terminal airspace data link architecture. On the airport surface, both Mode S and VHF data link will be available. The data link architecture is designed so that interface to a user aircraft will be standardized and compatible with an integrated input/output data display system. For example, on a commercial aircraft, Mode S, satellite, and VHF data links carrying ATC, weather, or airline business data will all be presented to the pilot on the same display. Priority ordering of messages will allow the most time-critical ATC messages to interrupt other messages. This architectural approach will also permit the general aviation user to receive data link services using Mode S only.

To obtain all benefits of service availability, additional equipment is required which will allow the detection of failures, switching to an alternative service, and isolation of failed equipment. This equipment will also allow the FAA to control totally its telecommunications services. The NMCE will manage and control the telecommunications system. It will provide control functions for all telecommunications services and support service availability by ensuring that the service restoral times are achieved when switching to alternate paths during periods of communications failure or poor service performance. The FAA will use a mixed media transmission system comprised of microwave links, copper cable, fiber optics, and satellites.

The backbone RCL transmission system will link all ACFs. Leased transmission circuits, when required, will be competitively obtained, taking advantage of potential traffic consolidation savings that now exist with fiber optics and future digital transmission systems.

Satellites will be used as the primary transmission medium for oceanic communications and in remote areas such as Alaska. In the continental United States, satellites will provide redundancy as alternate transmission paths for critical and essential communications.

The FAA's ground-to-ground data link will be provided by a packet-switched digital network, NADIN II. Ground-to-ground voice communications will be provided by VSCS, ICSS, and TCS circuit-switching equipment.

Surveillance

Knowledge of aircraft position is essential to the efficient functioning of air traffic control. Today's system uses primary (skin paint) and secondary (beacon) radar for this function, but provides limited electronic surveillance of oceanic operations and aircraft operating on the airport surface.

Improvements of surveillance in U.S. airspace and the introduction of surveillance systems for oceanic and airport surface operations are required to meet the increasing demands for improved air traffic control. Surveillance of U.S. airspace, oceanic operations, and airport surface are discussed separately.

U.S. Airspace:

The objectives of the surveillance system upgrade programs in U.S. airspace include: improved accuracy, continuity, and timeliness of aircraft surveillance; improved air-ground-air communications using a data link integral to the surveillance system; surveillance of all IFR operations from takeoff to landing; and improved detection of severe weather through the use of aircraft surveillance radars to complement dedicated weather radars.

Near-Term Improvements (1991 to 1995)

Today's surveillance system has two major elements: the terminal system which supports the approach and departure control functions at approximately 250 of the most active airports, and the en route system which supports the control of en route traffic between and over airports. Both use a combination of primary and secondary radar. The latter operates in conjunction with a beacon, or transponder, on board the aircraft. Coding of the transponder replies provides aircraft identity and altitude. The ARSR-4 is the newest en route radar and will replace FAA/USAF Joint Surveillance System radars.

The procurement of the Mode S sensors will result in improved coverage above 12,500 feet nationwide, and coverage to the ground at the busiest terminal areas by 1996. A second Mode S-compatible procurement may extend coverage downward to 6,000 feet, or the minimum en route altitude, whichever is higher, and to the ground near all airports. In addition, several projects are directed at improving the existing Air Traffic Control Radar Beacon System (ATCRBS) and the replacement of ASR-7/8 primary radars with ASR-9s to provide radar digitization and tracking.

Present plans also include the replacement of the Bright Radar Indicator Tower Equipment (BRITE) with digital BRITE systems that take advantage of digital scan converter technology.

Mid-Term Improvements (1996 to 2000)

Airport Surveillance Radars (ASR-9s) continue being deployed at the busiest airports. Additional radars with ASR-9 functionality will be required to continue primary radar surveillance at other terminal areas once AAS is implemented.

By the year 2000, all air carrier and other high-performance aircraft will be equipped with Mode S transponders. Aircraft will also have to be equipped with an operating transponder to receive ATC service. It is further assumed that many of the Mode S equipped aircraft in the civil fleet will have data-link capability. In addition, VFR operations by non-transponder-equipped aircraft will continue to be permitted in designated low density airspace.

There will be a single, integrated beacon system, with the output of each sensor contributing to a common surveillance capability that supports both en route and approach/departure control. Mode S sensors will provide higher accuracy surveillance for all transponder-equipped aircraft, plus air-ground-air data link communications for aircraft equipped with Mode S transponders. The use of back-to-back beacon antennas on en route long range radars will result in a surveillance update period of approximately five seconds from all sensors.

Finally, special high-update-rate (2.5 seconds or faster) beacon surveillance will be provided at selected airports having closely spaced parallel runways to permit independent IFR operations. This higher update rate surveillance will be accomplished by either back-to-back beacon antennas on the Mode-S (resulting in a 2.4 second update period) or a dedicated terminal sensor using an electronically scanned antenna.

Far-Term Improvements (2001 to 2005 and Beyond)

En route surveillance will be provided primarily by the beacon system. However, primary radar will continue to be employed as an adjunct to the beacon system in certain airspace. The functions of primary radar, in order of priority, will be: intruder detection, weather detection in terminal airspace, and backup ATC.

Intruder detection refers both to the detection of aircraft attempting to enter the United States without detection and to the inadvertent or intentional flight of uncontrolled, non-transponder-equipped aircraft into high-density airspace around busy terminals where transponders are required.

For the lowest-activity controlled airports, which do not now qualify for an ASR and are too far from a larger airport to receive radar approach control service from that facility, consideration is being given to the development and implementation of a Small Terminal Sensor. This will provide the benefit of establishing radar separation for IFR flights at low-activity airports. As an additional benefit, it would enhance safety during VFR operations by providing the tower controller with a second source of traffic awareness.

It is possible that primary radar coverage may be discontinued in en route airspace except as required to provide surveillance of U.S. borders by the Joint (FAA/Air Force) Surveillance System. This possibility is being studied. Since the current weather detection function of the long range radars will be taken over by the Next Generation Weather Radar (NEXRAD) network during the near-term period, the high replacement, operation, and maintenance costs of en route radar may not be warranted.

Oceanic Airspace:

Near-Term Improvements (1991 to 1995)

There is currently no independent surveillance of aircraft flying on oceanic routes out of range of land-based radar systems. Procedural-based separation standards are used with infrequent position reporting via High Frequency (HF) radio or UHF radio relay. The position reported is obtained from the on-board navigation system, and the separation standards are based on the limitations of these systems. Before 1995 it is assumed that a satellite navigation system, based on GPS and/or a GPS/GLONASS combination, will be deployed and made available for civil use. The advent of oceanic air/ground communication via satellite, plus more accurate navigation systems, will allow the introduction of ADS. Each ADS-equipped aircraft will automatically report its position via the satellite link on a relatively frequent basis. This will allow better monitoring of aircraft position, leading to a reduction in separation standards and increased airspace capacity.

Mid-Term Improvements (1996 to 2000)

Previously implemented oceanic automation functions will be consolidated into the AAS.

Far-Term Improvements (2001 to 2005 and Beyond)

As more accurate satellite-based navigation systems become available, higher aircraft positional accuracy combined with more frequent reporting (perhaps once every 10 seconds), and backed up with on-board collision avoidance systems, can be expected to lead to substantially decreased separation standards. Where it is possible to require all aircraft to be suitably equipped, oceanic separation standards may approach those currently used on Continental U.S. (CONUS) routes.

Airport Surface:

Near-Term Improvements (1991 to 1995)

An increase in safety operations is needed on the airport surface, where several accidents and near accidents have occurred in recent years. An increase in the efficiency and capacity of surface operations is needed during low visibility conditions. These requirements lead to the need for surveillance and surface traffic control at high activity airports. The first step in this process, currently under way, is the deployment of ASDE-3 radar systems.

Improvements in the planning and development stages include runway incursion detection and alerting (AMASS) and improved digitization and tracking of the ASDE radar output.

Mid-Term Improvements (1996 to 2000)

By the year 2000 most or all aircraft operating at high-density airports will be equipped with Mode S transponders. Also, it is assumed that a complementary effort will be developed as part of the automation program to produce an ASTA system. Improvements in the planning and development stages, including a Mode S surface surveillance system, will provide automatic identity of Mode S equipped targets on the ASDE display, as well as data link communication with aircraft on the airport surface. In addition to supporting improved airport surface traffic control, the digitized, tracked ASDE with Mode S identity can be combined with the airspace surveillance radar to provide an integrated final approach and runway display for the local controller.

Far-Term Improvements (2001 to 2005 and Beyond)

The relatively high cost of the ASDE-3 may limit its use to high activity airports. Consideration is being given to the development of a lower cost ASDE system, with more limited capability matched to the requirements of smaller airports. This would allow more airports to qualify for, and users to benefit from, the safety and operating efficiency benefits provided by surface surveillance.

Navigation and Landing

Near-Term Improvements (1991 to 1995)

Near-term improvements will provide for full implementation of the LORAN-C system as an en route and nonprecision navigation aid. Projects include the completion of the LORAN-C stations in the center of the CONUS, deployment of the LORAN-C monitors to provide for signal calibration, agreement with the United States Coast Guard to provide the monitoring for nonprecision approach, and approval of nonprecision approach procedures to many low-activity airports.

Other near-term improvements represent the fine tuning and maintenance of the existing systems. These projects include:

- Establishment and upgrading of ILSs to provide precision approach guidance at new and existing installations.
- Conversion of some specific VORs to Doppler VORs to solve siting problems.
- New Remote Maintenance Monitoring (RMM) compatible DME systems to replace existing DME systems at VOR/DME sites and to establish DME service at VOR-only sites.
- Acquisition of new VOR/DMEs to establish new stations and retire the last of the tube-type units.
- Replacement of tube-type VHF Omni-Directional Range Test (VOT) equipment with new solid-state units.
- Replacement of Tactical Air Navigation (TACAN) antennas with high-efficiency units.
- Replacement of all tube-type Direction Finders (DFs) with solid-state equipment.
- Installation of Runway Visual Range (RVR) equipment and implementation of visual landing aids such as the Precision Approach Path Indicator (PAPI) and approach light improvements.
- Upgrading or enhancement activities will be initiated in the early 1990's to extend the life of the VOR/DME/TACAN/LORAN-C systems to 2010.

Since the GPS constellation of 21 operational and three active spares is scheduled to be operational by 1994, the possibility of using it with LORAN-C to provide a sole means of navigation will be investigated and so will the application of GPS to precision approach.

Mid-Term Improvements (1996 to 2000)

The MLS will become operational during this period, and up to 960 systems may be procured by the year 2000. Implementation of Runway Visual Range (RVR) systems will be completed. Implementation of visual approach and landing aids will continue. The approach lighting system improvement program will be completed. Establishment and collocation of DFs with other equipment in shared buildings and utilities will be completed.

GPS integrity monitoring will be implemented to ensure nonprecision approach integrity. Since GLONASS is expected to be operational with a 24 satellite constellation, it may be possible to implement a Global Navigation Satellite System (GNSS) composed of GPS and GLONASS or GPS augmented by other satellite systems to meet the requirements of a sole-means navigation system.

Far-Term Improvements (2001 to 2005 and Beyond)

The primary objective of the emerging NAS navigation and landing system is to provide higher levels of accuracy and operational flexibility at reduced costs.

By the year 2005 the NAS may have available two sole-means navigation systems: a satellite system based on GPS in combination with GLONASS, LORAN-C, or other augmentation; and the VOR/DME/TACAN system. A 15-year GNSS deployment phase is needed from 1995 to 2010 to allow validation of system performance and adequate time for airborne equipage. In parallel, a phase-out period for any unneeded radio navigation systems could occur. Considering the GPS and GLONASS proposed operational dates, it is possible that the VOR/DME/TACAN/LORAN-C system could be phased out in the 2010 time frame.

Extensive general aviation equipage of LORAN-C airborne equipment dictates that LORAN-C transmitters be available at least until 2005. Additionally, the potential use of a combined GPS/LORAN-C system for sole-means navigation may further extend LORAN-C life cycle requirements. Since neither Omega nor Nondirectional Beacon systems (NDB) (other than as ILS compass locators) will be required to satisfy user requirements beyond 2005, decommissioning of these facilities can occur as their operational life cycle terminates. In the case of ILS compass locators, selective enhancements or upgrades may be required to extend service life.

MLS should achieve parity with ILS in the year 2001, and it is expected that the transition to a total MLS precision approach capability will take place after 2005. The older equipment will be retained for five years or more to allow for users to transition from ILS to MLS. Therefore, it is expected that ILS will be retained in the NAS until after 2005. At this point MLS will provide Category I, II, and III precision approaches and will also provide area navigation capability in the terminal airspace. Differential techniques augmenting GNSS may provide limited precision approach capability at airports not equipped with MLS.

Weather

The FAA and the NWS have embarked on a major aviation weather program consisting of weather systems and weather sensor upgrades in their modernization programs. These upgrades are expected to address aviation needs of the community by providing greatly improved resolution of storm-scale weather.

Increased safety will be realized through expanded hazard detection and integration of terminal area weather by:

- Providing integrated, fully-automatic aviation weather products for controllers, pilots, and traffic managers. .
- Expanding capabilities of terminal radars to detect aviation weather hazards. This may involve extending coverage to general aviation airports using existing or new, low-cost technologies.

Integrated weather products will be available to users for the first time in the aviation weather program. This integration, coupled with the planned improvements in weather products, will allow weather information to be used in new ways. For near-, mid-, and far-term improvements, all of these advanced weather products will be provided in formats that are designed by air traffic control personnel and pilots for use without meteorologist interpretation, and presented in both digital and color-graphical form.

Implementation of the planned aviation weather system projects will enhance the efficiency and capacity of the airspace system through strategic use of aviation weather products in flight planning and traffic management. This will be achieved by:

- Improving terminal forecasts with specific weather products such as detection and forecasting of in-flight icing, thunderstorms, lightning, and turbulence.

- Providing radar vectoring service around hazardous weather.

- Using weather products in central flow control decision-making to reduce weather related delays.

- Increasing the availability of improved weather products to all users, including the expansion of general aviation weather services.

Near-Term Improvements (1991 to 1995)

During the near-term, many planned improvements will become available. These improvements will provide the basis for the integrated weather products that will become available in the mid- and far-term and will immediately enhance system safety and the dissemination of weather products to the users and operators of the NAS.

All Low-Level Wind Shear Alert Systems will be in operation Additional sensors and improved algorithms will be added to the LLWAS to improve detection of wind shear. Real-time weather information provided by the AWOS, and its NWS equivalent, the ASOS, will be digitally displayed to both pilots and air traffic controllers, thus reducing the need for controllers and FSS specialists to provide these data as they do in today's system. These data will also be provided automatically on a specified geographical area or route depending on user preference. Data from these systems will be supplied to air traffic control system personnel and synthesized into voice messages for broadcast to pilots. AWOS broadcasts will complement other existing services such as the Hazardous In-Flight Weather Advisory Service (HIWAS). ATIS recording equipment will be replaced with minimal maintenance models that will improve reliability and broadcast quality.

Integration of the NWS and FAA weather products will be enhanced through the replacement of the WMSC with state-of-the-art technology.

The DUAT service will be expanded to include Alaska, Puerto Rico, and Hawaii, and will provide increased user access to weather information and flight plan filing. Similar capabilities will also be enhanced through the implementation of several Flight Service Station projects.

The Central Weather Processor (CWP) project consists of two major elements. The first element, a leased Meteorologist Weather Processor (MWP), will be implemented for Center Weather Service Unit (CWSU) meteorologists and flow management applications. Development of the second CWP element, a prototype Real-time Weather Processor (RWP) which supports the unique weather product requirements of the NAS, is underway.

Several weather radar systems will also be implemented during this time frame. The ASR-9 project, which is primarily a surveillance radar, contains a separate Doppler weather channel capable of generating weather map contours for six-levels of precipitation intensity. The TDWR system will detect microbursts, gust fronts, wind shifts, and precipitation, and will be used to provide alerts of hazardous weather conditions in the terminal area. Advanced notice of changing wind conditions will also permit timely runway changes thus contributing to the overall capacity of the airport. The majority of the planned TDWRs will be installed by the end of this period. The contract for NEXRAD has been awarded and the implementation of the first NEXRAD will be accomplished. This radar differs from the TDWR in that it is a long range Doppler weather radar for en route application. A network of these radars will provide accurate aviation weather products including precipitation reflectivity, wind velocity, and turbulence indicators. The improved weather radar data provided by these projects will enhance aviation safety, improve fuel efficiency, and support traffic flow management.

Mid-Term Improvements (1996 to 2000)

The mid-term improvements build upon the capability of computers to process huge amounts of data, the increasing scientific understanding of atmospheric behavior, and the near-term investments, particularly the extensive network of deployed sensors (e.g., NEXRAD). Instead of major new investments in sensors, the mid-term improvements will have two major features. First, they will emphasize integration of data from existing sensors, so that the controller receives unambiguous, complete, single-source weather information.

Second, they will emphasize "nowcasting", the ability to predict severe weather with high accuracy in small geographical areas. With today's system, controllers must rely on multiple weather sensors that occasionally provide conflicting information. Moreover, weather forecasts lack precision in local geographical areas, making it difficult to use in air traffic control management decisions (e.g., restricting airport access when a thunderstorm develops).

To better define the future aviation weather products and address aviation user needs, the following new weather projects are included in Chapter 6 of the CIP for initiation in the mid-term:

- Integrated Terminal Weather System (ITWS).
- Aviation Weather Products Generator (AWPG).

The purpose of the ITWS is to ensure that air traffic controllers and pilots receive accurate, timely, and fully integrated hazardous weather products. ITWS will produce a uniform set of airport weather products that include warnings of the most severe forms of wind shear, thunderstorms, wake vortex tracking, heavy snow, and ground icing.

The AWPG project consists of two elements. The first is operational in nature and will provide a new generation of short-term forecast products to assist safety, capacity, and efficiency at the national and regional levels. This will be accomplished through the development of national and regional data processors that are totally devoted to merging and channeling these highly specific weather products to the various user systems.

The second element of the AWPG is the Aviation Weather Development Laboratory (AWDL). The purpose of AWDL is to develop advanced aviation products from the available sensor data that are relevant to identified user needs. Specifically, the AWDL is a rapid prototyping facility that will conceive, develop, test, demonstrate, and help implement a new generation of weather products. This includes forecasts of the onset of thunderstorms, tornadoes, severe local winds, snowstorms, in-flight and ground icing, and short-term changes in ceiling and visibility at airports. This will be accomplished by assimilating weather data from a variety of sources, creating a national aviation weather database, generating aviation user-specific forecast products, and timely distribution of these products.

With implementation of the ITWS and the AWPG it will be possible to pinpoint the precise location of a convective storm hazard prior to its formation. For example, advanced automation displays will show a 20- to 60-minute look-ahead of thunderstorm formation in small geographical areas, typically in three- to five-mile data boxes. These data collection boxes will outline the precise location of hazards. Those used today sometimes measure thousands of square miles. These precise hazard warning areas will also include tornado detection and forecast position, in-flight storm turbulence, and location of lightning and very heavy precipitation. The products will be hundreds of times more accurate than similar products today. This improvement is not only attributed to enhanced sensor and modeling capabilities, but it is also due to a more precise identification of the exact hazard area.

Prior to the implementation of the TCCC, air traffic terminal controllers will see a single microburst wind shear alert product on an integrated display. Microbursts will be detected by the various combinations of TDWR, an enhanced LLWAS, and a modified ASR-9 radar.

These high quality alerts will be available to pilots via data link in an unambiguous digital form. Traffic management units at terminal and en route locations will use weather graphic products displayed on strategic planning consoles that identify airport locations where microburst alerts are in effect.

Detection of severe weather will be accomplished primarily by the national network of long range NEXRAD radars, complemented by TDWRs for microburst and wind shear detection at selected airports. The ASR-9 will complement these dedicated weather radars, providing detection of precipitation in the terminal areas. With upgrading, these radars can also provide a limited capability for microburst detection, augmenting TDWR and providing a capability at airports not equipped with a TDWR.

Improved detection and forecasting of in-flight turbulence and icing conditions will be available, allowing controllers, traffic managers, and pilots to have a much greater knowledge of the presence of these dangerous conditions. These hazardous conditions are reported in Significant Meteorological Information (SIGMET) reports that cover large areas of the United States. The hazards, if accurately predicted, are found only in a minute fraction of today's warning area. In the mid-term period, such products will be significantly more accurate than today's estimates. They will be transmitted in both color graphic and digital forms to controllers and pilots through data link.

Far-Term Improvements (2001 to 2005 and Beyond)

As the aviation weather system advances, improved weather modeling will bring increased capabilities. The forecast of the onset and ending of heavy snowstorms and ground icing, to the accuracy of five to 15 minutes, may be provided two hours or more in advance. This will allow air traffic managers, airport operators, and airlines to strategically plan the use of airspace and aircraft in a manner that is not possible today. Airports and airlines will be in a much better position to deal with major snowstorms, reducing the overwhelming delays that currently disrupt the entire system. In addition, precise short-term forecasts of ceiling and visibility changes in 15-minute increments will become available. This will provide precise knowledge of when airport acceptance rates will change. In addition, new wake vortex detection and tracking capabilities could improve airport capacity, allowing more precise acceptance/departure rates. It will allow for critical capacity adjustments in the airport hub environment and become the most important strategic aviation weather planning change available at NAMFAC.

Maintenance and Operations

High availability and reliable performance of equipment and software is essential to system safety and efficiency High availability is achieved through the implementation of a responsive infrastructure that includes maintenance and monitoring, logistics support, training, and diverse testing. Features of maintenance and operations include:

- RMM systems that contribute to the high availability by reducing downtime through early detection, diagnosis, and resolution of equipment problems.
- A comprehensive integrated logistics system that supports the NAS equipment throughout its life cycle and enhances system cost-effectiveness.
- Training that provides the mechanism for all NAS personnel to progressively improve their operational skills and knowledge of new systems.
- Testing that ensures that equipment introduced into the NAS meets requirements.
- Strategically located, staffed and unstaffed facilities that permit the efficient use of maintenance personnel and equipment.

Maintenance and operations support (M&OS) is provided throughout the NAS. Responsibilities at the national, regional, and local level are designed to complement one another. This approach provides substantial benefits to the Government due to the commonality of equipment and the strategic location of support facilities such as national field support sectors. Benefits to the users are also realized through reduced maintenance and operations cost and improved availability of user services.

Fully automated remote monitoring and maintenance management systems wi l help ensure high system availability and reliability. New training programs and methods will be introduced to prepare field personnel to operate and maintain new and upgraded NAS equipment. Automated test tools and methods will be developed to rapidly diagnose complex system hardware and software problems, and support facilities will be designed and located to minimize cost and maximize effectiveness and efficiency.

Near-Term Improvements (1991 to 1995)

The maintenance and monitoring portion of M&OS architecture will be partially implemented and will include: Remote Monitoring Subsystem (RMS), Maintenance Processing Subsystem (MPS), Maintenance Control Centers (MCCs), and Maintenance Data Terminals (MDTs). The RMS will collect subsystem status data, detect key performance parameters, and transfer these data to the MPS. A facility RMS will monitor remote facility generators and security, i.e., smoke, fire, and physical intrusion. The MPS will collect and process subsystem data and transfer relevant parameters to the MCC and maintenance personnel.

Status and control commands will be sent from the MCC back to individual RMSs, allowing maintenance personnel to remotely detect and isolate faults down to the Lowest Replaceable Unit (LRU). On-site maintenance personnel will use the MDT to troubleshoot, locate, and replace the LRU and check out the system. The technician will have local, regional, and national support only via telephone or radio with maintenance logs contained mainly on paper. Some RMSs will not be remotely monitored and controlled.

A key aspect to the successful implementation of the architecture is that each future NAS project will contain an embedded RMS capability so eventually almost all systems will contain an RMS. As more RMSs are introduced, several activities will occur.

- The MPS will be upgraded to service these new units.

- Remote Maintenance Subsystem Concentrators (RMSCs), collecting data from a group of RMSs, will be strategically located to reduce transmission costs.

- Training, through the use of Computer Based Instruction (CBI), will increase so that technical specialists, such as the MCC specialist, will have appropriate skills with the available aids.

- The integrated logistics system will evolve with consolidated work centers and spares strategically placed throughout the NAS.

- Selected facilities will be consolidated and power systems upgraded to provide quality electrical power necessary to ensure high availability.

Mid-Term Improvements (1996 to 2000)

Improvements will accrue from additional training courses and facilities, as well as from installation of more subsystems with remote maintenance and monitoring capability. The MCCs will be operational and facility consolidation will continue. The number of flight inspection hours will be reduced from 27,000 hours annually in 1981 to 20,000 hours by the year 2000. The planned power and structure improvements will have been completed. More reliable cable loop systems will serve large airports.

The existing support laboratories located at the FAA Technical Center will focus primarily on installed system modifications and improvements rather than on initial test and evaluation. In addition to these laboratories, a National Simulation Laboratory will be established to provide a vehicle to evaluate the impact of new concepts and systems on the NAS.

Far-Term Improvements (2001 to 2005 and Beyond)

By the year 2005, the M&OS architecture will be fully implemented and systems maintenance personnel will become extremely efficient at maintaining NAS subsystems through the use of online support, improved training, and automated maintenance systems. All major NAS subsystems will be remotely monitored and controlled. The methods used by technical specialists to monitor and control subsystems (locally and remotely) will include the use of advanced systems to assist with problem diagnosis and resolution. The technician will be provided with online support at the local, regional, and national levels. Automated maintenance logs will be implemented to reduce human error, support logistics planning, and alleviate paperwork. Finally, the National Maintenance Control Center, located at NAMFAC, will be established to monitor system status at a national level and automatically perform trend analysis. The result will be more efficient system maintenance and cost-effective provisioning of spares.

PROJECT OVERVIEW

The contents of the CIP are identified in Figure 1-3. As shown, chapters 2 through 6 are divided into six functional sections; En Route, Terminal, Flight Service and Weather, Ground-to-Air, Interfacility Communications, and Maintenance and Operations. These functional sections serve as an umbrella for the CIP and produce an appropriate location for all projects within the document.

A written description for each CIP project provides the major aspects of that project. This includes: purpose of the project; approach being taken to accomplish the effort; products (number of systems, locations, etc.); and related projects/activities. Additional information may be included: progress since the last publication; problems resulting in delays; and how the delays were minimized. If a contract has been awarded, prime and all major subcontractors are listed. All prime contractors have a contract with the FAA, and these are denoted by filled-in-bullets. Principal deliverables for each prime contractor are contained within parentheses. Subcontractors have contracts with the prime and are indented under the prime.

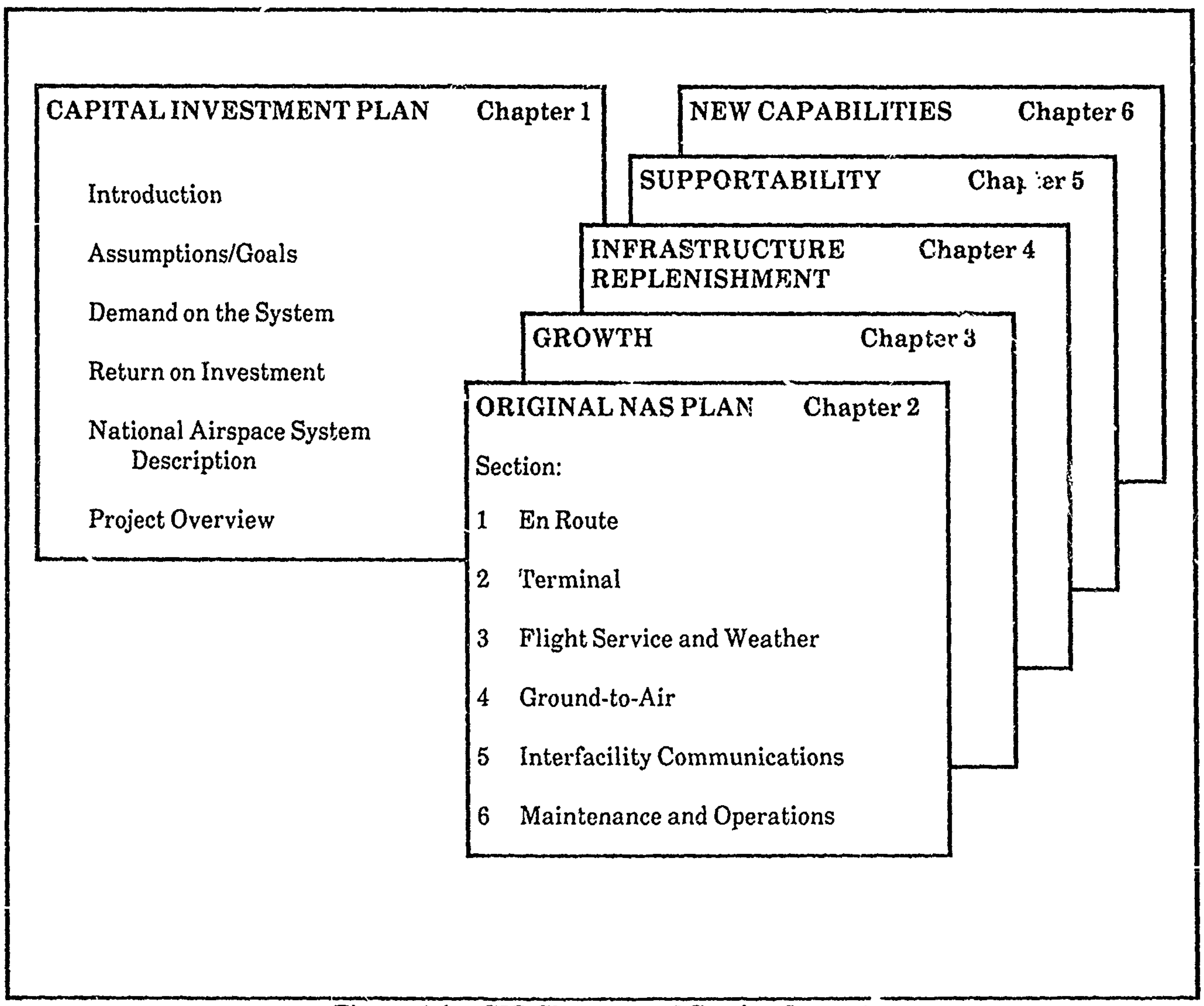


Figure 1-3. CIP Chapter and Section Layout

A detailed schedule for each project is provided showing such key items as project approval, contract award, and implementation dates. It should be noted that a functional capability, such as ILS, may appear in more than one chapter. An example of these project schedules is presented in Figure 1-4. These schedules may include both R&D and F&E activities where appropriate. The legend shown below the sample schedule provides a guide for the reader's use. Page numbering has the following meaning: the first number identifies the chapter, the second number provides the section, and the third number is the sequential section page number.

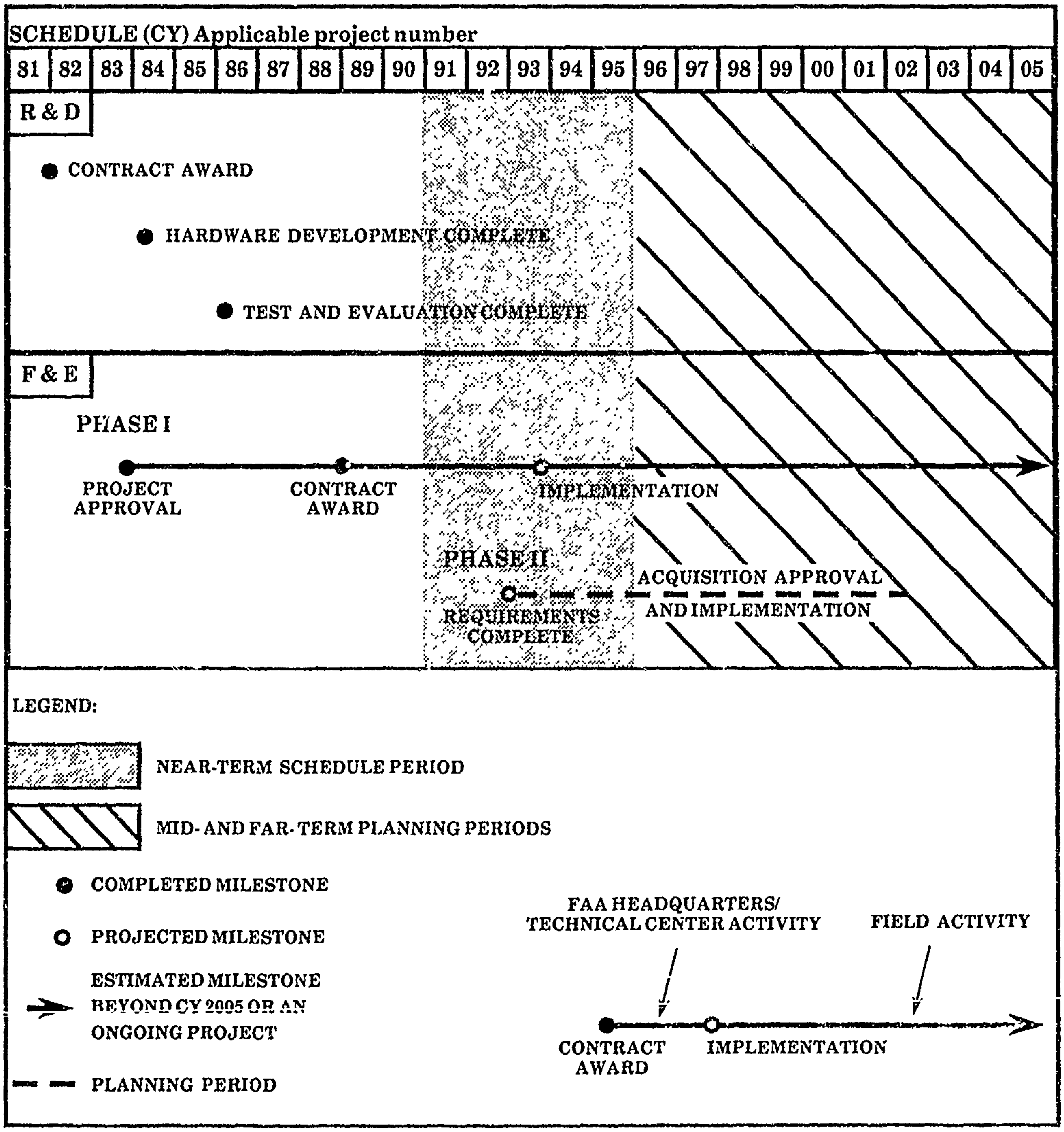
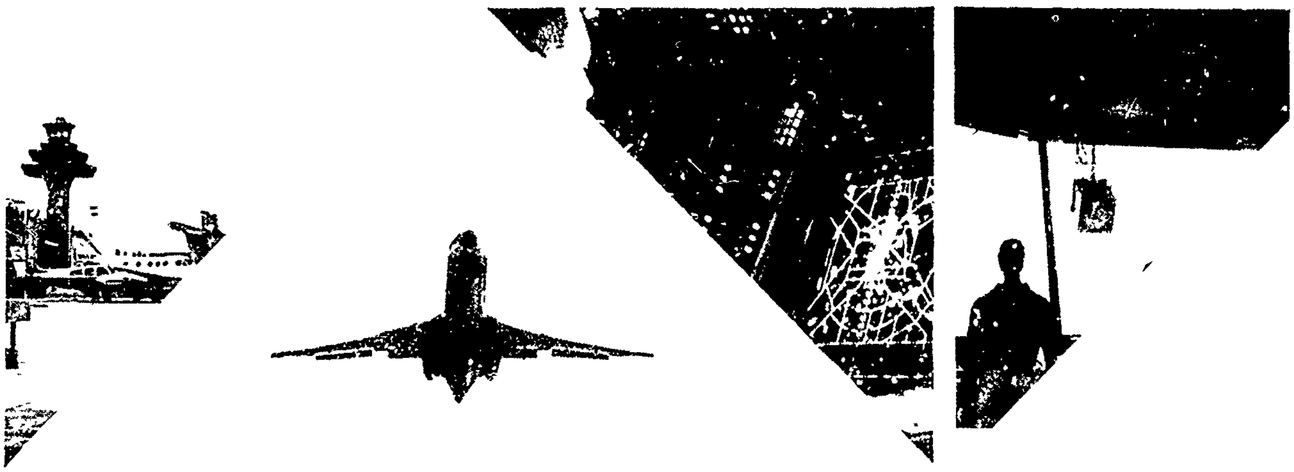
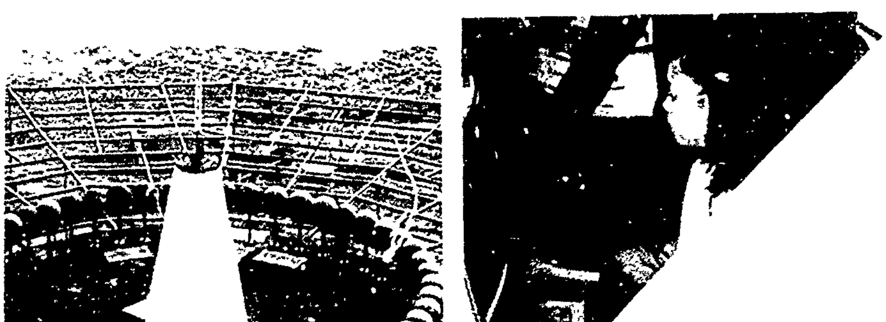


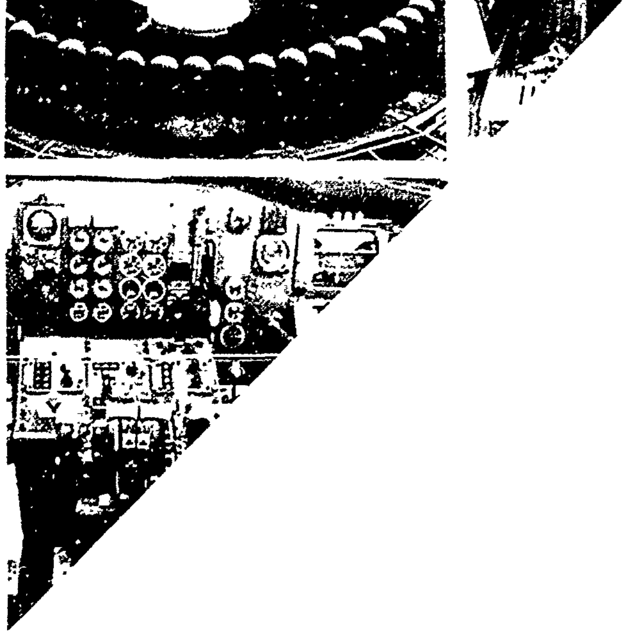
Figure 1-4. Project Schedule Description

Chapter 2: Original NAS Plan

A key goal of the Secretary of Transportation's National Transportation Policy is the completion of the NAS Plan. To meet and document this goal, the Original NAS Plan chapter presents all remaining original projects.







Section	Page Numbers
1 - En Route	(2-1-1 thru 2-1-20)
2 - Terminal	(2-2-1 thru 2-2-7)
3 - Flight Service and Weather	(2-3-1a thru 2-3-14)
4 - Ground-to-Air	(2-4-1 thru 2-4-21)
5 - Interfacility Communications	(2-5-1a thru 2-5-7)
6 - Maintenance and Operations	(2-6-1a thru 2-6 30)

CHAPTER 2

ORIGINAL NAS PLAN

This chapter contains a discussion of the projects from Chapters III through VI of the original NAS Plan as they stand today. The projects are categorized according to the part of the air traffic control system that they were designed to improve. En route projects affect the control of aircraft in flight, between takeoff and landing. Terminal projects affect aircraft approaches, landings, takeoffs, and departures from airports. Flight service and weather projects provide vital information to pilots about conditions and requirements along the route the pilots will follow. Ground-to-air projects provide the facilities and equipment on the ground that support communication, navigation and landing, and surveillance of aircraft in flight. Interfacility communications projects allow FAA facilities on the ground to communicate with one another, while maintenance and operations support projects provide the facilities and equipment needed to ensure that the system is well maintained.

EN ROUTE

The en route activities include projects to support the system existing at the onset of the NAS Plan, to provide interim upgrades, and to implement automation and communication systems capable of supporting advanced functions well into the next century.

The original NAS Plan's en route modernization programs were aimed at replacing existing air traffic control computer systems with modern technology. New software is being implemented to enhance safety, increase productivity, and permit the integration of a number of functions previously performed separately. This program provides for and accommodates future enhancements which best meet the FAA's objectives and, at the same time, greatly benefit the users of the National Airspace System.

The Advanced Automation System (AAS) will:

- Provide more reliable, safer services to the user;
- Accommodate safety enhancements as they are developed;
- Enable reduction of manpower, training, and logistics costs;
- Be capable of providing both en route and terminal services; and
- Enable reduction in the number of facilities through consolidation.

Consolidation of TRACONs into Area Control Facilities (ACFs) will eliminate or considerably reduce the present, somewhat arbitrary, demarcation of services between en route and terminal and, thereby, reduce operational overhead. Significant savings in staffing, rents, utilities, and energy costs will be realized. Airport traffic control towers will remain to provide airport service.

The ACF consolidation plan is being revalidated. The results to date indicate that ACFs will provide effective, efficient air traffic control for arrival, departure, and en route functions.

In July 1988, the AAS acquisition phase contract was awarded. Under the AAS concept, operations requiring centralized processing will be accomplished in the centralized computers with all remaining functions performed within the individual sector suites. The emergency and reduced capability modes of AAS operation and the sector suite processing capability will ensure that surveillance, flight, and weather data are provided with near 100 percent functional reliability. The AAS acquisition approach minimizes the adverse impact of a major technical and operational transition. Additional safety and productivity functions will be included in the new software.

A typical sector suite will consist of displays that present a plan view of the current situation such as: (1) position of aircraft, and real-time weather; (2) electronic display of flight data (eliminating the need for the manual flight strip processing); and (3) the display of planning information and advanced functions such as Automated En Route Air Traffic Control (AERA). Implementation of the AERA functions will further enhance safety, controller productivity, and fuel savings for the users.

The Voice Switching and Control System (VSCS) required for ACFs will provide automatic switching of communications and resectoring to meet demands. Leased-line and equipment costs will be reduced and eventual integration of voice and data communications will further reduce transmission costs.

The Agency will enhance its flow control capabilities to provide more coverage and prediction features for the NAS. The goal is to couple this traffic management capability with ACFs for total national flow management.

In summary, the FAA's present en route plans are designed to meet future needs for greater capacity and reliability. With higher levels of automation, present en route plans will improve both safety and productivity. The capability to provide both en route and terminal services from the same facility will enable the Agency to consolidate and reduce the total number of facilities needed to do the job.

Eleven projects are under way to provide enhanced capability and growth margin. All have had production contract awards except VSCS.

Flight Data Entry and Printout (FDEP) Devices, Direct Access Radar Channel (DARC) System, En Route Automated Radar Tracking System (EARTS) Enhancements, Oceanic Display and Planning Systems (ODAPS), and Offshore Flight Data Processing System (OFDPS) are relatively short term in nature (last completion anticipated in 1991) and will provide near-term benefits to the pre-AAS system.

The Conflict Resolution Advisor[illegible]) Function and Traffic Management System (TMS) projects provide intermediate functional improvements (completion anticipated in 1994) with enhancements to safety and traffic flow.

Long-term projects for en route operations are the Advanced Automation System (AAS) and the Voice Switching and Control System (VSCS). These projects will form the backbone of the future en route and terminal automation and communications systems and will allow restructuring of facilities with the ACF project. The Automated En Route Air Traffic Control (AERA) project will add new automation functions to increase capacity and reduce potential delays.

TERMINAL

The three major types of facilities used in terminal air traffic control are the Airport Traffic Control Tower (ATCT), Terminal Radar Approach Control (TRACON), and Terminal Radar Approach Control in the Tower Cab (TRACAB).

Located on airports, the ATCTs are the most common facilities, as well as the most visible. Their purpose is to separate aircraft, sequence aircraft in the traffic pattern, expedite arrivals and departures, control ground traffic, and provide clearance and weather information to pilots.

The second most common are the TRACONs that control airspace around airports with moderate-to-high density traffic. TRACON controllers separate and sequence both arriving and departing flights. Normally each TRACON is associated with one ATCT and located within the same building. TRACONs, however, may be remotely located and may serve more than one ATCT.

The third type of facility, the TRACAB, serves a function similar to that of the TRACON. TRACABs are located within tower cabs of airports with lower density traffic. TRACABs and TRACONs may be consolidated into ACFs via an en route systems project.

Terminal control facility updates and enhancements in this chapter are concerned with terminal automation equipment, communications, and facilities used for terminal control. ARTS II systems, which provide alphanumeric display of aircraft identification for aircraft transmitting a discrete beacon code, are being upgraded, first to provide interfacility data interchange and then to provide ARTS IIA functions which include tracking, display of aircraft identification, conflict alert, minimum safe altitude warning, and data interchange with the overlying ARTCC.

ARTS III systems, already capable of performing the ARTS IIA functions described above, have been upgraded to provide the capability of operating with data from primary radar to improve the tracking function and to provide alphanumeric data display for aircraft not equipped with transponders. Additional terminal automation support already completed includes enhanced terminal conflict alert to reduce nuisance alarms, additional displays for both ARTS II and ARTS III, ARTS III memory, ARTS III support system, and assembler. ARTS IIA systems will soon be upgraded to interface with Mode S/ASR-9 equipment. Underway are activities to sustain the New York TRACON and to replace/establish Bright Radar Indicator Tower Equipment (BRITE).

Communications switching systems at many terminals have been replaced with Integrated Communications Switching Systems (ICSS) (flight service and weather systems project); further communication upgrade will be provided in the future with the Tower Communications System (TCS).

The establishment, replacement, and modernization of facilities used for terminal operations are supported by project 22-13 in this section.

Nine terminal projects have been completed, one has been deleted and the remainder of the projects are well under way. All projects are scheduled for completion prior to 1993 with the exception of the TCS.

FLIGHT SERVICE AND WEATHER

The flight service and weather projects were designed to upgrade the flight service operations by providing automation, new functions including direct user access terminals, and consolidation from over 300 facilities to just over 60 facilities. The greatly reduced number of facilities will lower the cost of operating the system. Upgraded systems to gather weather data are being provided as are the communications capabilities needed to store and disseminate the weather-related information. A communication system provides voice communications for Flight Service Stations and ATCTs.

Six of the projects in this section have been completed. The remaining seven are expected to be completed by 1997. When complete, an automated weather capability will provide improved weather data inputs, improved dissemination of weather data, and upgraded functionality.

GROUND-TO-AIR

The ground-to-air projects include the air/ground communications, navigation systems based on air/ground signals, ground-based systems which support approach and landing, surveillance systems, and radar-based weather systems.

The major improvements described in this section upgrade ground-to-air systems to solid-state; provide for remote maintenance monitoring; and match the location of navigation, surveillance, approach and landing systems, and communications facilities with the projected demand. New and more capable systems such as the Mode S with data link, the Microwave Landing System (MLS), Next Generation Weather Radar (NEXRAD), and Terminal Doppler Weather Radar (TDWR) will be placed into operation.

Surveillance systems are undergoing the most radical changes. The addition of Mode S will provide more accurate aircraft positioning information, allow for discrete aircraft identification, and provide the framework for data link services. Radar surveillance with Mode S or an ATC Radar Beacon System (ATCRBS) will be provided down to the ground at qualifying airports and down to 12,500 feet altitude above mean sea level in other areas. New Airport Surveillance Radars (ASRs) are replacing vacuum-tube systems that are difficult to maintain, and an expanded number of locations will have radar service. New Airport Surface Detection Equipment (ASDE) will replace the present systems and new locations will be established, providing the ground surveillance capability required at our busiest airports. New ASDE will provide controllers with more accurate and reliable information than the older models presently in use and will greatly increase the safety of ground movement of aircraft.

Long-range radar, including those radars currently installed at FAA/military joint-use locations, are being upgraded to solid-state by modifying existing radars and by the joint procurement of new Air Route Surveillance Radars (ARSR-4s). The joint use of military radars to supplement existing coverage will be expanded.

New weather radar will provide more reliable and accurate data to aid in forecasts and detection of real-time weather phenomenon. Weather radar coverage will be provided above 10,000 feet and down to the surface at selected airports. The Next Generation Weather Radar (NEXRAD), being jointly procured by the FAA and Departments of Commerce and Defense, will provide a long range network for Doppler weather radar products. The Terminal Doppler Weather Radar will detect weather phenomena, including hazardous winds, in the terminal area.

The ground-to-air communications system is being improved and modernized by replacing old, obsolete tube-type equipment with new solid-state equipment. Further improvement to operating cost will result from consolidation of as many facilities as practical. This will be done without loss of required service coverage. Communications and navigation networking studies will aid in identifying candidates for consolidation or relocation. En route navigation and communication coverages will be available 2,000 feet above the terrain except where there is little air traffic. Direction finder coverage will be expanded as required, emphasizing those areas below radar coverage.

The navigation system is being improved by replacement of maintenance-intensive equipment with solid-state systems and establishment of additional systems to provide coverage where it is required and not available today. In addition to VOR and DME equipment, which is the primary navigational system, LORAN-C, with approximately 100,C0 users already equipped, will be expanded to provide mid-continent coverage. LORAN-C monitors will be installed to support nonprecision approaches by providing calibration data and availability information.

The approach and landing systems are being modernized. Obsolete equipment will be replaced and new systems established as dictated by operational requirements. More reliable ILS components have been installed to replace tube-type components. The Microwave Landing System (MLS) is expected to replace the ILS equipment at all locations. MLS is currently undergoing a demonstration/evaluation program mandated by Congress to determine the economic and operational benefits. Procurement will follow determination of favorable benefits. Runway Visual Range (RVR) systems are providing accurate information for pilots preparing to execute IFR approaches. Additional visual navaids, including new types such as Precision Approach Path Indicators (PAPI), are being installed to enhance safety during visual approaches to airports. Approach lighting will provide lighting necessary for various categories of terminal operations.

Three projects have been completed, and production contracts have been awarded for all remaining projects. Some projects will have follow-on production awards.

INTERFACILITY COMMUNICATIONS

Interfacility communications equipment, found at nearly all FAA facilities, provides communication, transmission, switching, and monitoring and control for other NAS elements. Interfacility communications projects upgrade/establish voice and data communication connectivity between the facilities and sites of the NAS. These projects also provide economic advantages over prior systems which were leased/single purpose links.

Transmission provides connectivity between facilities of the NAS. The transmission network consists of combinations of leased lines and FAA owned media, such as the backbone microwave system (i.e., Radio Communications Links (RCLs)).

The switching service adds operational flexibility between the transmission network and the user. This flexibility is used to reconfigure resources (e.g., combine sectors), reroute service in the event of failure, and reduce costs by sharing circuits among several users. The National Airspace Data Interchange Network (NADIN) projects and the Data Multiplexing Network project of this chapter provide part of the switching service for the communication network.

Monitoring and control provides a way of managing the communication network remotely. The monitoring and control of remote radios is the responsibility of the Radio Control Equipment (RCE) project.

Four of these projects have been completed and are providing both operational and economic benefits. Four other projects are underway with contracts awarded for each project and completion anticipated before 2000. Upon completion of these projects, further communications efficiency, reliability, and connectivity improvements will be available.

MAINTENANCE AND OPERATIONS

The maintenance and operations projects discussed in this section were established to provide flight inspection capability, maintenance support, emergency systems, power systems, structures, laboratories, and environmental support facilities.

Maintenance, flight inspection, and system support capabilities are being improved and modernized in support of efforts identified in the previous chapters. Modernization of maintenance and operation support systems allows the NAS to operate more efficiently, enables maximized system performance, and supports the goals of reducing staffing and energy expenditures. The changing technology and the influx of new systems and capabilities, coupled with the need to provide uninterrupted air traffic control and air navigation services, require a planned evolution of supporting capabilities and equipment.

The original maintenance program was developed to address the evolutionary change in system maintenance. It was based on the following: implementation of solid-state technology, introduction of remote monitoring, control and certification, centralization of the work force, improved centralized repair facilities, and decentralized training capability. The individual systems specialist will continue to be the most important link in system integrity. Maintenance automation aids, power systems, environmental systems, and structure improvements, in combination with the replacement of all vacuum-tube technology systems, will allow for increased productivity and decreased cost.

The provision of technical support to maintain equipment is complex and may result in the use of contract maintenance. Contract maintenance is being used to support older equipment and permit FAA technicians to train in new technology. New systems are being analyzed case-by-case to determine the viability of the contractor providing maintenance on a nationwide basis as an alternative to ensuring an internal FAA capability for the system lifetime.

Instead of periodic preventive maintenance and frequent site visits, automated aids allow the FAA to monitor system performance continually from Maintenance Control Centers (MCCs). This reduces travel requirements and cost. Also, by using remote monitoring techniques, the FAA can eliminate staffing of many facilities and consolidate maintenance personnel into a relatively small number of centralized work centers without harm to service. On site corrective maintenance at remote locations will be limited to replacement of the Lowest Replaceable Units (LRUs). This will minimize both service restoration time and the requirement for costly test equipment at these locations. Due to the increased complexity of high-technology modules, LRU repair will be performed at a high-technology repair facility, which will be equipped with the necessary diagnostic and test equipment and staffed by skilled personnel.

Elimination of staffing at remote facilities depends partly on the replacement of engine generators and removal of other systems that require on-site personnel. Facility consolidation of additional facilities with remote monitoring, and an increasing use of contractors will allow reductions in FAA-owned housing at facilities in isolated areas. Centralized technical training provided at the FAA Academy will continue to be augmented by computer based instruction at field locations. Computer based instruction will be particularly useful for proficiency training on the new systems, Air Traffic recurrent training, and safety inspector training.

The FAA's flight inspection program is undergoing a similar evolution. New technology, more fuel efficient aircraft, new system capabilities for automatic flight inspection, past consolidation of the work force, and policy changes will allow for orderly transition from the old to the new with no decrease in safety and a reduction in operating costs.

The FAA's system support has been geared to support the existing systems while a full-scale effort is underway to produce the capabilities required in the future. Contracts for system engineering, integration, and technical assistance have been awarded to provide management assistance and technical support for project implementation. Contractual support has also been established to provide technical support services and materials to assist regions and centers in accomplishing implementation.

The emergency command, control, and communication capability will be provided nationally with a radio network of High Frequency (HF) and Frequency Modulation (FM) equipment.

Frequency engineering and management is a critical activity to ensure interference-free operation of the many FAA facilities. Electromagnetic compatibility aspects make close monitoring of frequency assignments a must.

Two major laboratories located at the FAA Technical Center are being upgraded for use in the testing and evaluation of new systems prior to and during field use. The System Support Laboratory (SSL) is used for direct assistance to field facility technicians; development and testing of systems; hardware, software, and firmware modifications; and support of new development activities. The General Support Laboratory (GSL), consisting of general purpose systems, facilities, and aircraft, supports the SSL as well as most other center activities.

All projects are in the implementation phase. Many of the maintenance and operations projects are dependent on other projects discussed elsewhere in this chapter and require accomplishment of those projects as a prerequisite. An example is the decision whether or not to provide remote monitoring capability. Since systems provide significant cost benefits through remote monitoring, and others will not provide a payback, each new unit must be analyzed.

Subsequent chapters in this document address infrastructure and support needs which are complementary to the projects discussed in this section.

PROJECT 21-02: Flight Data Entry and Printout Devices

Purpose: This project replaces the existing Flight Data Entry and Printout (FDEP) and en route Flight Strip Printer (FSP) systems and establishes Flight Data Input/Outputs (FDIOs) at additional airport locations. Replacement of staffing-intensive equipment is resulting in significant savings. New establishments allow the automatic exchange of flight data with the Air Route Traffic Control Centers (ATRCCs) over telephone lines. Automatic exchange is a vast improvement over manual exchange which is time-consuming, can cause delays to air traffic, and can create the potential for human error because the flight plan information is copied by hand.

Approach: A basic contract with multi-year delivery requirements has been awarded. Initial equipment deliveries began in 1986 and were completed in mid-1987. The FDIO program consists of ARTCC systems, systems for the FAA Academy and the FAA Technical Center, 318 remote systems, spare parts, documentation, engineering support services, implementation plans, and test procedures. A rewrite of a portion of the Host software was necessary to use the General Purpose Output/General Purpose Input (GPO/GPI) adapters in lieu of the FDEP adapters currently used. The software is required to process data from both old and new systems simultaneously during FDIO implementation.

Products: This program includes the replacement of flight strip printers at 23 ARTCCs, 318 ATCT/TRACONs, 108 military terminals, the FAA Academy, and the FAA Technical Center, and the establishment of new FDIO systems at each of these facilities. Additionally, FDIO systems will be used as integral components of ODAPS and OFDPS.

Progress/Activity from October 1989 through November 1990:

- The last ARTCC is being prepared for commissioning.
- Remote sites and military terminals are transitioning to full FDIO implementation.

Related Projects/Activities: 21-05 ODAPS, 21-16 OFDPS, and 22-13 ATCT/TRACON Establishments Replacement, and Modernization all require the new FDIO devices. Modifications to Host computer software is required for interface with the FDIO system. DOD interfaces and requirements are included in the FAA's contract. This project will require interfacility communications service from NICS. Projects providing that service include 25-02 DMN and 25-03 RML Replacement and Expansion.

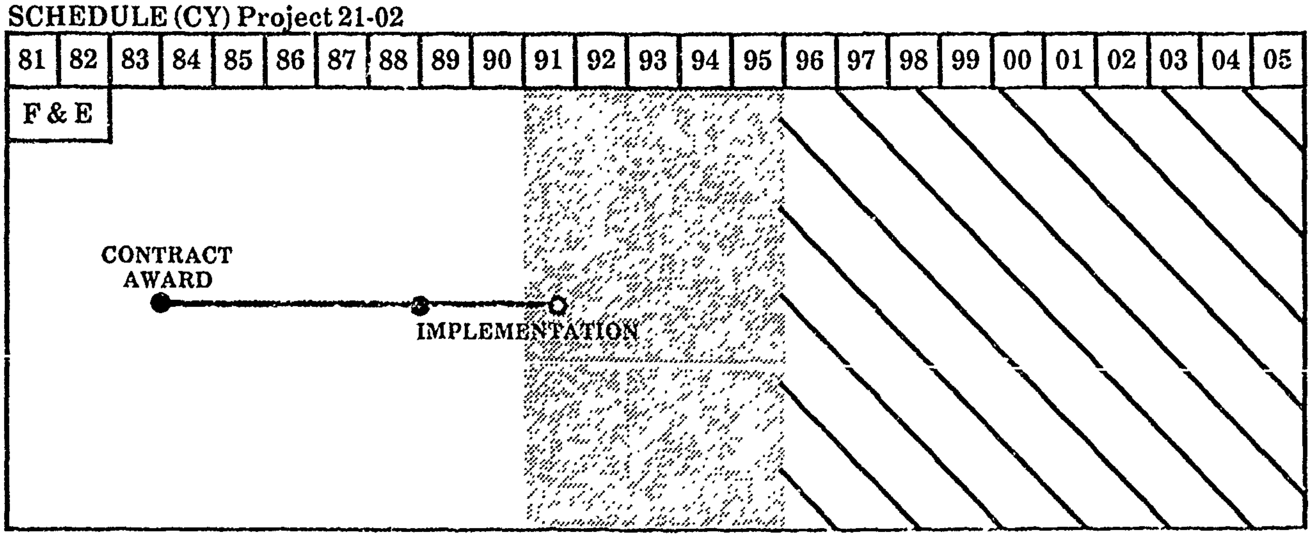
Problems Resulting in Delays: Implementation delays caused by delay in releasing updates to Host software. Some ARTCCs delayed FDIO implementation to resolve unrelated problems with Host software releases.

Delays Minimized by: Operations are being maintained through existing equipment.

List of Contractors:

- Wespercorp/FSG, Inc.
  (451 FDIO systems)
  Irvine, California

SCHEDULE (CY) Project 21-02



PROJECT 21-03: Direct Access Radar Channel (DARC) System

Purpose: The current DARC system was in place in all ARTCCs using IBM 9020 computers in June 1981. The DARC enhancements upgrade the backup system to look and function in a similar manner to the prime channel computer. DARC enhancements provide tracking, mosaicking, and real-time quality control and will allow each controller to select prime channel computer or DARC at the radar console. The DARC enhancements improve the safe and orderly transition from prime channel operation to the backup. From the controller's viewpoint, DARC enhancements eliminate the use of mechanical radar target markers and the need to move the Plan View Display (PVD) to the horizontal position.

Approach: The DARC system is being implemented in two phases. A contract for the first phase of the DARC system enhancements was awarded in early 1982 and provided for the development, production, documentation, installation, and test of three turnkey systems. The remaining systems were installed and tested by FAA personnel in 1986. The first Phase I system became operational at the Seattle ARTCC in late 1986.

Phase I DARC enhancements include system analysis recorders for post air traffic incident review, doubling memory and processing power by adding plug-compatible metal-oxide semiconductor memory and microcomputer boards. Added enhancements include tracking, automatic track initiation, mosaicking, and real-time quality control. Modified display generator input/output boards, cable harnesses for individual PVD switching capability, and fully automatic display processor and generator sparing were provided.

Phase I software delivered and tested by the contractor at the FAA Technical Center and FAA Academy was baselined and distributed to a selected ARTCC for key-site testing. Subsequent to key-site testing, software was delivered to the remaining ARTCCs in early 1987.

DARC Phase II implementation will include automatic initiation of tracks using flight plan related data received from the prime channel computer via a communications interface between the prime channel computer and DARC. If the prime channel computer becomes non-operational, DARC will continue to track and display full data blocks. A contract for the prime channel computer software modifications was awarded in 1984, and a similar contract for the DARC software modifications was awarded in early 1986. The implementation of the prime channel computer modifications will allow a more transparent transition to DARC operation if the prime channel fails. Two-way prime channel computer/DARC interface software is now available for inclusion in revisions to the Host software.

Products: Twenty-two Enhanced DARC systems -- 20 for Host ARTCCs, 1 for FAA Technical Center, and 1 for FAA Academy. Prime channel computer/DARC interface software.

Progress/Activity from October 1989 through November 1990:

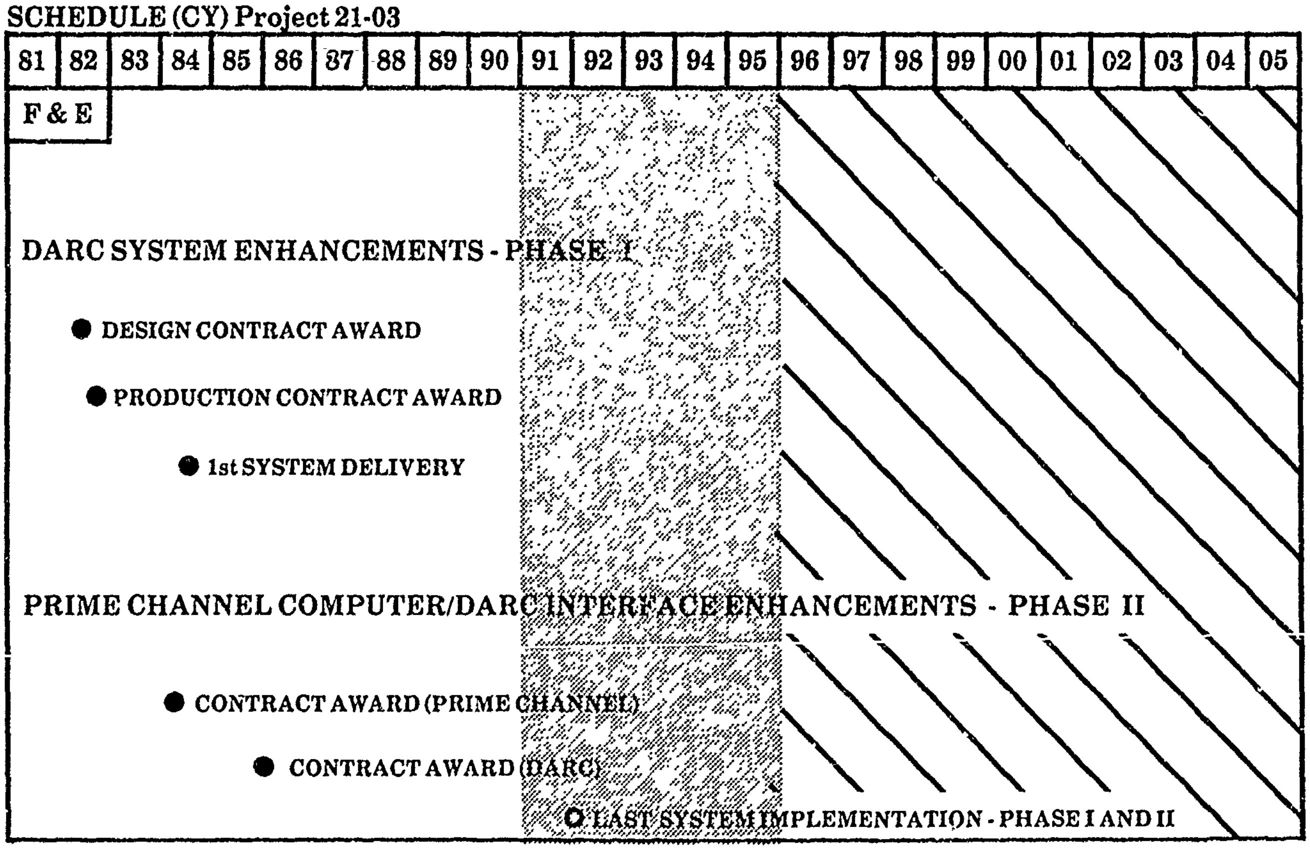
- Last DARC system is being prepared for commissioning.
- Commissioned DARC/NAS bidirectional interface.

Related Projects/Activities: 21-12 AAS. The DARC will provide backup for periods of transition to ISSS and AAS. DARC will be removed once AAS is operational. Improved weather display capability will require DARC software modification.

List of Contractors:

- Raytheon Company
  (22 DARC hardware/software modifications)
  Marlboro, Massachusetts
  - RMS Technologies, Inc.
    (DARC interface modifications)
    Atlantic City, New Jersey
- Computer Sciences Corporation
  (Host interface modifications)
  Silver Spring, Maryland

SCHEDULE (CY) Project 21-03



PROJECT 21-04: EARTS Enhancements

Purpose: This project enhances air safety and increases ATC system capacity by providing radar data mosaicking, conflict alert, and minimum safe altitude warning for En Route Automated Radar Tracking System (EARTS).

Increased radar coverage allows more efficient use of airspace and reduces fuel consumption. The mosaicking of radar data in EARTS allows reconfiguring of the sectors at offshore centers resulting in improved controller workload distribution. For FAA to fully use the USAF's Minimally Attended Radar (MAR) in Alaska, changes and additions to the EARTS hardware and software were necessary to interface and accept the MAR-generated digital target reports and status messages.

Conflict Alert (CA) and Minimum Safe Altitude Warning (MSAW) capabilities are being provided to alert air traffic control personnel to potential hazardous in-flight conditions where less than standard separation exists between aircraft, aircraft and the ground, or aircraft and ground obstructions.

Approach: As the USAF's Alaskan Air Command updates and provides narrowband data from its long-range radars back to Anchorage, this data (search and/or beacon) is provided to the Anchorage ARTCC. EARTS was expanded and upgraded to use and display this data effectively. Mosaic software has been combined with MSAW/CA software. Delivery and key site testing of the combined package at Nellis AFB, San Juan, Honolulu, and Anchorage began in August 1987. The mosaic software portion has been operationally implemented at each site. MSAW/CA operational use has also been implemented.

Products: Four upgraded operational EARTS.

Progress/Activity from October 1989 through November 1990:

- Final CA and MSAW are being prepared for commissioning.
- Developed and tested modular interface to automatically exchange flight data with adjacent facilities.
- Initiated final actions to modify the MAR to improve radar beacon/target resolution.

Related Projects/Activities: 21-12 AAS will replace the EARTS systems at FAA locations. FAA must also incorporate modifications to the affected MAR units to improve beacon target resolution performance. This project will require interfacility communications service from NICS. 25-02 DMN will provide additional transmission network savings.

The Anchorage EARTS uses radar data from the Canadian Sandspit Facility to provide high-altitude surveillance of a 400-mile gap between Northwest CONUS and Alaska and to provide low-altitude coverage for Ketchikan, Alaska. This link, established four years ago, provides valuable support for operations between CONUS and Alaska and for Western Pacific air traffic. The Canadian Government intends to change the digitizer and modem equipment used to transmit data from Sandspit. Changes to the EARTS interface are being developed to assure continued availability of the Sandspit data at the Anchorage EARTS.

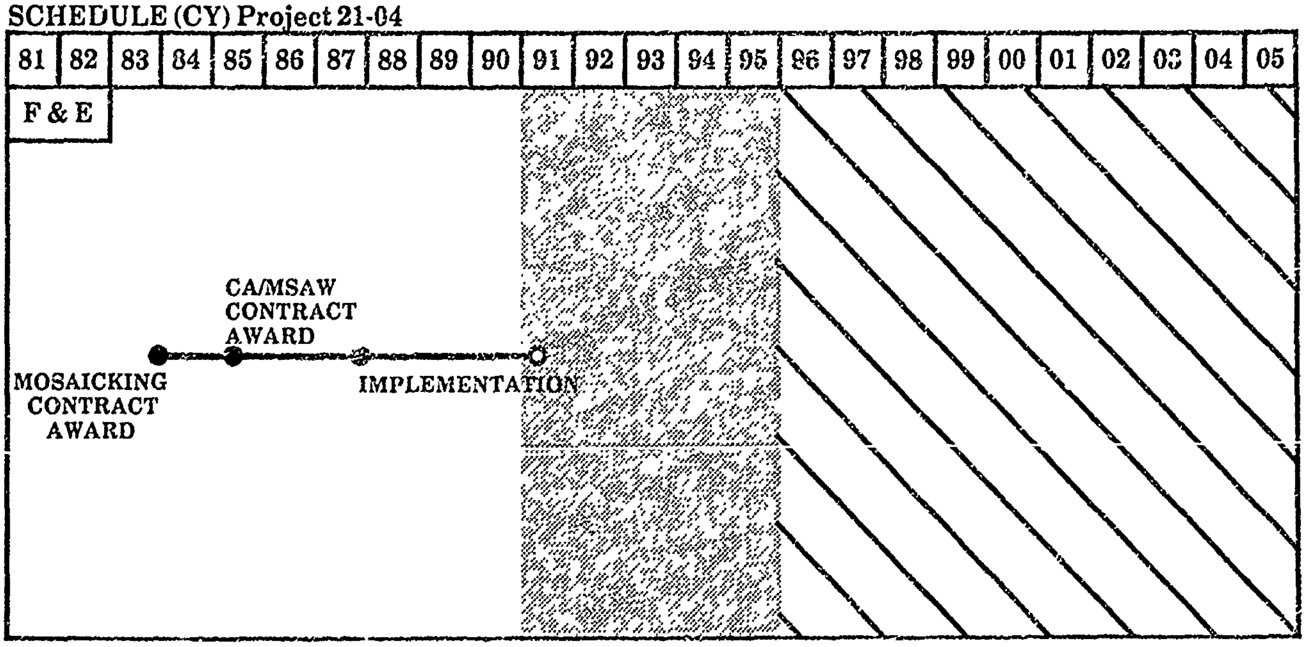
Problems Resulting in Delays: Hardware modifications to improve the MAR (AN/FPS-117) radar beacon range and azimuth resolution were delayed. This prevents the effective use of these radars in Alaskan airspace beyond FAA radar coverage.

Delays Minimized by: The Alaskan Region has initiated a mixed aircraft separation criteria to allow partial use of these radars. Final resolution awaiting USAF action to modify the radars.

List of Contractors:

- Unisys Corporation
  Electronics and Information Systems Group
  (four upgraded EARTS units)
  St. Paul, Minnesota

SCHEDULE (CY) Project 21-04



PROJECT 21-05: Oceanic Display and Planning System (ODAPS)

Purpose: ODAPS provides automation assistance for oceanic ATC. Included is an automated conflict probe which assists controllers in the timely identification and assignment of conflict-free, fuel-efficient routes and altitudes. These fuel savings are realized without adverse impact on the ATC system.

The current use of random tracks, inefficient flight data posting, and unstructured traffic flow in the oceanic Flight Information Regions (FIR) limit aircraft use of fuel-efficient altitudes. Oceanic controllers, confronted with an increasing number of random flight tracks, are faced with an increasing complexity in visualizing the spatial relationships of aircraft from data presented on flight progress strips. The maintenance of the strip and plotting board displays, and the methods for transfer of flight data are labor-intensive and antiquated. The major advancement made in the oceanic air traffic control system during the past 30 years has been the automated printing of flight progress strips.

The new system compares the planned tracks and altitudes of different aircraft and informs the controller whether the cruising altitude or route is free from potential conflicts and when transitions can be made. This function allows controllers to honor more flight profile requests and create a safer and more efficient environment in oceanic airspace.

Approach: Provide oceanic automation systems comprised of situation displays, processors, and interfaces with other ATC systems, including ARINC High Frequency (HF) data. The system will operate until the advanced automation system is implemented.

Products: The ODAPS contract was awarded in FY 85. Two systems have been procured for installation in Oakland and New York ARTCCs and one system for support services at the FAA Technical Center. Hardware for these systems was delivered in 1989. The basic ODAPS software, without the conflict probe capability, has been installed at Oakland and became operational in 1989. Enhancements to the Oakland software will be developed and implemented at Oakland in late 1990. The enhancements include conflict probe and many improvements to the man machine interface design. After implementation is completed at Oakland, the enhanced ODAPS software will be implemented in New York and is scheduled to be operational in 1991.

Progress/Activity from October 1989 through November 1990:

- Oakland ODAPS commissioned.
- Support and maintenance contracts awarded.
- Training contract modified to provide additional courses at New York.

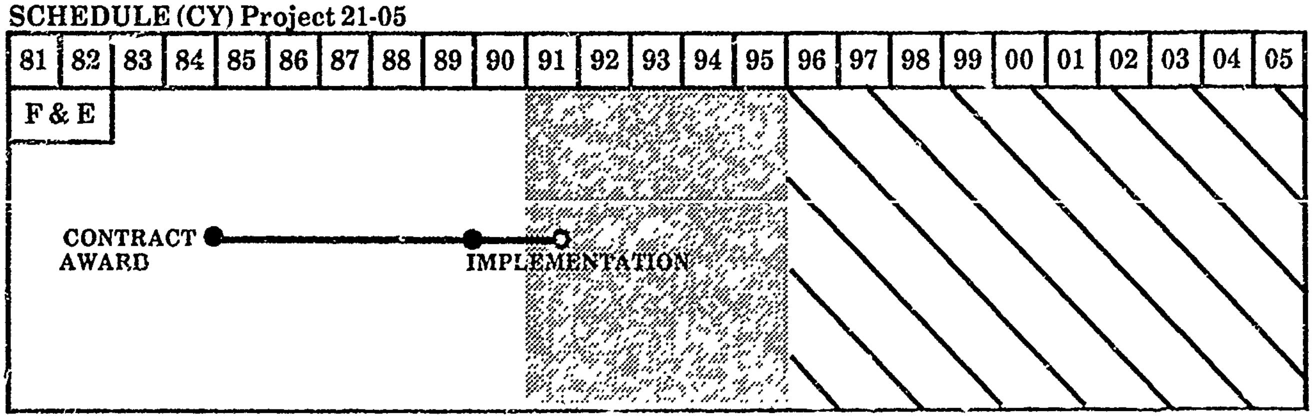
Related Projects/Activities:

- 21-12 AAS includes requirements for oceanic automation.
- 25-07 NADIN II provides specific communication services.

List of Contractors:

- ST Systems Corporation (STX)
  (three ODAPS)
  Vienna, Virginia
  - IBM Corporation
    Rockville, Maryland

SCHEDULE (CY) Project 21-05



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PROJECT 21-06: Traffic Management System (TMS)

Purpose: This project upgrades the present flow control system into an integrated Traffic Management System (TMS) which operates at the national level through the Air Traffic Control System Command Center (ATCSCC) at FAA headquarters and the local level through Traffic Management Units (TMUs) in each ARTCC and designated terminals. The upgrading of the TMS improves air traffic system efficiency, minimizes delays, expands services, and is more responsive to user requirements. The TMS functions include. Central Altitude Reservation Function (CARF); Airport Reservation Function (ARF); Emergency Operations Facility (EOF); Central Flow Weather Service Unit (CFWSU); various flow management programs with integrated En Route Metering (ERM) functions, such as the Departure Sequencing Program (DSP), En Route Spacing Program (ESP), and the Arrival Sequencing Program (ASP); and the hardware and software necessary to support them.

Approach: The present flow control and altitude reservation system will use a multi-step approach. Phase I provided the following enhancements.

- Replacement of Central Flow Control Facility (CFCF) 9020A computer system at Jacksonville, Florida, with the IBM 4341 Traffic Management Control Computer (TMCC) at the FAA Technical Center.
- Relocation of CARF and the automation staff to FAA Headquarters.
- Implementation of a data communications system to interface users and NAS Host computers at each ARTCC in a two-way data mode Interfacility Flow Control Network (IFCN).

To date Phase II has provided the following enhancements to the TMS:

- Relocation of CARF processors from the development location to the FAA Technical Center.
- Enhanced Traffic Management System (ETMS) - a state-of-the-art multiprocessing computer system network which implements the Aircraft Situation Display (ASD) and Monitor and Alert (MA) functions developed by the Advanced Traffic Management System (ATMS) research and development program.
- TMU automation - new computer and terminal systems with color graphics workstations in the ATSCC, TMUs, and the FAA Technical Center which interface to the TMCC, the Host computers, and the ETMS Computer Complex (ECC) to provide enhanced information displays and near real-time flight data.
- Initial ERM enhancements to the Host computer.

The continuing Phase II activities are focused on:

- Replacing the CFCC.
- Implementing the MA functions in all en route centers.
- Implementing metering list display devices in all en route centers.
- Completing implementation of ERM functions.

Products: The traffic management system provides integrated hardware and software that is highly responsive to existing and projected traffic management situations. It also assists traffic management personnel in evaluating the impact of various alternatives which may be employed for resolving traffic management conflicts.

Progress/Activity from October 1989 through November 1990:

- Completed implementation of the ETMS.
- Completed integration of initial ERM functions.

Related Projects/Activities:

- 21-12 AAS will incrementally replace the ARTCC and tower hardware and software being used by the TMUs and will provide improved capabilities. The non-AAS TMS functions (e.g., ATSCC capabilities) will interface with the AAS to obtain the data needed to support those functions.
- 21-13 AERA is developing controller automation which considers flow management information and will provide information of use to the TMS

- 23-02 CWP. Weather products will be provided by the Center Weather Service Units (CWSUs) via the Meteorologist Weather Processor (MWP) and the Central Flow Meteorologist Weather Processor (CFMWP) to stand-alone monitors in the TMUs and ATSCC to support the TMS.

- 41-22 Relocate ATSCC.

- 42-20 ATCT System Intra-Connectivity.

- 45-21 Satellite Communication Circuits System may support ETMS data transmission needs.

- 61-06 LFME flow management automation enhancements for radar controllers and TMCs at the terminal and en route (local) levels will need to interface with the TMS functions or be integrated into the TMS.

- 62-21 ASTA is developing airport surveillance and automation techniques that will provide information of use to TMS.

- 62-22 NAMFAC will utilize current TMS capabilities for traffic management functions.

- Data link services will be able to provide data directly from aircraft to support TMS functions.

List of Contractors:

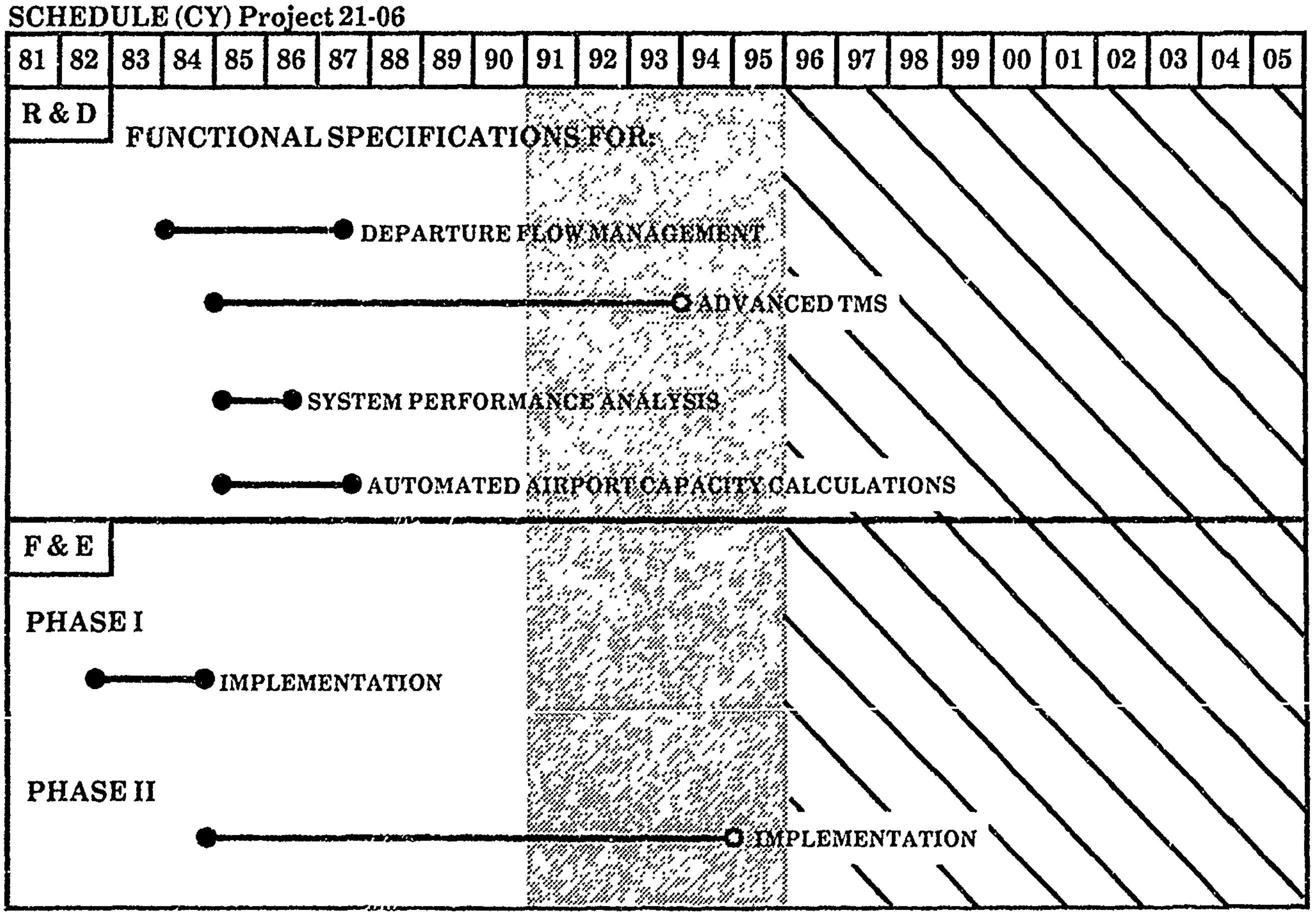
- NYMA
  (system integration/software)
  Greenbelt, Maryland

  - Computer Sciences Corporation
    Pomona, New Jersey

- MITRE Corporation
  (requirements and system engineering)
  McLean, Virginia

- Transportation Systems Center
  (software and ETMCC support)
  Cambridge, Massachusetts

SCHEDULE (CY) Project 21-06



PROJECT 21-09: Conflict Resolution Advisory (CRA) Function

Purpose: This project will provide automated assistance to en route radar controllers in resolving potential violations of minimum separation standards. The conflict resolution advisory function will provide the radar controller with a display of the optimum resolution to potential conflicts which have been detected by the Conflict Alert (CA) and Mode C intruder functions. The prime objective of conflict resolution advisories is to assist the radar controller in resolving potential conflicts. This results in reducing the number of operational errors.

Approach: Using functional specifications, a support contractor has designed, programmed, and tested a prototype to incorporate the conflict resolution advisory function into the operational en route computer program. The prototype demonstrated the feasibility of CRA. The operational program is now being developed based on the data obtained from the prototype effort. A contract to cover system design and software development was awarded in 1989. Implementation of the operational CRA program is planned for the A4e1.2 Host software release.

Products: One computer program adaptable for use at 20 Host-equipped air route traffic control centers.

Progress/Activity from October 1989 through November 1990:

- CRA prototype software was successfully upgraded from the 9020 CRA software to the Host software release A4e0.1 baseline.

- Completed system requirements review and system design review to enhance CRA baseline.

Related Projects/Activities: Conflict Alert/Mode C Intruder functions to be implemented in the A4e0.4 host software release are prerequisites for CRA implementation. CRA implementation is a transitional step toward a similar function in 21-12 AAS.

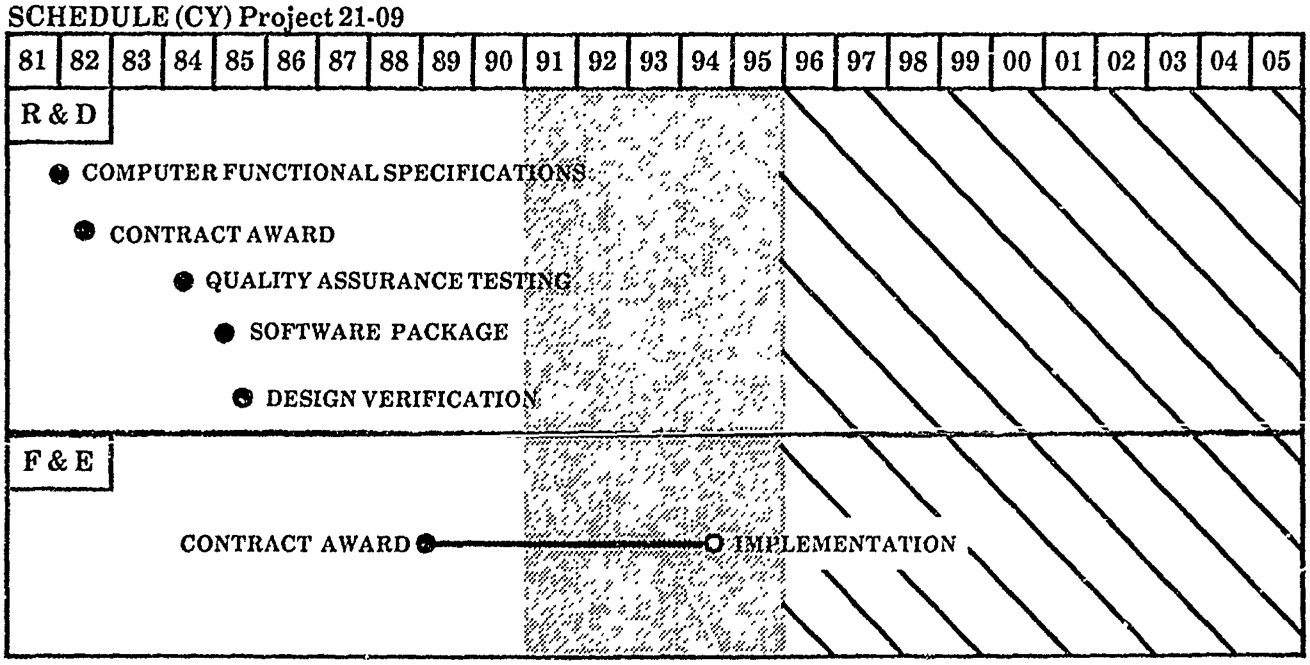
Problems Resulting in Delays: The Government has redirected the contractor concerning reallocation of resources and changed requirements.

Delays Minimized by: Increased program office interface with the contractor to ensure proper interpretation of the revised requirements.

List of Contractors:

- Computer Sciences Corporation
  (system design/software)
  Silver Spring, Maryland

SCHEDULE (CY) Project 21-09



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PROJECT 21-11: Voice Switching and Control System (VSCS)

Purpose: This project will provide a voice communications system which performs the intercom, interphone, and air-ground voice connectivity and control functions needed for air traffic control operations in an ARTCC and an ACF. The VSCS must satisfy the voice communications reconfiguration, service, quality, and availability needs of the ARTCC/ACF users. Also, the VSCS will reduce leased costs, increase modularity and growth capability, and increase controller productivity over current VSCS-type services.

Approach: The VSCS will use current technology adapted to meet FAA requirements. Two competing prototype systems will be produced and evaluated prior to award of a contract for the production systems. The winning system will be upgraded to production specifications and remain at the FAA Technical Center. The VSCS contractor will design position equipment compatible with the man-machine interface used today in ARTCCs and TRACONs. The VSCS position equipment will also be compatible with the man-machine interface of the initial sector suite system. The AAS contractor will position the voice communications equipment and display devices in common consoles to best fit the total man-machine interface and console design. An interface is required with the AAS for reconfiguration and status reporting purposes. A set of predetermined reconfiguration maps will be embedded in the VSCS. Capability to modify or create new reconfiguration maps from designated VSCS positions shall be provided. The AAS (ACCC) will be able to direct VSCS reconfigurations.

In FY 84, VSCS operational requirements were finalized. The VSCS prototype systems contracts were awarded in early FY 87.

A production contract award is anticip ted following prototype demonstrations. After being upgraded to production specifications, the prototype equipment will be integrated and tested prior to commencing field deliveries. VSCS will be implemented in the existing ARTCC consoles prior to implementation of the initial sector suite system (ISSS).

Products:

- One system per ACF.
- One system for the FAA Technical Center and one for the FAA Academy.

Progress/Activity from October 1989 through November 1990:

- Formal prototype testing and controller testing continued.

Related Projects/Activities:

- 21-12 AAS interfaces with the VSCS for configuration status and control data. VSCS must be available and installed in existing ARTCC consoles prior to the ISSS implementation.
- 22-11 Multichannel Voice Recorders will store VSCS traffic.
- 25-08 RCE performs the radio channel signaling and control functions to support ground/air voice communications.
- This project will require interfacility communications service from the NAS Interfacility Communications System (NICS). The project providing the required transmission network service is RML Replacement and Expansion.

Problems Resulting in Delays: The program has been delayed to assure VSCS meets requirements.

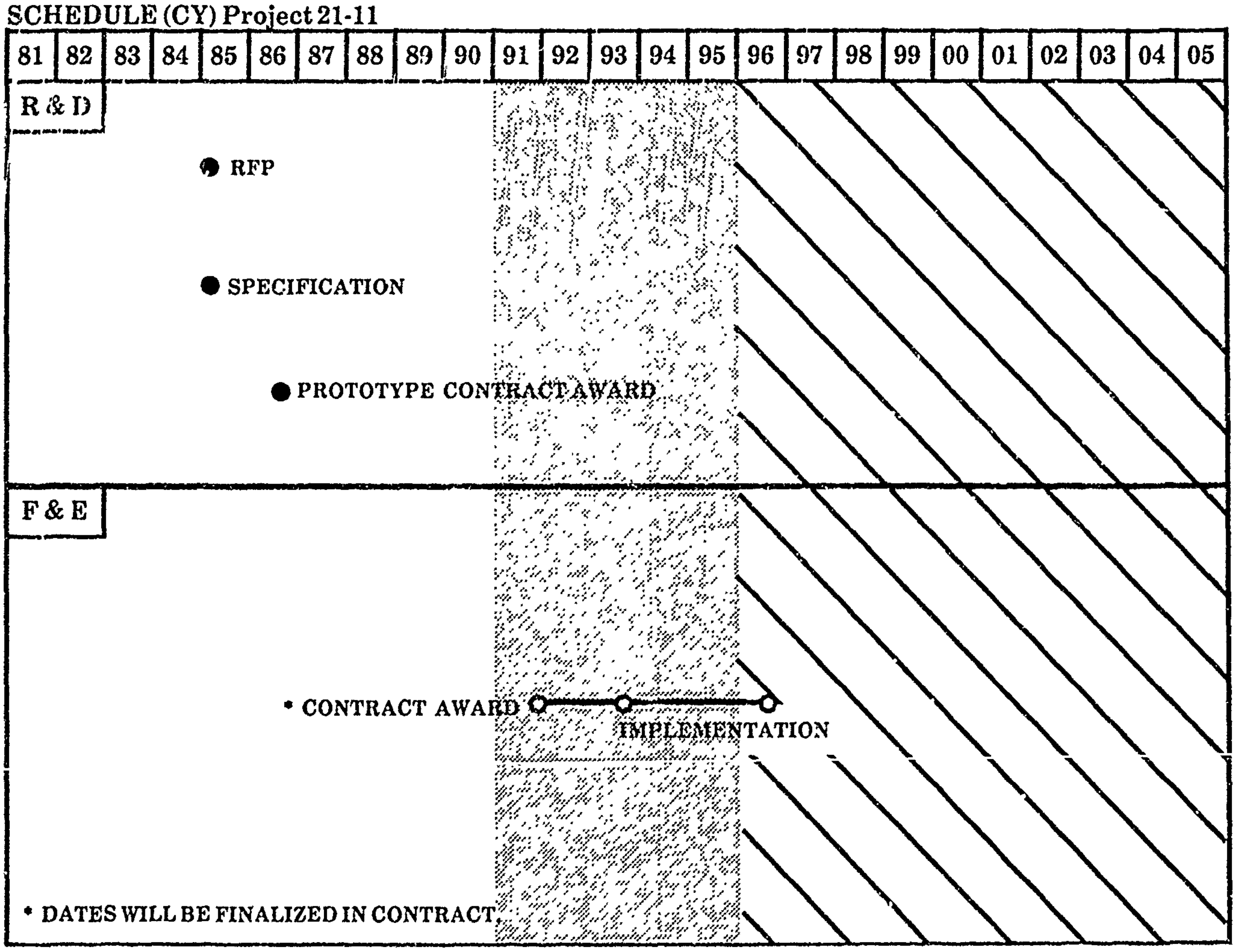
Delays Minimized by:

- Modifying the prototype development phase contracts to include parallel efforts to: correct deficiencies, add critical requirements, continue testing a 60 position prototype and upgrading the prototype to meet minimum existing M1/ISSS console requirements with 430 positions.
- VSCS that meets full requirements will be a planned product improvement during the production phase.

List of Contractors:

- American Telephone and Telegraph Technologies
  (1 prototype system)
  Greensboro, North Carolina
  - Computer Sciences Corporation
    McLean, Virginia
  - Raytheon Corporation
    Marlboro, Massachusetts
- Harris Corporation
  (1 prototype system)
  Melbourne, Florida
  - Magnavox
    Ft. Wayne, Indiana
  - Tandem Computers, Inc.
    Cupertino, California

SCHEDULE (CY) Project 21-11



PROJECT 21-12: Advanced Automation System (AAS)

Purpose: The AAS will provide a new automation system that includes improved controller work stations, computer software, and processors. The AAS will provide. the capacity to handle the projected traffic load and the capability to perform the new functions to be introduced into ATC into the 21st century, increased productivity through introduction of new sector suites, a high degree of reliability and availability; and the capability for enhancement to perform other functions subsequently introduced into the system.

Approach: The AAS design is essentially complete. It was designed through a top down, evolutionary, total system approach that paralleled the Host computer development and deployment. Controller sector suites will consist of common consoles used for both en route and terminal functions. They will incorporate an improved man-machine interface, including the use of color displays and electronic presentation of flight data to enhance controller productivity. The AAS will make possible the full integration of en route and terminal operations in the Area Control Facilities (ACFs).

The transition to AAS will consist of five steps. In step one, implementation of the Peripheral Adapter Module Replacement Item (PAMRI) will be completed prior to Initial Sector Suite System (ISSS) equipment delivery. The PAMRI includes replacement of the PAM, Data Receiving Group (DRG), and Radar Multiplexor (RMUX) equipment. This will provide an interface with additional radars, and will provide higher data transmission rates for radar site interfaces. PAMRI will provide sufficient redundancy to support ISSS transition and simultaneously support full ATC operations.

In the second step, the ISSS and the Coded Time Source (CTS) will be installed in en route facilities served by the Host computers. Installation requires a sterile environment previously provided by the expansion of ARTCC buildings to accommodate the Host computer. After transition to the initial sector suite system, the old control room will be refurbished to accommodate additional sector suites necessary for terminal consolidation.

The third step will be implementation of the Terminal Advanced Automation System (TAAS) for TRACON functions. AAS processors and additional sector suites will be introduced. Software functions required to process terminal radar inputs and provide arrival and departure control of terminal traffic will be implemented.

The fourth step will be the installation of Tower Control Computer Complexes (TCCCs) in selected airport traffic control towers. TCCCs will be installed over an extended period, beginning when arrival/departure control is provided by TAAS. The first TCCC implementation will coincide with the first TAAS implementation.

The fifth step in the evolution to full AAS is the addition of software to perform en route functions in ACFs. Additional sector suites will be installed to enable conversion of ARTCCs into ACFs. The hardware/software will be referred to as the Area Control Computer Complex (ACCC).

An incremental production commitment for each of the above steps will be made only upon completion of FAA acceptance and operational suitability tests at the FAA Technical Center.

Products: The AAS project includes construction and site preparation that is required for the implementation of the AAS at area control facilities.

- AAS design.
- AAS software for terminal and en route ATC operations.
- AAS computer hardware.
- ISSS (20 CONUS ARTCCs).
- TAAS (22 ARTCCs and NY TRACON).
- ACCC (23 ACFs, i.e., 22 ARTCCs and New York TRACON).
- TCCC (up to 258 towers).
- Support systems at the FAATC and the FAAAC.

Progress/Activity from October 1989 through November 1990:

- PAMRI delivered to FAA Technical Center.
- Common console lighting demonstration.

- Successful Risk Reduction Demonstrations in the areas of: Local Communication Network Design, Fault Tolerant Design, Hardware Man-Machine Interface, TCCC Computer Human Interface Risk, and the Ada software.

Related Projects/Activities: 21-03 DARC is required in CONUS ARTCCs for the transition to AAS and will be removed following AAS implementation. 21-06 TMS is a related project. 21-11 VSCS and 22-12 TCS will provide the voice switching and communications necessary for AAS implementation. The AAS en route software will include 21-13 AERA 1 functions and facilitate later implementation of AERA 2 and 3 functions. Past development projects provided input to the sector suite and TCCC position console designs. The AAS is the automation system for 21-15 ACF. 23-02 CWP, 23-05 Aeronautical Data Link, 24-12 Mode S, 24-18 TDWR, 26-01 RMMS, 26-09 ARTCC Plant Modernization, 36-20 ARTCC/ACF Support Space, and 46-09 Sustain ARTCC/ACF Facilities are related projects. This project will require interfacility communications service from NICS. Projects providing the required service include DMN, RML Replacement and Expansion, and NADIN II.

AAS products are subject to change pending completion of the ACF cost effectiveness study.

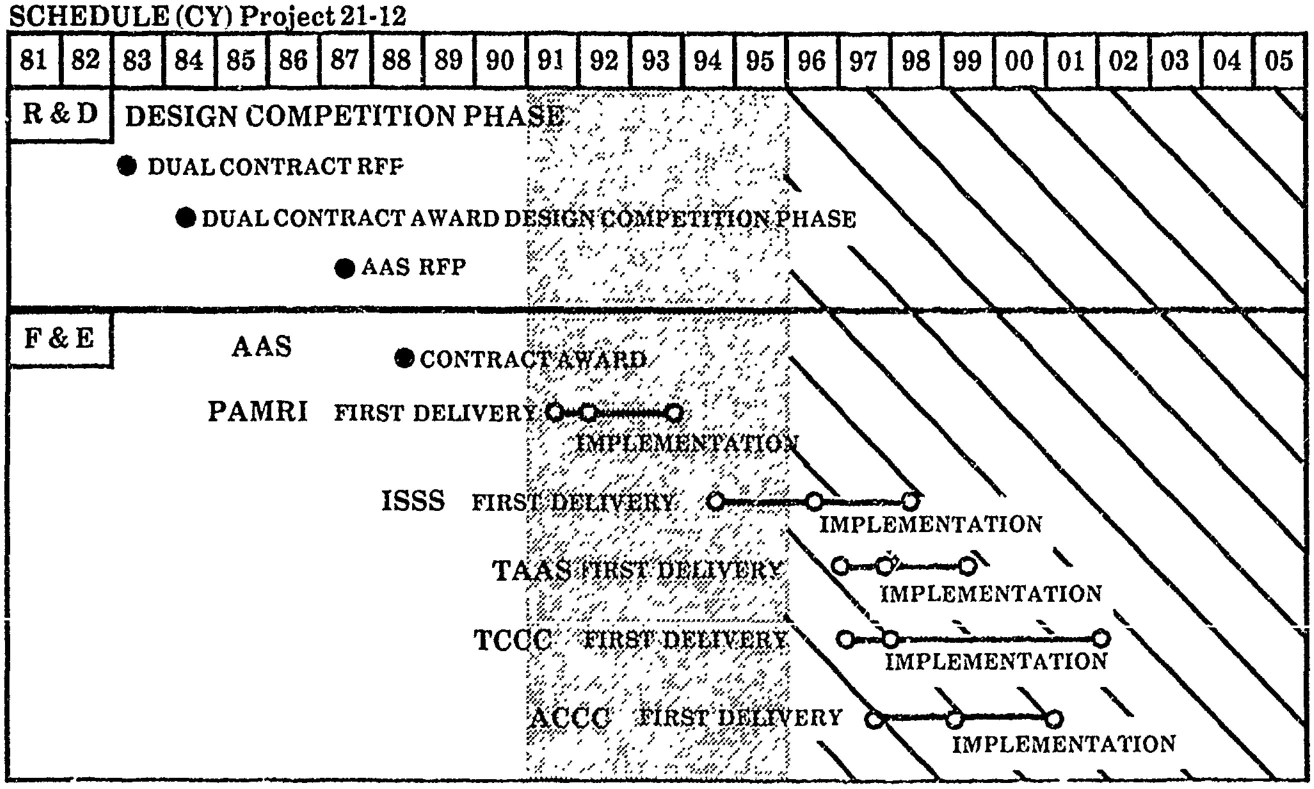
Problems Resulting in Delays: ISSS software development problems were identified six months after contract award. Hardware development remained on schedule.

Delays Minimized by: A joint FAA and contractor task force was initiated to identify and quantify the problem and any other problems which would affect the ISSS schedule. As a result, IBM redefined its software "build" structure and schedule. Changes were made both in the contractor's and FAA organization to improve communication and tighten the software monitoring and control functions.

List of Contractors:

- International Business Machines
  (AAS hardware and software)
  Rockville, Maryland
  - Computer Sciences Corporation
    Silver Spring, Maryland
  - Raytheon Corporation
    Marlboro, Massachusetts
  - Formation, Incorporated
    Mount Laurel, New Jersey

SCHEDULE (CY) Project 21-12



PROJECT 21-13: Automated En Route Air Traffic Control (AERA)

Purpose: This project will provide interactive software for use by the Area Control Facility (ACF) to plan and monitor the four-dimensional flow of air traffic. Specifically, AERA will: (1) permit most aircraft on IFR flight plans to fly fuel-efficient profiles, (2) increase safety of the system by reducing the potential for operational errors, (3) increase system capacity by integrating en route metering with local and national flow control, and (4) increase controller productivity by increasing the number of aircraft and volume of airspace that a control team can safely manage.

Approach: AERA will be developed in three implementation packages -- AERA 1, AERA 2, and AERA 3. AERA 1, designed primarily to provide user benefits, will be delivered with the Area Control Computer Complex (ACCC) software and will be used operationally approximately six months after ACCC implementation. AERA 1 is based on developing a four-dimensional flight path trajectory estimation model to support such features as:

- Flight plan conflict probe which will predict potential violations of separation standards between aircraft and between aircraft and special use (e.g., restricted) airspace.
- Sector workload analysis which will calculate and display personnel workload measures to supervisors and specialists to assist them in balancing sector staffing levels.
- Trial flight plan function which will allow controllers to evaluate alternative clearances prior to issuing them to aircraft.
- Reconformance aid which will assist controllers in re-establishing aircraft conformance with their flight plan positions.
- Reminder function which will assist controllers by reminding them of planned actions.

AERA 2 will be the first enhancement to the ACCC and is aimed primarily at enhancing system safety and increasing system capacity and controller productivity, while providing expanded services to the user. It will extend the AERA 1 functions from detecting potential conflicts to providing the controller with resolutions. It will also provide other automation aids that permit the granting of conflict-free user requests at the earliest possible time and introduce the concept of computer-generated data link clearances.

AERA 3 will introduce automated decision-making in the ATC process and will exploit the capabilities of advanced avionics, e.g., Flight Management Systems (FMSs), more fully than is possible with earlier ATC systems. AERA 3 is to be implemented as a later enhancement to the ACCC.

Each AERA development package will undergo a series of rigorous engineering and validation steps consisting of algorithmic development, operational suitability evaluations, computer performance functional specification development, and field implementation.

Products: Functional specifications for the AERA 1 functions were completed in FY 84. AERA 1 research and development was completed in early FY 85, and operational development will be accomplished as part of the AAS.

AERA 2 functional specifications were completed in FY 86. The next step in AERA 2 will be to develop performance and detailed algorithmic specifications. Then software will be prepared for ATC laboratory simulations to evaluate operational suitability. AERA 2 operational software will be finalized after operational suitability has been demonstrated.

The AERA 3 concept was refined in FY 89 and the development of AERA 3 algorithms has been initiated. A decision on whether to proceed with AERA 3 will be made in FY 94, based on evidence demonstrated in laboratory simulation of an ACF environment. The prototype software will be evaluated at the FAATC, and this will lead to the development of production-level specifications in FY 97.

Progress/Activity from October 1989 through November 1990:

- Completed first phase laboratory evaluations needed to complete detailed AERA 2 specifications.
- Several operationally oriented documents were published:
  - AERA 2 Operational Description
  - AERA 2 Controller Perspective
  - AERA 2 Controller Activity Sequences

Related Projects/Activities:

- AERA will provide key en route traffic conditions and prediction data to 21-06 TMS. The upgraded traffic management system will be integrated with AERA to keep both short- and long-term traffic planning coordinated.

- 21-12 AAS will include AERA 1 functions and facilitate later implementation of AERA 2 and AERA 3 functions.

- Weather products provided by 23-02 CWP will be used by AERA. More accurate wind data will improve AERA performance.

- 23-05 Aeronautical Data Link, interfaced through AAS, will provide automated controller/pilot data and advisory interchange.

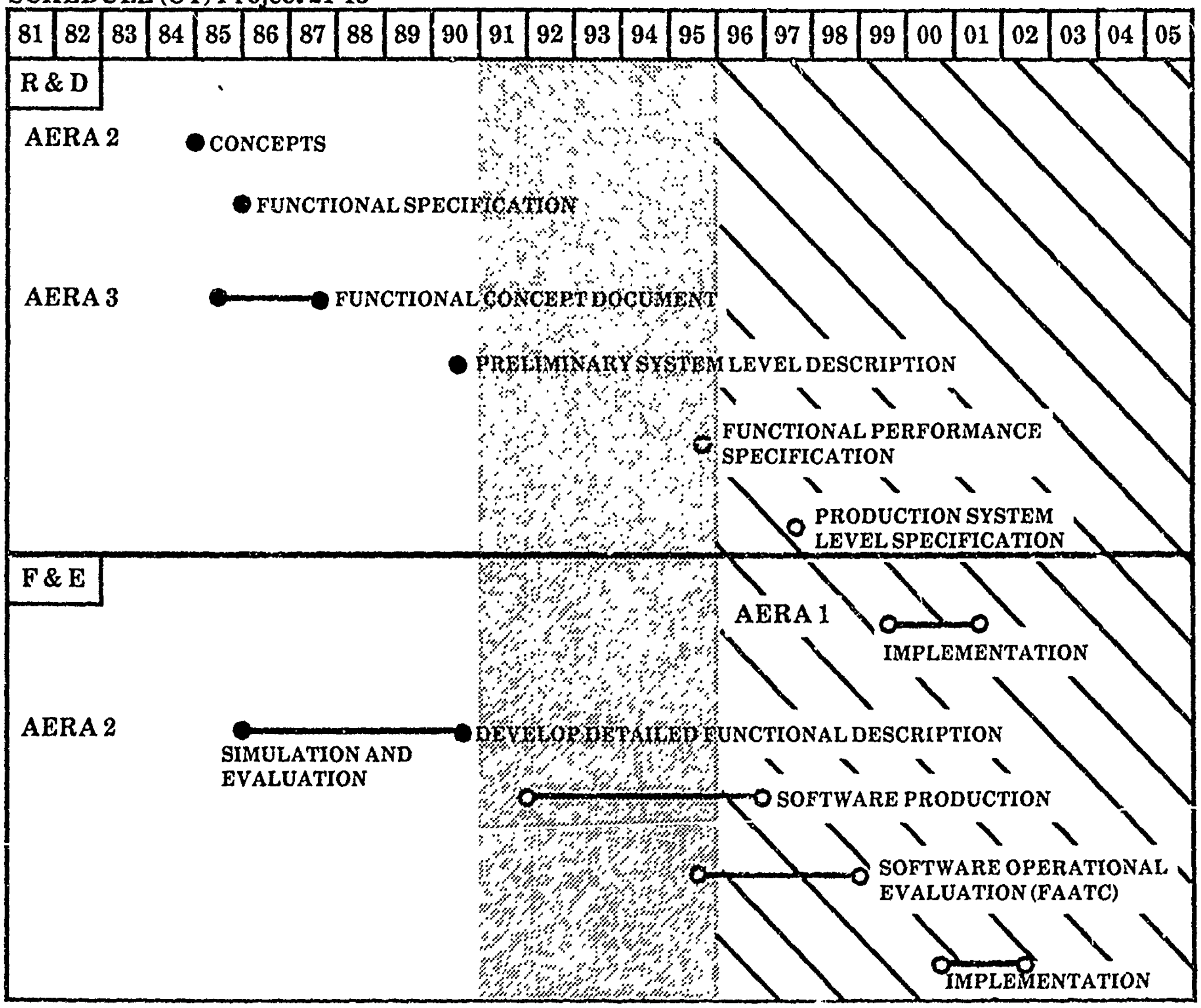
List of Contractors:

- MITRE Corporation
  (software specification)
  McLean, Virginia

- International Business Machines
  (production software)
  Rockville, Maryland

- Computer Technology Associates
  (engineering services)
  Rockville, Maryland

SCHEDULE (CY) Project 21-13



PROJECT 21-15: Area Control Facilities (ACF)

Purpose: This project will improve air traffic control service to users, increase Air Traffic personnel capabilities, and absorb growth through consolidation of air traffic control facilities. Additionally, creation of ACFs will improve productivity and minimize the cost of providing identical advanced automated features to en route and terminal controllers at a large number of facilities.

ACFs will have boundaries based upon operational need and traffic flow throughout large geographical areas. The airspace associated with the ACFs will evolve from the current boundaries to more appropriate boundaries that will better accommodate the users of the NAS. Once full ACF implementation is achieved and the ACF environment encompasses all programmed terminal and en route airspace, the ACF boundaries can be refined in a carefully evaluated and synergistic fashion. This evolution has no predetermined length, but will maximize both the new technology and the efficiency of operation which will be gained through the consolidation of the terminal approach controls. ACFs will provide en route air traffic control and terminal arrival/departure operations as a result of facility consolidations. The ACF program does not affect the establishment or disestablishment of control towers, but will allow a full range of radar services to all terminal radar sites and provide full time service to all networked locations.

Approach: There are many programs/projects progressing concurrently in the en route, terminal, and flight service areas which will culminate in the establishment of ACFs. The thrust of the ACF project as an "umbrella" concept is directed towards maximizing the capabilities of technological advances created by these programs/projects to provide even higher levels of safety, service, and efficiency in the operation and use of the ATC system. The ACF project will be accomplished in two phases:

Phase I - ACF pre-commissioning activities consist of those activities that are necessary prior to the establishment of ACFs. Environmental changes and equipment relocations are accomplished and funded by other programs. Major activities will include:

- ACF airspace designs.
- Upgrading of environmental systems.
- Expanding and upgrading of power systems.
- Expanding and upgrading of administrative and support areas.
- Monitoring and coordinating the development and installation of required NAS equipment, e.g., AAS, VSCS, and RCL.
- Upgrading vacated electronic equipment rooms.
- Increasing facility security.
- Modification/reconfiguration/relocation of certain existing systems to satisfy ACF requirements.

Phase I began in 1988 and is scheduled to be completed in 1998.

Phase II ACF establishment activities consist of relocation/consolidation of TRACONs and the necessary remoting of radar interfaces and communications. Also, during this time the refurbishment of the space vacated by the related TRACONs and the modernization of the remaining tower cabs to receive tower control computer complexes will be completed. Revalidation of the ACF configuration is under way based on the changing requirements, risk and vulnerability assessments, optimized consolidation scenarios, and cost-effectiveness study results.

Products: Twenty-three area control facilities will provide arrival, departure, and en route control functions resulting in more efficient/effective air traffic control. Some locations, such as Los Angeles, Dallas/Ft. Worth, and Chicago, will not be consolidated into ACFs due to their complexity and importance to the NAS. Those facilities will primarily provide terminal air traffic control functions.

Progress/Activity from October 1989 through November 1990:

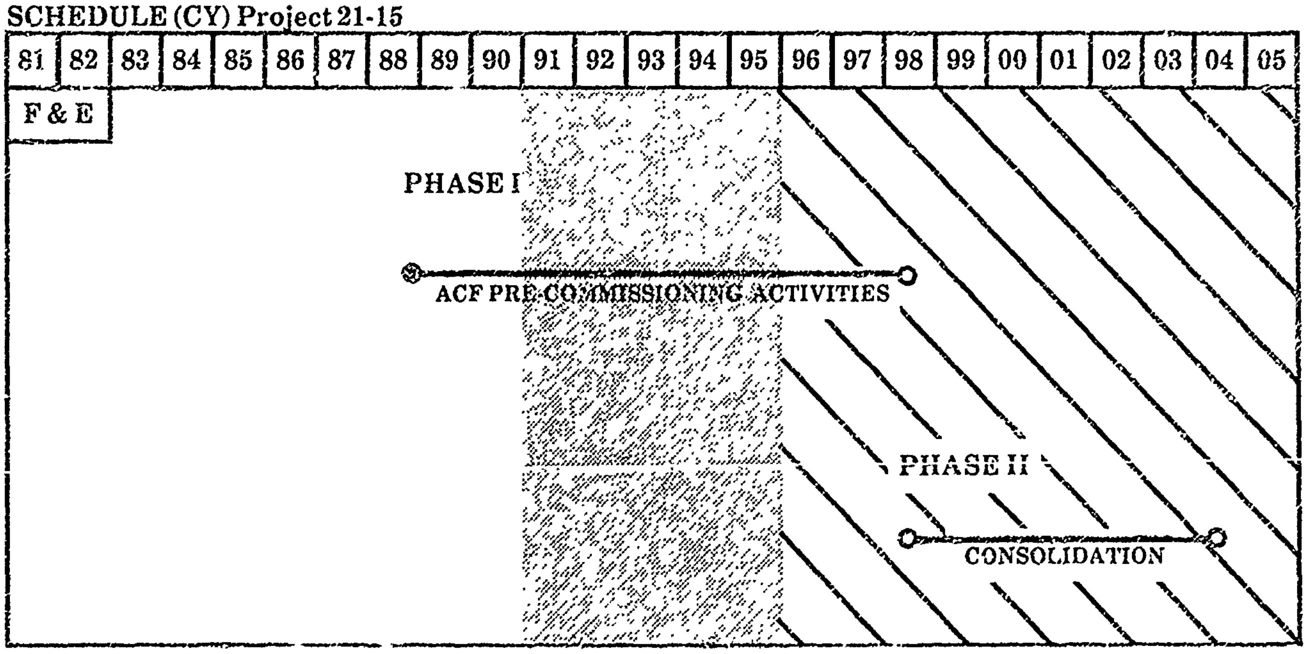
- ACF cost-effectiveness study in demonstration phase.
- ACF programmatic decision policy developed.

Related Projects/Activities: 21-11 VSCS, 21-12 AAS, 23-02 CWP, 23-05 Aeronautical Data Link, 25-02 DMN, 25-03 RML Replacement and Expansion, 25-07 NADIN II, 26-04 MCC, 26-07 Power Systems, 26-09 ARTCC Plant Modernization, 36-20 ARTCC/ACF Support Space, and 46-09 Sustain ARTCC/ACF Facilities.

List of Contractors:

- MITRE Corporation
  (software/system integration)
  McLean, Virginia
  - Transportation Systems Center
    Cambridge, Massachusetts
- Booz-Allen and Hamilton
  (cost-effectiveness support)
  Washington, District of Columbia

SCHEDULE (CY) Project 21-15



PROJECT 21-16: Offshore Flight Data Processing System (OFDPS)

Purpose: This project replaces the Compact Flight Data Processing System (CFDPS) in use at the Honolulu ARTCC. The CFDPS consists of obsolete data processing equipment, is labor-intensive, provides limited functions, uses outmoded equipment that is operating at capacity, and, thus, is only marginally reliable. The replacement system will consist of modern equipment and associated software which will provide real-time enhanced functional capabilities, including comprehensive flight data processing, needed interfaces, system reliability, increased system capacity, and flexibility, while ensuring that safety is maintained.

Approach: An automated flight data processing system has been developed to combine the Flight Data Input/Output (FDIO) system with a duplex Flight Data Processing System (FDPS). The FDIO system provided for data entry and display, while the FDPS processes flight data.

The OFDPS duplex system consists of redundant computers for flight data processing with a communications subsystem composed of redundant processors to provide the necessary interfaces with other systems. The adaptation software permits modifications to satisfy Honolulu ARTCC site-specific requirements.

Products: One upgraded offshore flight data processing system.

Progress/Activity from October 1989 through November 1990:

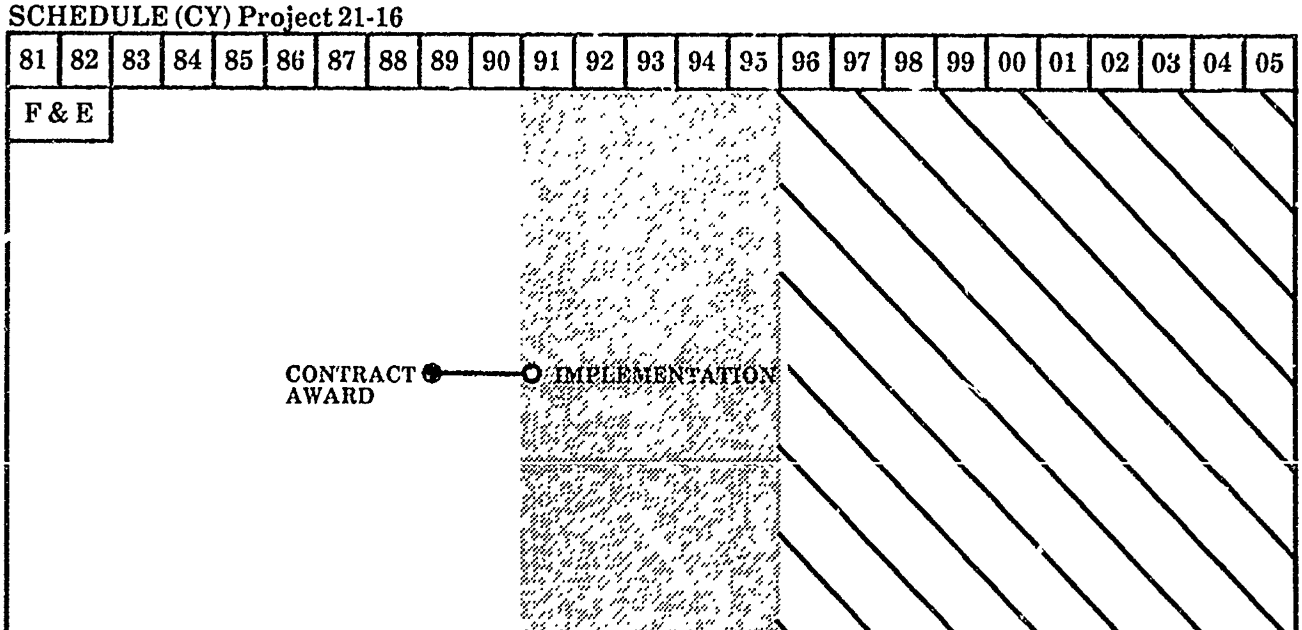
- OFDPS has been installed at Honolulu ARTCC and is being readied for commissioning.

Related Projects/Activities: 21-12 AAS, 25-02 DMN, and 25-07 NADIN II will incorporate OFDPS functions and replace OFDPS. This project will require interfacility communications service from NICS. Projects providing the required switching and transmission network service include DMN, RML Replacement and Expansion, and NADIN II.

List of Contractors:

- ST Systems Corporation (STX)
  (one OFDPS)
  Vienna, Virginia
  - IBM Corporation
    Rockville, Maryland
- Diversified International Services Corporation
  (on-site technical support at Honolulu and FAA Technical Center)
  Lanham, Maryland

SCHEDULE (CY) Project 21-16



PROJECT 22-06: ARTS IIA Enhancements

Purpose: This project enhances all ARTS IIs to ARTS IIA capability by adding beacon tracking, Minimum Safe Altitude Warning (MSAW), conflict alert, and a training target generator. Conflict alert and MSAW are required to alert controllers to potentially hazardous conditions when less than standard separation is predicted. The training target generator provides the capability to train controllers in selected and varied control situations in a simulated environment.

Approach: Procurement of equipment, software, and services is necessary to provide conflict alert, MSAW (including cartographic support), training target generator, and tracking for ARTS II. Software was developed via techniques and methods used in the ARTS II and ARTS IIIA systems.

Products: Enhancements to 95 operational and support systems.

Progress/Activity from October 1989 through November 1990:

- All ARTS IIA hardware is implemented.
- Implementation of ARTS IIA software is under way.

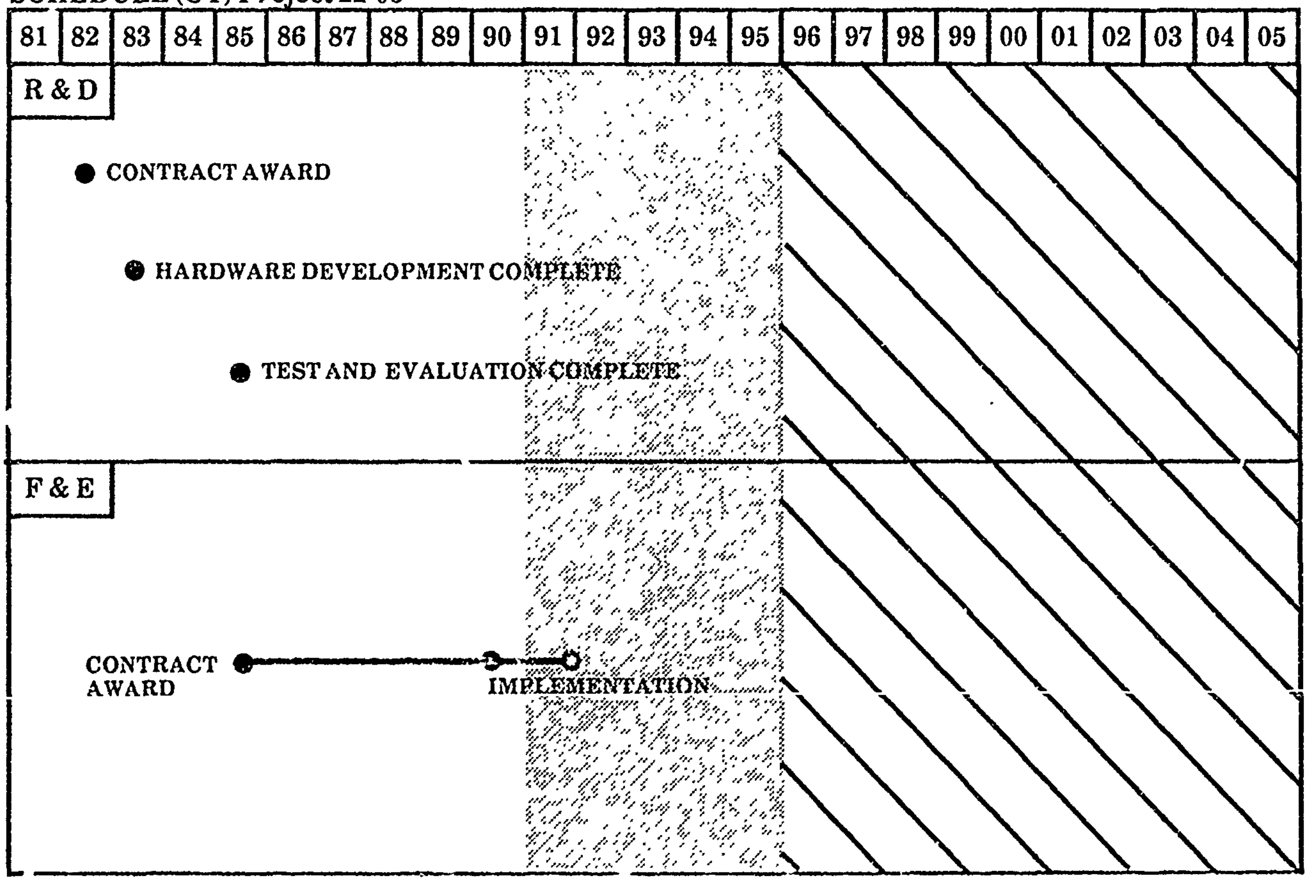
Related Projects/Activities:

- 32-06 Expand ARTS IIA Capacity and Provide MCI Capability provides further enhancements.
- Interfacility communications will be provided by NICS.

List of Contractors:

- Unisys Corporation
  Electronic and Information Systems Group
  (95 software and hardware kits)
  Paoli, Pennsylvania

SCHEDULE (CY) Project 22-06



PROJECT 22-09: ARTS IIA Interface with Mode S/ASR-9

Purpose: This project develops the hardware and software that will allow the ARTS IIA to receive and process digital data from terminal sites equipped with Mode S/ASR-9 surveillance equipment. This interface will allow the ARTS IIA to operate with common digitizer (CD) formatted radar data but will not use the Mode S capability for discrete addressing or data link communications.

Approach: Develop, test, evaluate, and implement hardware and software modifications so that those ARTS IIAs operating with Mode S/ASR-9 can receive CD-type messages and reformat the data to provide the ATC display required for ARTS operation.

Products: One interface board and upgraded software package for each ARTS IIA site which will interface with Mode S/ASR-9 facilities (75 total: 67 sites plus 8 support systems).

Progress/Activity from October 1989 through November 1990:

- Interim software builds/tests have been completed in preparation for final acceptance.

Related Projects/Activities: 24-12 Mode S and 24-13 ASR-9 are to be interfaced to ARTS IIA. Interfacility communications will be provided by NICS.

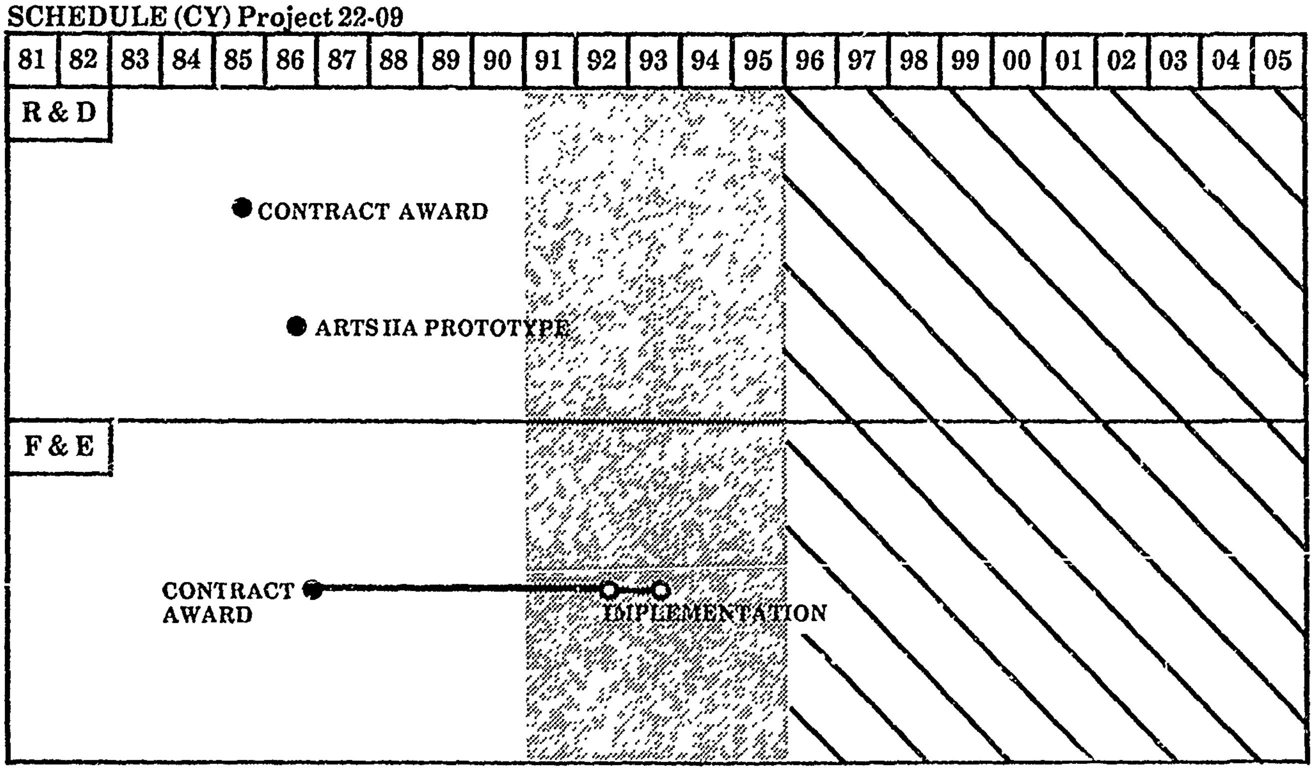
Problems Resulting in Delays: New software requirements and non-critical problem resolutions carried over from the ARTS IIA development have extended the program build/test cycle.

Delays Minimized by: Integration of new requirements and problem resolutions were strategically packaged to minimize schedule risk.

List of Contractors:

- Unisys Corporation
  Electronic and Information Systems Group
  (75 interface kits)
  Paoli, Pennsylvania

SCHEDULE (CY) Project 22-09



PROJECT 22-11: Multichannel Voice Recorders

Purpose: Multichannel voice recorders record all voice communications between air traffic controllers and pilots. The 5- and 9- channel recorders used at ATCTs and FSSs had serious operational reliability, maintenance, and supply/support problems. The high-capacity 152-channel recorders presently in use at the ARTCCs do not have sufficient capacity to support the ACF operation. In addition, they are experiencing supply/support problems because their production has been discontinued by the manufacturer.

Approach: 10- and 20- channel recorders were used for replacement of the remaining 5- and 9- channel equipment and will be used for establishment, relocation, and modernization of ATCTs as necessary. Additionally, certain FSSs and AFSSs will also receive the 10- and 20- channel recorder units. High-capacity (60-channel units) recorder systems will be procured for the ARTCCs/ACFs, selected TRACONs, and training/test facilities.

Products:

- Two hundred fifty-eight (258) 10- and 20-channel units for replacement of existing 5- and 9- channel units at ATCTs and FSSs.
- One hundred fifty (150) 10- and 20- channel units for new establishments, relocations, and FAA Logistics Center spares.
- Two hundred ten (210) high-capacity units for ARTCCs/ACFs, TRACONs, and training/test facilities.

Progress/Activity from October 1989 through November 1990:

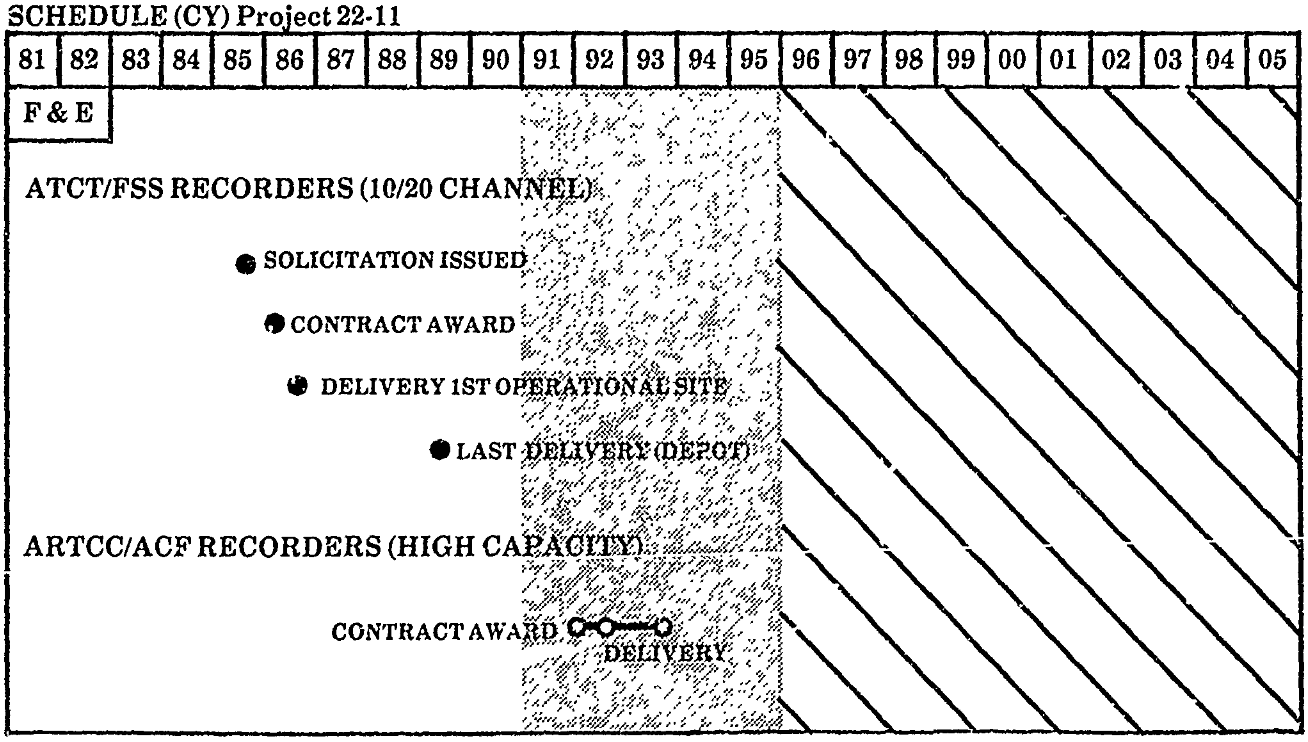
- Replacement of 5- and 9-channel recorders was completed. Recording systems were delivered for new establishments, relocations, and FAA Logistics Center spares.

Related Projects/Activities: All voice communications switching systems at air traffic control facilities such as 21-11 VSCS, 22-12 TCS, and 23-13 ICSS will require recording equipment.

List of Contractors:

- Dictaphone
  (408 10-/20-channel units)
  Melbourne, Florida

SCHEDULE (CY) Project 22-11



PROJECT 22-12: Tower Communications System (TCS)

Purpose: This project will provide a modern voice communications switch and control system which meets the needs of current and future tower operations. Replacement of the present system with modern equipment will significantly improve the operational and maintenance aspects of tower communication systems. A pre-TCS procurement will provide for current and near-term requirements.

Approach: Communications switch and control systems currently in the Airport Traffic Control Towers (ATCTs) are either leased systems with limited operational features or the more modern Integrated Communications Switching Systems (ICSSs). The TCS will be designed to operate with the Tower Control Computer Complex (TCCC) for Automatic Terminal Information Service (ATIS), but may operate independently at those locations where a TCCC is not installed.

There will be a limited procurement of ICSS communication switches prior to TCS for systems such as newly programmed ATCTs. These systems will be required in 1990-1993 prior to availability of TCSs.

Products: Approximately 250 new TCSs will be procured and installed in towers and small terminal radar approach control (TRACON) facilities. A small number of ICSS Phase IB voice switches will be required to meet current and near-term requirements before the TCSs are available.

Progress/Activity from October 1989 through November 1990:

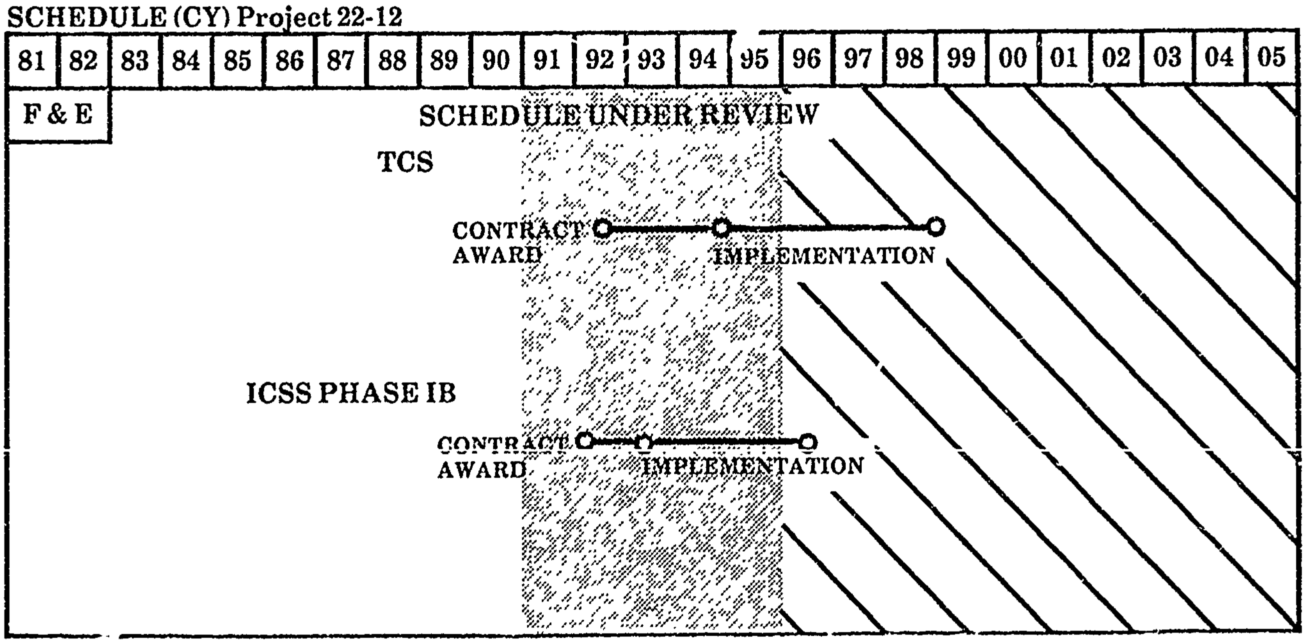
- ICSS Phase IB
  - Some systems were acquired via existing procurement authority.
  - The RFP to establish new procurement was released and proposals have been received and evaluated.
- The TCS baseline specification was developed.
- The TCS RFP package was completed.
- The TCS system level requirements were revalidated.

Related Projects/Activities: 21-11 VSCS, 21-12 AAS (TCCC), 22-11 Multichannel Voice Recorders, 23-13 ICSS, 25-08 RCE, 26-01 RMMS, and NICS.

Problems Resulting in Delays: TCS requirements need to be revalidated.

Delays Minimized by: Revalidation of requirements is under way.

SCHEDULE (CY) Project 22-12



PROJECT 22-13: ATCT/TRACON Establishment, Replacement, and Modernization

Purpose: This project provides for establishment of terminal ATC facilities and assumption of ownership and maintenance of sponsor-owned towers that meet the cost-effectiveness criteria of the airway planning standards. It also provides modernization (e.g., increase of tower cab height to improve visibility) or replacement when necessary. This project includes modernization of existing towers/TRACONs to add operating positions; establish administrative and training space; upgrade TRACABs to TRACONs; and replace obsolete or unreliable engine generators and Heating, Ventilating, and Air Conditioning (HVAC) systems.

A number of existing facilities will pass their 20-year design life before 2000. Thus, major costs will be incurred to replace or upgrade environmental systems and rehabilitate operational and administrative spaces.

Approach: FAA headquarters develops national standards and makes national equipment support buys. Construction will be by regional contracts supported by national architectural engineers for site-specific designs. This project does not include establishment or relocation of TRACON base buildings due to the Area Control Facility (ACF) program. Unusual circumstances and/or overriding operational considerations may dictate deviation from this philosophy. When such circumstances occur and supporting justification is made, site-specific proposals for TRACON replacement are considered.

Products: Approximately six ATCT facilities will need to be replaced each year. Also, one or two locations each year will qualify for establishment of a new tower or assumption of an existing facility. Approximately 20 facilities per year will require some level of major modernization and over 100 facilities per year will need some level of minor modernization; i.e., tower console, wind instruments, clocks, digital altimeter setting indicators, etc.

Progress/Activity from October 1989 through November 1990:

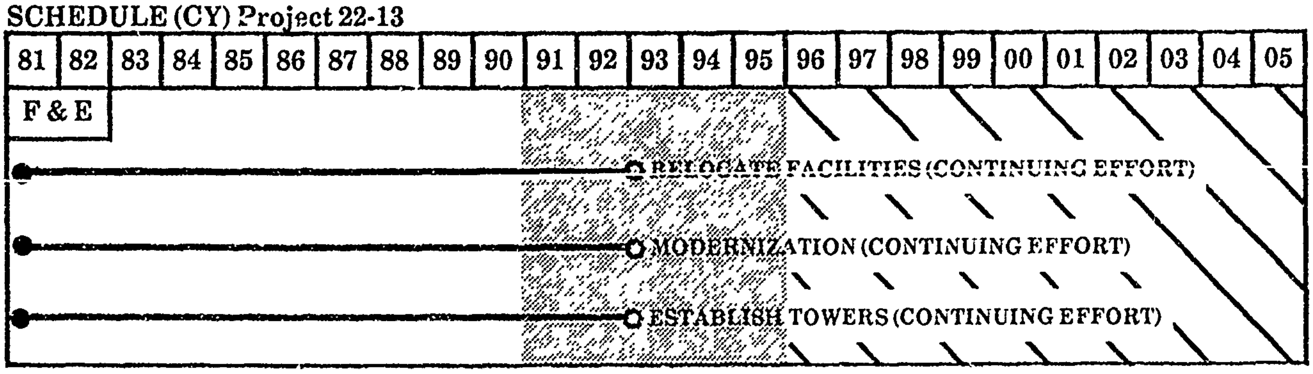
- Temporary tower established at Alliance Airfield, Fort Worth, Texas.
- Project authorization of $10 million to the Southwest Region for east satellite ATCT at Dallas - Fort Worth International.
- Project authorization of $2.2 million to the Western Pacific Region for establishment of an ATCT at Camarillo, California.
- Proposals submitted to establish permanent ATCTs at Alliance Airfield (Fort Worth); Sanford, Florida; Greeley, Colorado; and Vancouver, Washington for FY 92.

Related Projects/Activities: 21-12 AAS (TCCC and tower position consoles), 21-15 ACF, 22-12 TCS, 23-13 ICSS, and NICS. Continuing efforts are provided by 32-13 ATCT Establishment, 42-13 ATCT/TRACON Modernization, and 42-14 ATCT/TRACON Replacement.

List of Contractors:

- Leo A. Daly
  (architectural and engineering support)
  Omaha, Nebraska
- Holmes and Narver
  (architectural and engineering support)
  Orange, California

SCHEDULE (CY) Project 22-13



PROJECT 22-16: Bright Radar Indicator Tower Equipment (BRITE)

Purpose: This project replaces the BRITE systems which have been in the field since 1967, as they do not provide reliable service with digital scan converter (DBRITE) systems. It will also provide alphanumeric display systems for satellite Airport Traffic Control Towers (ATCTs) that presently do not have radar. Digital scan converter systems are inherently much more stable and reliable than the Plan Position Indicator (PPI)/TV camera converters in use today. Approximately 90 percent maintenance workload reductions will result.

Approach: DBRITE systems will be procured which take advantage of digital scan converter technology. This project will replace all BRITE and Bright Alphanumeric and Numeric Generator Conversion Equipment with digital (DBRITE) systems. The new system is also being installed at qualifying satellite towers providing radar and automation system display and interface capabilities. This project is a joint FAA/DOD procurement, with the USAF as the procuring agency.

Television Microwave Links (TMLs), both terminal and repeaters, are being procured to provide service to 40 satellite towers.

Products:

• Replace BRITE I/II/IV	347 Systems
• Establish ASR/ATCT	9 Systems
• Establish Satellite ATCTs	40 Systems
• System Support	5 Systems

Progress/Activity from October 1989 through November 1990:

- Exercised third option for procurement of additional DBRITE systems.
- Ongoing delivery of DBRITE systems.
- TML delivered to FAA Technical Center for acceptance testing.

Related Projects/Activities: 25-02 DMN and 26-15 NAS Spectrum Engineering are required for the TML systems.

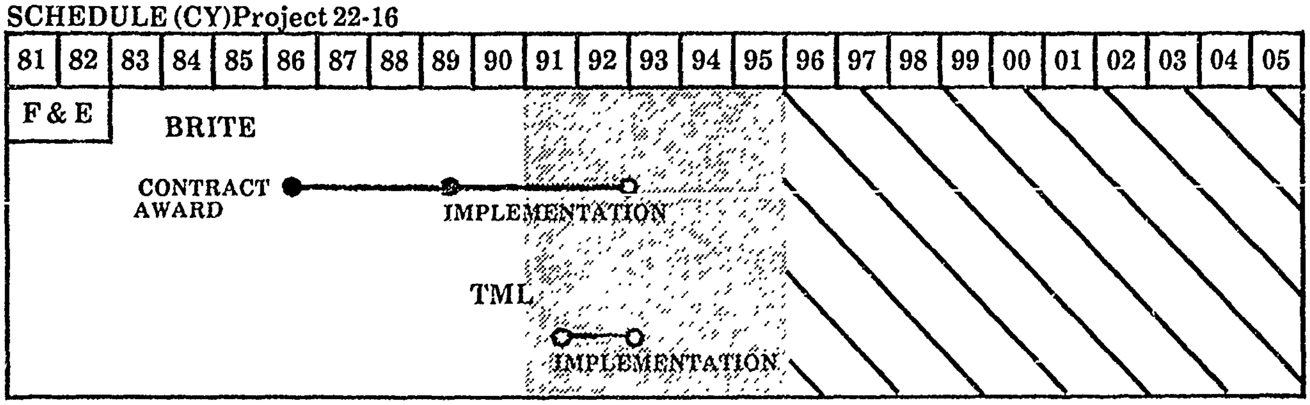
Problems Resulting in Delays: Contractor manufacturing inefficiencies resulted in less than required quantities to meet delivery schedules.

Delays Minimized by: The Government conducted production audits and provided information to increase production rate. The contractor transitioned production to a higher capacity facility.

List of Contractors:

- Unisys Corporation
  Electronic and Information Systems Group
  (401 FAA systems and approximately 150 separately funded DOD systems)
  Paoli, Pennsylvania
  - Orwin Associates Inc.
    Amityville, New York
  - Capital Switch, Inc.
    Bethel, Connecticut
- Communications International, Inc.
  (33 TML systems)
  Norcross, Georgia

SCHEDULE (CY)Project 22-16



PROJECT 22-18: Sustain the New York TRACON

Purpose: The New York TRACON ARTS IIIA system must continue to provide the current level of reliability and the required air traffic control services until replacement by the advanced automation system. However, the New York TRACON ARTS IIIA is a unique system that has reached the operational design limit of its hardware architecture and, with software modifications, can only provide satisfactory service in the face of increasing aircraft operations. This project will develop and implement a modified system architecture with appropriate hardware/software changes to satisfy air traffic requirements until replacement.

Approach: This project will provide the necessary modifications and additional hardware/software to sustain the New York TRACON. An interim capacity upgrade portion of Stage 1 completed in June 1988, provided early capacity relief with the installation of Solid-State Memory (SSM) and new intelligent displays.

Stage 1, completed in April 1989, has implemented a new local area communications network and software to more fully use the intelligent displays. Stage 2 will provide the system architecture modifications to further increase capacity to meet projected operational requirements.

Products: A modified ARTS IIIA architecture with additional hardware/software installed at the New York TRACON. This involves replacement, modification, and/or additional processors, memory, intelligent displays, and software. This modified ARTS IIIA system is referred to as an ARTS IIIE system.

Progress/Activity from October 1989 through November 1990:

- Completed Stage 2 system acceptance testing at the FAA Technical Center.
- Installed Stage 2 hardware at New York TRACON.

Related Projects/Activities: 46-30 ISP. New displays and SSMs will be required under the ISP project to upgrade ARTS IIIA locations.

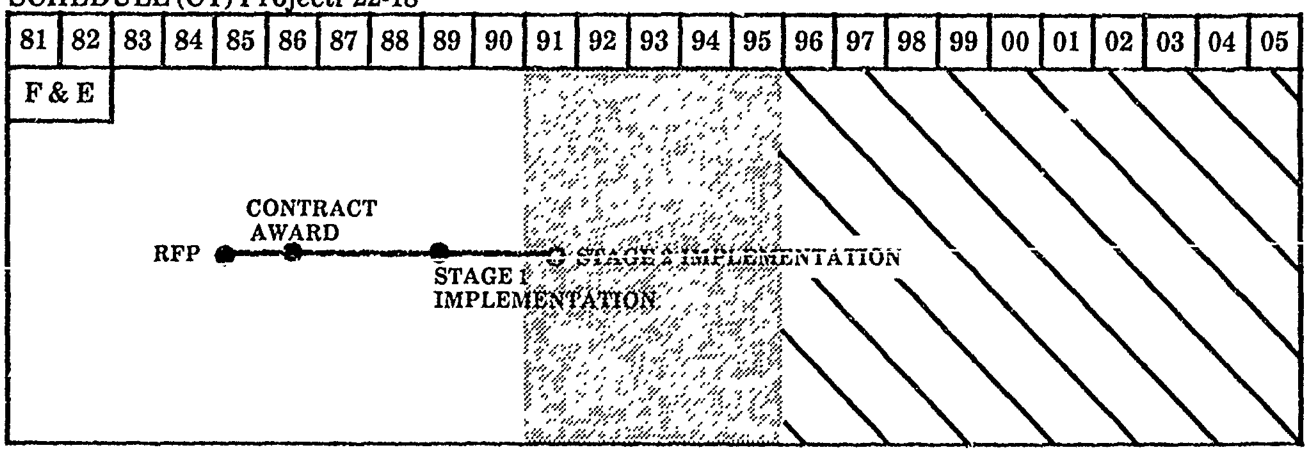
Problems Resulting in Delays: Completion of Stage 2 implementation was delayed to provide SSM hardware to meet critical capacity requirements at Dallas/Fort Worth and Chicago.

Delays Minimized by: SSM deliveries on the ISP project were accelerated to replace assets borrowed from this project for the Dallas/Fort Worth and Chicago systems.

List of Contractors:

- Unisys Corporation
  Electronics and Information Systems Group
  (upgraded New York TRACON system)
  St. Paul, Minnesota
  - DY-4 Systems, Inc.
    Nepean, Ontario, Canada
  - Magnavox Electronics Systems Company
    Ft. Wayne, Indiana
  - Metric Systems Corporation
    Ft. Walton Beach, Florida

SCHEDULE (CY) Projectr 22-18



PROJECT 23-01: Flight Service Automation System (FSAS)

Purpose: This project improves pilot access to weather information and NOTAMs, simplifies flight plan filing, and provides a flight service automation system that can handle projected increases in demand for flight services without proportional increases in staff.

Approach: The development and implementation of automation for flight service stations has been phased. The first Model 1 system was commissioned in February 1986, and the last Model 1 was commissioned in 1987.

The Model 1 Full Capacity (M1FC) system builds upon the base provided by the Model 1 design. It increases processing capacity by adding hardware (including two aviation weather processors) and more efficient software so that FSS consolidation can be completed. All Model 1 systems will be converted to Model 1 Full Capacity systems. In addition, Model 1 Full Capacity systems will be provided to the remainder of the AFSS and FSDPS facilities.

The Direct User Access Terminal Service (DUATS) improves user access to weather information and flight plan filing. This service is leased from commercial vendors.

Forty-six AFSSs were commissioned through 1990. All 61 AFSSs will be commissioned by 1994.

Products:

- Model 1.
  - 13 flight service data processing systems (at ARTCCs).
  - 39 FSSs equipped with automation position equipment.
- Model 1 Full Capacity.
  - 2 Aviation Weather Processors (AWPs) at NADIN switching centers.
  - 21 operational flight service data processing systems.
  - 61 AFSSs.

Progress/Activity from October 1989 through November 1990:

- Delivered systems to test site (FAATC) and first operational site.
- Completed integration and shakedown tests.
- Implemented DUAT service.
- Delivered M1FC hardware to Kansas City and Chicago.
- Completed M1FC site surveys at Los Angeles, Anchorage, Indianapolis, and Fort Worth.

Related Projects/Activities: 21-06 TMS, 21-12 AAS, 23-04 WMSC Replacement, 23-13 ICSS, 24-11 DF, and the U.S. NOTAM System will support enhanced flight services. This project will require interfacility communication services from 25-07 NADIN II. The FSAS will interface with 26-01 RMMS. Space for most of the 61 AFSSs has been acquired by 26-10 Acquisition of Flight Service Facilities on a sponsor-provided, leased basis at selected airports. The 61 new facilities will house FSAS specialist automation positions and the other equipment necessary to satisfy FSS system requirements.

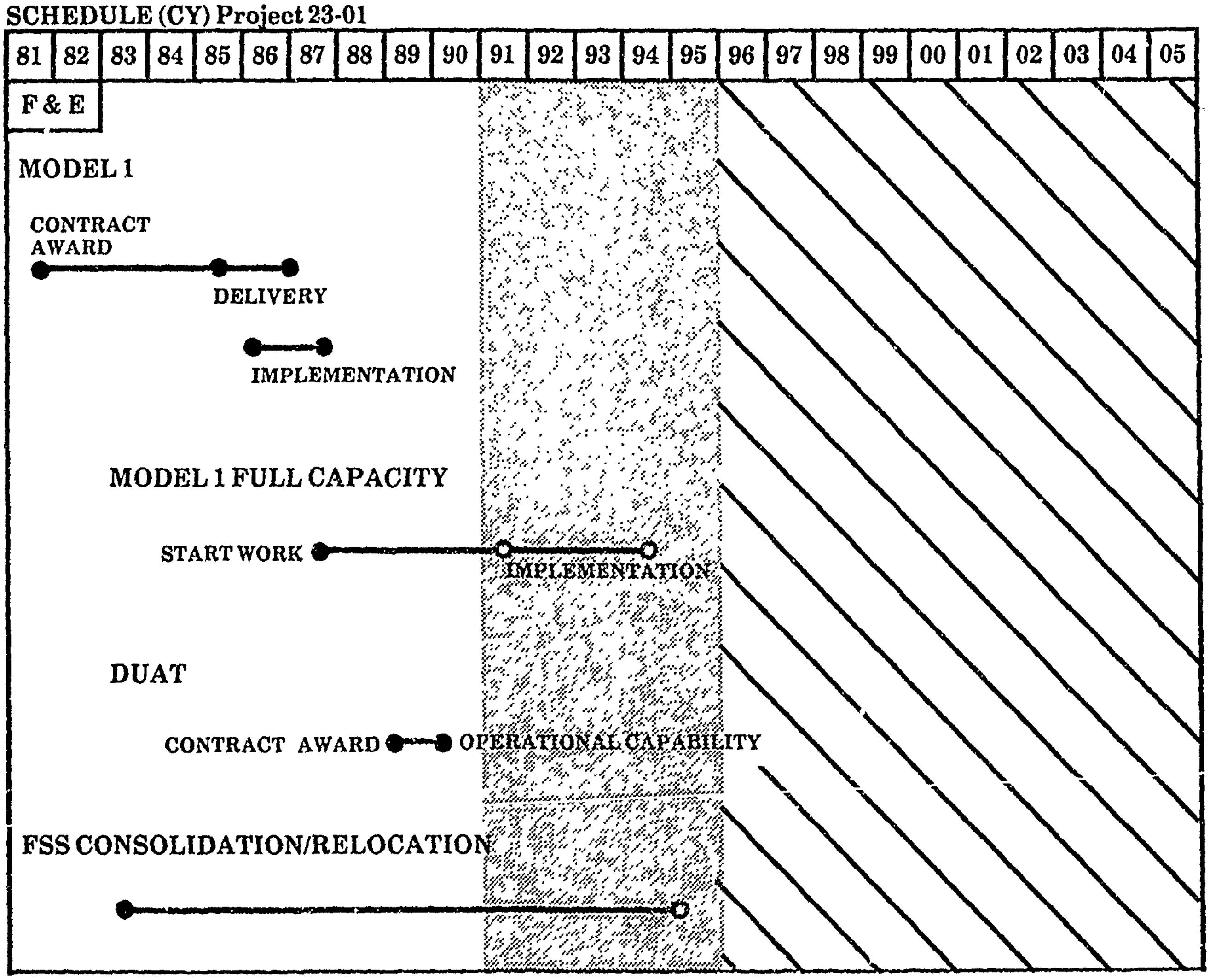
Problems Resulting in Delays: Delays in the contractor's software development caused a slip in the Factory Acceptance Test.

Delays Minimized by: The contractor's software development was completed and Factory Acceptance Tests were subsequently completed successfully.

List of Contractors:

- E-Systems, Inc.
  (operating systems for 61 AFSSs, 21 FSDPSs)
  Garland, Texas

SCHEDULE (CY) Project 23-01



PROJECT 23-02: Central Weather Processor (CWP)

Purpose: This project will improve the collection, synthesis, and dissemination of weather information throughout the NAS to pilots, controllers, traffic management specialists/coordinators, and meteorologists. This project provides the Center Weather Service Unit/Central Flow Weather Service Unit (CWSU/CFWSU) meteorologists with automated workstations which greatly enhance their ability to analyze rapidly changing, potentially hazardous weather conditions, and ensures that the latest and best information is provided to all system users. It also provides for a mosaic display of multiple weather radars. These improvements are deemed necessary to reduce accidents and air traffic delays directly related to weather.

Approach: The CWP project is composed of two elements. The first is a commercially-available Meteorologist Weather Processor (MWP) procured through a series of leases, the first of which started in 1989. The MWP will provide modern automation support to the weather analysis and forecasting functions of the CWSU in each ARTCC/ACF. An identical Central Flow MWP (CFMWP) will support the CFWSU. The second element is a Real-time Weather Processor (RWP) in each ARTCC/ACF which will create unique weather products required by the NAS and provide the NAS unique interfaces.

The MWP will be a computer-based, interactive meteorological data processing service. The MWP used in the second lease period will interface with the NWS Warning and Forecast Offices, WMSC Replacement, Maintenance Processor Subsystem (MPS), and the RWP. The feasibility of using a version of the NWS AWIPS-90 workstation starting in the second lease period will be determined through a joint FAA/NWS effort.

The RWP will mosaic data from multiple NEXRAD radars and provide these products and other time-critical and operationally significant weather information for use by air traffic controllers via the AAS. The RWP will also transmit a subset of its weather products to the Data Link Processor (DLP) for uplink to pilots via the Mode S data link. A contractor will develop operational RWP software on prototype hardware. The prototype RWP will undergo test and evaluation. After approval for production, turnkey systems will be procured. Software developed during the prototype phase will be government-furnished to the production contractor for field implementation.

Products: MWP - The initial lease provides 23 leased MWPs, including intrafacility traffic management and area supervisor briefing terminals (21 MWPs to ARTCCs/ACFs and 2 CFMWPs to the ATCSCC). During the second lease period an additional MWP will be leased for the FAA Technical Center.

RWP - Twenty-five production RWPs will be provided. (23 to ACFs, 1 to the FAA Academy, and 1 to the FAA Technical Center).

Progress/Activity from October 1989 through November 1990:

- Initial MWP leased service contract awarded.
- Prototype RWP critical design review completed.
- Prototype RWP test readiness review completed.

Related Projects/Activities:

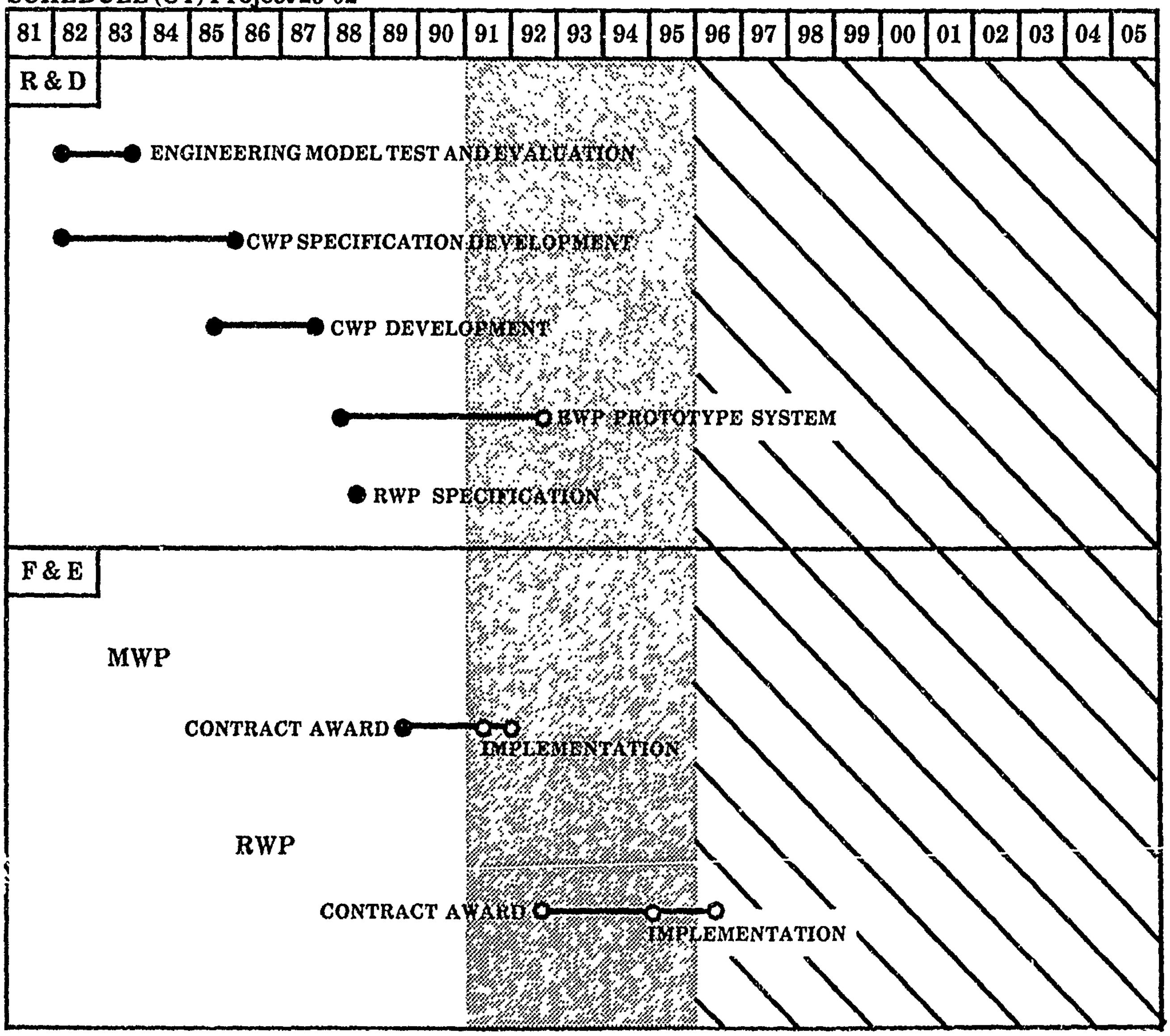
- The CFMWP will provide displays for the 21-06 TMS specialists in the CFCF, and the MWP will provide them for the traffic coordinators in the ACF TMUs.
- The RWP will send weather products to and receive Pilot Reports (PIREPs) from 21-12 AAS.
- The CWP will exchange weather products with 23-04 WMSC Replacement.
- The RWP will send graphic weather products to 23-05 Aeronautical Data Link.
- The RWP will receive 23-09 AWOS/ASOS data via the ADAS.
- The DLP will send PIREPs received via 24-12 Mode S data link to the RWP.
- The CWP will receive periodic products and request/reply products from 24-16 Weather Radar Program.
- This project will require interfacility communication services from NICS. Projects providing these services include 25-07 NADIN II.

- The CWP will interface with 26-01 RMMS for status reporting.
- 63-02 CWP interfaces broaden the use of CWP data.

List of Contractors:

- Jet Propulsion Laboratory
  California Institute of Technology
  (one RWP prototype unit)
  Pasadena, California
  - General Electric Company
    Western Systems
    (one RWP prototype test data generator unit)
    San Jose, California
- Harris Corporation
  Air Traffic Control Systems Division
  (23 MWPs)
  Melbourne, Florida

SCHEDULE (CY) Project 23-02



PROJECT 23-04: Weather Message Switching Center (WMSC) Replacement

Purpose: This project will replace the WMSC with state-of-the-art equipment and technology to perform all current data handling functions of the WMSC, and the storage and distribution of NOTAMs. It will rely on the NADIN packet switched network for a majority of communications support. Further, the system will accommodate graphic data and function as the primary FAA gateway to the National Weather Service Telecommunications Gateway (NWSTG), which will be the source of National Weather Service's products for the NAS.

Approach: The system will be procured for turnkey installation. To provide geographic redundancy, the WMSC Replacement will have identical nodes located in the National Aviation Weather Processor (NAWP) facilities sites in Atlanta, Georgia, and Salt Lake City, Utah, and a NWSTG/WMSCR Interface Device (NWID) located at the Washington ARTCC. Each node will support approximately one-half of the network and continuously exchange data and coordination messages in order to maintain identical databases. In the event of a nodal failure, the surviving node will assume responsibility for the entire network. The implementation of the WMSC Replacement will allow the closing of the National Communications Center.

Products: WMSC Replacement nodal processors and related peripherals to be located at each of the two NAWP facilities, and the NWID located at the Washington ARTCC.

Progress/Activity from October 1989 through November 1990:

- Critical design review completed.
- Initial design readiness review completed.
- Quarterly project status review completed.
- Provisioning conference completed.

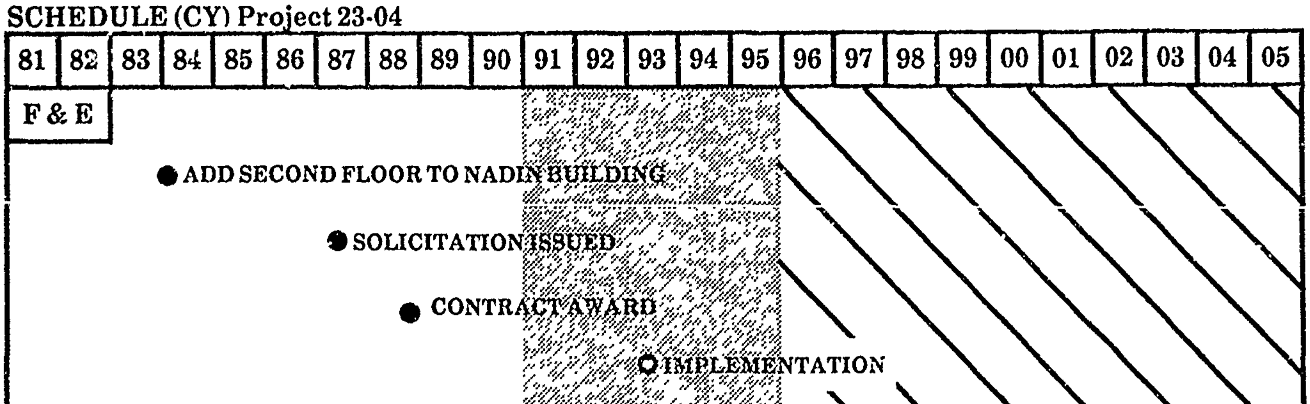
Related Projects/Activities: The WMSC Replacement will:

- Exchange weather products with 21-06 TMS Traffic Management Processor.
- Exchange alphanumeric weather data and NOTAMs with the Aviation Weather Processor (AWP) from 23-01 FSAS.
- Exchange weather products with the MWP and RWP from 23-02 CWP.
- Transmit alphanumeric weather data to 23-05 Aeronautical Data Link.
- Route weather products from 23-09 AWOS Data Acquisition System (ADAS) to NWSTG and other NAS users.
- Interface with 25-07 NADIN Packet Switch Network which will provide the communications between the WMSC Replacement and its users.
- Interface with 26-01 RMMS for status reporting.

List of Contractors:

- Harris Corporation
  (two WMSC Replacement units and one NWID)
  Melbourne, Florida

SCHEDULE (CY) Project 23-04



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PROJECT 23-05: Aeronautical Data Link

Purpose: This project will develop a digital telecommunications system to provide a variety of weather and ATC data link services. Weather products such as surface observations, terminal forecasts, winds aloft forecasts, pilot reports, and hazardous weather advisories will be provided to pilots on a request/reply basis. Specific definition of ATC data link applications will result from an associated R&D effort. The availability of data link communications will improve air/ground communications and contribute to system safety and capacity by enhancing pilot accessibility to information, relieving congested voice frequencies, and reducing the workload of pilots, specialists, and controllers.

Approach: This project requires the construction of the initial communications architecture (air and ground) and the selection, development, and evaluation of candidate services. The elements involved are development and implementation of the initial Data Link Processor (DLP) and definition of the Tower Workstation. The initial (Build-1) DLP will provide Mode S specific communication processing, message routing between application processors and Mode S sensors, and weather application processing and associated end-to-end communication functions. This project includes the effort to define how the DLP must be enhanced to function as the router, connecting application processors with the Mode S network and with other ground-to-air networks. Also, requirements have been developed for airborne processors to perform corresponding communications functions in data link equipped aircraft. Demonstration tower workstations that accept automated and manually entered weather observations and airport information, and format ATIS messages for data link distribution have been evaluated. The demonstration tower workstations will also support the predeparture clearance data link service. Host test software enhancements that provide ATC applications processing functions have also been developed.

Products: Twenty-four DLPs (Build-1) - 22 for ARTCCs/ ACFs, 1 to the FAA Academy, and 1 to the FAA Technical Center; RTCA Minimum Operational Performance Standards; FAA Advisory Circulars for data link certification requirements.

Progress/Activity from October 1989 through November 1990:

- Initial weather application software for DLP completed.
- Specification of Aeronautical Telecommunications Network (ATN) function for DLP (Build-2) completed.
- Specification of initial ATC data link services completed.
- Tower Workstations to support predeparture clearance delivery demonstrated.

Related Projects/Activities:

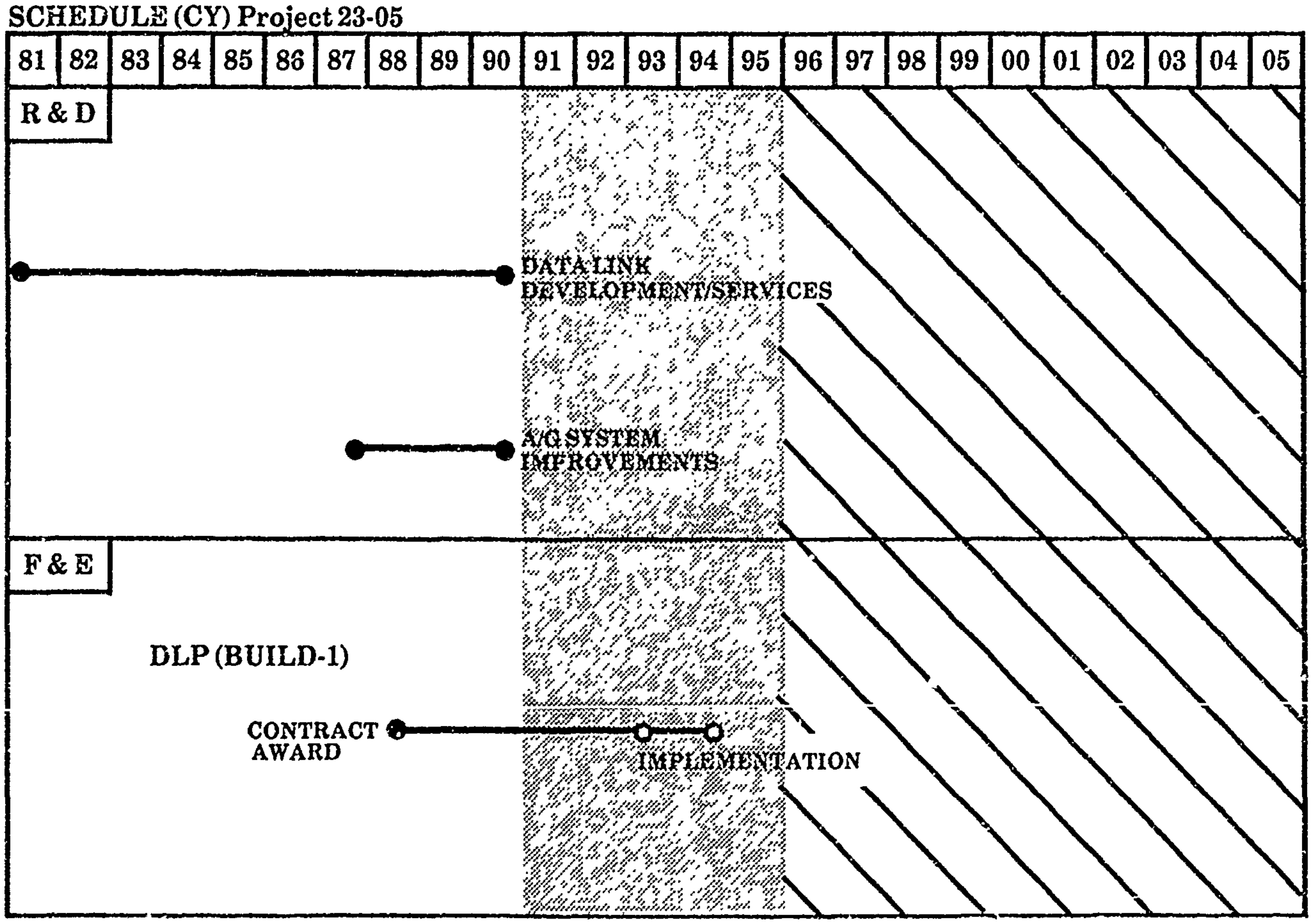
- 21-12 AAS and 21-13 AERA.
- The DLP will obtain alphanumeric weather products from 23-04 WMSC Replacement for data link weather applications processing.
- The ADAS will send minute-by-minute 23-09 AWOS/ASOS messages to the DLP for storage and dissemination via data link.
- The DLP will interface with the 24-12 Mode S sensors for the reception and dissemination of Mode S data link transactions.
- This project will require interfacility communications from NICS. 25-03 RML Replacement and Expansion will provide communications for transmission of data.
- The DLP will interface with 26-01 RMMS for status reporting.
- Other related projects are 63-05 Aeronautical Data Link Communication and Applications, 64-29 ATC Application of ADS, and 65-22 ATN.

List of Contractors:

- Arcon Corp
  (software)
  Waltham, Massachusetts

- Contel ASC
  (hardware)
  McLean, Virginia

SCHEDULE (CY) Project 23-05



PROJECT 23-09: Automated Weather Observing System (AWOS)

Purpose: AWOS will obtain aviation-critical weather data (e.g., wind velocity, temperature, dew point, altimeter setting, cloud height, visibility, precipitation type, occurrence, and accumulation) through the use of automated sensors. It will process the data, and allow dissemination to pilots via computer synthesized voice.

Systems located within an ACF area will be connected to the AWOS Data Acquisition System (ADAS). The ADAS will collect and concentrate weather messages from AWOSs and the National Weather Service (NWS) Automated Surface Observing Systems (ASOSs) for internal distribution within the ACF and national distribution via the WMSC Replacement to the NWS. This will make weather observation data available to pilots on a timely basis for safety and efficiency.

Approach: A demonstration program for AWOS was successfully completed in 1984. Immediately thereafter, a pilot program contract was awarded for a design of an AWOS for nontowered airports. In 1986, FAA Advisory Circular AC 150/5220-16 was published for certification and acquisition of AWOS devices for such users as airport operators, fixed-base operators, and heliport operators. This document is also the basis for systems to be funded and installed under the Airport Improvement Program (AIP).

AWOS equipment is being procured as commercial-off-the-shelf systems (in accordance with the requirements of the advisory circular) to meet immediate needs. The commercial AWOS will be used primarily as stand-alone units for airports without weather observers. These units will be installed between 1989 and 1991 and will be maintained by the contractor.

NWS will procure, install, and maintain ASOS equipment for the FAA at selected airports. Deployment of non-towered systems will begin in early 1991 and be completed in 1993. Requirements for 304 towered airports and FSS locations where the FAA takes surface observations will also be met by the NWS procurement after 1992.

Products:

- 200 nontowered commercial systems (F&E funded, FAA contract).
- 233 nontowered airports (F&E funded, NWS contract). Options to include an additional 204 systems.
- 304 towered airports and/or closing FSSs (F&E funded - post 1992, NWS contract).
- 25 ADASs - 22 to ACFs; 1 to the FAA Academy, 1 to FAATC and 1 to New York TRACON.

Progress/Activity from October 1989 through November 1990:

- NWS awarded ASOS contract for preproduction units.
- Extended AWOS contract option.
- ADAS design phase completed.

Related Projects/Activities:

- 23-02 CWP will receive the current (minute-by-minute) AWOS and ASOS weather messages from the ADAS for processing.
- 23-04 WMSC Replacement will receive AWOS and ASOS hourly and special weather messages through the ADAS.
- ADAS will provide minute-by-minute AWOS and ASOS data to the 23-05 Aeronautical Data Link to respond to pilot requests via 24-12 Mode S data link.
- AWOS data will be broadcast through 24-03 VORTAC, NDB, or discrete VHF/UHF communications outlets depending on cost-effectiveness and spectrum engineering.
- This project will require interfacility communications service from NICS. Projects providing that service include 25-02 DMN and 25-03 RML Replacement and Expansion.
- Interference-free frequencies from 26-15 NAS Spectrum Engineering.
- AWOS data will be furnished for controller use and to update ATIS weather information.

- AWOS will support the surface weather observation needs of FAA's rotorcraft programs.

- ADAS will translate AWOS and ASOS weather messages into the NWS standard aviation weather observation format.

- The Lightning Detection Data System will provide lightning data to the AWOS and ASOS.

Problems Resulting in Delays:

- Site preparation delayed installation of some units.

- ASOS software development problems may delay deliveries.

Delays Minimized by: Improved coordination between the project office, regions, and contractors.

List of Contractors:

- Magnavox Corporation (NWS contract)
  (4 ASOS prototype units)
  Fort Wayne, Indiana

  - Qualimetrics Corporation
    Sacramento, California

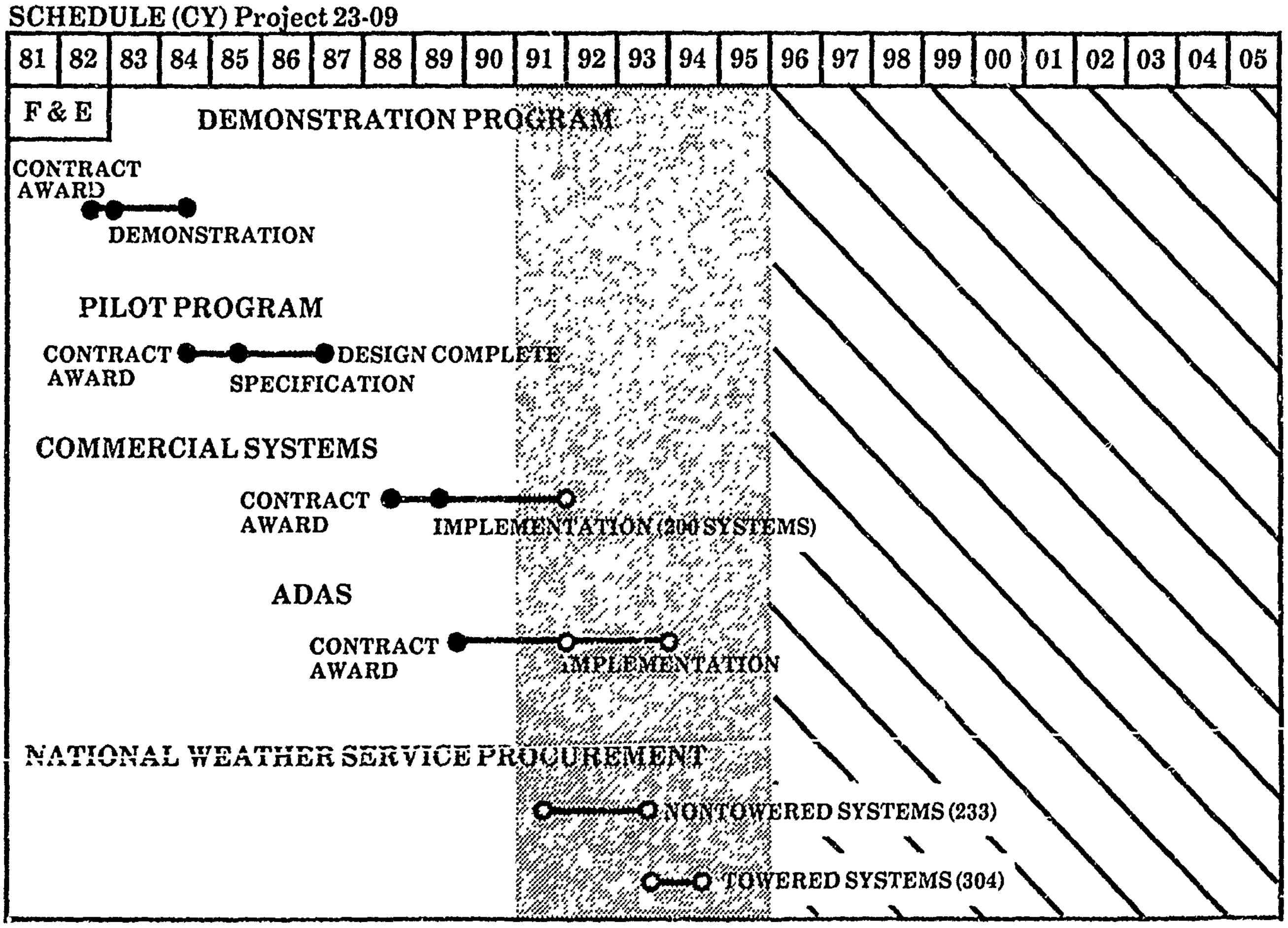
- AAI Corporation (NWS contract)
  (4 ASOS prototype units)
  Hunt Valley, Maryland

  - Belfort Company
    Baltimore, Maryland

- Qualimetrics Corporation
  (200 AWOS units)
  Sacramento, California

- Commpower, Inc.
  (25 ADAS)
  Agoura Hills, California

SCHEDULE (CY) Project 23-09



PROJECT 23-12: Low-Level Wind Shear Alert System (LLWAS)

Purpose: This project provides local controllers and pilots with information on hazardous wind conditions (on or near airports) that create unsafe conditions for aircraft landings or departures.

Approach: Wind shear detection equipment is being implemented through an ongoing program for the LLWAS. The basic six-sensor system consists of a wind sensor located at center field, five sensors near the periphery of the airport, and a computer which processes sensor information and displays wind shear conditions to air traffic controllers for relay to pilots.

Since the basic six-sensor LLWAS was designed primarily for the detection of frontal shears in the immediate vicinity of the airport, two avenues for improvement are planned.

Near-term modifications consist of improving the algorithms associated with the basic 6-sensor system to more effectively detect and identify microbursts, incorporating data recorders, and increasing the computer capacity. Long-term modifications include. expanding the existing systems by adding more sensors, correcting sensor height to reduce sheltering, developing improved algorithms, providing runway-oriented wind shear information, and providing new data/alert displays. These improvements, in addition to increasing LLWASs capability to detect wind shear, will also reduce false alarms and enhance maintenance features. Extensive R&D efforts have contributed to LLWAS development. Two enhanced operational LLWAS test beds were installed in New Orleans/Denver (consisting of one center field and 11/15 remote units) to determine the benefits of increasing the number of sensors. Data from Joint Airport Weather Studies (JAWS), a combined effort involving the National Oceanic and Atmospheric Administration (NOAA), National Aeronautics and Space Administration (NASA), National Science Foundation, and the FAA permitted evaluation of different algorithms and optimization of the number of sensors.

Products:

- JAWS research leading to algorithm development and evaluations.
- 110 near-term modifications (six-sensor improvement).
- Expansion of the six-sensor LLWAS with improved algorithms, additional sensors, and new displays (network expansion) at seven sites.
- Develop interface to TDWR.

Progress/Activity from October 1989 through November 1990:

- The Phase II (six-sensor improvement) contract modification and the network expansion contract were awarded.

Related Projects/Activities:

- 21-12 AAS. In ATCTs, the tower control computer complex (TCCC) will receive and display LLWAS data to the ATCT controller.
- 24-18 TDWR is a related project when installed at the same airports as LLWAS.
- LLWAS will be interfaced to the 26-01 RMMS (MPS) for remote maintenance monitoring.
- 26-15 NAS Spectrum Engineering will ensure that the LLWAS frequencies are free of interference.
- 43-12 Upgrade LLWAS to Expanded Network Configuration and 63-12 LLWAS Enhancements provide follow-on LLWAS improvements.
- Provide full integrated logistical support capabilities to 110 LLWAS-equipped airports.

List of Contractors:

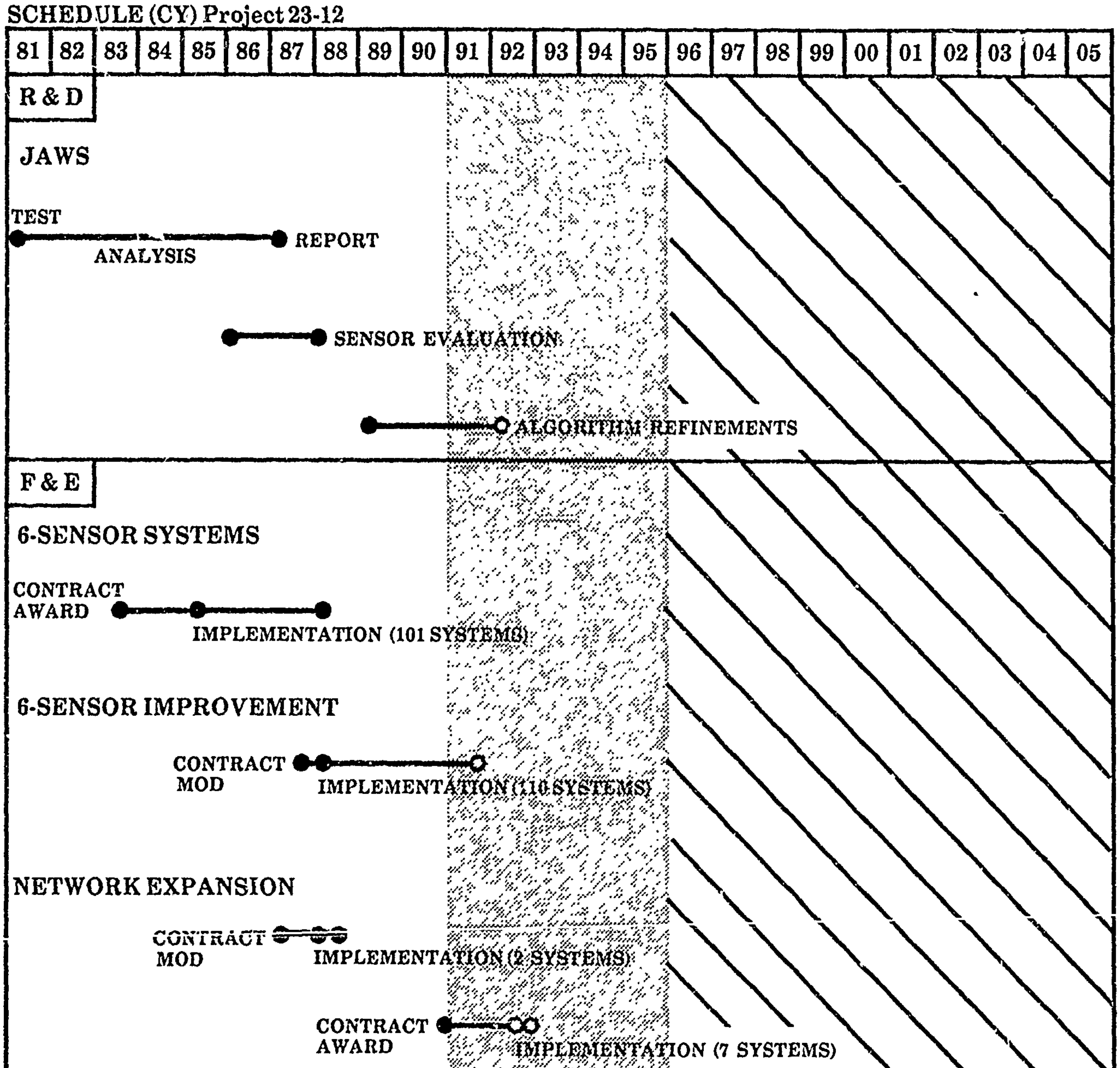
- National Center for Atmospheric Research
  (algorithm development)
  Boulder, Colorado

- Climatronics Corporation
  (51 LLWAS units)
  Bohemia, New York

- International Computers and Telecommunications, Inc.
  (59 LLWAS units)
  Rockville, Maryland

- LORAL Data Systems Inc.
  (formerly Fairchild Weston Systems, Inc.)
  (hardware and software uptrades to 7 LLWAS units)
  Sarasota, Florida

SCHEDULE (CY) Project 23-12



PROJECT 23-13: Integrated Communications Switching System (ICSS)

Purpose: This project provides voice communications switching systems for new, replaced, or modernized Airport Traffic Control Towers (ATCTs) and Terminal Radar Approach Controls (TRACONs) (previously provided with leased communication equipment), and for facilities which have obsolete equipment which can no longer be maintained. Also, it provides systems for use at automated FSSs (AFSSs).

Approach: An initial procurement (Phase I) and one additional reprocurement (Phase IA) are envisioned to implement ICSS. Phase IB is now part of project 22-12 Tower Communications System (TCS). In Phase I competitive proposals were solicited for off-the-shelf systems. The requirements were divided into three types:

- Type 1's for ATCTs and TRACONs having up to 15 operator positions. Basic intercom, interphone, and radio communications capabilities were specified as an integrated system.
- Type 2's for TRACONs having 16-80 operator positions. All Type 1 requirements plus rapid automatic reconfiguration of pushbutton terminations, alphanumeric displays of the button functions, and traffic data collection were specified.
- Type 3's for AFSSs. Type 2 requirements plus an automatic call distributor, call transfer, Pilots Automatic Telephone Weather Answering Service (PATWAS), fast file recorders, and a management information system display were specified. These systems will continue in use at all AFSS facilities.

First-phase contracts for all three types were awarded in May 1982. Type 1 systems are being obtained from one contractor. Type 2 systems are being obtained from another contractor. Both contractors are supplying Type 3 systems.

Under Phase I, systems are being leased with an option to buy. Systems are being purchased as funds are made available; the option is being exercised on a system-by-system basis.

Phase IA is the reprocurement phase for AFSS requirements. The contract for Phase IA was awarded in December 1988. Under this phase, the remainder of the Type 3 ICSSs for AFSSs will be procured.

Products:

- Phase I:
  - 132 Type 1 systems for ATCTs and small TRACONs.
  - 31 Type 2 systems for larger TRACONs.
  - 45 Type 3 systems for AFSSs.
- Phase IA:
  - 14 Type 3 systems (plus 3 support systems for the FAA Aeronautical Center).

Progress/Activity from October 1989 through November 1990:

- Phase IA
  - Factory testing completed.
  - Nine Type 3 systems delivered.

Related Projects/Activities:

- 21-11 VSCS/22-12 TCS. The ICSS will enable controllers and specialists to establish voice communications with operations personnel in ATCTs/TRACONs having a TCS and in ARTCCs and ACFs equipped with VSCS.
- Requirement for ICSS Phase IB are in 22-12 TCS.
- 21-11 VSCS/22-13 ATCT/TRACON Establishment, Replacement, and Modernization. ICSS will be installed as the voice communications switching system for new, replaced, or modernized ATCTs and TRACONs.
- 23-01 FSAS. ICSS is the communications equipment of the AFSS facility that will enable the AFSS to establish voice communications with pilots and other operational personnel throughout the ATC system.
- NICS - Interfacility communication will be provided by NICS.

Problems Resulting in Delays: Minor delays in FSS consolidations have resulted from module failures, rework, and associated testing.

Delays Minimized by: ICSS difficulties have been resolved and the remainder of the ICSS systems will continue to be shipped.

List of Contractors:

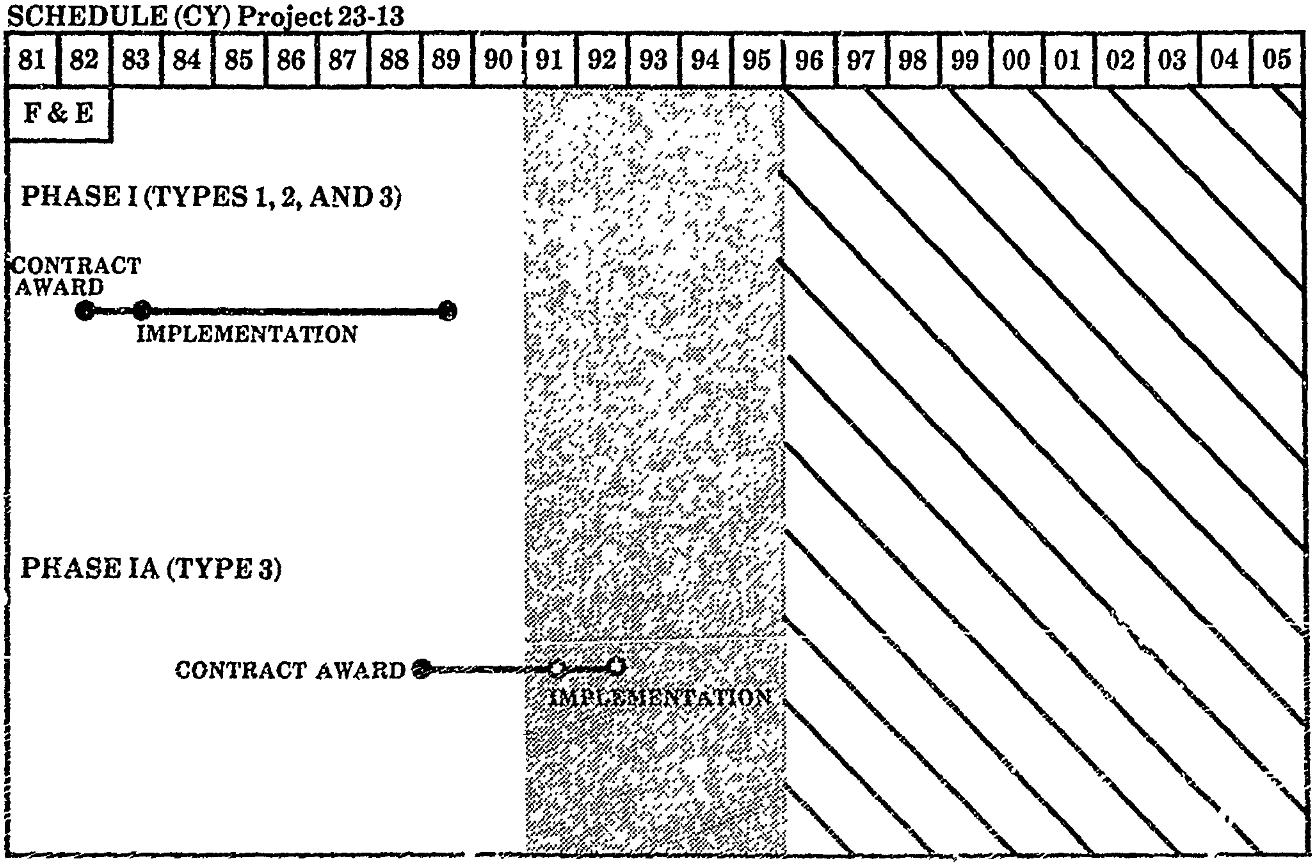
Phase I:

- Litton-AMECOM
  (62 ICSS units)
  College Park, Maryland
- Denro, Inc.
  (146 ICSS units)
  Gaithersburg, Maryland

Phase IA:

- Denro, Inc.
  (14 ICSS units)
  Gaithersburg, Maryland

SCHEDULE (CY) Project 23-13



PROJECT 24-02: Communications Facilities Consolidation /Network

Purpose: This project reduces the cost of operating radio communications facilities by consolidating air/ground communication into larger, more cost-effective, consolidated Remote Communication Facilities (RCFs) in lieu of the existing large number of facilities -- approximately 2,700 Remote Transmitter/Receivers (RTRs), Remote Center Air/Ground (RCAG) communications facilities, Remote Communications Outlets (RCO), and Backup Emergency Communications (BUECs).

- The consolidation and relocation of remote communication facilities establishes communication facilities which serve the combined needs of air traffic control and flight service station facilities.
- Consolidation of these facilities into FAA-owned facilities is one step in FAA's program to provide a solid-state, remote-monitored radio communications network. These efforts result in cost-savings and cost-avoidance through reduced land leases, reduction in maintenance and maintenance travel, reduced power consumption (heating and air conditioning for separate buildings), and reduction in leased services.

Approach: Multiple RTR facilities at many airports are being consolidated as solid-state receivers and transmitters are installed. FSS communications not already at VORTACs are being consolidated at selected FAA-owned facilities. New and existing RCAGs are being collocated with other FAA-owned facilities as Air Traffic requirements dictate. A frequency interference study, required prior to combining large numbers of transmitters and receivers, has been completed. Development of receiver multicouplers and transmitter combiners is underway to reduce the number of antennas required, especially at VORTACs. This project also includes interference suppression devices and ancillary devices such as multicouplers, combiners, filters, and cavities. It has been determined that an RCF can operate with a maximum of 12 frequencies.

A national air/ground communications network plan has been completed and will be updated as needed. Air/ground communications coverage will be provided down to 2,000 feet above ground level in all areas except where there is low air traffic count. In certain specifically defined areas, coverage will be required to or approaching ground level.

Products: Each region has selected a list of proposed sites to be consolidated and completed a detailed cost estimate for each site. Two hundred (200) facility consolidations are being used as the estimate to be achieved by the year 1992.

Progress/Activity from October 1989 through November 1990:

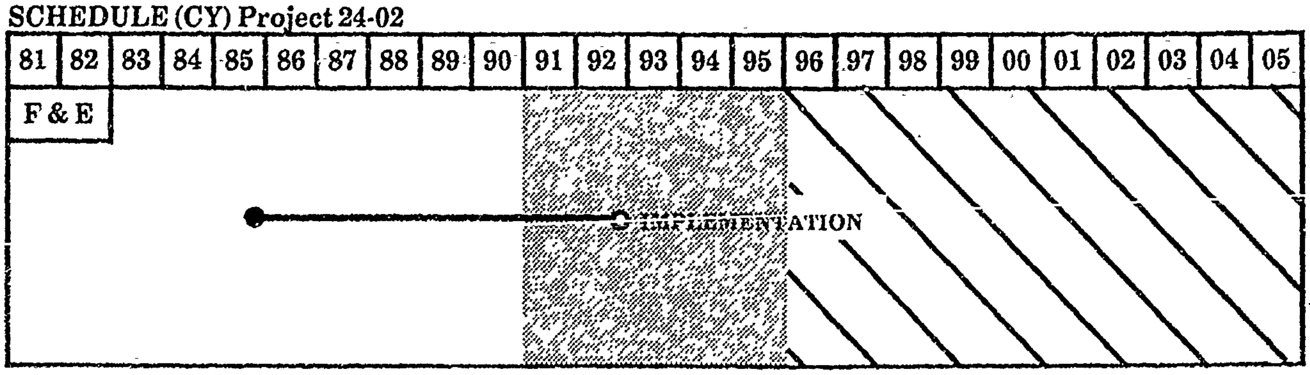
- Developed updated consolidation plan.
- Prepared antenna and transmitter/receiver procurement requests.

RelatedProjects/Activities: This project will require interfacility communications service from NICS. That service will provided through 25-03 RML Replacement and Expansion. Consolidated communication facilities with 25-08 RCE installed will include 26-01 RMMS. 26-15 NAS Spectrum Engineering has conducted Electromagnetic Compatibility (EMC) studies and EMC guidelines have been developed for consolidated sites. Continuing effort beyond 1992 will be provided by 34-23 Communications Facilities Expansion and 44-03 Air/Ground Communication RFI Elimination.

List of Contractors: Implemented by FAA regions using various identical communications equipment currently deployed throughout the NAS.

Section 4

SCHEDULE (CY) Project 24-02



PROJECT 24-03: VORTAC

Purpose: Very High Frequency Omnidirectional Ranges (VOR) with Distance Measuring Equipment (DME) or Tactical Air Navigation (TACAN) are en route air navigational and approach aids used by pilots to conduct safe and efficient flights and landings. This project forms a modern cost-effective national navigation network which provides required coverage through replacement, relocation, conversion, and establishment of VORTAC, VOR/DME, and VHF Omnidirectional Range Test (VOT).

- Replacements. From FY 82 through FY 89 the FAA replaced 950 vacuum tube-type VOR and VORTAC systems with modern solid-state equipment. New RMM compatible DME systems will replace existing DME systems at 40 VOR/DME sites. The units removed from these sites will be redeployed to ILS sites. 77 tube-type VOTs will be replaced with solid-state equipment. VOT equipment will be replaced with solid-state equipment.

- Relocations. VOR/DME facilities are being relocated to accommodate route structure changes, real estate considerations, and site suitability.

- Conversions. Conventional VORs are being converted to Doppler VORs to solve siting problems and to obtain required signal coverage.

- Establishments. Operational requirements that arise in various geographic areas require the establishment of VHF navigational aid services. Provisions have been made to establish 70 VOR/DME sites including new VOR/DME equipment at non-Federal takeover locations. DME systems will be added at 47 sites equipped with VOR only. As many as 35 VOT sites may be established.

Approach: All vacuum tube-type VOR and VORTAC equipment has been replaced with solid-state equipment which has embedded remote monitoring and control capabilities. DME service will be provided at all VOR facilities. A network plan has been developed to redistribute VORs to meet operational requirements. Tube-type VOR test (VOT) equipment will be replaced with solid-state equipment. VOR/DME and VOT sites will be established to meet operational requirements.

Products:

	1981-1985 Quantity	1986-1990 Quantity	1991-2000 Quantity
Replace VORTAC	725		
Replace VOR/DME	145		
Replace VOR	80		
Establish VOR/DME			70
Establish DME at VOR			47
Replace DME at VOR			40
Reinstall DME at ILS			40
Convert VOR to DSB DVOR		15	25
Retrofit DVOR with RMM & DSB		50	
Establish VOT		35	
Replace VOT		77	

Progress/Activity from October 1989 through November 1990:

- VOR/DME contract award.
- VOR/DME system design review.
- VOT completed design qualification test.

Related Projects/Activities: 23-09 AWOS, 24-11 DF, 24-17 LORAN-C Systems, 26-15 NAS Spectrum Engineering, 44-12 Low-Power TACAN Antennas, 44-14 SustainVOR/VORTAC, 44-30 Sustain DME, and remote communications facilities.

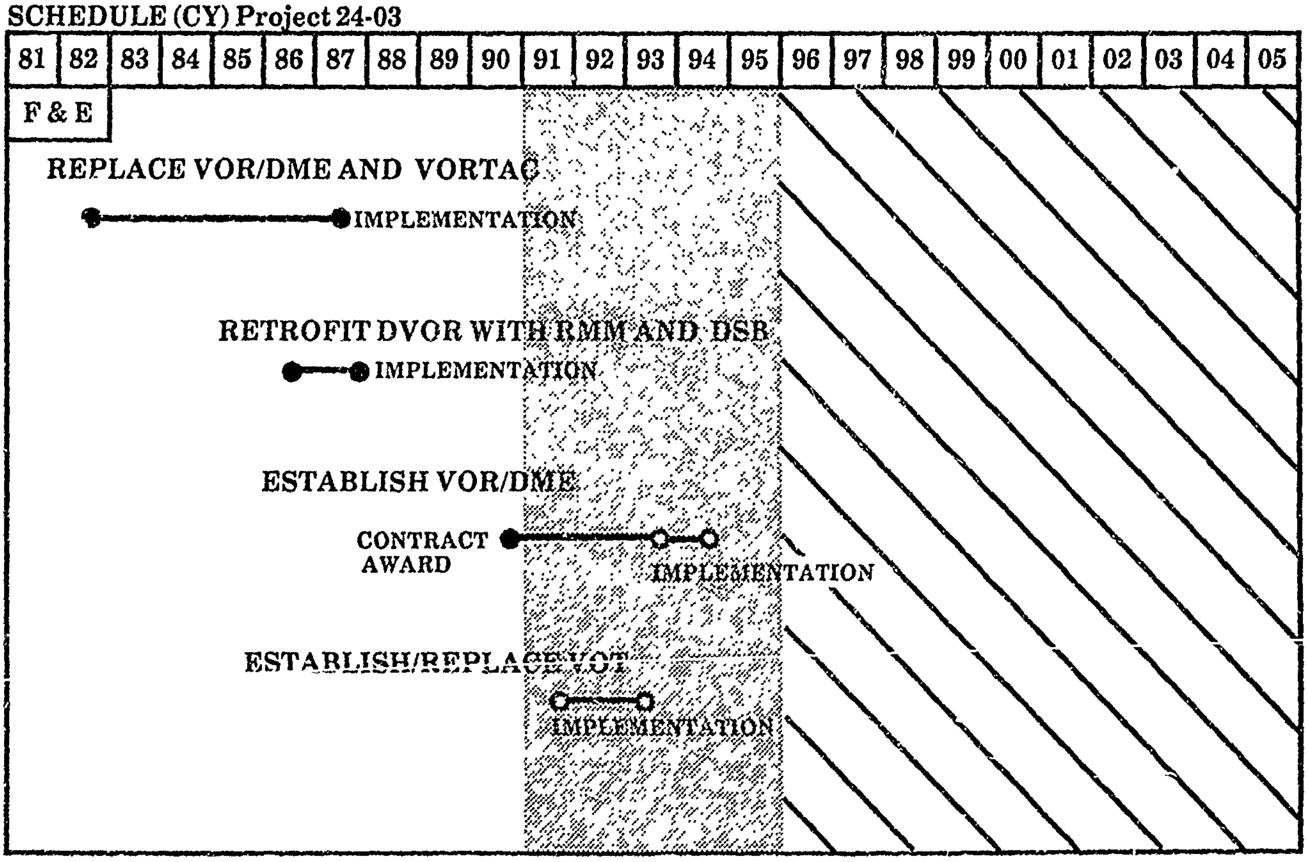
List of Contractors:

- Canadian Marconi Company
  (112 VOT systems)
  Kanata, Ontario, Canada

  - Antenna Products
    Mineral Wells, Texas

- Wilcox Electric, Inc.
  (VOR/DME units)
  Kansas City, Missouri

SCHEDULE (CY) Project 24-03



PROJECT 24-07: Microwave Landing System (MLS) - First Procurement, Design Phase, and Production Phase I

Purpose: In 1978 MLS was adopted by the International Civil Aviation Organization (ICAO) as a world standard to replace ILS. MLS consists of azimuth, elevation, and DME/P equipment. It provides precision guidance that is expected to satisfy the full range of operational requirements, both civil and military, for all types of aircraft in all categories of landings. It also will overcome inherent limitations of the ILS. MLS signals are minimally affected by surrounding terrain, structures, and weather effects, thereby providing low-cost installation in all airport environments. MLS with RMM capabilities will reduce the maintenance manpower requirements associated with ILS. MLS provides a radio signal which allows multiple-curved and segmented approaches and selectable glide slope angles when aircraft are equipped with appropriate MLS avionics.

MLS has the potential to improve NAS capacity. MLS can improve capacity by providing lower IFR minimums, allowing capacity enhancing IMC flight operations, and by providing precision approach services at locations where ILS service is not possible or beneficial. The use of advanced operational procedures to improve capacity is particularly significant in complex multi-airport environments such as metropolitan New York City, Chicago, Dallas-Fort Worth, and San Francisco, and yields benefits unavailable with ILS.

Approach: In 1984 a multi-year contract was awarded to procure initial quantities of production quality systems. Funding was provided for 15 systems each in FY 82 and FY 83, 28 systems in FY 84 (2 for training and test bed), and 60 systems each in FY 85 and FY 86. The contract was terminated for default without substantial delivery in 1989. Because of the delays and contract termination, the entire program has been restructured and out-year schedules are under review. After completion of the evaluation program, decisions will be made regarding full production of CAT II/III systems.

In 1989 Congress directed the FAA to develop a nine-project MLS evaluation program to evaluate the economic and operational benefits of MLS. This program will be completed by 1991 and the results will provide the basis for a decision on whether to proceed with a full CAT II/III MLS production contract. Current program implementation strategy is to complete the evaluation program, proceed with a CAT III prototype limited production procurement, and finally to proceed with a full production follow on CAT III procurement if results from the program indicate MLS benefits.

The MLS program includes, at most locations, a Medium-intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR). MALSRs installed to serve ILS will not be duplicated to serve a subsequent MLS installation on the same runway.

The operational Service Test and Evaluation Program (STEP) has been completed using prototype equipment at several typical locations. Users have participated with airborne receivers provided by the Government. Using results from STEP, operational procedures and obstacle clearance/critical area criteria are being developed to support the implementation process. These include unique MLS capabilities, such as curved and segmented approaches, missed approach and departure guidance, as well as conventional approaches.

New Terminal Instrument Procedures (TERPS) criteria applicable to both MLS and ILS are now in place. These criteria permit the design and use of MLS curved approach procedures. Analyses are being conducted to support ICAO standards for such items as DME/P, auxiliary data, operational criteria and procedures.

Products: Approximately 464 MLSs are planned to be procured through the year 2000 under Phase I of a production contract (subject to the results of the evaluation program). Procurements of an additional 786 or more MLSs are planned after 1999 and are included in Chapter 3 as Phase II. All these systems will be installed at sites selected from the more than 1400 locations currently qualified for a precision approach. The Department of Defense plans to procure a total of 405 fixed-base MLSs.

Progress/Activity from October 1989 through November 1990:

- A contract has been awarded for two CAT I systems.

Related Projects/Activities: 24-08 RVR will be installed with MLSs where weather conditions meet requirements in Airway Planning Standard Number One (APS No. 1). ILSs will be decommissioned in accordance with the ILS/MLS transition plan that minimizes impacts on users. Under this plan ILSs will not be decommissioned until a date yet to be established after ILS/MLS parity is reached in the United States. Some MLSs will not have (24-10 ALSIP) MALSRs due to obstructions to the plane of the MALSR light or excessive installation costs due to terrain. 26-15 NAS Spectrum Engineering is required for MLS establishment.

Problems Resulting in Delays: The Hazeltine contract default has caused delays to the MLS program.

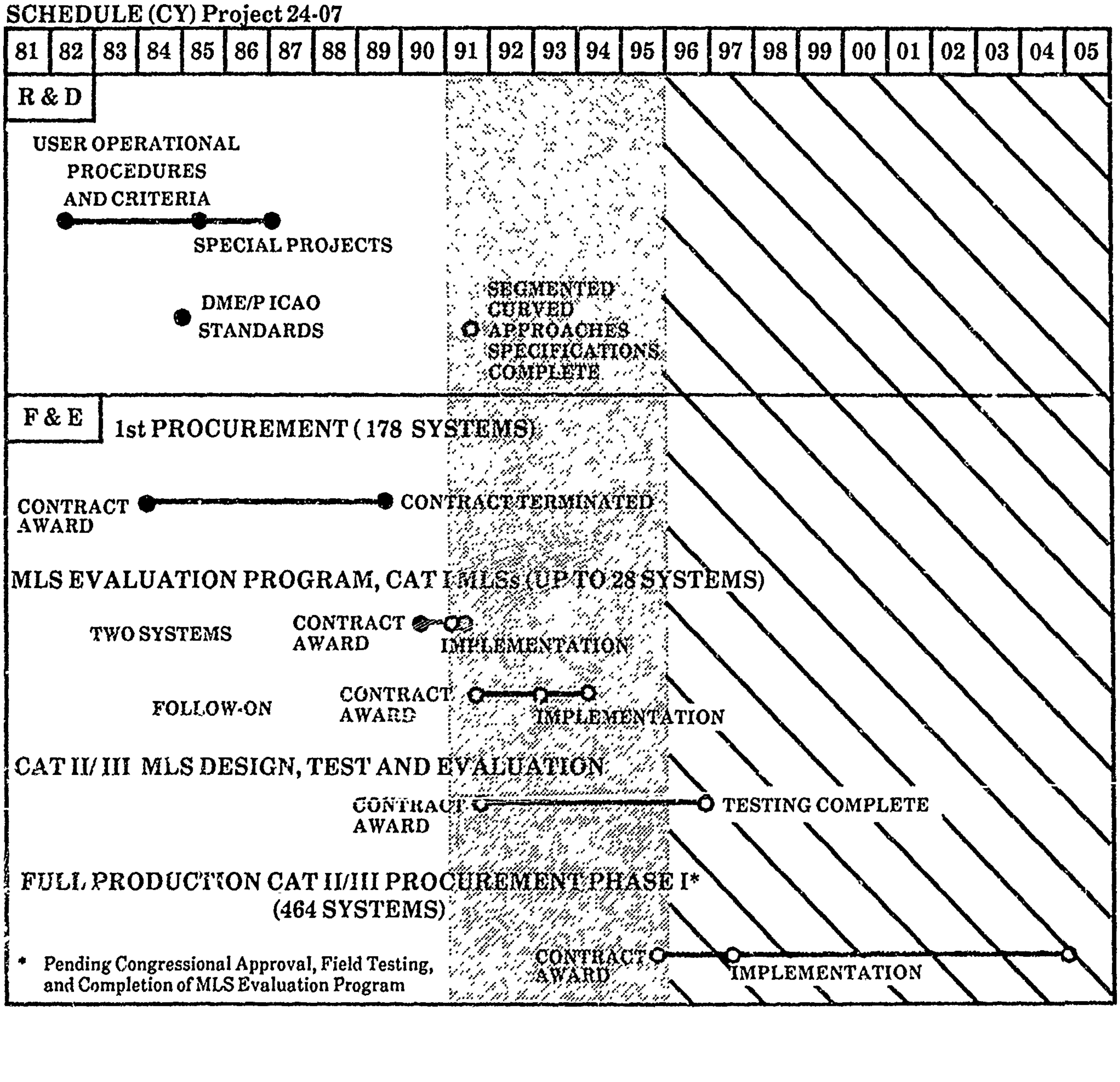
Delays Minimized by:

- FAA has awarded a contract for two CAT I, FAR paragraph 171, systems and will soon announce an RFP for two to 26 additional systems to support its demonstration program.
- The FAA has developed a dual-source strategy for CAT II/III system acquisition to preclude future contractual problems.
- The revised MLS program strategy and schedule supports FAA's international obligations to equip designated runways.

List of Contractors:

- Wilcox Electronics, Inc.
  (2 CAT I MLSs)
  Kansas City, Kansas

SCHEDULE (CY) Project 24-07



PROJECT 24-08: Runway Visual Range (RVR)

Purpose: This project establishes and modernizes existing RVR systems on qualifying Category I, II, and III runways.

There are 450 RVR systems of various generations currently in service in the NAS. Approximately 10 percent of these consist of Runway Visibility Value (RVV) equipment which requires manual computation by the air traffic controller to arrive at RVR data and does not take into account such variables as runway lighting intensity and ambient light conditions.

Approach: A new RVR system, employing current technology, will provide an inherent capability to satisfy CAT I through CAT IIIb requirements. The new RVR System will be fielded to replace all existing RVV and RVR equipments which are maintenance intensive and employ outdated technology. The project will also provide new generation equipment for establishment at qualifying facilities to satisfy instrument landing facility requirements.

Products:

- Replace existing systems 247
- Establish new locations 97

Progress/Activity from October 1989 through November 1990:

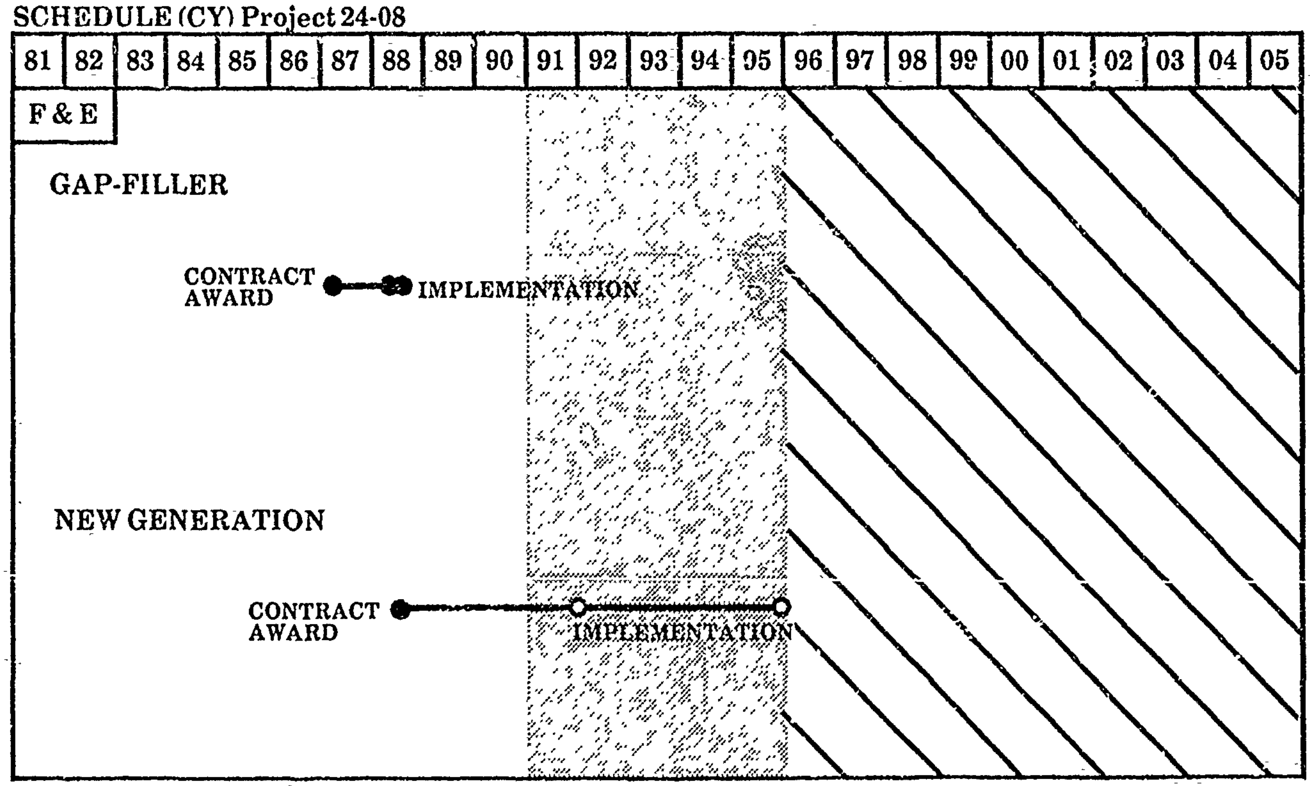
- Critical design review completed.
- Contract option exercised for 176 additional systems.

Related Projects/Activities: 21-12 AAS (TCCC), 23-09 AWOS (ASOS), 24-07 MLS, 26-01 RMMS, 34-06 ILS, 34-08 RVR Establishment, and 44-29 RVR Replacement.

List of Contractors:

- Teledyne Controls
  (New Generation systems)
  Los Angeles, California
  - Handar
    Sunnyvale, California

SCHEDULE (CY) Project 24-08



PROJECT 24-09: Visual Navaids

Purpose: This is an ongoing multiyear program to provide safety-related facilities and enhancements at airports. The facilities provided are: Medium-intensity Approach Lighting Systems with Runway Alignment Indicator Lights (MALSR), Runway-End Identification Lights (REIL), Visual Approach Slope Indicator (VASI) or Precision Approach Path Indicator (PAPI), and Omnidirectional Approach Lighting System (ODALS).

This program also provides equipment for the replacement or establishment of remote radio control capabilities for visual aids which will meet the operational requirements of air traffic control and will remove complex manually activated coding methods. The new system permits single-button control of each visual-aid function.

Approach: Visual aid projects are being installed in conjunction with other related projects where possible. MALSR lights installed to serve an ILS will not be duplicated for a subsequent MLS installation on the same runway.

Products: Quantities vary from year to year depending on the urgency of the requirement, validation of requirements, and availability of funds. The radio control retrofit program will involve 1,348 airports having a total of 3,032 visual aids.

Progress/Activity from October 1989 through November 1990:

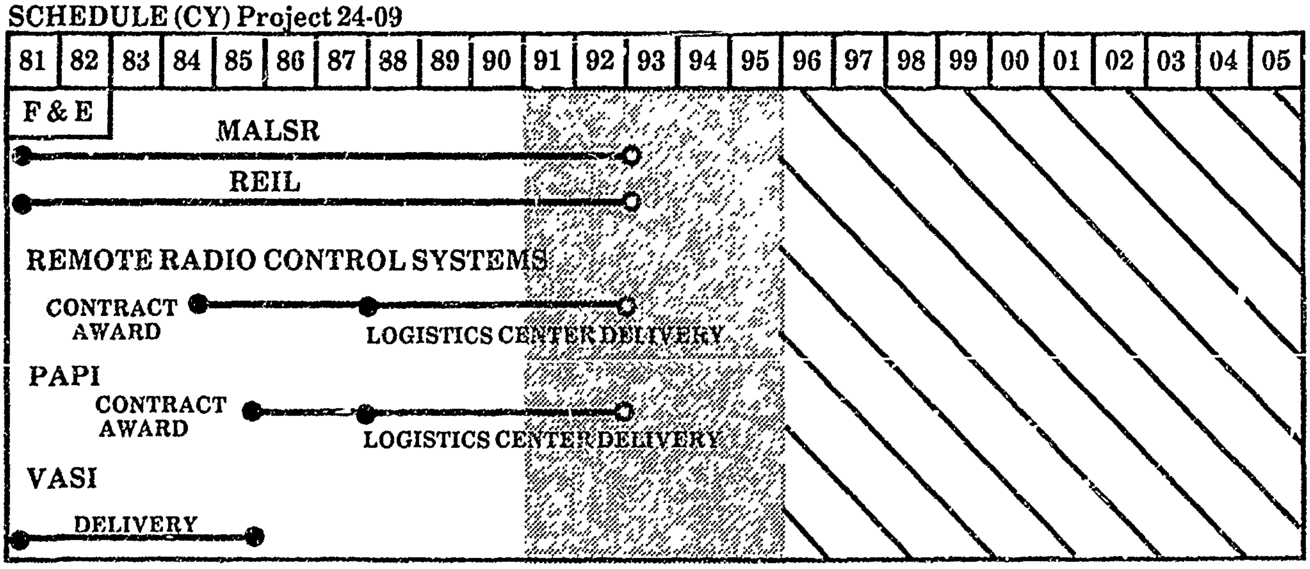
- Sonicraft completed delivery of 612 remote radio control systems.
- Sonicraft completed delivery of 90 PAPI systems: (FY80-83 and 85 requirements).

Related Projects/Activities: This project, when combined with 24-10 ALSIP, modernizes the currently installed airport lighting systems. The modernization results in improved safety and increased energy efficiency for both the approach and guidance lighting systems. 24-15 NAS Spectrum Engineering is required for all radio control retrofits. 26-05 Large Airport Cable Loop Systems, and 34-09 Establish Visual Navaids for New Qualifiers are also related projects.

List of Contractors:

- DME Corporation
  (FY 87-89 REIL)
  Ft. Lauderdale, Florida
- New Bedford Panoramex
  (FY 86-87 RRCS)
  Upland, California
- AVW Electronic Systems
  (FY 86-89 PAPI)
  El Segundo, California
- Sonicraft
  (FY 85 PAPI, FY 80-83 RRCS, FY 84-85 RRCS)
  Chicago, Illinois
- Godfrey Engineering
  (FY 86 REIL)
  Oldsmar, Florida
- AVW Electronic Systems
  (FY 86-89 MALSR)
  El Segundo, California

SCHEDULE (CY) Project 24-09



PROJECT 24-10: Approach Lighting System Improvement Program (ALSIP)

Purpose: This is a multiyear program to retrofit existing airport runway approach lighting systems with low-impact resistant approach light supports and other improvements. The intent is to bring approach lighting systems, built before 1975, up to current standards for new installations.

Replacement of the existing rigid tower structures with light-weight and low-impact resistant structures that collapse or break apart upon impact reduces damage to an aircraft should it strike an approach light tower structure during departure or landing. This should help reduce the severity of approach and landing accidents. This effort was mandated by FAA Order 1811.4, System Requirements Statement/Acquisition Authorization for the Approach Lighting System Program, signed by the Administrator on June 12, 1979, in response to an NTSB recommendation. The program also results in a significant reduction in FAA energy consumption and the replacement of outdated and obsolete equipment.

Federal air regulations authorize a pilot to descend below the published minimum descent altitude or decision height, provided that visual references (e.g., approach lights, threshold lights) for the intended runway are distinguishable. The installation of threshold light bars as part of the existing MALSR provides a visual reference to the runway threshold [illegible]kes the present system more effective in low-[illegible] conditions. The modification enhances safety and complies with ICAO minimum requirements.

Approach: In the interest of energy conservation, high-intensity approach lighting systems with sequence flashers, Categories II and III runway configurations, are to be switchable to the simplified short-approach lighting system with sequence flashers when visibility conditions permit. The simplified short-approach lighting system configuration uses less than half the lights of the full high-intensity approach lighting system. In addition, the program retrofits nonfrangible high-intensity approach lighting systems on Category I runways with frangible medium-intensity approach lighting systems with sequence flashers. When the program is fully implemented, energy consumption of these systems will have been reduced by 60 percent over FY 76 base-year requirements; and approach lighting systems will be of two standard types -- ALSF 2 and MALSR.

Products:

- 250 SSALF, SSALR, and ALSF-1 will be converted to MALSRs and will be placed on low-impact resistant structures.
- 68 ALSF 2s will be provided with low-impact resistant structures and the capability to switch to SSALR configuration.

Progress/Activity from October 1989 through November 1990:

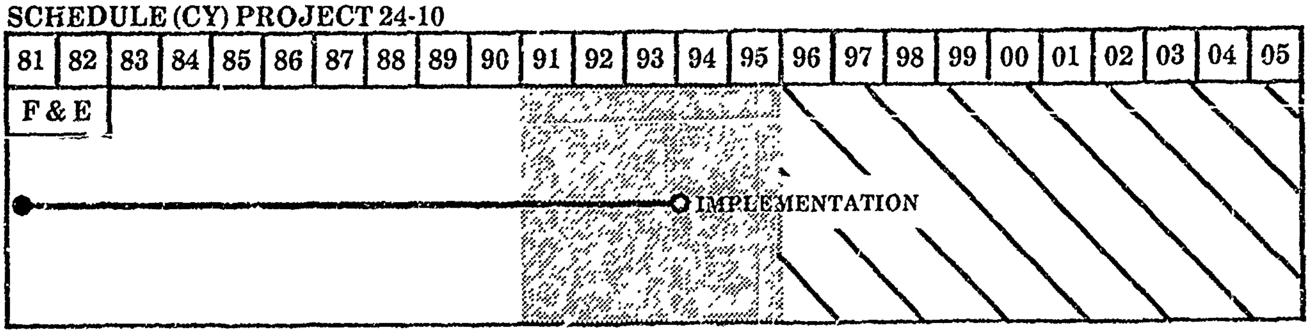
- Initial delivery of ALSF-2 and MALSR equipment completed.

Related Projects/Activities: This project, when combined with 24-09 Visual Navaids, will modernize the currently installed airport lighting systems. The modernization will result in improved safety and increased energy efficiency for both the approach light and guidance lighting systems. 44-33 ALSIP Continuation provides continuing support.

List of Contractors:

- Airflo Instrument Company
  (42 ALSF 2 systems)
  (FY 82-84 and FY 85 ALSF 2)
  Hartford, Connecticut

SCHEDULE (CY) PROJECT 24-10



PROJECT 24-11: Direction Finder (DF)

Purpose: This project upgrades existing direction finder (DF) systems with solid-state equipment, establishes sites for additional coverage and provides capabilities for remote maintenance monitoring, control, and certification. Additionally, new indicators will be established within selected FSS or AFSS control facilities to increase operational efficiency.

The replacement of the existing tube-type DF system with solid state equipment provides cost savings and cost avoidance by reducing power consumption and maintenance requirements.

Approach: The existing tube-type DF equipment will be replaced with new solid-state equipment which has remote maintenance monitoring, control, and certification capabilities.

This project will establish/replace 372 systems. There have been 127 of these systems procured to date. An existing contract is procuring 115 systems. A future procurement of 130 systems is necessary to provide the total complement of 372 systems.

In areas where present DF equipment does not provide complete coverage, new sites will be established and collocated with existing FAA facilities (such as VORTAC). New displays and processing equipment will be located within AFSS facilities interfacing with both existing and new solid-state receiver sites. Multiple DF receivers will be networked to the display equipment.

The regional network studies indicate that the total number of DFs will be 372.

Products:

- 66 new establishments.
- 3 support systems for the FAAAC.

Progress/Activity from October 1989 through November 1990:

- System installed at T&E site.
- System OT&E complete (Green Bay, Wisconsin).

Related Projects/Activities: DFs will be collocated with communications equipment, depending on the results of facility consolidation activity. 23-01 FSAS and 44-31 Replace Type FA9964 DF are also related projects.

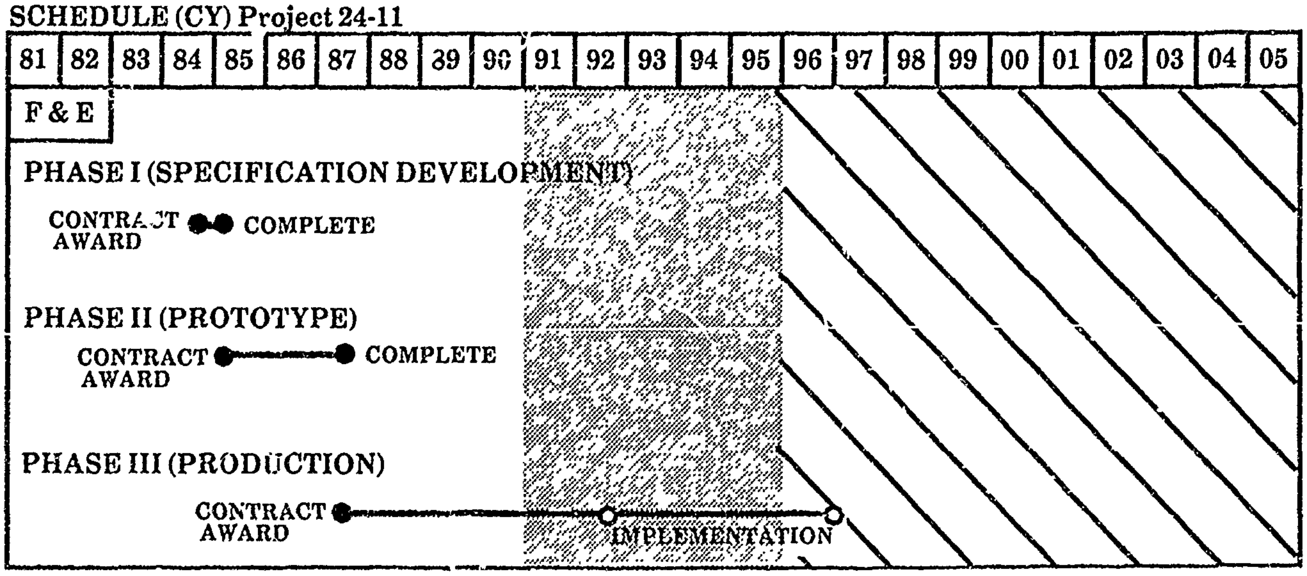
Problems Resulting in Delays: The first ORD was delayed to accommodate additional operational testing.

Delays Minimized by: FAA is devoting resources to expedite completion of field tests and to thoroughly demonstrate DF system compliance with Air Traffic operational requirements.

List of Contractors:

- ST Systems Corporation (STX)
  (up to 115 systems plus spares)
  Vienna, Virginia
  - CELTECH Corporation
    Carlsbad, New Mexico
  - CATC Corporation
    San Diego, California

SCHEDULE (CY) Project 24-11



PROJECT 24-12: Mode S

Purpose: This project will improve the surveillance capability of the Air Traffic Control Radar Beacon System (ATCRBS). Mode S provides more accurate positional information and minimizes interference. This is accomplished by discrete interrogation of each aircraft and improved processing of aircraft replies.

In addition, Mode S provides the medium for a digital data link which will be used to exchange information between aircraft and various ATC functions and weather databases.

Approach: 137 Mode S systems will be procured to provide coverage down to the ground at 108 terminals and down to 12,500 feet above mean sea level (MSL) in other areas. Mode S systems are designed to be remote maintenance monitored and unmanned. Existing ATCRBS antennas not already capable of improved azimuth resolution will be replaced and additional antennas procured where increased data rates are required.

Products:

- 137 Mode S systems at a maximum production capability of 48 per year.
- Specification for Mode S antenna for long-range radars.
- 13 equipment shelters.
- 56 Mode S back-to-back monopulse antennas for en route surveillance sites.
- 41 new and 34 modified rotary joints.

Progress/Activity from October 1989 through November 1990:

- Completed qualification testing for the front end/interrogator, the en route rotary joint, and the back-to-back antenna.
- Initiated integration of Real Time Software Release 1.1 for the Data Processing Subsystem (DPS).
- Completed design qualification testing of Calibration Performance Monitoring Equipment (CPME).
- Initiated formal system qualification testing.
- Initiated Deployment Readiness Review.

Related Projects/Activities: 21-12 AAS software (21-13 AERA) will use Mode S data link for transmitting data from ACFs to aircraft. 23-05 Aeronautical Data Link will use the Mode S data link to transmit weather data to aircraft. This project will require telecommunications service from the NICS. Projects providing that service include 25-02 DMN and 25-03 RML Replacement and Expansion. The Traffic Alert and Collision Avoidance System (TCAS) uses Mode S data formats and frequencies. Mode S will be an RMM system (26-01 RMMS). Most terminal and en route surveillance radars will be collocated with Mode S and share a digital interface with the ATC automation system. 26-15 NAS Spectrum Engineering is required to assure interference-free operation. Also related are 34-12 ATCBI Establishment, 34-20 Surveillance System Enhancements, 44-45 ATCRBS Relocation, 44-46 ATCBI Replacement, 44-48 AN/FPS-117 Beacon Improvement, 63-05 Aeronautical Data Link Communications and Applications, 64-27 Landing Monitor for Closely Spaced Parallel Runways, and 64-28 Improve Capacity of Closely Spaced Parallel Runways.

Problems Resulting in Delays: Problems in developing and integrating the DPS software resulted in a slip in the program schedule.

Delays Minimized by: The contract has been modified to deliver software in two releases, minimizing the impact of development problems on the deployment schedule.

List of Contractors:

- Westinghouse Electric Corporation
  (interrogators for 137 Mode S sensors)
  Linthicum, Maryland

- Unisys Corporation
  (data processing for 137 Mode S sensors)
  Paoli, Pennsylvania

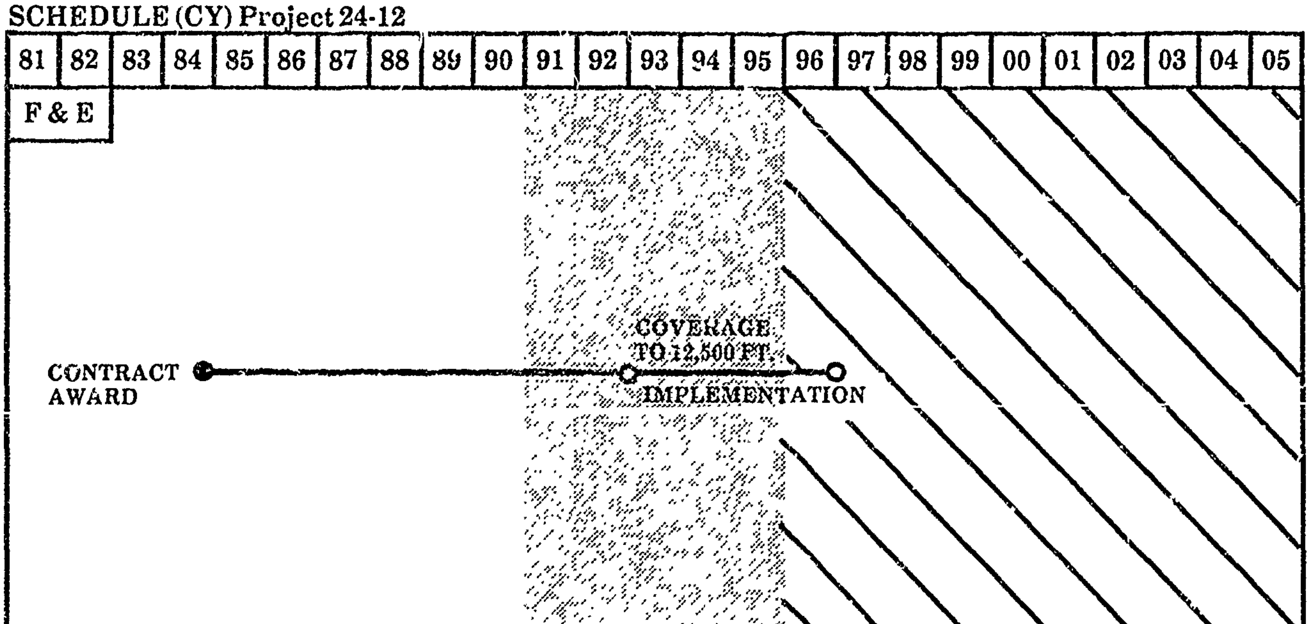
  - Wilcox Electronics
    Kansas City, Missouri

  - Unr-Rohn
    Birmingham, Alabama

- Radiation Systems Incorporated
  (antennas)
  Sterling, Virginia

- Kevlin Microwave Corporation
  (rotary joints)
  Wilmington, Massachusetts

SCHEDULE (CY) Project 24-12



PROJECT 24-13: Terminal Radar (ASR) Program

Purpose: This project provides economical radar service at airports with air traffic densities high enough to justify the service and upgrades the highest density airports with the latest state-of-the-art equipment.

Replacement of the ASR-4/5/6 is necessary because of the decreasing availability of spare parts and the high-maintenance workload. Repair parts for the ASR-4/5/6 radars are in short supply; parts from decommissioned units are being used to support field requirements..

Approach: Four separate activities have been combined to form this program.

- Replacement of 96 ASR-4/5/6 vacuum-tube radars with ASR-7/8/9 (leapfrog 16 ASR-7s to ASR-4/5/6 sites, leapfrog 40 ASR-8s to ASR-4/5/6, and install 40 ASR-9s at ASR-4/5/6 sites).

- Procurement of ASR-9 systems to provide radar service at airports where the air traffic volume increases to a level requiring the coverage.

- Relocation of existing solid-state radars (ASR-7/8) where necessary due to new construction interfering with required radar coverage or to changes in air traffic volume.

- Procurement of secondary radar systems to provide Air Traffic Control Radar Beacon System (ATCRBS) service at newly qualified facilities.

Data from ASR-9 radars is being remoted in digital format only. At the indicator site, the data is available in digital and analog format.

Products:

- Replace 96 radars.

- Establish the minimum number of additional radars.

- Leapfrog 56 radars.

- Procure up to 36 secondary radars.

- Raise antennas where required.

- Remote data from some terminal radars based on coverage requirements that will exist prior to ACF implementation.

Progress/Activity from October 1989 through November 1990:

- Implementation of ASR-9s has continued.

- The leapfrog program is underway.

Related Projects/Activities: 22-09 ARTS IIA software and hardware changes will be required to interface with the ASR-9. Changes to ARTS IIIA software will not be required to accept ASR-9 digital data. ASR-9 installations are planned to precede 24-12 Mode S installations and must be coordinated. The Terminal Radar, 24-14 Long-Range Radar, and 24-16 Weather Radar Program are involved with 26-15 NAS Spectrum Engineering since these systems compete for pulse repetition frequency (prf) and spectrum. This program will require interfacility communications service from the NICS. Projects providing that service include 25-02 DMN and 25-03 RML Replacement and Expansion. 32-13 ATCT Establishment, 34-13 Terminal Radar Digitizing, Replacement, and Establishment, 34-20 Surveillance System Enhancements, 44-43 Radar Pedestal Vibration Analysis, 44-60 Sustain/ Relocate ASR, 62-21 ASTA, and 64-13 ASR-9 Modification for Low-Altitude Wind Shear Detection are also related projects.

List of Contractors:

- Westinghouse Electric Corporation
  (ASR-9 Systems - 101 for FAA and 8 separately funded for DOD)
  Linthicum, Maryland

  - Varian
    Palo Alto, California

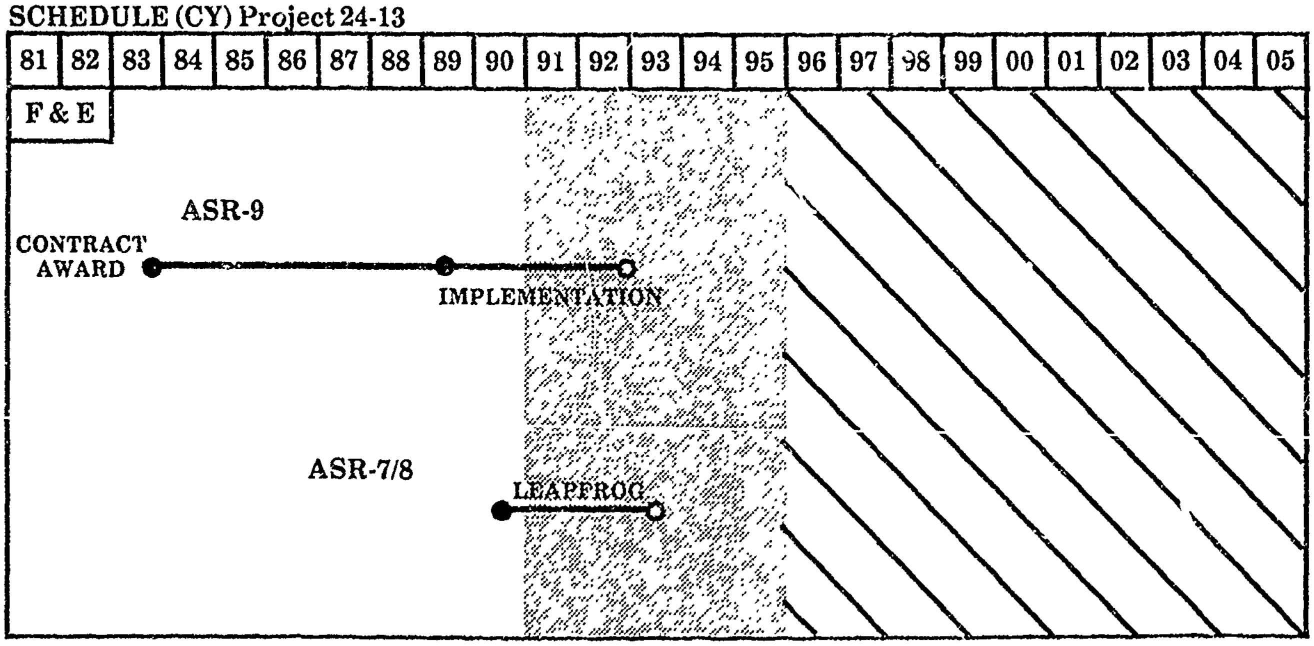
  - Keltec
    Ft. Walton Beach, Florida

  - Kevlin
    Woburn, Massachusetts

  - General Defense
    Pinellas Park, Florida

- Raytheon Service Company
  (leapfrog of ASR-7/8 to new locations)
  Washington, District of Columbia

SCHEDULE (CY) Project 24-13



PROJECT 24-14: Airport Surface Detection Equipment (ASDE-3) Radar

Purpose: The ASDE-3 will provide radar surveillance of aircraft and airport service vehicles at high-activity airports. Radar monitoring of airport surface operations (ground movements of aircraft and other supporting vehicles) is required to provide an effective means of directing and moving surface traffic. This is especially important during periods of low visibility such as rain, fog, and night operations.

Approach: The contract for a ground surveillance radar that will map the airport complex and determine aircraft or service equipment locations and movement was awarded in 1985. An option to this contract was exercised in 1988 to provide additional sensors.

The ASDE-3 antenna may be located on top of the Airport Traffic Control Tower (ATCT) or located remotely on its own tower. Installations on existing ATCTs may require structural modifications to the tower.

Products: The basic contract will buy 30 ASDE-3 systems for 17 new sites (includes FAA Academy) and for replacement of 13 older ASDE systems at existing sites. Three additional sensors, provided via contract option, will satisfy the requirement for three dual-sensor systems.

Progress/Activity from October 1989 through November 1990:

- Completed design qualification testing.
- Installed system at operational test site (Pittsburgh, PA).
- Initiated field test and evaluation test.
- Initiated NAS integration test.
- Initiated remote monitoring system test.

Related Projects/Activities: 26-01 RMMS will provide remote maintenance monitoring for ASDE-3s. 26-15 NAS Spectrum Engineering will assure interference-free operation. 34-14 Additional ASDE Establishment, 62-21 ASTA, and 62-23 AMASS are also related projects.

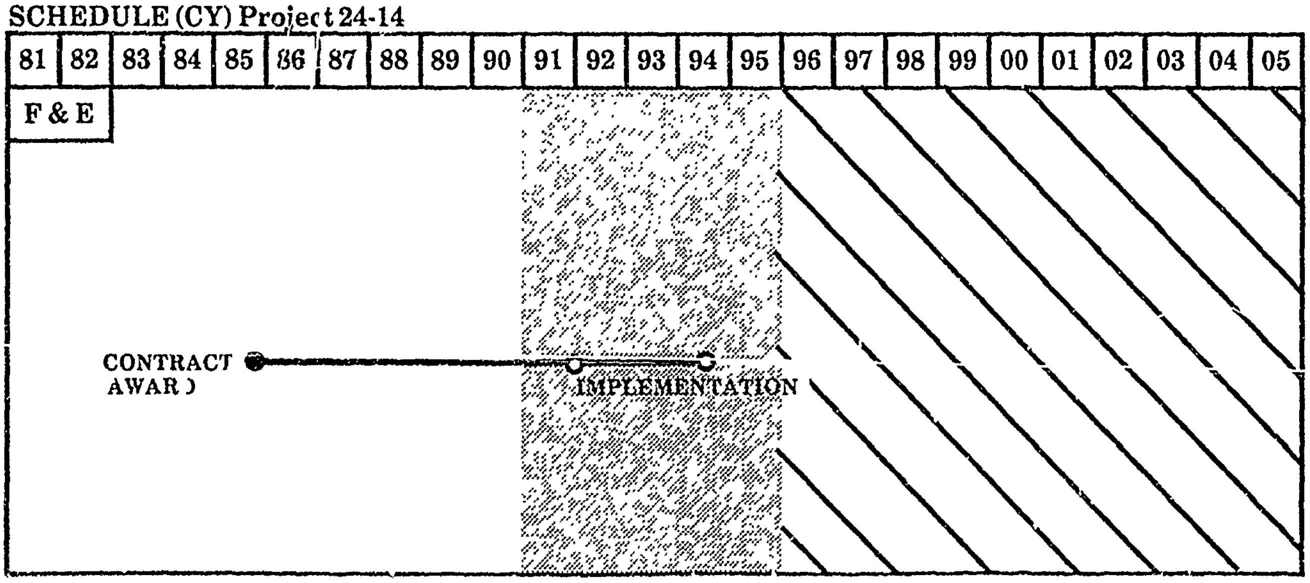
Problems Resulting in Delays: Field testing resulted in antenna reflector failure and dual target display.

Delays Minimized by: First implementation date adjusted to allow time to correct problems.

List of Contractors:

- Norden Systems, Incorporated
  (30 ASDE radar systems)
  Long Island, New York

SCHEDULE (CY) Project 24-14



PROJECT 24-15: Long Range Radar Program

Purpose: This project will provide a national surveillance network by installing the ARSR-4 at both existing and new sites and by replacing or upgrading existing radars that are obsolete or require excessive maintenance.

Accurate and timely data on the presence and movements of aircraft must be continuously available to the en route ATC system so that maximum use of the airspace can be safely afforded to all users.

This replacement/upgrade program will significantly reduce maintenance workload and logistics costs, as well as resolve support problems relating to the non-availability of spare parts for the existing old radars.

Approach: Replace selected portions of vacuum-tube radars with solid-state devices. Repair and refurbish other portions and improve tolerance to power fluctuations. Provide limited remote control. These steps will extend the usable life of the vacuum-tube radars RMM will be provided for all ARSR-3 facilities on a retrofit basis.

Expand the joint use of military radars to supplement existing coverage. Jointly procure with the USAF to replace all Joint Surveillance System (JSS) radars. Leapfrog ARSR-3 radars from JSS sites to locations with older ARSR/FPS systems..

Products:

- 42 three-dimensional ARSR-4 radar systems, including one for field support and training and three fully funded by DOD.
- 10 ARSR-3 leapfrogs relocations.
- Long range radar relocations as required.
- 76 upgraded en route tube-type radars.

Progress/Activity from October 1989 through November 1990:

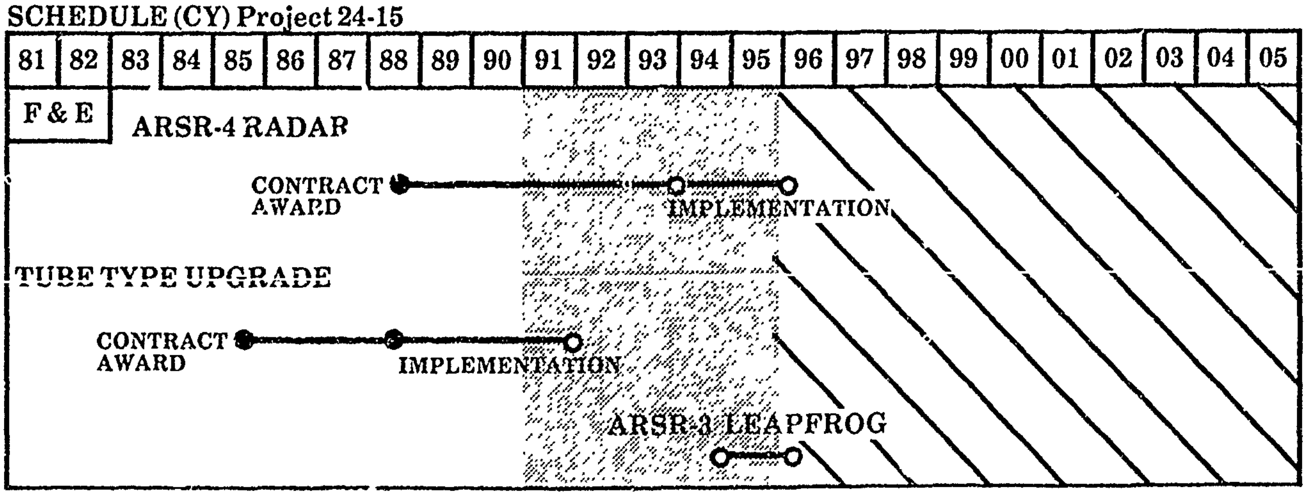
- ARSR-4 CDR completed.

Related Projects/Activities: 21-12 AAS will receive target and beacon data from the radars. 24-13 Terminal Radar, Long Range Radar, and 24-16/24-18 Weather Radar Programs are involved with 26-15 NAS Spectrum Engineering since these systems all compete for prf and frequency assignments. This program will require telecommunications service from the NICS. Projects providing that service include 25-02 DMN and 25-03 RML Replacement and Expansion. Long Range Radars will be remotely monitored from an MCC (26-01 RMMS). 24-12 Mode S is planned to be collocated and interfaced with the radars. 44-39 Relocate ARSR, 44 40 Long Range Radar Improvements, 44-42 Long Range Radar Radome Replacement, 44-43 Radar Pedestal Vibration Analysis, and 56-53 Refurbish AN/FPS-20 Radars are also related projects.

List of Contractors:

- Norden Systems, Incorporated
  (64 long range radar upgrade kits)
  Long Island, New York
- Westinghouse Electric Corporation
  (42 ARSR-4 systems - 39 jointly funded by FAA and DOD and 3 fully funded by DOD.)
  Baltimore, Maryland

SCHEDULE (CY) Project 24-15



PROJECT 24-16: Weather Radar Program

Purpose: This project establishes a weather radar network that will provide accurate aviation weather products. It will also furnish software algorithms to take advantage of the improved radar detection of weather data.

Radar weather presentations available from today's systems provide limited data for air traffic control. Improved weather data will increase aviation safety and fuel efficiency. In addition to the improvements to be gained in today's system, future automated ATC functions, such as AERA and improved flow management, must have reliable and accurate weather data before maximum fuel efficiency and manpower productivity gains projected for these improvements can be realized.

Approach: This program consists of the definition, development, procurement, and installation of a new Doppler weather radar for en route applications. The long-range Doppler weather radar for en route applications, known as the Next Generation Weather Radar (NEXRAD), is being funded jointly by the Department of Commerce (60 percent), the Department of Defense (20 percent), and the FAA (20 percent).

Interim display capability will be provided by Principal User Processors (PUP) to support operation prior to central weather processor (CWP) availability.

Products:

- NEXRAD
  - CONUS network (joint purchase with FAA, National Weather Service, and DOD) 113
  - FAA 13
  - DOD 44
  - NWS support 3
  - Other 3
- Displays and processors for ARTCCs 231

Progress/Activity from October 1989 through November 1990:

- Operational test and evaluation completed with the prototype NEXRAD.
- Production readiness demonstration completed.
- Initiated DRR process for the NEXRAD PUP.
- Terminal NEXRAD deleted because of limited benefit prior to availability of TDWR.
- Full production option exercised following successful operational tests.

Related Projects/Activities: 23-02 CWP and NICS are related activities. 24-13 Terminal Radar, 24-15 Long-Range Radar, and 24-16/24-18 Weather Radar Programs are involved with 26-15 NAS Spectrum Engineering since these systems compete for prf and spectrum. FAA non-CONUS NEXRADs will be remote maintenance monitored (26-01 RMMS). 64-16 Weather Enhancements provides future improvements to NEXRAD.

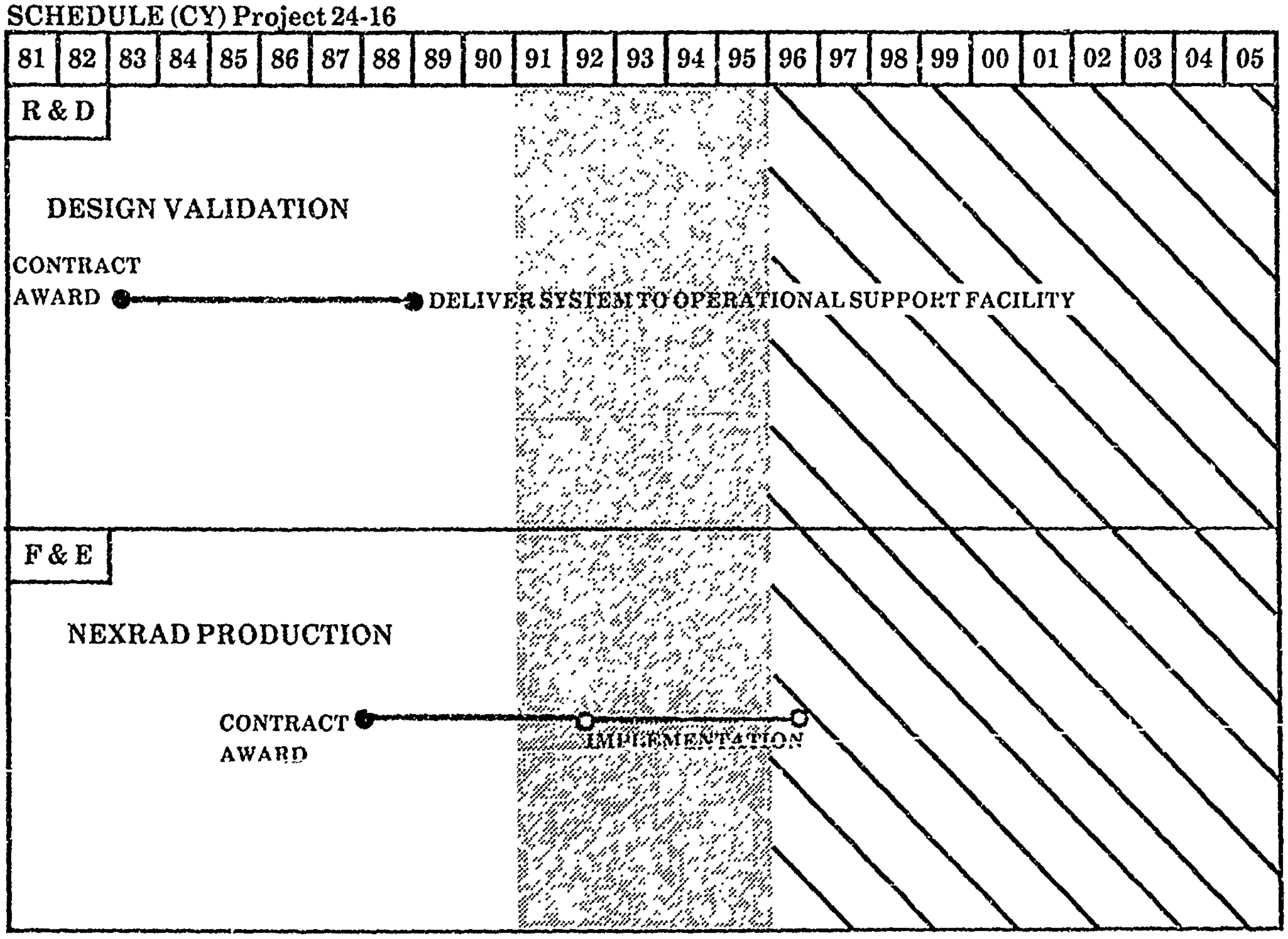
Problems Resulting in Delays: Software problems caused a 5-month schedule slip.

Delays Minimized by: The schedule was revised to reflect the software problem.

List of Contractors:

- Unisys Corporation
  Defense Systems
  (175 radars, 130 with FAA participation)
  Great Neck, New York
- Lincoln Laboratory
  (technical support/algorithm development)
  Lexington, Massachusetts
- National Severe Storms Laboratory
  (technical support/algorithm development)
  Norman, Oklahoma

SCHEDULE (CY) Project 24-16



PROJECT 24-17: LORAN-C Systems

Purpose: This project responds to a growing demand for LORAN-C random navigation (area navigation) services by the aviation community, particularly in low-altitude, remote, and offshore areas not well served by VOR/DME equipment. LORAN-C was originally developed for marine use and is presently being used for supplemental air navigation by approximately 100,000 users, primarily because of its low acquisition cost and area navigation coverage down to the surface. This is especially attractive for general aviation and rotorcraft operations. LORAN-C is intended as a supplemental radio navigation system for aviation use, providing at least single-level coverage for en route and terminal IFR navigation for the contiguous United States. Additionally, nonprecision approaches will be supported where signal requirements are met.

Approach: Studies have been completed to define the number and locations of LORAN-C stations and signal monitors. Additional LORAN-C stations will improve signal coverage for the Gulf of Mexico and fill the midcontinent coverage gap with at least single-level coverage. Signal monitors located at VOR facilities will provide correction values for nonprecision approaches. An interface between the monitors and the VOR will expand the use of the link used to communicate VOR status, performance and control to also communicate LORAN-C monitor data and status.

The FAA has provided funds to the U.S.Coast Guard to provide, operate, and maintain the transmitters under an interagency agreement. Deployment, operation, and maintenance of signal monitors will be an FAA responsibility.

Products: Four LORAN-C stations will be required to complete single-level signal coverage for the 48 contiguous states. There will be 212 monitors provided to support nonprecision approaches, training, logistics, and field support.

Progress/Activity from October 1989 through November 1990:

- Site acceptance test of monitors, interface, and communications of monitor and status data completed.

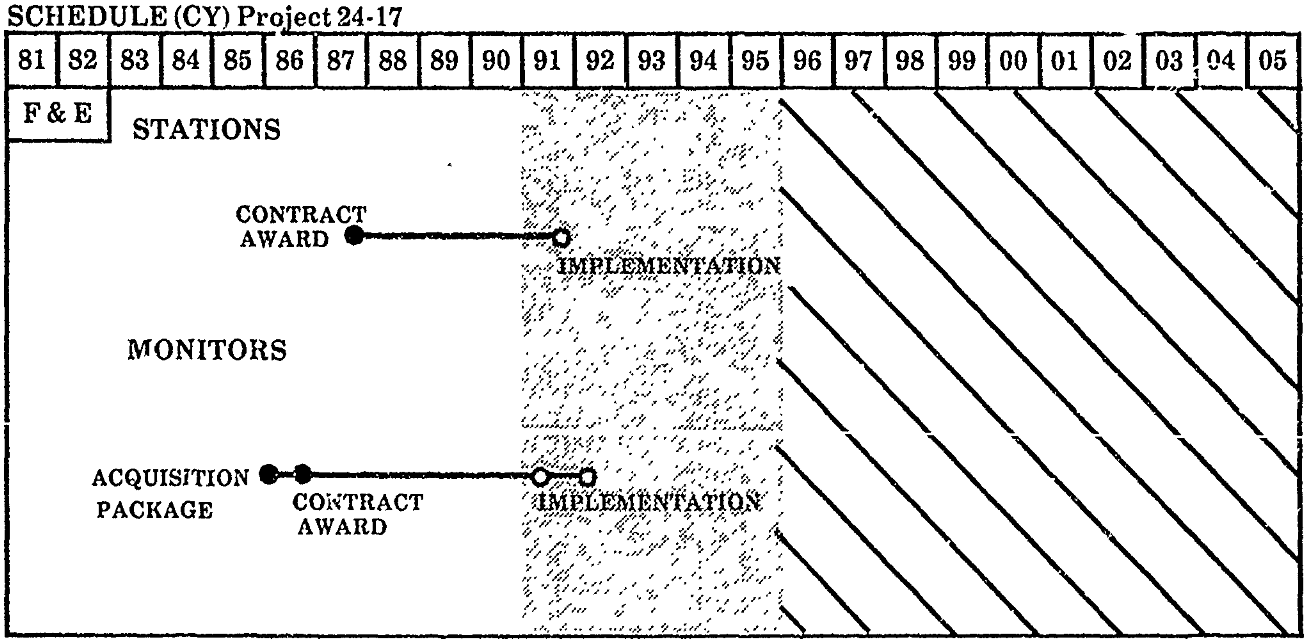
Related Projects/Activities: This project will require telecommunications service from NICS. 44-35 LORAN-C Monitors and 64-17 LOFF are related projects.

List of Contractors:

- Frontier Engineering, Inc.
  (212 LORAN-C monitors)
  Stillwater, Oklahoma

- Wilcox Electric, Inc.
  (249 LORAN/VORTAC interface cards)
  Kansas City, Missouri

SCHEDULE (CY) Project 24-17



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PROJECT 24-18: Terminal Doppler Weather Radar (TDWR) System

Purpose: This project consists of the procurement and installation of a new Terminal Doppler Weather Radar System (TDWR) which will detect microbursts, gust fronts, wind shifts, and precipitation. TDWR will be used to provide alerts of hazardous weather conditions in the terminal area and to provide advanced notice of changing wind conditions to permit timely change of active runways.

Microbursts are a weather phenomenon that consist of an intense downdraft that may occur in clear air or in precipitation areas and are particularly dangerous to aircraft landing or departing. The TDWR scanning mode will be optimized for microburst/wind shear detection. The radar will be located near or on the airport.

Approach: Trade studies that examined alternative designs, frequency comparisons, and other design considerations have been completed by the two Next Generation Weather Radar (NEXRAD) development contractors. Data from these studies contributed toward TDWR specification development.

TDWR algorithms are being developed by the Government and furnished to the contractor. Data collected using the FAA Doppler weather test bed radar provided the primary basis for algorithm development. This radar, previously used at Memphis, Huntsville, Denver, and Kansas City, is now operating in Orlando. In addition to supporting the algorithm development, the facility will be used to evaluate enhancements for improved algorithms and to evaluate new algorithms on a continuing basis.

A competitive contract was awarded for a contractor-furnished turnkey system to include TDWR design, production, site preparation, installation and implementation at sites specified and acquired by the government.

The TDWR project will benefit from experience gained in the development, design, production, installation and implementation of NEXRAD, and associated studies.

Products: 48 TDWR systems (including 1 support system at the FAATC and 2 support systems at the FAAAC). In addition to the previously identified training system at FAAAC, a second FAAAC system is required for software maintenance support.

Progress/Activity from October 1989 through November 1990:

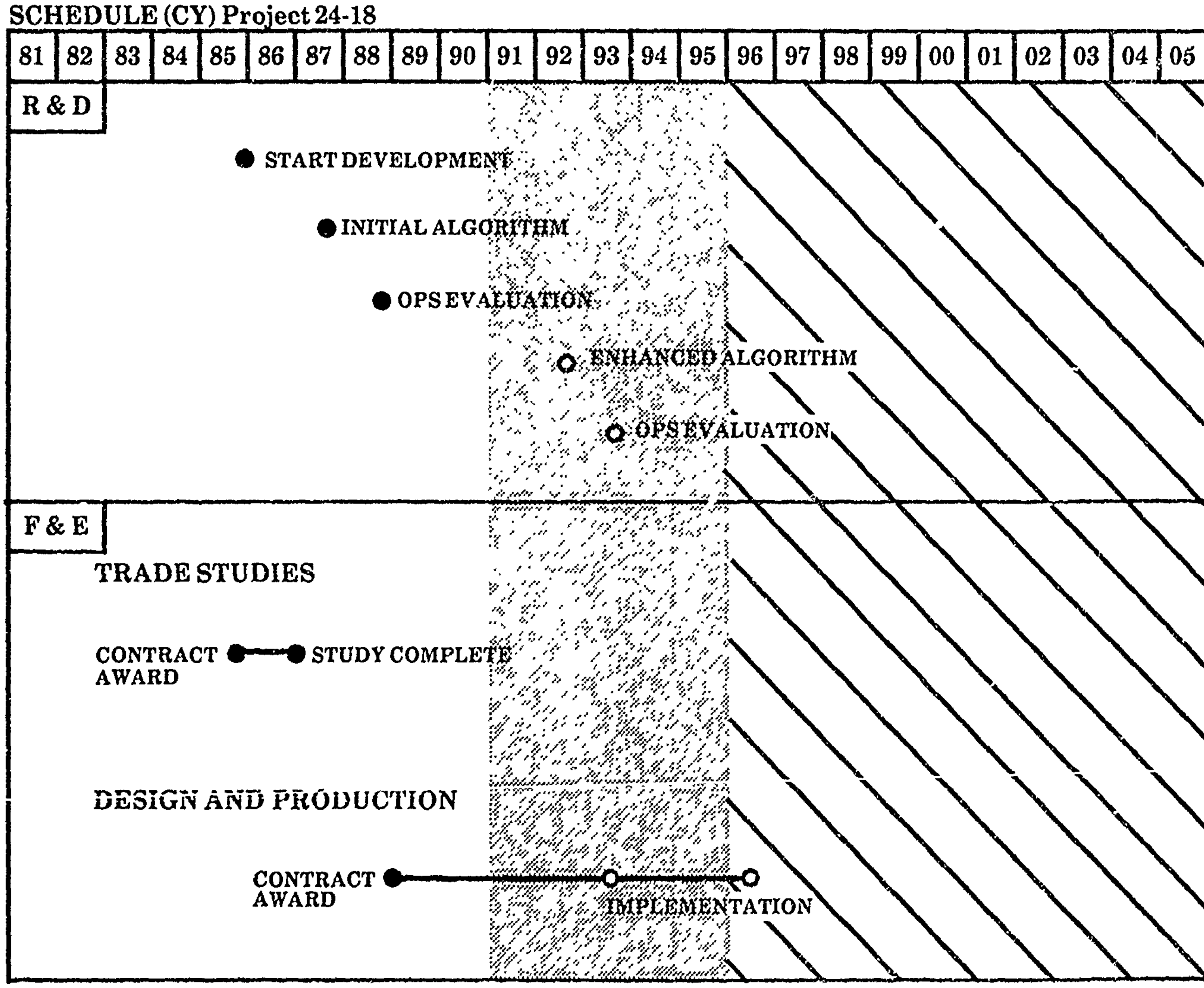
- Hardware design completed.
- Software design completed.
- Engineering test unit assembled.

Related Projects/Activities: 21-12 AAS. 23-12 LLWAS is related when LLWAS and TDWR are both used at a facility. 24-16 Weather Radar Program, 26-01 RMMS, and 26-15 NAS Spectrum Engineering are related projects. 64-16 Weather Enhancements will provide long-range improvements to TDWR.

List of Contractors:

- Raytheon Corporation
  (technical support/algorithm development)
  Sudbury, Massachusetts
- Lincoln Laboratory
  (technical support/algorithm development)
  Sudbury, Massachusetts
- National Center for Atmospheric Research
  (technical support/algorithm development)
  Boulder, Colorado
- National Severe Storms Laboratory
  (technical support/algorithm development)
  Norman, Oklahoma

SCHEDULE (CY) Project 24-18



PROJECT 25-02: Data Multiplexing Network (DMN)

Purpose: The DMN provides the NAS with state-of-the-art data communications technologies for cost effective point-to-point data transmission. These technologies include. (1) data multiplexing, which enables a number of independent transmission requirements to be consolidated onto a single circuit, and (2) automated network monitoring and control, which enables the identification of failed network elements from central locations and circuit restoral in real-time. The use of data multiplexing is an integral part of FAA's strategy for cost-effective interfacility communications transmission.

Approach: The DMN project uses Commercial-Off-the-Shelf (COTS) equipment and is being accomplished in three phases: Phase I addressed en route requirements; Phase II addressed terminal requirements, and Phase III addresses network expansion and reconfiguration requirements generated by new NAS Plan projects.

Phase I and II service requirements have been met via a competitively awarded, indefinite delivery, requirements type contract for COTS analog data communications equipment. Phase III service requirements will be met via competitively awarded, indefinite delivery requirements contracts for COTS analog and digital data communications equipment. Traffic carried by the Phase I and II network includes: long-range radar data, en route and terminal interfacility data, Traffic Management Systems (TMS) data, Flight Service Data Processing System (FSDPS) Service A (weather) data, Maintenance Management System (MMS) data, and Computer Based Instruction (CBI) data.

Phase III increases trunk capacity and adds terminal facilities and various other locations to the network. Three separate contracts will be awarded to provide Phase III equipment.

Products:

- Phase I and II equipment deliveries and installation were completed in June 1989. They included approximately 3400 major equipment items (modems, multiplexing modems, statistical multiplexers, and automated network monitor and control systems) at over 750 network nodes throughout the continental United States and off shore locations.
- Major equipment items to be acquired under Phase III include: Deterministic Time Division Multiplexing (DTDM) equipment, Statistical Time Division Multiplexing (STDM) equipment, and Digital Service (DS-1) equipment.

Progress/Activity from October 1989 through November 1990:

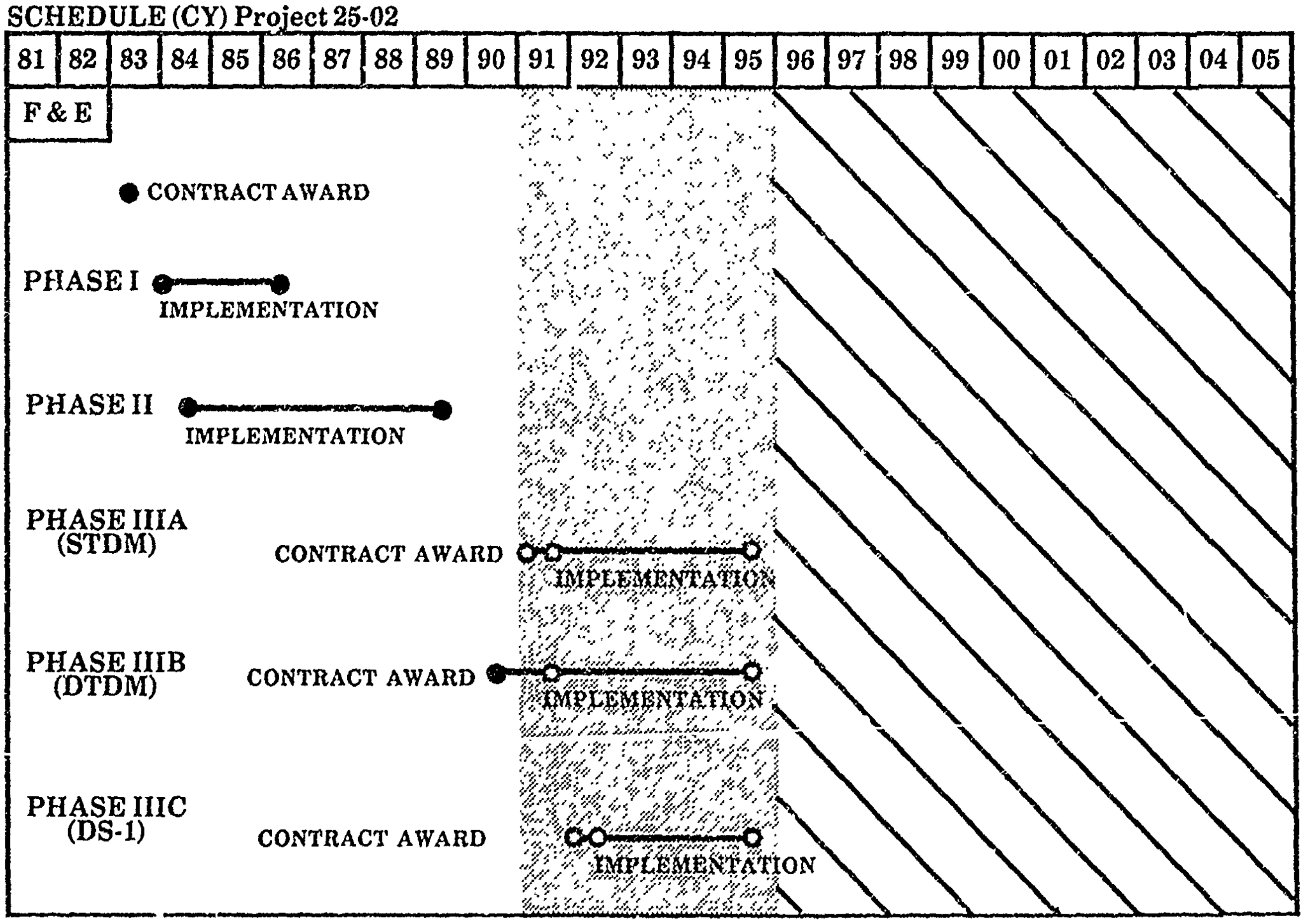
- DTDM contract awarded.

Related Projects/Activities: DMN provides network transmission services to a majority of CIP projects that require point-to-point data connectivity. Project 25-02 DMN Continuation will complete implementation of Phase III.

List of Contractors:

- Paradyne Corporation
  (Phases I and II implementation, automated network monitoring system upgrade, maintenance contract)
  Largo, Florida
- Codex Corporation
  (Phase IIIB DTDM Equipment)
  Canton, Massachusetts

SCHEDULE (CY) Project 25-02



Section 5

PROJECT 25-03: RML Replacement and Expansion

Purpose: The FAA Radar Microwave Link (RML) system provided broadband radar, voice frequency, and data communications between ARTCCs and ARSR facilities but was outdated and expensive to maintain. To increase its reliability and to maximize the cost-effectiveness, message quality and availability of an RML replacement for the interfacility voice and data transmission needed now and in the future, an integrated transmission system is being implemented. This system considers the total traffic, both national and area.

This project contributes to the above objectives by providing a modern national microwave Radio Communications Link (RCL) network for voice and data, with capacity for future requirements and redundancy. Automatic alternate routing is the method chosen to meet the availability requirements for the RCL subsystem.

The network selected will eventually tie together all ACFs and other facilities with communications needs. The RCL, along with other leased or FAA-owned transmission media, will be used to satisfy national and area communications transmission requirements.

This project will ensure that message and availability requirements are met and reduce costs for interfacility communications.

Approach: An analysis was completed to develop a network design by examining user requirements and FAA objectives with respect to the performance-cost aspects. Transmission alternatives were analyzed, including satellites and leased circuits. Based on this analysis, plans for an overall comprehensive backbone network have been developed which use the existing RML locations as a basis, supplemented by leased circuits, area networks, satellites, and other FAA links where cost-effective. It is highly cost-effective to convert existing special-purpose links used for radar remoting to general-purpose links used for interfacility communications. The existing RML equipment is being upgraded, and additional links are being established to complete a nationwide network. Monitoring of RCL equipment and path integrity is being done with diagnostic and monitoring equipment obtained as part of the RCL network. Routing and Circuit Restoral (RCR) switching equipment will provide service restoral at the circuit level. In some areas the number of circuits in use will be such that smaller systems can be used to provide service with reduced cost. Low Density RCL systems (LDRCLs) will provide connectivity in these areas.

Products:

- RCL network plan.
- Specifications for RCL, LDRCL, and RCR.
- Replacement of 750 backbone RMLs.
- Establishment of approximately 250 additional backbone RCL facilities.
- RCR equipment.
- Establishment of approximately 100 LDRCL facilities.

Progress/Activity from October 1989 through November 1990:

- Final order placed for RCL backbone equipment.
- RCR specification baselined.

Related Projects/Activities: 21-12 AAS, 21-15 ACF, 23-01 FSAS, 24-12 Mode S, 24-13 ASR, 24-15 Long Range Radar, and 26-01 RMMS, all requiring data or voice transfer between sites or facilities, will use RCL and LDRCL systems as the transmission media. 25-02 DMN will consolidate data for transmission over RCL and LDRCL networks. 26-15 NAS Spectrum Engineering is required to provide interference-free operation.

Problems Resulting in Delays:

- Inability of contractor to procure high-density multiplexers impacted implementation.
- Some towers found to be safety hazards due to use of defective materials.

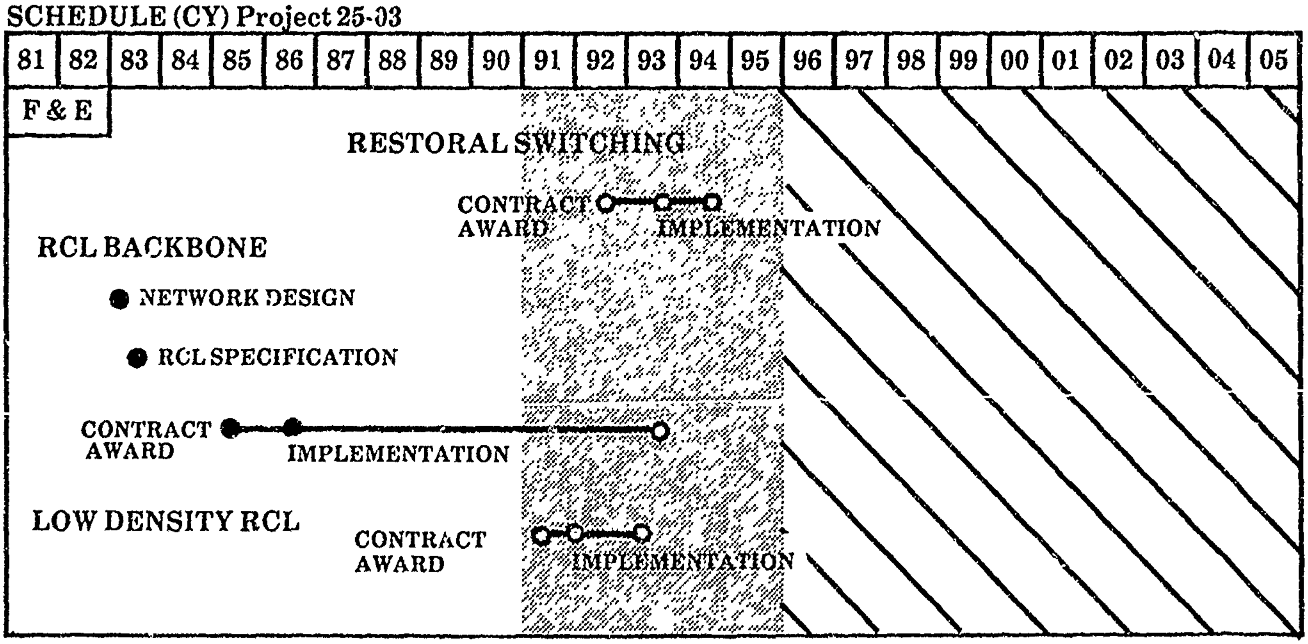
Delays Minimized by:

- Preparing technical study to determine alternate scenarios.
- Contract to AT&T to provide new towers as parallel effort to ongoing installation.

List of Contractors:

- American Telephone and Telegraph (AT&T) Technologies
  (RCL equipment and towers and RCL backbone network)
  Greensboro, North Carolina
- TRICON, Inc.
  (shelters)
  Fort Worth, Texas

SCHEDULE (CY) Project 25-03



PROJECT 25-07: National Airspace Data Interchange Network (NADIN) II

Purpose: This project will provide expanded data communications, high-speed switching capability, and the throughput capacity needed by future NAS systems.

Approach: NADIN II will achieve increased throughput capacity, automatic alternate routing switching control, and service availability through the use of advanced packet switching technology and a highly connected network architecture. The NADIN II Packet Switched Network (PSN) will consist of two network control centers, 26 packet switching nodes, and up to 100 concentrators. It will employ standardized access interface and exchange protocols to ensure flexible future evolution. Domestic message switching will shift to NADIN II as systems transition into service. International message switching will remain as part of NADIN IA. NADIN IA will be interconnected with the NADIN II PSN via communications gateways. NADIN II hardware and software will be integrated and tested using the support system at the FAA Technical Center.

NADIN II will be implemented in two phases. Phase I will implement packet switching nodes, transmission trunk lines between nodes, and two network control centers. Phase II will add throughput capacity and interfaces to the data transmission system.

Products:

Phase I:

- Twenty-six operational packet switch nodes will be installed at 20 CONUS ARTCCs, Honolulu ARTCC, Anchorage ARTCC, the two National Aviation Weather Processing Facilities (NAWPFs), the New York TRACON, and the FAA Technical Center.
- Two second level support nodes and one Network Control Center (NCC) will be provided to the FAA Technical Center.
- Two training support nodes and one NCC will be provided to the FAA Aeronautical Center.
- Two NCCs will be provided at Atlanta and Salt Lake City NAWPFs for centralized monitoring and control of the NADIN II network.

Phase II: This the expansion phase of the contract. It provides for additional sites, increased throughput capacity, new user ports, and additional maintenance support.

Progress/Activity from October 1989 through November 1990:

- SRR and PDR completed.

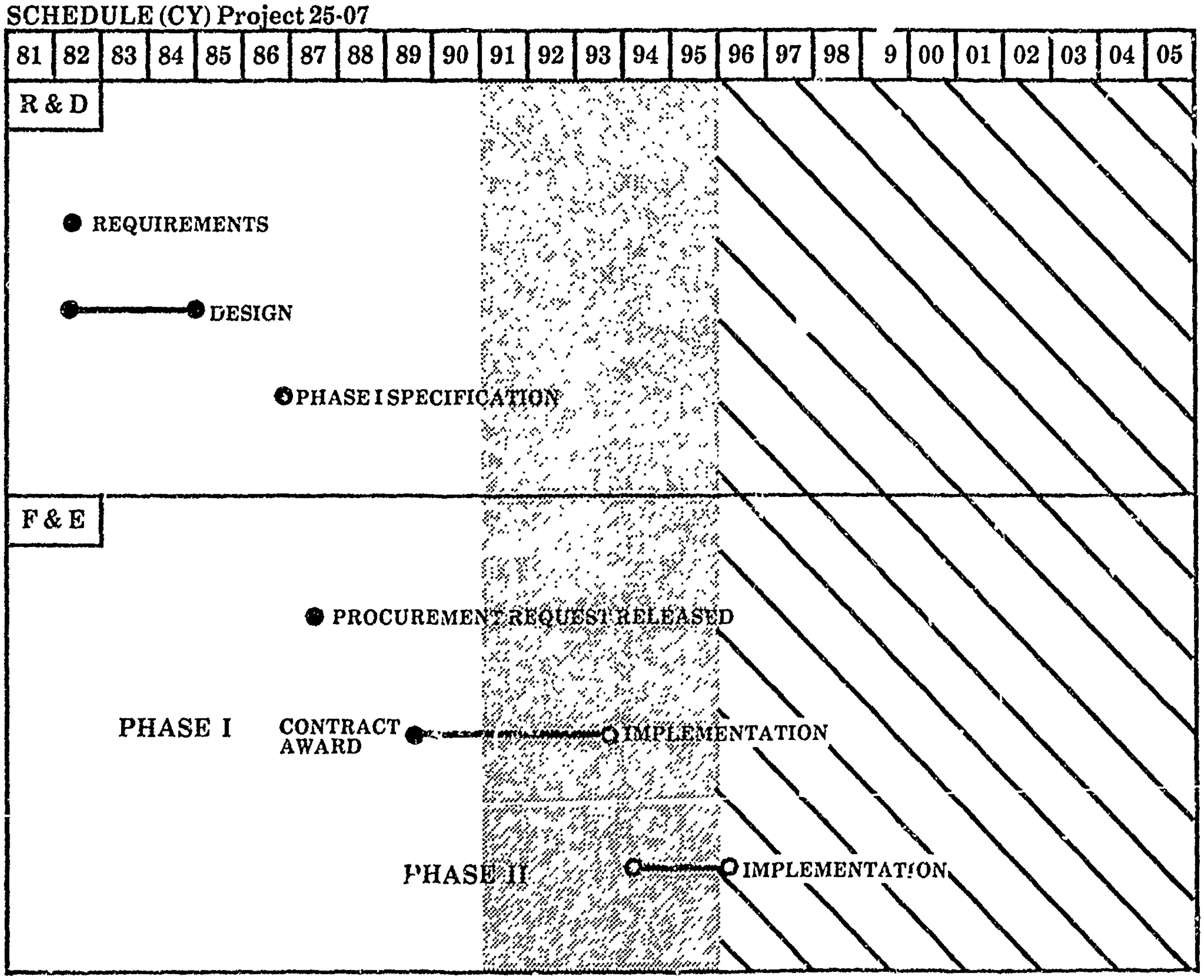
Related Projects/Activities:

- This project will interface with all NAS operational systems that require data switching between facilities. Future needs for area control facilities/advanced automation system will be met by NADIN II. NADIN will switch data communications associated with the maintenance management system. NADIN II will require interfacility communications service from NICS. 25-03 RML Replacement and Expansion will be the principal provider of transmission services for NADIN II.
- 35-07 NADIN II Continuation will implement new requirements established subsequent to the original plan and 65-07 Conversion of NADIN IA Message Network Users to the NADIN II Packet Switched Network will upgrade NADIN IA users.

List of Contractors:

- Harris Corporation
  Air Traffic Control Systems Division
  (26 NADIN II systems)
  Melbourne, Florida

SCHEDULE (CY) Project 25-07



PROJECT 25-08: Radio Control Equipment (RCE)

Purpose: This project will replace the present radio control equipment to improve operational performance and reduce maintenance cost. RCE provides an integrated system approach to remote radio control, remote environmental sensor and maintenance monitoring, and emergency back-up battery power. The RCE integrates each control facility with all of its associated remote facilities into a single monitoring and control subsystem based on a modular building block design and system level software. The subsystem has fault detection and reconfiguration capabilities, which may be accomplished locally or remotely with a RMMS maintenance data terminal. The RCE modular construction accommodates the FAA's various size requirements for ARTCC, TRACON/ATCT, AFSS, and ACF control facilities and their associated remote facilities.

Approach: The approach is to replace existing point-to-point Voice Frequency Signaling Systems (VFSS) and keying control equipment with modern system-based equipment which uses presently available hardware and software technology.

The initial contracts under this project provide equipment to replace VFSS and keying control equipment at ARTCCs and selected high activity TRACON/ATCTs, and their associated RCAG, RTR, or RCF facilities. The contracts also provide options for completing current equipment replacement at high activity TRACON/ATCTs, ARTCC/ACFs and AFSSs, and their associated RCAG, RTR, or RCF facilities.

Radio control equipment for the AFSSs may be obtained by a separate contract. This determination will be based on a cost analysis of alternatives for meeting less stringent requirements of AFSS services. Based on the results of this cost analysis, RCE for AFSSs will either be commercial-off-the-shelf and procured via a follow-on contract, or will be equivalent to other RCE and procured via an option to the initial contract.

Products: Replacement of approximately 2,950 channels of VFSS and keying control equipment associated with ARTCCs, TRACON/ATCTs, and ARTCC/ACFs starting in FY 90.

Installation of 1,830 channels of RCE for AFSS applications starting in FY 95.

Progress/Activity from October 1989 through November 1990:

- First article module qualification.
- Functional system testing begun.

Related Projects/Activities: RCE will perform the radio channel signaling and control functions to support ground/air voice communications and connectivity between the voice switching equipment in the operation of air traffic control facilities. This includes 21-11 VSCS in ARTCC/ACFs, 22-12 TCS in ATCTs, 23-13 ICSS in ATCTs and AFSSs, and the ground/air radio equipment in the remote communications facilities for 26-01 RMMS. 44-08 RCE Enhancements will provide follow-on improvements.

Problems Resulting in Delays:

- Software problems resulted in hardware redesign of AT&T processor modules.
- Technical problems were encountered with validation of module test set at Sonicraft.

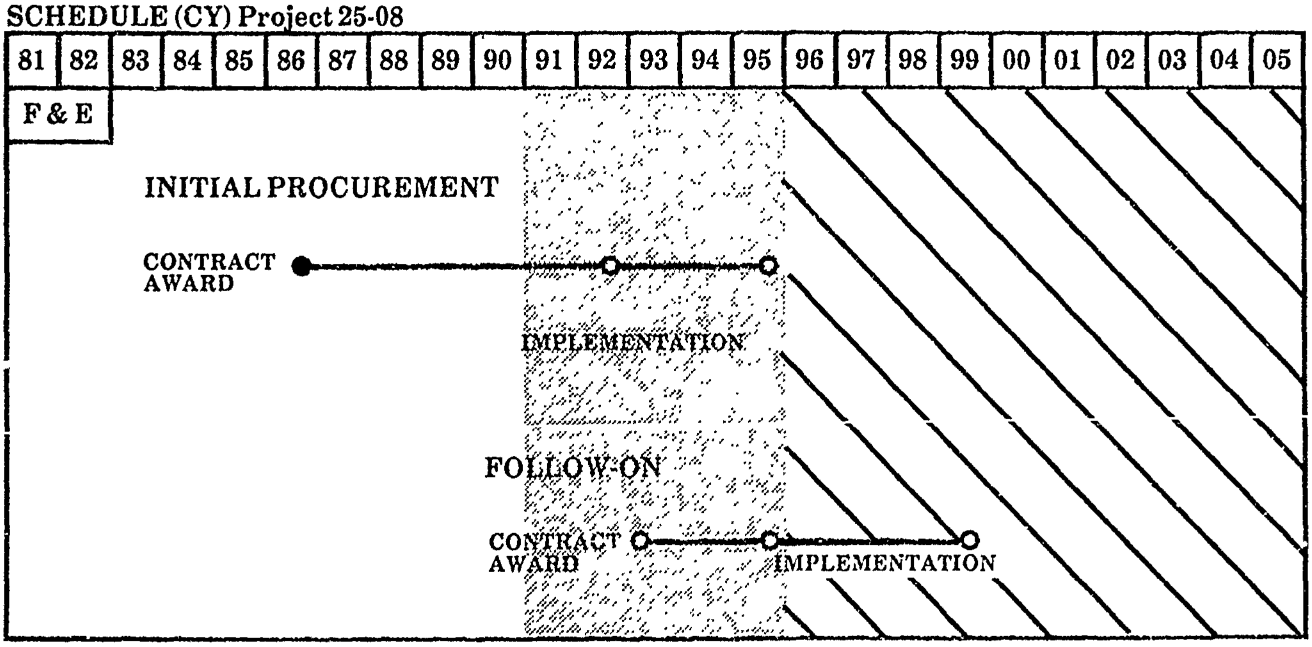
Delays Minimized by:

- Program office established in-plant representation at both companies to improve monitoring and communications.
- Prequalification of modules at Sonicraft was begun to meet test schedules.

List of Contractors:

- American Telephone and Telegraph (AT&T) Technologies, Inc.
  (principal prime contractor, system integrator and two-thirds of equipment)
  Greensboro, North Carolina
- Sonicraft, Inc.
  (associate prime contractor, one third of equipment)
  Chicago, Illinois

SCHEDULE (CY) Project 25-08



PROJECT 26-01: Remote Maintenance Monitoring System (RMMS)

Purpose: This program provides a system to automate FAA maintenance operations. It provides monitoring and control equipment for most FAA facilities so that equipment performance monitoring, control, and certification can be accomplished from centralized work centers. RMM will permit staffing reductions and consolidation, improve quality of workplace, improve work force utilization, and increase work force productivity. When fully implemented, remote maintenance monitoring permits substantial savings in operating cost and manpower.

Approach: Implement the RMMS in an evolutionary fashion to assure a smooth transition of the maintenance automation program.

Remote Monitoring Subsystems (RMSs) will be employed to collect, store, and transmit performance data as well as to provide the means to remotely adjust, certify, and/or reconfigure the facilities. Systems which are deployed and do not have RMM capabilities will be equipped with RMSs according to the needs of the maintenance work force. Newly designed systems will have RMM embedded.

Remote Monitoring System Concentrators (RMSCs) will concentrate data from a group of RMSs, typically at airports, for transmission to the control and monitoring locations. The concentrators will be placed where it is cost-beneficial to reduce leased communications costs. It is estimated that up to 750 concentrators will be required to complete the total end-state RMM network.

Maintenance Data Terminals (MDTs) will be used to access the RMM Network and will be provided in two phases. 589 MDTs were bought in FY 89 and have been implemented to establish the basic system capabilities. Additional MDTs, purchased from FY 89 through FY 93, will complete the network.

Maintenance Processor Subsystems (MPSs) have been installed at all ARTCC and 10 GNAS Sectors to process, store, and route facility data to and from MDTs and RMSs.

Monitoring/Control Software (MCS), running in the MPSs, will provide the primary facility monitoring and control functions. Interim MCS (IMCS) software is currently installed in all MPSs, and will be used until MCS becomes available.

Maintenance Management System (MMS) software is being provided (to run concurrently with MCS in the MPSs) to permit the use of facility data at sectors, work centers, regional offices, and FAA support organizations. MMS will be implemented in two phases: Phase 1 currently provides basic information gathering functions, such as automated facility logs, performance reporting, preventive maintenance scheduling, and a facility, service, and equipment profile data base. Phase 2 will add additional record keeping functions, such as facility modifications, inspections, configuration management, energy management, and personnel training and certification.

Products:

- RMMS Software Interim and final monitoring/control software, and maintenance management system software.
- RMMS Hardware - 38 MPSs at ARTCC, GNAS and field support sectors; up to 750 RMSCs; up to 5000 MDTs.
- RMS Retrofits - For ARSR, ATCBI, CD, ILS, and other facility types shown to be cost beneficial.

Progress/Activity from October 1989 through November 1990:

- 2300 additional MDTs deployed.
- RMS retrofits for ARSR-3, ILS, and ATCBI sites deployed.

Related Projects/Activities: The establishment of remote facility monitoring and control from central locations will require coordination and interfaces with most activities, the more significant being: 21-12 AAS, 21-15 ACF, 26-04 MCC, all interfacility communications projects, and project offices with RMS requirements. 46-04 MCC Enhancement and 56-30 Aeronautical Center Training and Support Facilities are also related projects.

Problems Resulting in Delays: Protests affecting MDT contract award have delayed deployment of additional MDTs by six months.

Delays Minimized by: Headquarters, national field support, and development personnel have worked closely with field sites to minimize impact of MDT delays.

List of Contractors:

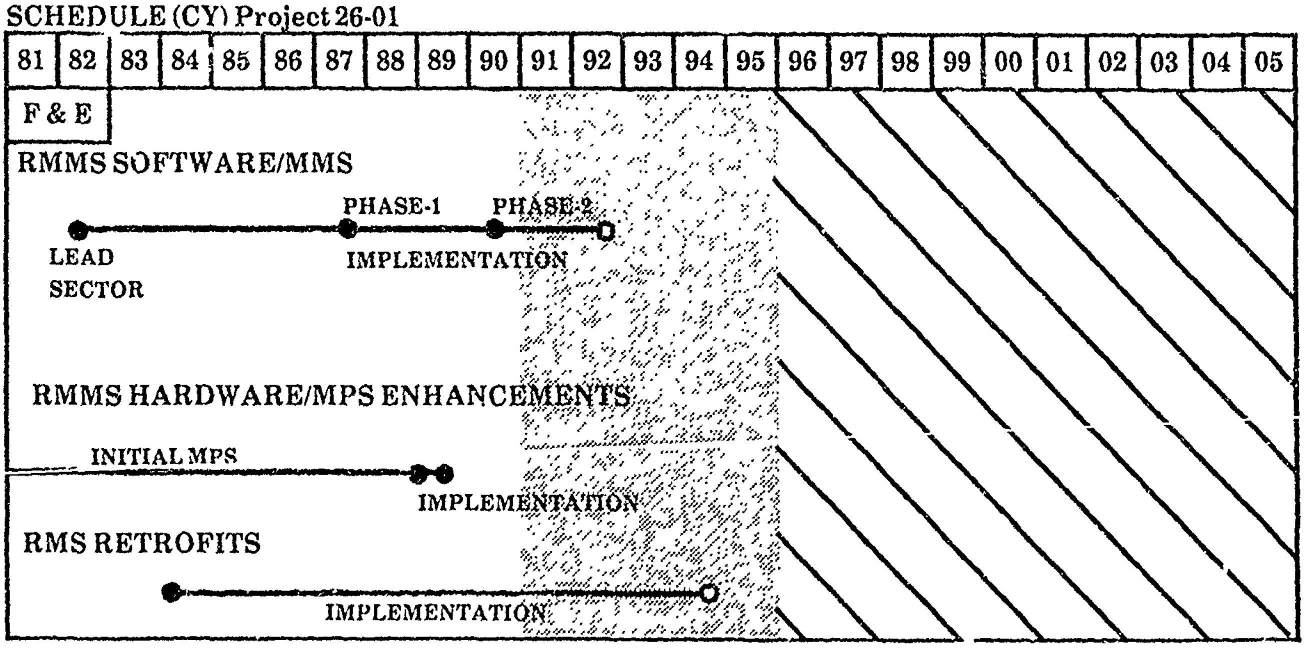
- Tandem Computers, Inc.
  (38 MPS systems)
  Cupertino, California

- International Data Products, Inc.
  (2,889 MDTs)
  Gaithersburg, Maryland

- American Telephone and Telegraph (AT&T)
  Federal Systems Division
  (approximately 2000 MDTs)
  Silver Spring, Maryland

- Unisys Corporation
  (MMS and IMCS software)
  McLean, Virginia

SCHEDULE (CY) Project 26-01



Section 6

PROJECT 26-02: Computer Based Instruction (CBI)

Purpose: This project expands the present program of standardized high-quality, cost-effective training of FAA personnel at decentralized work locations. CBI provides developmental training in Air Traffic and Airway Facility field locations. Enhanced proficiency training based on individual needs and requirements is also being provided for Airway Facilities, Flight Standards and Air Traffic employees. Proficiency training, always a formal Air Traffic requirement, is also now required by Airway Facilities because of the high reliability of the new equipment and the new maintenance philosophy. Where possible in Airway Facilities, CBI is planned for local or field sites and will form the nucleus of field-conducted training. In other cases CBI will be coupled with hands-on equipment training at the FAA Academy. Simulations permit an increase in learning apart from the actual equipment.

CBI promotes the accomplishment of the agency mission by:

- Significantly reducing the current travel costs associated with centralized training.
- Improving the efficiency and productivity of existing facility training staffs.
- Providing flexibility in scheduling and conducting training according to the individual's and facilities' unique needs.
- Allowing for greater local management control of the training schedules and resources.
- Making standardized onsite proficiency/update training more available.
- Fostering improvements in employee productivity.

Approach: Establish CBI learning centers with hardware/software/courseware where there are concentrations of field personnel. Additionally, upgrade existing hardware/software.

During 1981 to 1983, a limited number of Airway Facilities courses were developed and provided at 60 field locations. Additional high-volume technical training became available in 1984 and 1985. Other courses were available in 1986 and 1987 at Airway Facilities and Flight Standards field offices.

Air Traffic currently has over 350 national and 600 site-specific lessons in the field for use in the en route and terminal options.

The CBI terminals now interface with a mainframe computer at a facility provided by the U.S. Army at Redstone Arsenal as part of an intergovernmental software support system. This is accomplished using some new and some existing leased circuits via an FAA multiplexing modem network. This approach is significantly less expensive than procuring additional leased circuits for each terminal.

Considerable telecommunications costs have been avoided in the Air Traffic CBI program because the majority of the courseware is suitable for delivery in an off-line mode using disk drives. Lines are used only to transfer student records or other training information. The Airway Facilities CBI program requires the greater capacity of the on-line CBI system, but future technology may make this capability available in an off-line format.

Products: By 1985 there were a total of 429 CBI terminals accompanied by disk drives at 182 locations. Printers were provided at each of the following locations:

• Airway Facilities sector offices	131
• Flight inspection offices	7
• ARTCCs	150
• Airport Traffic Control Towers, Levels IV and V	83
• FAA Academy	46
• Regions/centers/Washington Headquarters	12

By December 1990, 438 terminals with disk drives will be provided for 218 Level III Airport Traffic Control Towers, 159 Level II Towers, and 61 Automated Flight Service Stations. A substantial training workload exists at the lower level towers where the ongoing operational needs preclude dedication of staff personnel to perform required proficiency training.

This training impact is also experienced at the larger towers whose staff requirements are most often met by moving staff from lower activity towers. CBI terminals are also being provided to all automated flight service stations. Because of the numerous AFSS operational changes, training requirements have escalated, with no increase in training staff. The CBI units will assist us to fill that gap.

- Airport Traffic Control Towers, Level III 218
- Airport Traffic Control Towers, Level II 159
- Automated Flight Service Station 61

In 1989, 100 CBI learning stations were budgeted to improve safety inspector training in Aviation Standards field facilities. The requirement is in accordance with Project SAFE (Safety Activity Functional Evaluation) and addressed in the comprehensive review, a Blueprint for Flight Standards. Project SAFE is a product of a Secretary of Transportation initiative. CBI will deliver local recurrent/update training requirements.

- Aviation Standards 89
- Washington Headquarters 1
- FAA Academy 10

Progress/Activity from October 1989 through November 1990:

- Revision plans completed to allow courseware to run on OATS equipment.
- Courses are being given on OATS equipment and the authoring language.

Related Projects/Activities: With the many technological improvements being made in the CBI field, a continuing study of these changes is being conducted by the Office of Personnel and Technical Training, each service, and the Aeronautical Center. We anticipate the need to upgrade each CBI training center at a minimum of 7-year intervals. This project will require interfacility communications service from NICS. Projects providing that service include 25-02 DMN and 25-03 RML Replacement and Expansion. 56-02 CBI Expansion, 56-29 On-Site Simulation Based Training Systems, and 56-35 NAS Training are also related projects.

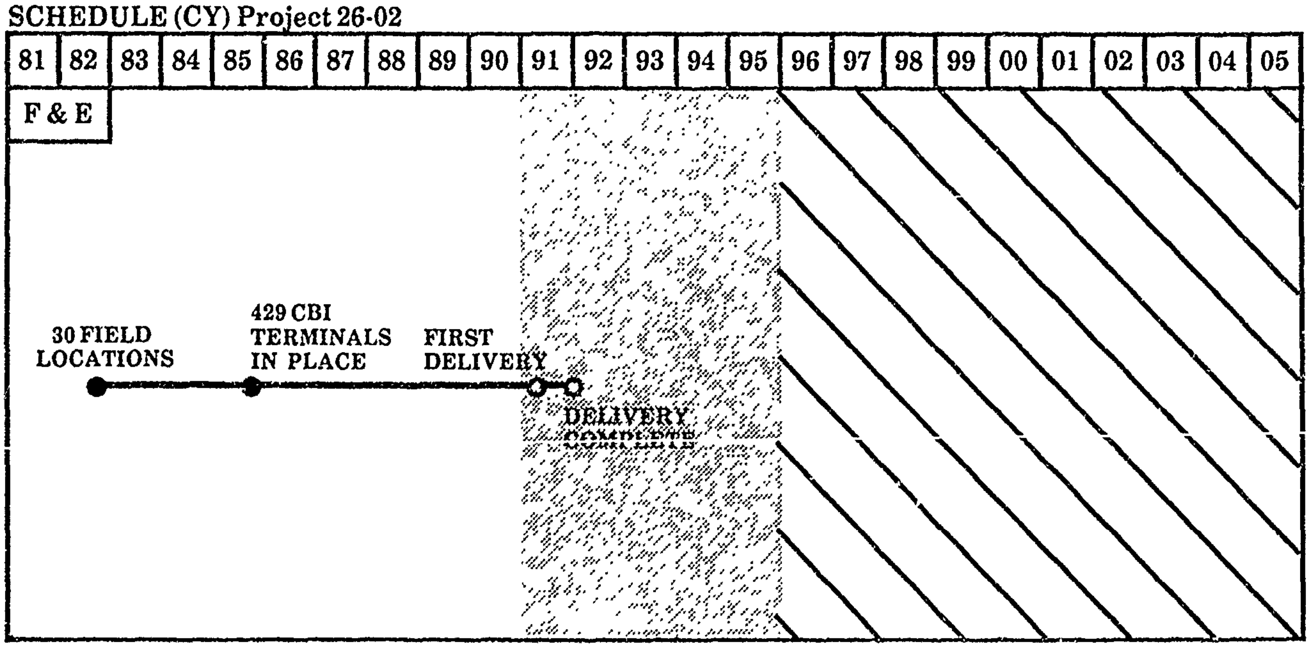
Problems Resulting in Delays: Delivery delays have occurred due to testing schedule.

Delays Minimized by: The existing system is being maintained pending availability of new equipment.

List of Contractors:

- American Telephone and Telegraph (AT&T)
  Federal Systems Division
  (hardware and packaged software)
  Silver Spring, Maryland

SCHEDULE (CY) Project 26-02



PROJECT 26-04: Maintenance Control Center (MCC)

Purpose: This project provides an MCC in each Airway Facilities Sector to be the nerve center for monitoring and control of facilities in a specific jurisdictional area. Should failures occur, MCC initiates corrective action through RMMS and notifies the work force by telephone or by the regional FM communication network (an integral part of NARACS). MCCs also serve as centers for communications and coordination during emergency situations (natural/defense/accident) as well as the primary interface between ATC operations and maintenance/support activities. The final configuration will be the result of an evolutionary process incorporating the monitoring of new subsystems as they become part of the National Airspace System.

Approach: Lead sector studies were completed which established the initial procedures and requirements for MCCs at ARTCC and GNAS sectors. Established prototypes were tested and completed in three field test sites.

Centralized monitor and control capabilities include.

- Establishment of ARTCC/ACF MCCs (AMCCs) in each ARTCC/ACF to enhance NAS performance monitoring and service restoration and to provide a Maintenance Control Center Processor (MCCP) and a Maintenance Monitor Console (MMC). The existing Systems Maintenance Monitor Console will be replaced with a Maintenance Control Center Processor/Maintenance Monitor Console (MCCP/MMC) to consolidate the monitoring devices already deployed. The MCCP/MMC will be augmented to incorporate the monitoring functions of new subsystems as they transition into the NAS. A prototype system was deployed to Atlanta in December 1985.

- Establishment of GNAS MCCs (GMCCs) at each sector to provide a central focus for the facility restoration activities The GMCC consists of an MCC workstation and includes processing capability and interfaces with the RMMS. The primary workstation equipment is being provided under the RMMS project.

The MCCs are being equipped with the necessary workstations, processing capability, interfaces, and voice communications capabilities to perform monitor and control functions. The final configuration of each MCC will depend on the number of facilities being monitored and other sizing considerations. MCC receives and processes alarm and status information from remote facilities as well as co-located facilities. Processed data (status reports and alarms) will be displayed to specialists at this central location. These specialists will be able to take action as appropriate via the remote maintenance monitoring system or co-located automation and interfacility communication systems.

Products:

- AMCC - A prototype was completed in 1985; production units will be deployed to all ARTCCs, the FAA Technical Center, and the FAA Aeronautical Center.

- GMCC prototypes were completed in 1989; production units will be deployed to all GNAS Airway Facilities sectors, the FAA Technical Center, and the FAA Aeronautical Center.

Progress/Activity from October 1989 through November 1990:

- GMCC
  - Production unit design determined from prototype effort.

- AMCC
  - Integration and shakedown testing completed for Phase I interfaces.
  - FAATC system completed.

Related Projects/Activities: Systems implemented by this project will use capabilities provided by the RMMS. The establishment of remote facility monitoring and control from a centralized location will require interfaces and coordination with all NAS program activities implementing RMM capabilities. 46-04 MCC will provide follow-on support.

Problems Resulting in Delays:

- The AMCC project has experienced a schedule slippage which delays first ORD due to:

  - Difficulties in producing acceptable software and software documentation.

  - Excessive response time demonstrated in the development hardware delivered to the FAATC and Atlanta ARTCC.

Delays Minimized by:

- The FAA has directed the contractor to implement a two-phased approach. Phase I consists of all hardware and five critical interfaces. Phase II provides all the remaining interfaces. The contractor has been redirected to implement this two-phased approach.

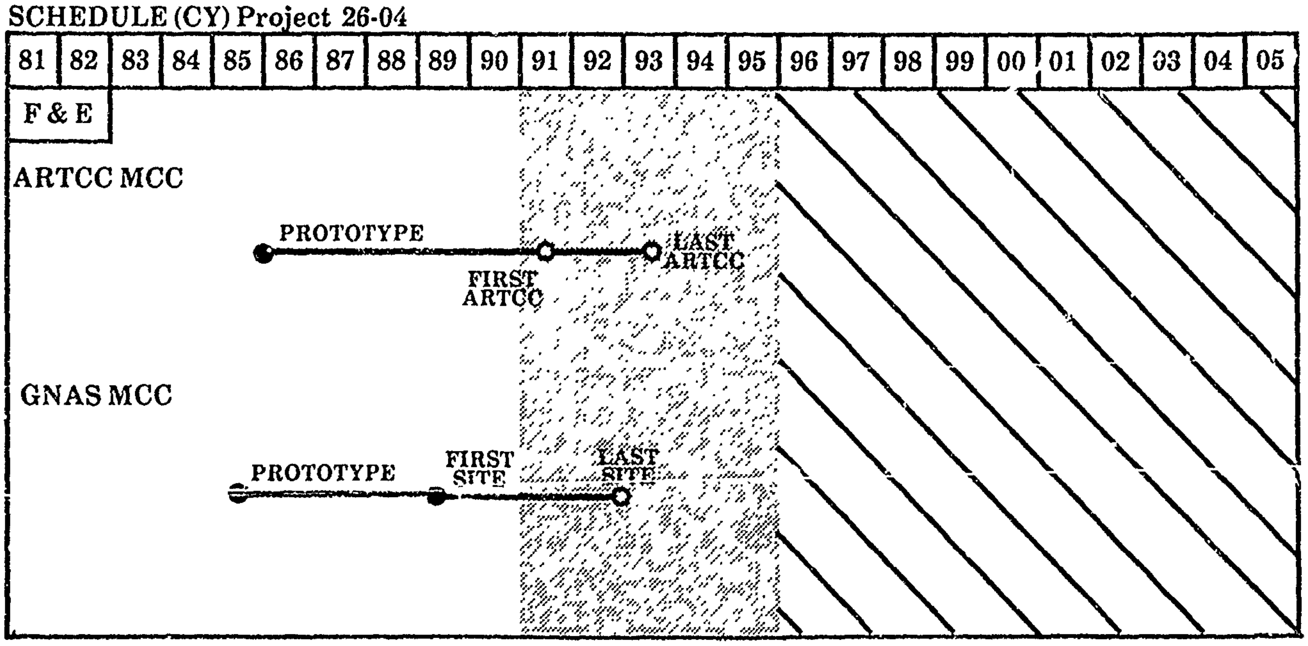
- To reduce the software documentation problems, detailed specifications for the required documentation were developed by the FAA and concurred with by the contractor. A contract modification was made to implement the new specifications.

- Changes have been made in COTS and custom software was developed to accelerate response time.

List of Contractors:

- Systems Management American Corporation (ARTCC MCC - 22 systems with an option for 4 additional systems)
  Norfolk, Virginia

SCHEDULE (CY) Project 26-04



PROJECT 26-05: Large Airport Cable Loop Systems

Purpose: This project establishes a reliable and flexible signal and power distribution system at approximately 100 activity level III, IV, and V airports. Airport signal and power distribution must be viewed as a coordinated system rather than an individual facility by facility project installation.

Emphasis is given to major construction projects, requiring significant cable installation. Coordination of cable requirements for new establishment, consolidation, and relocation projects as well as replacement of deteriorated cables should be included. Reliable signal distribution, using fiber optic or other technology, is being provided through new, upgraded, or replaced cables at major airports and reconfiguration into loop systems.

The reconfigured cable network distribution:

- Eliminates outages caused by deteriorating or failing cables.
- Allows cable repair with minimum outage time.
- Provides for better planning of airport cable systems.
- Minimizes the number of small engine generators.

Additionally, fiber optic or other technology installation:

- Provides for greater capacity than metallic conductor cables.
- Permits system growth with minimal additional cables.
- Eliminates cable damage from lightning surges.
- Reduces electromagnetic interference.

Approach: Each region developed a master plan for the cable systems for those major and intermediate activity level airports qualifying on a cost-benefit basis. The master plan provides for the replacement of deteriorated cables as well as installation of new cable in conjunction with major construction and facility establishment. All cable designs will provide for future growth and capacity.

Fiber-optic cable compatibility with power cable allows for placement in the same trench or ducts and provides for a cost-effective installation. Fiber-optic cable may be used with Remote Maintenance Monitoring (RMM).

Outage time resulting from cables damaged accidentally by animals or environmental factors will be minimized through fault sensing and switching of power, communication, and control cables.

An engineering analysis will determine the cost versus benefits of establishing the system scheme (loop network configuration) in comparison with the current approach of replacement in-kind and establishment of individual facility cables.

Products:

- More reliable and flexible power and signal distribution systems at 100 airports.
- Power system standards.

Progress/Activity from October 1989 through November 1990:

- Southern Region has begun construction of cable loop systems at Atlanta and Memphis airports.
- Northwest Mountain Region has completed designs with TSC for the new Denver Airport.
- Western Pacific Region has initiated the cable loop project at Burbank, California, and Phoenix, Arizona, is in the design stage.
- Central Region has a cable loop project in the design stage at Indianapolis Airport.
- Eastern Region has fiber optic systems in the design stages for Middletown, Pennsylvania, and Dulles International Airport

Related Projects/Activities: Planning for each airport will include the power, control, and communications needs since there are obvious benefits in providing cable ducts or direct earth burial concurrently. Noise and external interference will be minimized by proper spectrum engineering. Cost avoidance is also possible by coordinating the cable loop activities with other airport construction, either by FAA or airport management, such as MLS installations and runway extensions. Loop switching devices will have RMM capability. 46-05 Large Airport Cable Loop Systems Sustained Support provides follow-on support.

Problems Resulting in Delays:

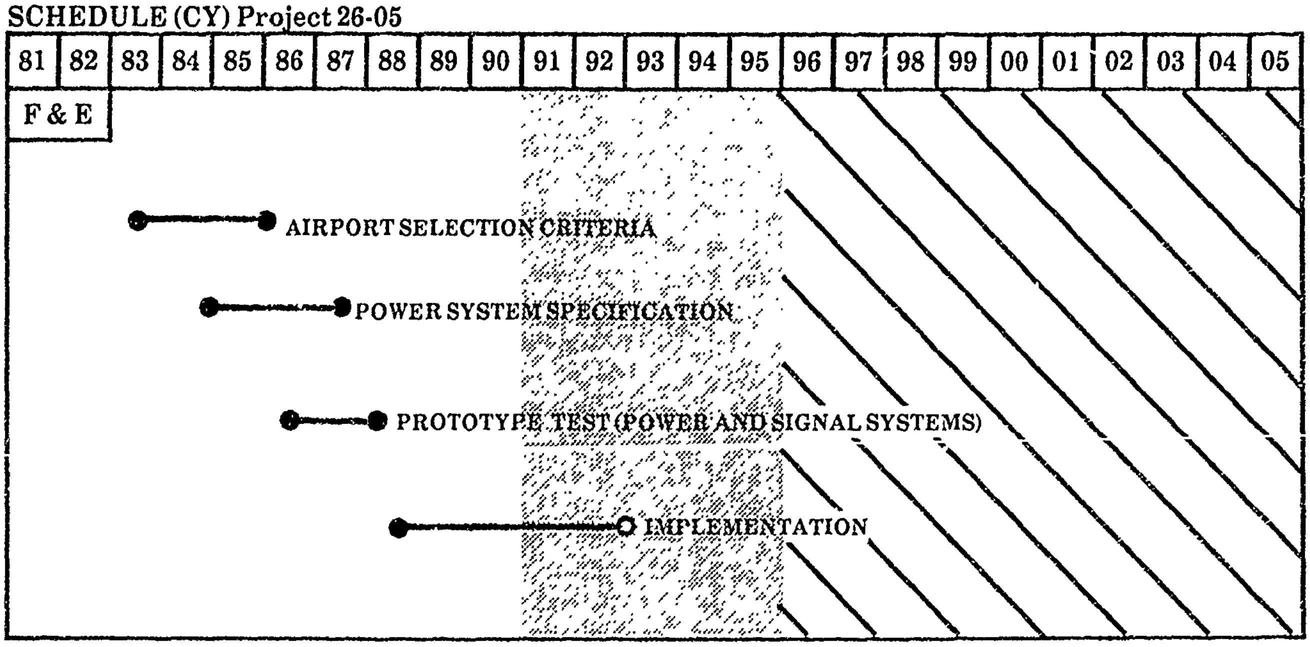
- No funding for FY 91.
- San Francisco earthquake reprogramming actions resulted in program changes.

Delays Minimized by: Application of existing funds to critical areas.

List of Contractors:

- Regional installation contractors.
- Transportation Systems Center (architectural and engineering support) Cambridge, Massachusetts

SCHEDULE (CY) Project 26-05



PROJECT 26-07: Power Systems

Purpose: This project will provide the optimum type and quality of electrical power necessary to ensure high facility availability and reliability, and to reduce operating costs and energy consumption of standby power systems at all major manned and unmanned facilities.

Standby power at unmanned facilities was almost entirely provided by engine generators. Vacuum tube technology imposed demands for standby power sources were best satisfied by engine generators. New electronics technology results in significant reductions in its energy consumption and related environmental support systems. New long-life batteries are now a practical alternative to small standby power engine generators. Battery standby power systems provide for increased facility availability, reduced operating costs, and reduced overall energy consumption Also, recent technological advances in alternate power sources such as photovoltaics, fuel cells, and wind generators now offer a potential cost savings for prime power sources at locations when commercial power is not readily available. This program will accomplish the removal of replaced engine generators and the retrofit of existing facilities with battery standby power system, cost-effective alternate prime power system, and power conditioning equipment.

Many FAA structures and facilities do not have adequate lightning protection systems installed. Some facilities have obsolete wiring and inadequate grounding, bonding, and shielding. Lightning surge protection devices must be improved at many facilities; deficiencies in wiring, grounding, bonding, shielding, and code violations must be corrected.

In the future, most facilities will be unmanned and may normally be operated at lower temperatures in cold weather and higher temperatures during hot weather Environmental RMS is expected to reduce the number of scheduled maintenance trips from monthly to quarterly, as well as reducing the time required to perform scheduled performance checks.

The modernization of critical power systems at major manned facilities is also part of this project. The Power Conditioning System (PCS) at ARTCCs is approaching the end of its predicted life and capacity limits The system will require a partial upgrade and replacement to continue to satisfy critical power requirements through and beyond the area control facilities implementation.

The method by which the PCS at the ARTCCs will be upgraded and replaced has been determined by an engineering study completed in 1987. The final system will be one which will increase the reliability of electrical power while providing for future load growth. The PCS at the offshore ARTCCs will be investigated and recommended improvements made to provide increased reliability.

Approach: Develop a national plan and criteria to improve power quality where required to satisfy facility mission requirements. Modifications will be made to standby power systems (replacement of small engine generators with batteries and dc distribution systems) and power transfer systems. Large engine generators will be overhauled or replaced. Remote maintenance monitoring systems will be used to permit monitoring, certification, and control. Approximately 2,000 smaller engine generators (30 kW and below) are in need of replacement with batteries and dc distribution systems as facilities are converted to solid state. Approximately 1,000 engine generators require overhaul or replacement. Other commercially available power sources will be introduced for use by the FAA.

Line conditioning, lightning surge protection and grounding, bonding, and shielding efforts will be continued to upgrade existing equipment to the latest state-of-the-art. Power conditioning devices will be provided to correct other known deficiencies. Replacement of obsolete wiring to meet code requirements will continue.

Products: A total of 90 of the most critical of approximately 1000 large engine generators will be modified, refurbished, or replaced as required to maintain availability and quality of standby power service.

Approximately 120 line-conditioning devices (battery systems/power filters/motor-generators/ uninterruptible power systems/etc.) will be provided, where required, to compensate for poor quality or reliability of available utility services.

Approximately 1000 facility electrical systems will be modernized as required to support new solid-state electronic systems. This modernization encompasses upgrading facility lightning protection and grounding, bonding, and shielding systems, replacement of obsolete wiring and electrical devices to meet current national electrical code requirements. Electrical system improvements will also be made to provide optimum electromagnetic compatibility

(EMC) between electronic subsystems and adequate immunity to electrostatic discharges. Approximately 50 percent of these facility electrical system modernizations will be required at large-scale facilities such as ARTCCs, ATCTs, ARSRs, and ASRs.

Progress/Activity from October 1989 through November 1990:

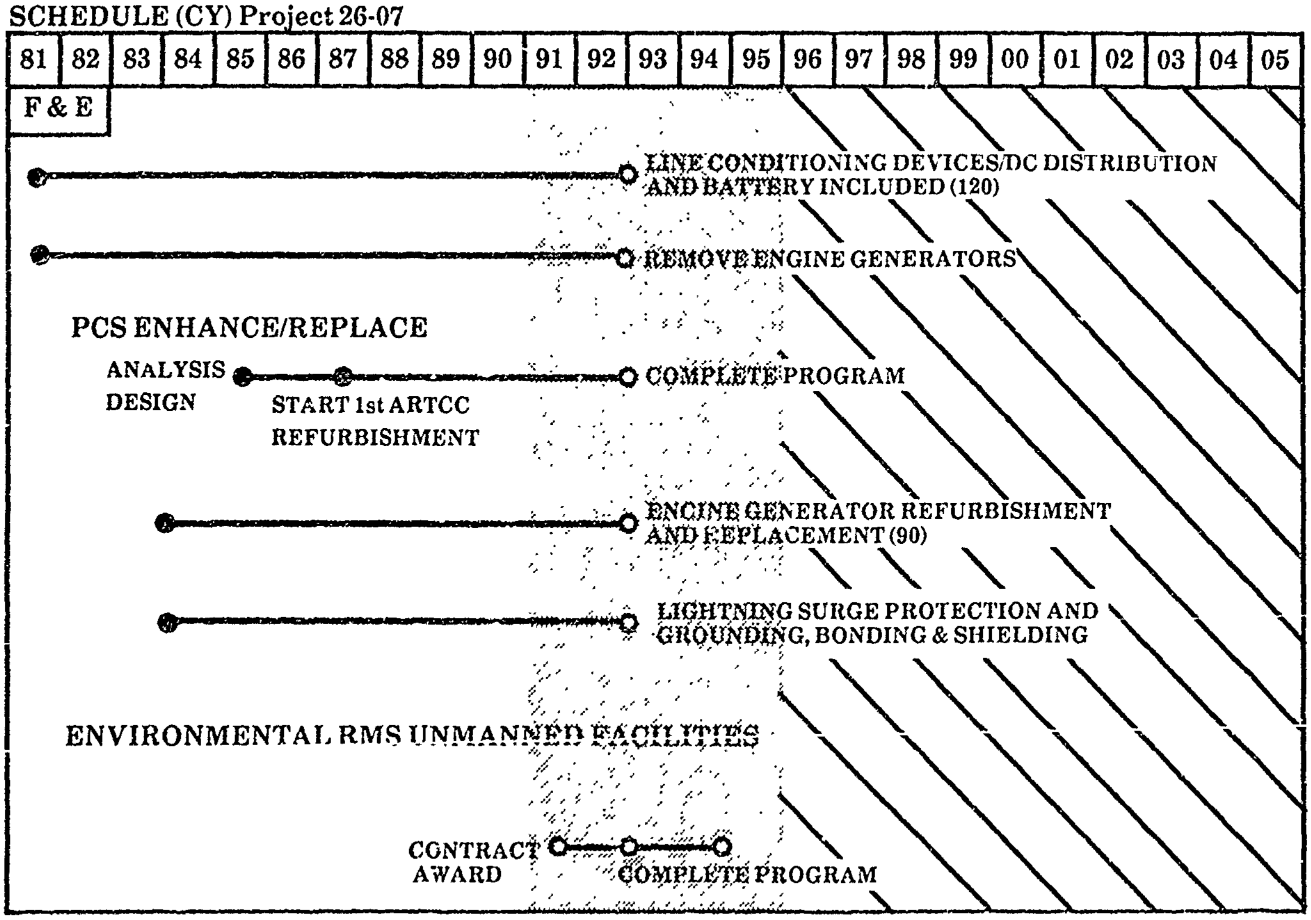
- Continued delivery of engine gener^ors.
- Continued delivery of loadbanks for ASR-9.
- Pı ovided support for ARTCC modernization.
- Continued site investigations for lightning surge protection, grounding, bonding, and shielding.

Related Projects/Activities: Electrical and environmental control system work described herein will be completed in consonance with the mechanical and facility modernization work described in 26-08 Modernize and Improve FAA Buildings and Equipment. Coordination is also required with 26-09 ARTCC Plant Modernization. 46-07 Power Systems Sustained Support will provide future needs.

List of Contractors:

- Essex Electro Engineers
  (95 engine generators)
  Bensonville, Illinois
- BESAFA, Inc.
  (115 load banks)
  Carson, California
- Sam Brown, Inc.
  (32 engine generators)
  Kansas City, Kansas
- Lakeshore Electric
  (71 bypass switches)
  Chicago, Illinois

SCHEDULE (CY) Project 26-07



PROJECT 26-08: Modernize and Improve FAA Buildings and Equipment

Purpose: This program develops new standards and upgrades existing buildings and plant equipment to provide adequate plant facilities for operation and maintenance of electronic facilities. These buildings house navigation, communications, surveillance, or landing systems.

Regions typically have accomplished facility improvement work with regional personnel or by individual contracts managed by the region. The work has been accomplished on an as-needed basis dependent on manpower and funding availability.

The large number of buildings approaching the end of their normal service life (generally 20 to 30 years) has created a need for a national program. It is quite probable that it will be more economical to replace some older buildings than to modernize them.

Approach: The practice of performing modifications according to the needs of the moment and tailoring these modifications to the requirements (climate, existing equipment mixes) reduces the degree of standardization between facilities. A systems approach provides improved standardization and decreased support costs. A comprehensive national plan has been developed to provide new standards and implement modernization and improvement projects.

Many existing Airway Facilities buildings will continue to be used for the next 20 years. Much of the original electronic equipment installed in these buildings has been or will be replaced with a newer generation of equipment with environmental, size, and maintenance requirements that are substantially reduced. Appropriate modification are being made to adapt these facilities to the new equipment requirements and, thereby, reduce operational costs.

Modifications to repairable facilities are being made to keep the buildings in a usable condition through the year 2000. Modifications include improvements to the buildings' weather tightness, installation of cost-beneficial insulation, and other energy conservation upgrades.

Building modifications are being made to provide for co-locating navigation and communication systems at some sites. Standard designs have been completed for ASR-9 and RCL. New standard designs have been developed for new facilities such as consolidated communications and ARSR-4. Tramways are considered for dependable access to mountaintop ARSRs when economically justifiable and operationally advantageous.

Products:

- Standard facility designs will be provided.
- Approximately 150 separate improvements at 60 facilities are planned each year .
- The program has been expanded. Beginning in FY 90, approximately 2,400 separate improvements are planned to be made at 1,000 facilities per year.

Progress/Activity from October 1989 through November 1990:

- Standard facility designs to house ARSR-4 were completed.
- New VOR building design initiated.

Related Projects/Activities: Mechanical and facility modernization work described herein will be completed in consonance with electrical and environmental control system work described in 26-07 Power Systems. Support will also be provided to other radar, communication, and navaid programs. Communication facilities consolidation and the ACF program final configuration decision may alter the schedule or requirements. 46-08 Modernize and Improve FAA Buildings and Equipment is also related.

Problems Resulting in Delays: Many facilities have deteriorated to the point that emergency repairs are often required to correct leaks, replace corroded or rotted structures, and make repairs to impassable access roads. Responding to these emergencies requires reprioritization of other program assets to address the emergencies.

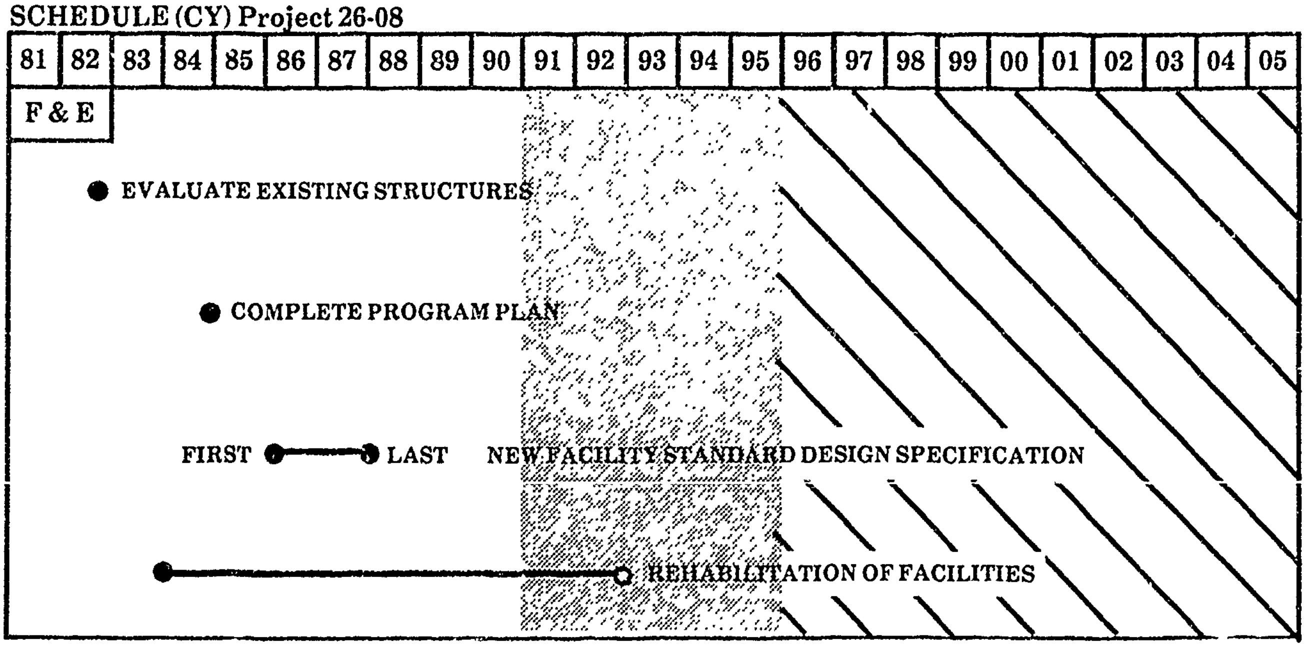
Delays Minimized by:

- Adequate funding has been requested to accomplish some of the deferred work from previous years.
- Adjustments to the out year funding levels required to adequately support this program.

List of Contractors:

- Martin Marietta Corporation
  Air Traffic Systems
  (architectural and engineering support)
  Washington, District of Columbia
  - Ralph M. Parsons Company
    Pasadena, California
- Various regional contractors

SCHEDULE (CY) Project 26-08



PROJECT 26-09: ARTCC Plant Modernization

Purpose: This project will assure that adequate facilities are provided for air route traffic control centers. Certain portions of the ARTCC buildings have been operating in their present configuration since the early 1960s. Within the next 5 years, much of the existing plant and structures will require replacement, refurbishment, or upgrading. In addition, new requirements have surfaced due to changing energy, safety, security needs, and new equipment installations which may require building additions.

Approach: Modernization designs and site adaptation will be provided by the System Engineering and Integration Contractor. Site-unique designs and construction will be by regional contracts. Construction in ARTCCs specifically required for the implementation of the advanced automation system will be funded under the advanced automation program and other ACF-related programs.

Building expansion, rehabilitation, and modernization include:

- HVAC system and electrical system replacement and upgrade to include critical and essential system switchgear.
- Refurbishing of interiors, asbestos control, OSHA compliance, and building code compliance.
- Security enhancements.
- Energy conservation.
- Grounds, roads, and parking upgrades.
- Reroofing.
- Central control monitoring system replacement and upgrade.

Products: ARTCC facilities will be involved as follows:

- The 20 existing CONUS centers will house Area Control Facilities (ACFs) and will be upgraded as appropriate to provide an additional 20 to 30 years of service.
- Two offshore centers (Anchorage and Honolulu) will continue in service indefinitely and will be converted to ACFs and receive appropriate upgrades.
- The remaining offshore CERAPs (San Juan and Guam) will receive appropriate upgrades.
- The New York TRACON will receive appropriate upgrades until conversion to an ACF.

Progress/Activity from October 1989 through November 1990:

- Standard end-state equipment layouts were updated to reflect the latest NAS equipment requirements and site-specific end-state drawings have been finalized for 90% of the centers.
- Standard designs completed for the air traffic operational areas and site adaption designs are underway at 70% of the centers.
- Construction is underway on upgrading the equipment areas and HVAC systems at approximately 80% of the centers.
- Cost reducing improvements have been made to the power system standard design, and procurement is underway for the major power system components.

Related Projects/Activities: This project will provide the environment and physical plant interfaces with 21-12 AAS. This mandates an integrated planning and engineering effort to assure the adequacy of the end product and prevent duplication of work. Scheduling and space requirements for the upgraded PCS system provided under 26-07 Power Systems will be integrated into the overall master facility modernization plan.

Problems Resulting in Delays:

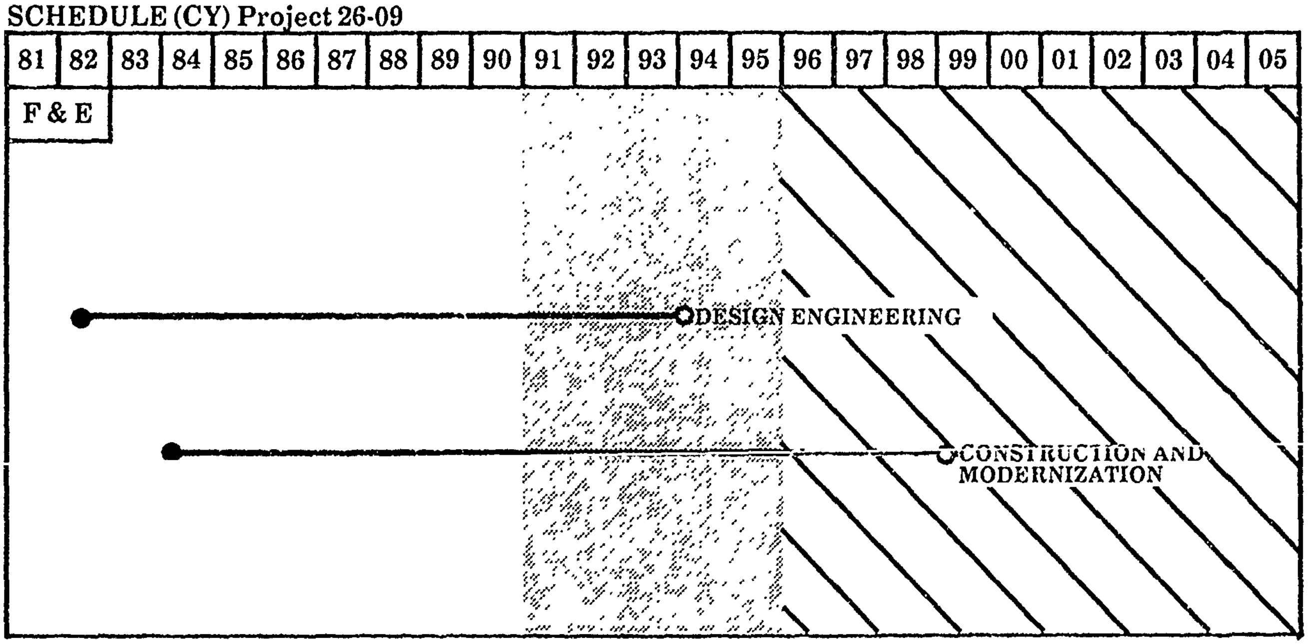
- Major increases in scope of work were caused by growth in space and power requirements for projects planned for ARTCC deployment. Site adaptation design is critical for delivery of key NAS equipment.
- If this effort is not accomplished as scheduled, implementation of the AAS and VSCS will be delayed and the transition to ACF facilities will be affected accordingly.

Delays Minimized by: Baseline requirements were approved and critical schedules were controlled. Additional SEIC resources were requested and appropriate priorities were assigned to this effort to assure adequate funding. Emphasis was placed on additional ARTCC space requirements to support the transition to the ACF environments.

List of Contractors:

- Martin Marietta Corporation
  Air Traffic Systems
  (architectural and engineering support)
  Washington, District of Columbia
  - Ralph M. Parsons Company
    Pasadena, California
- Various regional contractors

SCHEDULE (CY) Project 26-09



PROJECT 26-10: Acquisition of Flight Service Facilities

Purpose: This project acquires the space required to accommodate the modernized FSS configuration of 61 facilities.

Approach: Space for the 61 automated FSSs is being acquired on a sponsor-leased or FAA-provided basis at selected airports throughout the United States and Puerto Rico. The 61 facilities are being designed in accordance with standard FAA operational and technical requirements. These 61 automated facilities range from 8,000 to 12,000 square feet and accommodate all personnel and equipment requirements.

There have been 60 sites selected and approximately 93 percent are under construction or completed.

The following factors are considered in evaluating sponsors' proposals for building facilities:

- Life-cycle cost, which includes all FAA costs associated with a particular location, such as one-time costs, lease costs, maintenance, utility, and service costs. The analysis also considers both lease construction and FAA construction in determining the most cost-effective method.
- Building factors which include location on airport and parking provisions, suitability of technical and administrative space, and electrical distribution and telephone facilities.
- Other factors include telephone exchange capability, number of employees to be relocated, availability of quality housing, number of aircraft operations, and number of based aircraft.

Products: 61 automated flight service station facilities.

Progress/Activity from October 1989 through November 1990:

- FAA took occupancy of buildings at Boise, Idaho; Great Falls, Montana; Buffalo, New York; and Elkins, West Virginia.

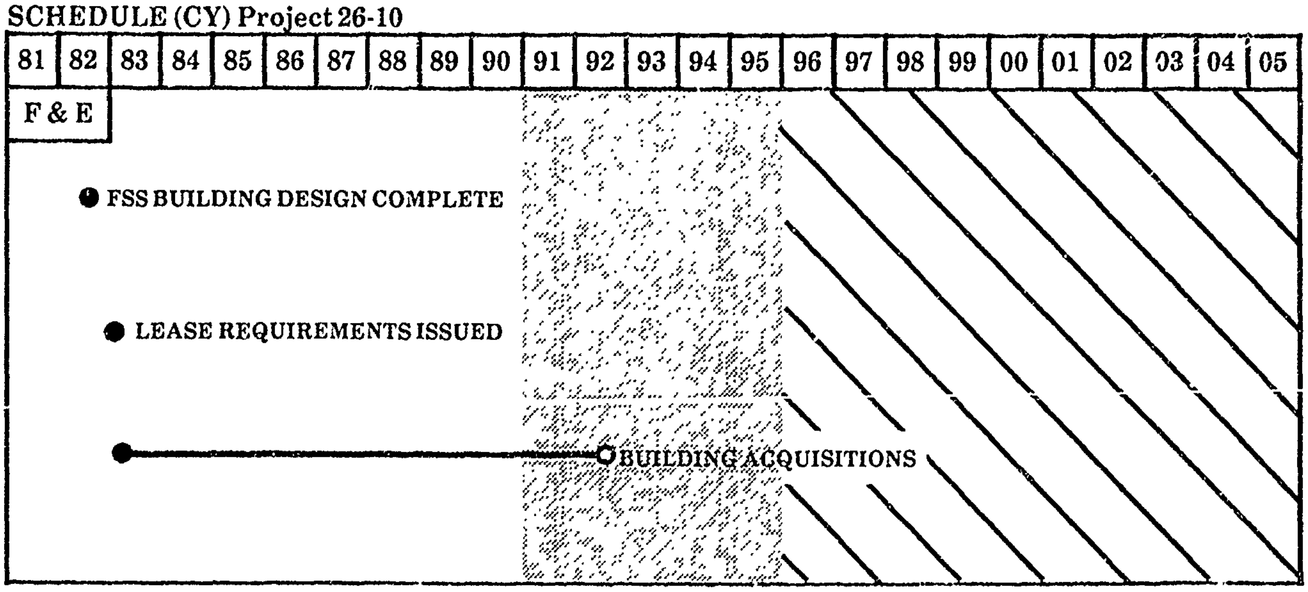
Related Projects/Activities: 23-01 FSAS will be located at the facilities provided by this project. 23-13 ICSS provides the computer based switching and control equipment required to support FSS air-ground and ground-ground voice communications.

Problems Resulting in Delays: Construction at Oakland, California, was delayed because of contractor nonperformance.

Delays Minimized by: Construction at Oakland, California, is now underway with a new contractor.

List of Contractors: Facility modification/construction contractors are determined by each individual region as required.

SCHEDULE (CY) Project 26-10



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PROJECT 26-12: Aircraft and Related Equipment

Purpose: This project provides direct support to the FAA aircraft fleet. Increased initiatives in aviation safety inspector hiring and development of new air traffic control procedures (e.g., East Coast Plan) have resulted in additional requirements for the support and FAA Academy flight training programs. This project will ensure that the Agency fleet meets mission requirements, is representative of current state-of-the-art NAS technology, and has instrumentation essential to the safety of Agency aircraft and personnel.

Approach: Short- and long-term initiatives have been developed which consider all requirements that affect the capability to provide fleet support. Fleet enhancements and upgrades to state-of-the-art configuration include procuring and installing LORAN-C, MLS, Mode S, TCAS II, GPS, flight management systems, electronic flight instrumentation systems, precision distance measuring equipment, cockpit voice recorders, flight data recorders, automatic flight inspection systems, and replacement of obsolescent avionics which are not compatible with mission requirements.

Products: A state-of-the-art aircraft fleet which is capable of meeting the demands of increasing program requirements in the areas of R&D support, flight inspection, and training.

Progress/Activity from October 1989 through November 1990:

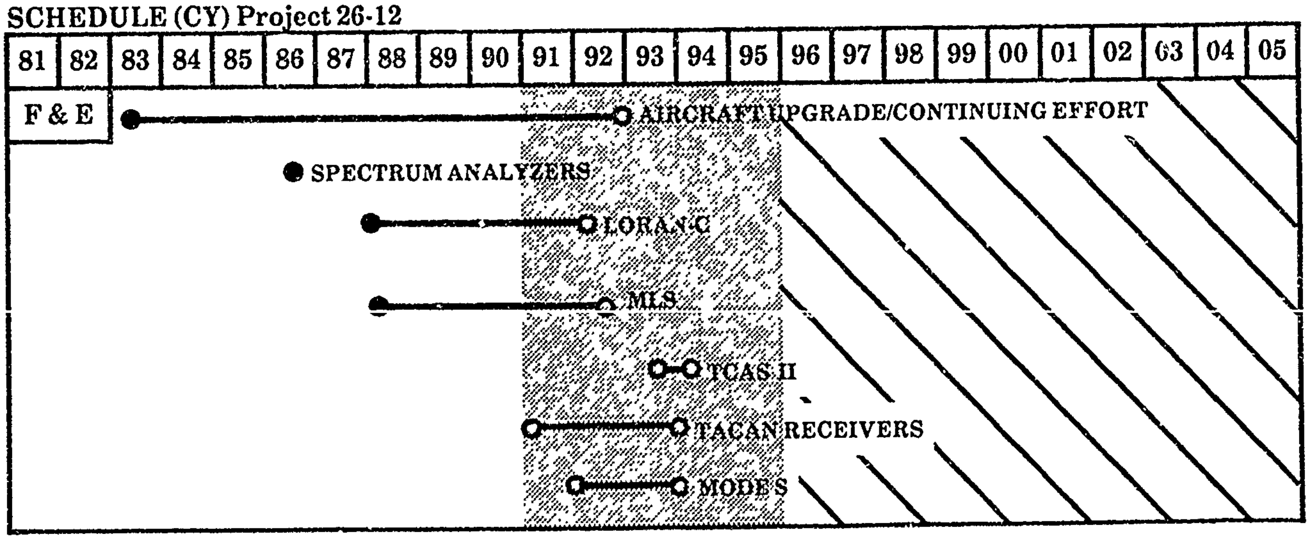
- Contract awarded for delivery of flight inspection TACAN systems.
- Contracts awarded for front-end flight inspection LORAN-C systems.
- Contract awarded for nonflight inspection MLS receivers.
- Mode S specifications developed and procurement request issued.
- Follow-on purchase request issued for HF/SSB communications systems.

Related Projects/Activities: Additional aircraft upgrade requirements beyond 1992 will be accomplished under 56-12 Aircraft and Related Equipment Program.

List of Contractors:

- Parker Hannifin Corp.
  Gull Electronics Systems Division
  (NCU development)
  Smithtown, New York
- Hewlett Packard, Inc.
  (15 spectrum analyzers)
  Oklahoma City, Oklahoma
- Allied Signal, Inc.
  Bendix/King Air Transportation Division
  (77 MLS receivers)
  Fort Lauderdale, Florida
- Honeywell
  (42 inertial sensor units)
  Minneapolis, Minnesota
- Collins
  (16 HF/SSB communications systems)
  Cedar Rapids, Iowa
- Sierra Research Corporation
  LTV Aerospace Division
  (60 TACAN systems)
  Buffalo, New York
- King Radio Corporation
  (50 front-end LORAN-C systems)
  Olathe, Kansas
- Foster Air Data
  (36 flight inspection LORAN-C systems)
  Columbus, Ohio

SCHEDULE (CY) Project 26-12



PROJECT 26-13: System Engineering and Integration Contract (SEIC)

Purpose: This project provides management and technical support for the implementation of the CIP. The complexity and high visibility of this Plan requires that unified contractual support be provided to:

- Audit the NAS Plan and provide annual CIP updates.
- Ensure compatibility of existing and evolving systems.
- Identify and compare alternative implementation strategies.
- Assess program impacts.
- Refine technical, cost, and schedule estimates.
- Review technical proposals.
- Evaluate alternative designs.
- Provide technical direction to subsystem contractors.
- Ensure that developed items meet specified requirements.
- Integrate subsystems into the operational system.

The requirement for technical expertise in the support of the large systems engineering and implementation effort cannot be met with the available FAA staff.

Approach: A contract was awarded in 1984 and provides the skills and support tools necessary for implementation of NAS projects and integration of acquired systems. An option was exercised in 1989 to cover support into 1992. A second option, if exercised, would provide support into 1994.

Products: Engineering documentation and management support for:

- Initial NAS Plan audit and annual CIP updates.
- Program support in the development of functional requirements statements, feasibility and trade studies, performance analyses and model, system designs, system integration plans, system implementation strategies, logistics, and training plans.
- Project management support for requirements analysis, specification development, procurement package review, proposal evaluation, contract monitoring and technical evaluation, and direction of field installation.
- Control tools and systems for benefits analysis, cost analysis, schedule analysis, risk analysis, configuration management, and program control and monitoring.

Progress/Activity from October 1989 through November 1990:

- The system engineering and integration contract continues to provide support for design, integration, and transition planning; technical assistance in subsystem specification development; independent verification and validation of software; monitoring of individual development contracts; and in-depth management assistance to selected individual CIP projects. In addition, the following specific progress/activities occurred.
  - The CIP has been developed. The CIP replaces the NAS Plan and identifies the ongoing nature of ATC modernization. It covers the entire F&E program including growth, infrastructure replenishment, supportability, and new capabilities. The preparation of the CIP required a cost/schedule audit of over 200 CIP projects and cost benefit analyses for over 100 new projects.
  - Key acquisition support continues for major systems including AAS, VSCS, and TDWR.
  - Major NAS system engineering design alternative studies were conducted including. en route radar replacement, Chicago area control facility, remote monitoring system implementation, communications architecture design, aviation weather products, and ILS/MLS transition.
  - The deployment readiness review process continues to be effective in assuring that projects are fully operational and supportable before they are fielded.
  - Air Traffic Control Tower (ATCT) transition received increased emphasis through the

initiation of regional ATCT transition teams, development of tower layout modeling tools, and continued close coordination between headquarters and regional tower integration working groups.

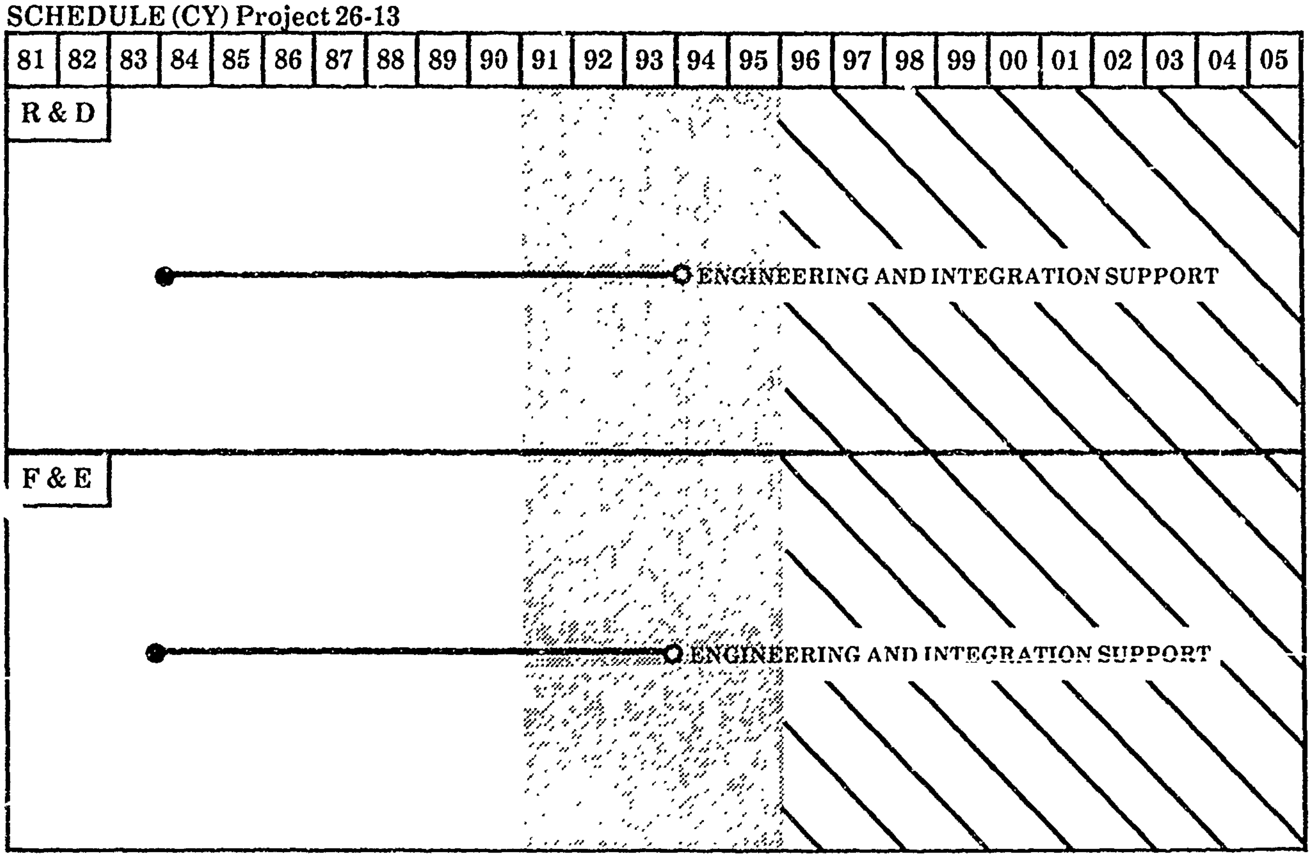
- The support and development of transition plans, procurement specifications, and construction packages continued for the Air Route Traffic Control Center (ARTCC) modernization. Fifteen procurement packages have been produced representing $20 million in construction effort for the ARTCC facility designs.

Related Projects/Activities: Most of the original NAS Plan projects are supported by the System Engineering and Integration Contractor.

List of Contractors:

- Martin Marietta Corporation
  Air Traffic Systems
  (systems engineering and integration support)
  Washington, District of Columbia
  - Logicon, Inc.
    San Pedro, California
  - ARINC Research Corporation
    Annapolis, Maryland
  - Ralph M. Parsons Company
    Pasadena, California
  - Stanford Telecommunications, Inc.
    Sunnyvale, California
  - Systems, Requirements & Services Associates, Incorporated
    Arlington, Virginia
  - Systems Control Technology, Inc.
    Palo Alto, California
  - EER Systems Corporation
    Vienna, Virginia
  - BTG, Inc.
    Vienna, Virginia
- MITRE Corporation
  (system development and engineering)
  McLean, Virginia

SCHEDULE (CY) Project 26-13



PROJECT 26-14: National Radio Communications System (NARACS)

Purpose: The National Radio Communications System will provide essential command and control communications entirely by radio for use in the event of a national or local emergency which may temporarily disrupt common carrier communications among NAS facilities. Coverage will be among FAA Headquarters, regions, field facilities, aircraft, and other Federal, state, and local government agencies. There will be no dependence on common carrier systems. The network will be available for routine purposes on a daily basis for dispatching and redirecting Airway Facilities maintenance technicians, aviation security, accident investigations, and other NAS activities. NARACS is based on National Security Decision Directives (NSDD-47, 97, and 145).

Approach: Phase I established a high-frequency/single-sideband (HF/SSB) backbone network (control network with nodes) at FAA Headquarters and at three emergency operating facilities. In addition, the HF/SSB radio systems at Seattle and Anchorage were upgraded to enable them to operate as an extension of the backbone network. The backbone network has voice, voice privacy, and data capabilities.

Phase IA provided secure data communications by adding security terminal equipment that connects with the Automated Digital Network (AUTODIN).

Phase II will establish two geographical networks that interface with the national command/control backbone communications network. These Eastern and Western Command Nets will provide HF/SSB radio communications with the regional offices, ARTCCs, Flight Inspection Field Offices (FIFOs), major airports, FAA support aircraft, and other key facilities within each area. These networks will have voice, voice privacy, and data capabilities. The HF capabilities portion of NARACS shall be protected from nuclear, High-Altitude Electromagnetic Pulse (HEMP) at Emergency Operations Facilities and ARTCCs.

Phase III has provided highly reliable two-way radio communications which are independent of common telecommunications carrier to the greatest extent possible, in any location in the region and in the United States with proper automatic/manual interfacing and linking with other networks of NARACS. Each regional network is an integral part of NARACS. Radio links have been installed as necessary to provide radio connectivity between regional VHF/FM and national HF networks. Network design supports the dispatch of technicians from central maintenance work centers via mobile/portable radios, repeaters, and fixed-base radios. RCL equipment will be used to connect regional VHF/FM networks with ARTCCs to the maximum extent possible.

Phase IVA will establish the Federal Secure Telephone Network (FSTN) at Washington Headquarters, regional offices, ARTCCs, and other major field offices.

Products:

- Phase I – Communications control center, FAA Headquarters, and three national emergency operations facilities.
- Phase IA – COMSEC network upgraded to AUTODIN.
- Phase II – Eastern and Western networks.
- Phase III – Regional networks.
- Phase IVA – Federal Secure Telephone Network.

Progress/Activity from October 1989 through November 1990:

- Commissioned last AUTODIN at Anchorage.
- Completed relocation of screen room at Boston ARTCC.
- Completed all retrofit activities (5 sites).
- Completed all resurveys (10 sites).
- Completed Phase II installations at 4 sites (37 of 44 sites now complete).
- Phase II installations in progress at 6 sites.
- Delivery of initial Phase IVA systems was expedited to support Agency drug interdiction programs.

Related Projects/Activities: NARACS will use the RCL (25-03 RML Replacement and Expansion) for inter-regional and intra-regional connectivity. Other methods, such as microwave, UHF/VHF, and low power HF will be used where RCL is not available. 56-15 NAS Spectrum Engineering Sustained Support is essential to ensure proper channel spacing and availability. Noise and external interference will be minimized by proper spectrum engineering. Interface requirements of NARACS equipment with the maintenance control center need to be satisfied and closely coordinated to assure proper hardware and software integration.

Problems Resulting in Delays: Delays have occurred due to increased operational requirements, software development, coordination, integration activities, and training.

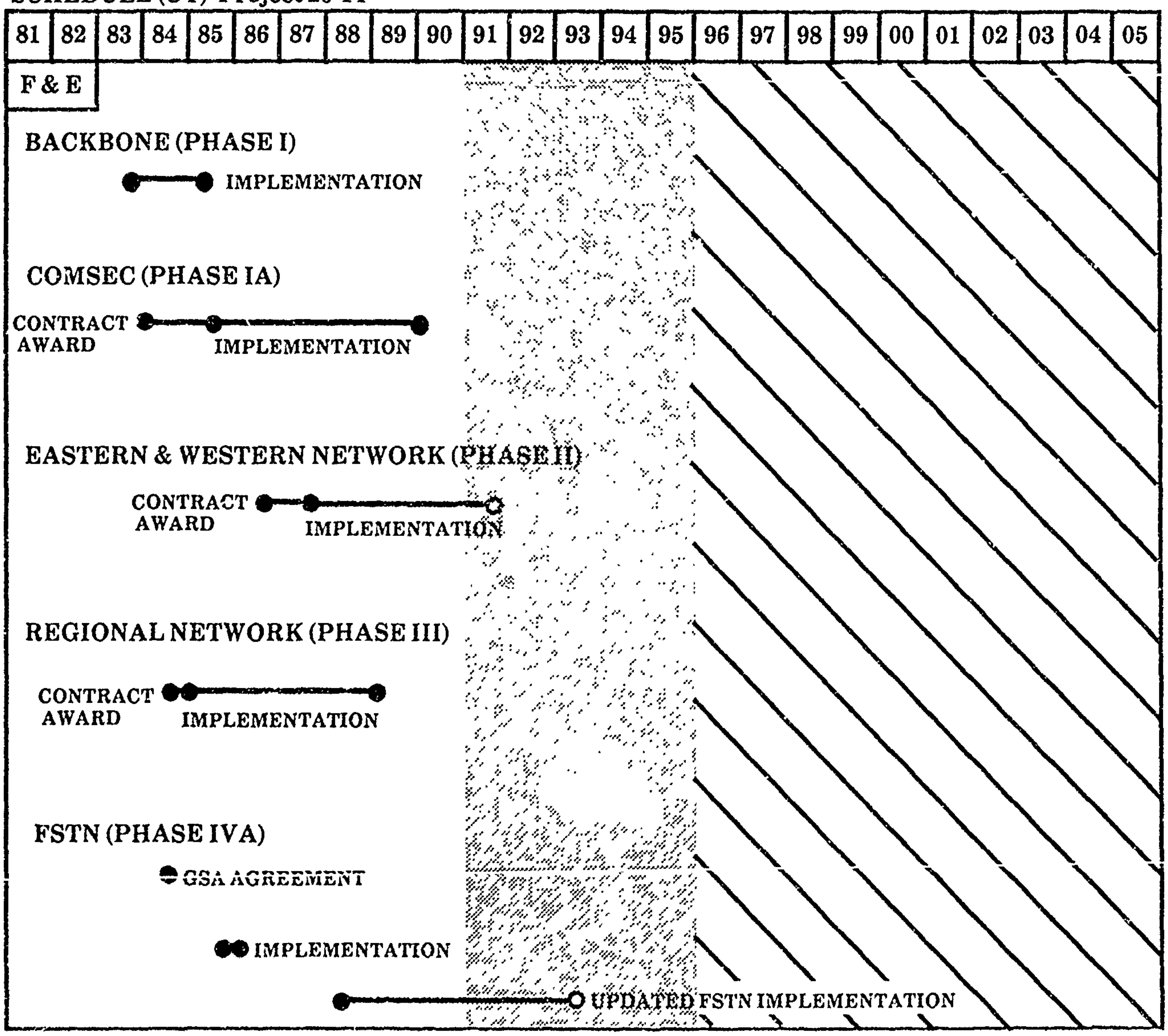
Delays Minimized by: Management attention has been increased to evaluate the program, to provide more frequent reviews, to enhance control of configuration and coordination, and to provide necessary training.

List of Contractors:

- Systems Management American Corporation (Phase II)
  Norfolk, Virginia

- Motorola Communications and Electronics, Inc. (Phase III)
  Landover, Maryland

SCHEDULE (CY) Project 26-14



PROJECT 26-15: NAS Spectrum Engineering

Purpose: This project provides spectrum utilization support necessary for interference-free operation of the modernized NAS. The NAS is dependent on the use of radio frequency spectrum. Therefore, effective management of the radio spectrum, including electromagnetic compatibility aspects, is vital to the implementation of the CIP.

Approach: Develop frequency assignment plans to ensure that adequate frequency spectrum is available for each CIP project requiring frequencies.

This planning effort involves electromagnetic compatibility analysis, large-scale frequency assessment studies, formal spectrum certification required by National Telecommunications Information Administration (NTIA) for new systems, national and international frequency coordinations, radio propagation studies, and facility networking.

Represent the U.S. in meetings of the International Telecommunications Union (ITU) and International Civil Aviation Organization (ICAO) to protect U.S. aviation interests. These meetings develop policy, technical procedures, and criteria concerning the use, sharing, management, and allocation of the radio spectrum for the NAS as well as other aviation systems.

Obtain and protect necessary frequencies for the NAS facilities through automated computer techniques to the extent possible. Investigate and resolve Radio Frequency Interference (RFI) problems. High-power AM, FM, and TV stations are serious interference sources to both ground and avionic equipment. Resolution and prevention of this type of interference involves close coordination with the broadcasting industry, FCC, and ICAO.

Investigate and conduct field measurements of potential personnel radiation hazards to ensure that all existing and planned NAS facilities meet existing U.S. standards.

Provide facility coverage charts necessary for proper engineering of frequencies and for networking of communications, navigation, surveillance, and DF systems.

Provide U.S. telecommunications support to international civil aviation as required in the CIP. This involves extensive international coordination on aeronautical mobile and fixed services (HF, AFTN, world area forecast system, etc.).

Products:

- Frequency assignment plans in support of the CIP include MLS, high-altitude EFAS, 25 kHz air-ground communications, RCL, NARACS, and NEXRAD.
- EMC guidelines for facility consolidation.
- Frequency authorization and formal spectrum approval from the National Telecommunications and Information Administration.
- Facility coverage charts.
- Spectrum engineering studies in support of the CIP. These studies include frequency engineering models, RFI suppression devices, investigation of state-of-the-art technology and procedures for RFI elimination, AM/FM/TV interference evaluation, etc.

Progress/Activity from October 1989 through November 1990:

- Identified requirements for upgrading the secure computer system used to process classified frequency data.
- The backbone RCL frequency assignments were completed. Revisions to accommodate changed installation requirements are ongoing.

Related Projects/Activities:

- Spectrum engineering facilities and activities at the FAA Technical Center provide the test bed and electromagnetic compatibility analysis necessary to accomplish the frequency spectrum management function.
- Spectrum engineering supports, as a minimum, all NAS projects that emit or receive radio frequency (RF) signals. This support applies to new projects, including facility relocations, and includes communications, radar, and automation programs. Frequency engineering, selection and interagency coordinations, spectrum studies, electromagnetic interference measurement analysis, and radiation hazard measurements are the main activities provided by spectrum engineering. This support is provided by 56-15

NAS Spectrum Engineering Sustained Support beyond 1992.

Problems Resulting in Delays:

- Certification of the secure computer system was delayed pending upgrades to meet security requirements. These upgrades were postponed due to budget restrictions.

- Completion of the conversion and development frequency assignment/interference analysis model was delayed due to funding limitations.

Delays Minimized by: Operations are being maintained with existing equipment/systems pending the system upgrade.

List of Contractors:

- CEXEC, Inc.
  (frequency automation support)
  Fairfax, Virginia

- Omar McCall and Associates
  (MLS program support)
  Beltsville, Maryland

- GraphTech
  (engineering support)
  Arlington, Virginia

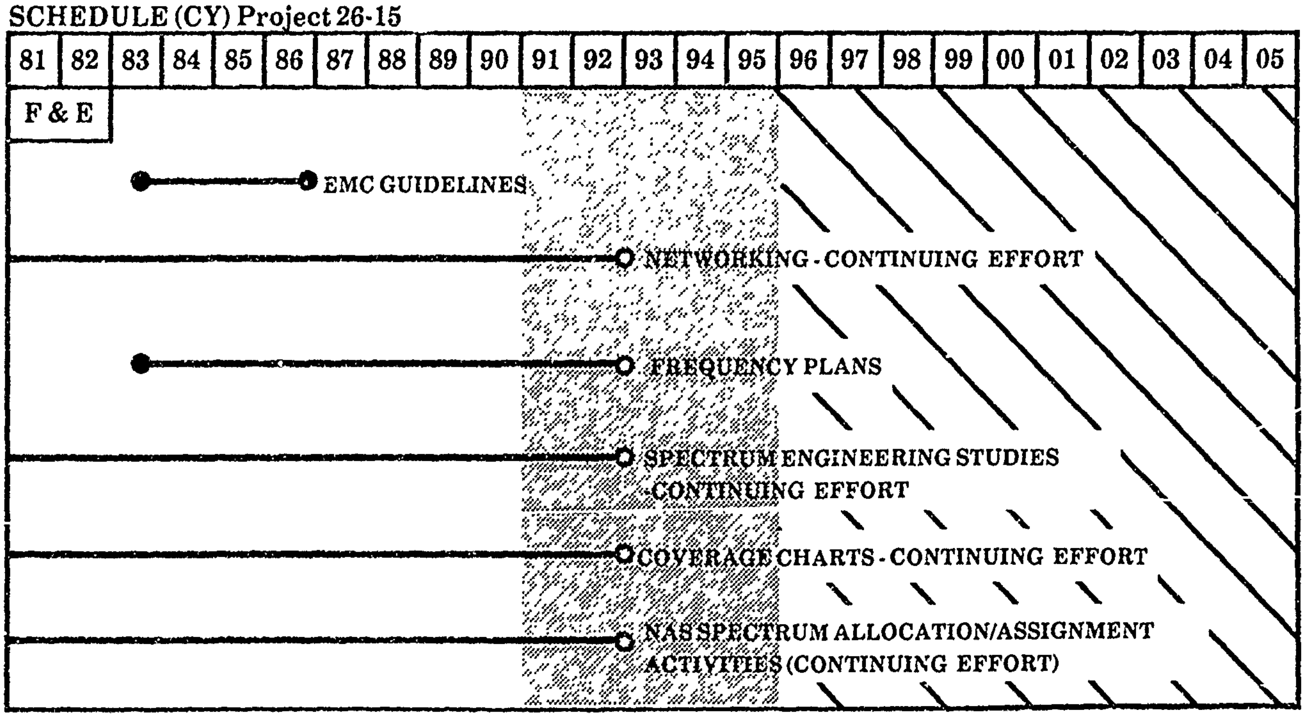
- Ohio University
  Avionics Engineering Center
  (engineering support)
  Athens, Ohio

- MiTech, Inc.
  (technical support)
  Washington, District of Columbia

- Martin Marietta Corporation
  Air Traffic Systems
  (technical services)
  Washington, District of Columbia
  - EER Systems Corporation
    Vienna, Virginia

- Electromagnetic Compatibility Analysis Center
  (FAA support)
  Annapolis, Maryland

SCHEDULE (CY) Project 26-15



PROJECT 26-16: General Support

Purpose: This project covers efforts in direct support of the overall National Airspace System and the ongoing F&E investments that are not covered elsewhere in the plan. These efforts generally improve operations, provide added capabilities, and promote safety.

Approach: Nonrecurring low-cost F&E projects which have been included in budget requests are: information processors for the aviation safety analysis system; universal printed-circuit board testers for installation at planned consolidated maintenance facilities; explosive detection systems; mechanized warehouse storage/retrieval system; automated Logistics and Inventory System (LIS), including on-line field requisitioning at the FAA Logistics Center; providing radomes at beacon-only sites; procuring calibration standards to certify test equipment; a computer-aided engineering design system at each regional office; and three-level weather for ARTCC displays.

Certain ongoing efforts must continue to support the NAS, including in-house and contractual engineering, design, and analysis for quick-reaction engineering and other technical assistance; minor regional and locally identified modifications, refurbishments, and equipment relocations; improvement and leasing of FAA Technical Center plant and facilities; earthquake hazard reduction of facilities; procurement, rehabilitation, or replacement of equipment for use in the engineering and development programs at the FAA Technical Center; where cost beneficial, purchasing land or acquiring protective easements for existing facilities rather than continuing to lease properties; real estate and contract management; upgrading of existing support equipment; en route hardware and software systems development and support; ATCRBS support; ARTS II MSAW topography and graphics; ARTS IIIA, ARTS II/IIA, EARTS, and ARTS IIIE software development and system engineering. replacement of radomes at long-range radar sites; and projects to meet Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA) standards at FAA facilities.

Products:

- Nonrecurring projects.
  - Information processors to support the aviation safety analysis system.
  - Printed circuit board testers.
  - Explosive detection systems.
  - Mechanized warehouse storage/retrieval system.
  - Automated logistics and inventory system (LIS), including on-line field requisitioning.
  - Upgrade the FAA Technical Center plant support complex.
  - Computer-aided engineering design systems.
  - Test equipment calibration standards.
  - Install false reply blanking units at 30 terminal beacon sites.
  - Provide radomes at beacon only sites.
  - Three level weather for ARTCC displays.

- Ongoing projects.
  - Engineering, designs, and analyses.
  - Regional and local minor projects.
  - Improvements of the plant and facilities at the FAA Technical Center.
  - FAA Technical Center building lease.
  - Purchase and leasing of land and easements.
  - Regional Logistics Contract Support.
  - OSHA and EPA improvements.
  - Printed circuit board maintenance software.
  - Radome replacement at selected sites.
  - Airports precise reference data program.
  - Leasing of space.
  - Earthquake hazards reduction.
  - ARTS II MSAW topography and graphics.
  - ARTS III Support.
  - En Route hardware and software systems support.
  - ATCRBS support.
  - Terminal Software Development (TSD).

Progress/Activity from October 1989 through November 1990:

- Solid-state radar beacon recorder preliminary and critical design reviews were completed and an engineering model was demonstrated.
- False reply blanking units prototype completed and invitation for bid issued.
- Computer Aided Engineering Graphics (CAEG) contract modifications for 21 ARTCCs, the FAA Technical Center, the FAA Aeronautical Center, and Washington Headquarters equipment.
- CAEG factory and site acceptance test completed for FAA Aeronautical Center equipment.

- Three Level Weather
  - Software operational at Honolulu and deployed to Kansas City and Fort Worth.
  - ARSR-3 modification is underway.
  - CD-2 contract being modified to support three level weather remote Maintenance Monitoring (RMM).
- Completed regional briefings and training for over 300 regional personnel on CAEG.
- Deployed CAEG equipment to support Dallas/Fort Worth Metroplex project.
- Developed application software for obstruction evaluation and airport airspace analysis, and for integrated noise modeling.

Related Projects/Activities: This program supports ongoing F&E efforts and operations. 46-16

Continued General Support provides follow-on support.

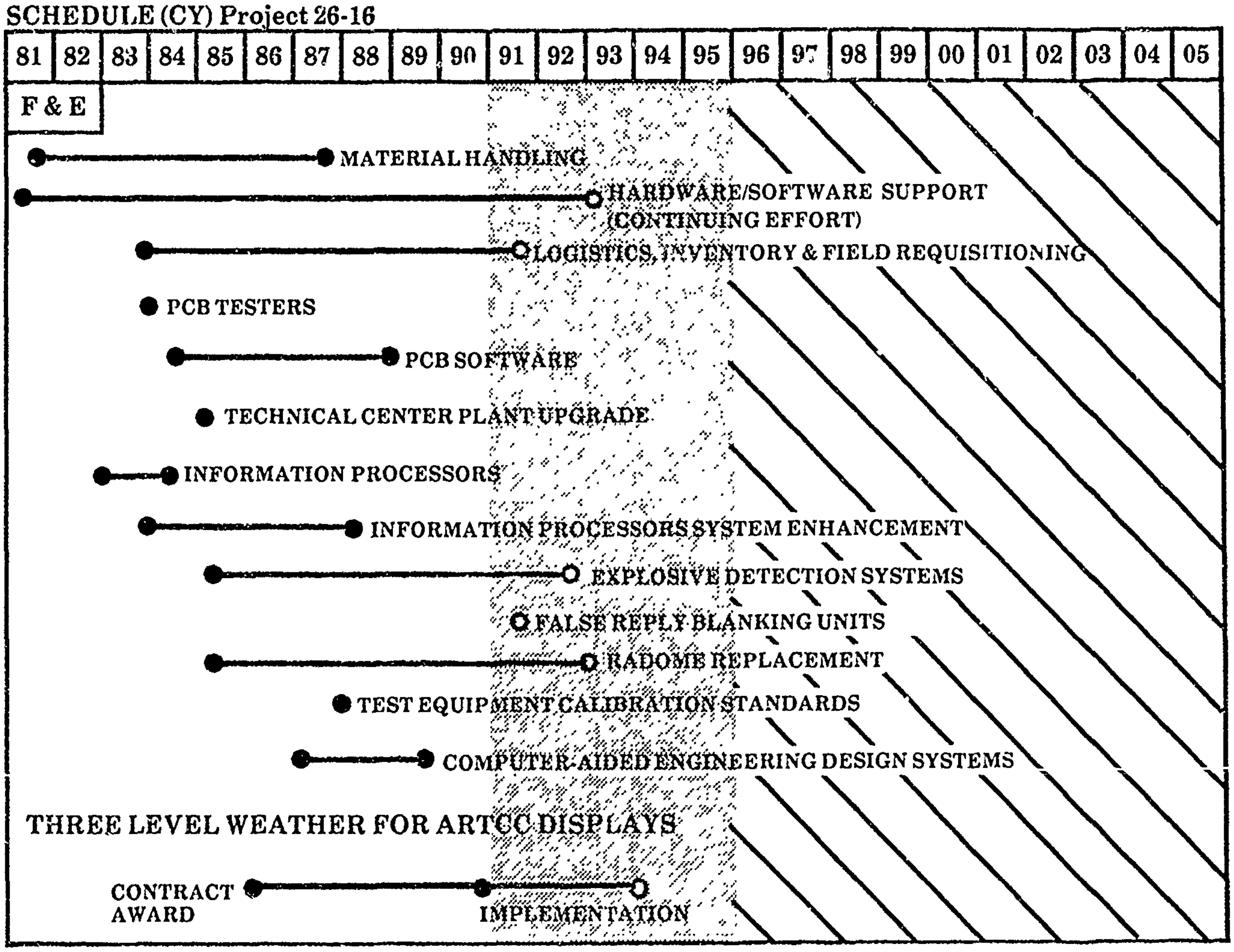
Problems Resulting in Delays: The CD-2 three level weather RMM was delayed because of funding availability.

Delays Minimized by: The three level weather function was extracted from the CD-2/RMM/three level weather design and a stand-alone modification kit for CD-2/three level was deployed.

List of Contractors:

- Telephonics Corporation
  (CD-2 weather modification kits)
  Farmingdale, New York
- Auto-Trol Technology Corporation
  (CAEG systems)
  Denver, Colarado
- Most contracts are administered at the regional level.

SCHEDULE (CY) Project 26-16



PROJECT 26-17: System Support Laboratory

Purpose: This project provides facilities and equipment at the FAATC in direct support of CIP projects. The FAATC provides technical support for current field systems and for test, evaluation, and integration of new systems. In accordance with FAA test and evaluation policy, the System Support Laboratory duplicates future systems, equipment, and interfaces necessary to establish realistic environments for all types of developmental, operational, and production acceptance testing. The testing ensures that total system requirements are met prior to installation at field facilities. Upon completion of testing, systems are integrated into the laboratory for direct field support; for development and testing of hardware, software, and firmware modifications; and for development of system enhancements.

Systems in this laboratory are configuration controlled and baselined to the level of operational field systems. Modifications are installed, tested, and baselined prior to installation at field facilities. This provides a centralized maintenance and field support capability for deployed systems.

Approach: The System Support Laboratory is partitioned into six support complexes:

- En route systems.
- Terminal systems.
- Flight service and weather systems.
- Ground-to-air systems.
- Interfacility communications systems.
- Maintenance and operations support systems.

An FAA Technical Center Transition Plan has been developed and is periodically updated. The plan is consistent with the Master Transition Plan and reflective of the Master Baseline Schedule. It identifies space requirements, installation plans, and evolutionary changes that ensure the integrity of System Support Laboratory configurations. System interdependencies and the switching capabilities of system configurations are also defined in the transition plan.

Products: System Support Laboratory.

Progress/Activity from October 1989 through November 1990:

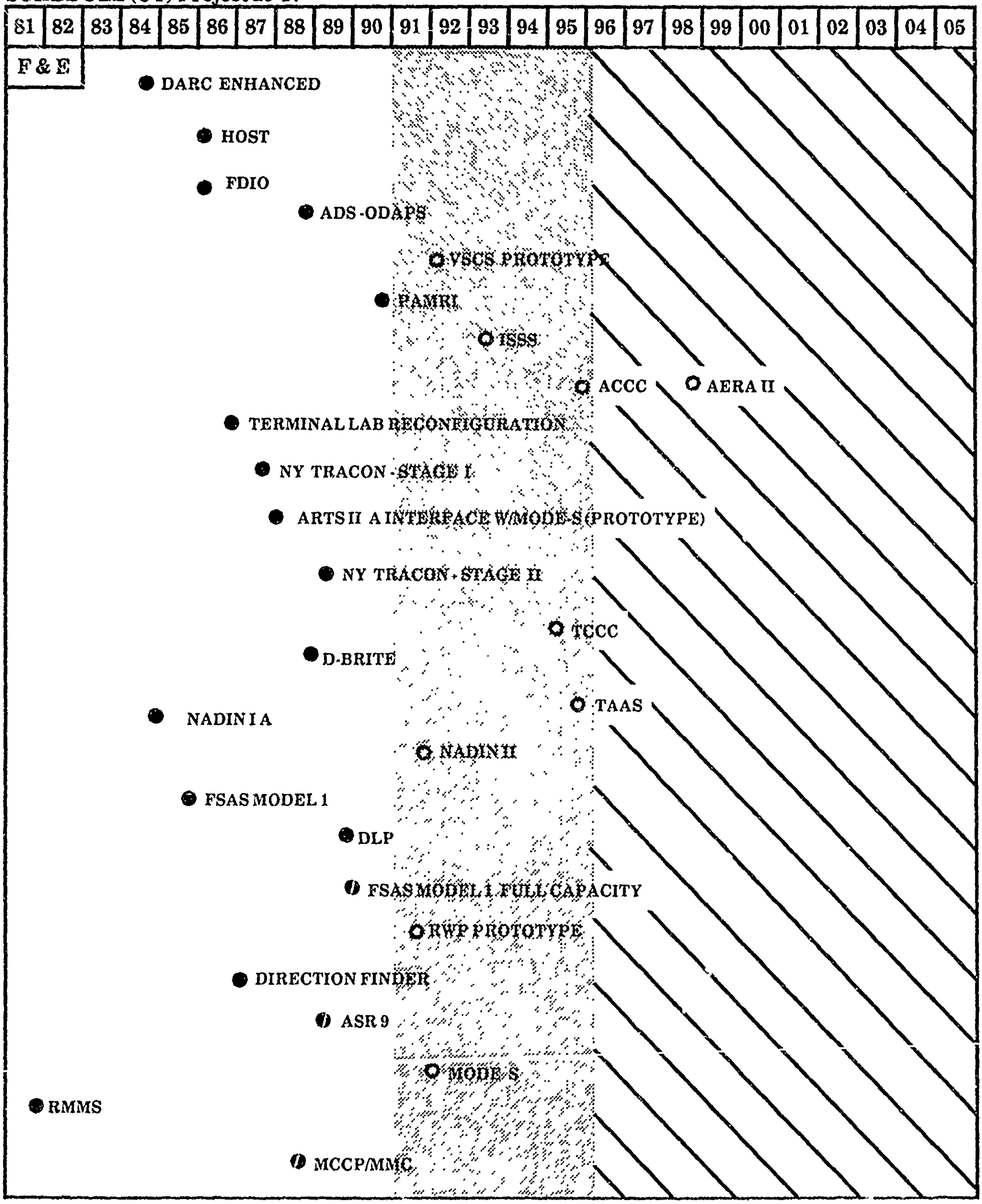
- Three Peripheral Adapter Module Replacement Items have been received and installed.
- The AAS job shop segment of the System Support Computer Complex has been received and installed.
- The Television Microwave Link (TML) has been received and installed.

Related Projects/Activities: A majority of major F&E projects. Continuing efforts beyond 1992 will be provided by 56-17 System Support Laboratory Sustained Support.

List of Contractors:

- International Business Machines (IBM)
  (hardware, software maintenance support)
  Bethesda, Maryland
- Unisys Corporation
  Federal Information Systems
  (hardware, software support)
  McLean, Virginia
- Other elements of the System Support Laboratory are provided by associated projects.

SCHEDULE (CY) Project 26-17



PROJECT 26-18: General Support Laboratory

Purpose: This project will provide the FAATC with general computer systems, equipment, aircraft, etc. for support to various FAATC projects.

Approach: The General Support Laboratory (GSL) is partitioned into distinct complexes and facilities whose resources are shared by systems and projects. The complexes provide:

- Airborne support.
- Simulation support.
- Test and evaluation support.
- General purpose data processing support.

The support systems and projects of the above complexes are involved with design, research, development, and test and evaluation of advanced concepts, procedures, and systems that are being considered for introduction into the NAS.

Airborne support includes both fixed-wing aircraft and helicopters, which are instrumented to provide flight data for projects.

Simulation support is provided for system tests that require both real-time and fast-time simulation of present and future air space environments. The Target Generation Facility replaces the existing NAS Simulation Support Facility to continue providing this function.

Test integration and control support includes centralization of systems management and configuration control of laboratory systems.

The General Purpose Data Center supports computational models as well as reduction and analysis of data obtained in tests and research.

Plans are being developed to upgrade specific complexes within the GSL. The plans will be responsive to the requirements of F&E and R,E&D Planing, and various other technical programs. 56-18 General Support Laboratory Sustained Support provides follow-on support.

Products: An upgraded GSL.

Progress/Activity from October 1989 through November 1990:

- Preparations for the target generation facility have begun.

Related Projects/Activities: Many of the major F&E projects.

List of Contractors:

- MiBo Construction Co., Inc.
  (construction)
  Vincentown, New Jersey

- Department of the Air Force
  (engineering and logistics)
  Patrick Air Force Base, Florida

- Systems Integration & Research, Inc.
  (hardware maintenance and technical support)
  Falls Church, Virginia

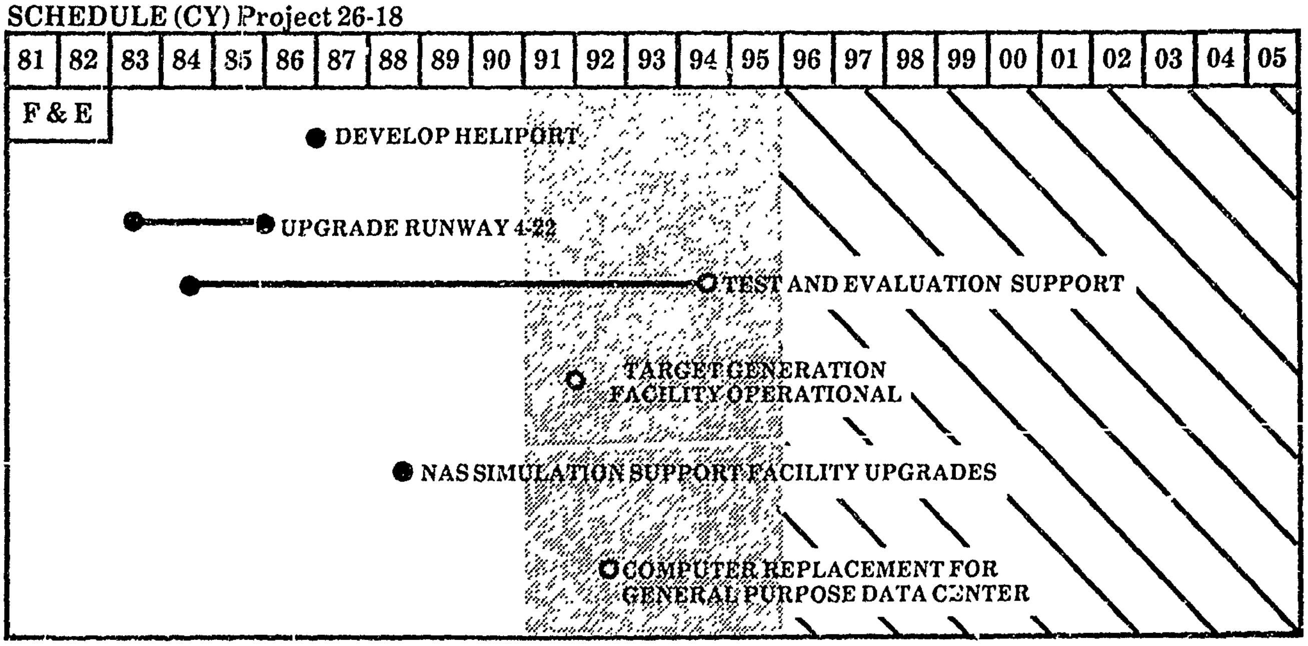
- Computer Resource Management, Inc.
  (software support)
  Vienna, Virginia

- International Business Machines (IBM)
  Information Systems Group
  (hardware maintenance and software support)
  Philadelphia, Pennsylvania

- Gould Inc.
  Computer Systems Division
  (hardware maintenance)
  Horsham, Pennsylvania

- ISC Cardion Electronics, Inc.
  (acquisition support)
  Woodbury, New York

SCHEDULE (CY) Project 26-18



PROJECT 26-19: Technical Support Services

Purpose: This project provides technical services and materials to supplement region, FAA Aeronautical Center, and FAA Technical Center staff efforts necessary to implement NAS improvements. These improvements create peak implementation work requirements on FAA region and center organizations which cannot be accommodated within current and projected staffing levels. It is not prudent management to increase the federal work force to meet these short term peak work requirements.

Approach: A national Technical Support Services Contract (TSSC) has been awarded to provide a means whereby regions and centers can obtain the support required to accomplish their facilities and equipment (F&E) mission. This support involves site preparation, equipment installation and tune-up, hands-on testing and equipment modifications. Work under the TSSC is issued to the contractor via a work release which may cover any portion of the "hands on" effort necessary to complete a particular project. Work releases are issued and managed by headquarters for work which is national in scope (cuts across region boundaries and involves most regions) or in the more common form, issued and managed by and for individual regions. An annual establishment engineering planning cycle with a semi-annual update is used to identify regional and national TSSC work, and to assess total F&E field support needs and establish priorities for TSSC work. The contract structure provides the capability for the contractor to begin work within 30 to 60 days following issuance of a work release. Most F&E funded projects may be considered for implementation support under this contract.

Funds are obligated on the contract via contract modifications which identify planned projects Routine contract modifications against which work releases are written are made on a semi-annual basis. Emergency modifications to accommodate "pop-up" requirements are initiated on an as-needed basis.

Funding to support the projects included in the annual contract modification is provided by the individual regions and offices whose programs use TSSC services.

Products: Support regions and centers in completing NAS improvement implementation.

Progress/Activity from October 1989 through November 1990:

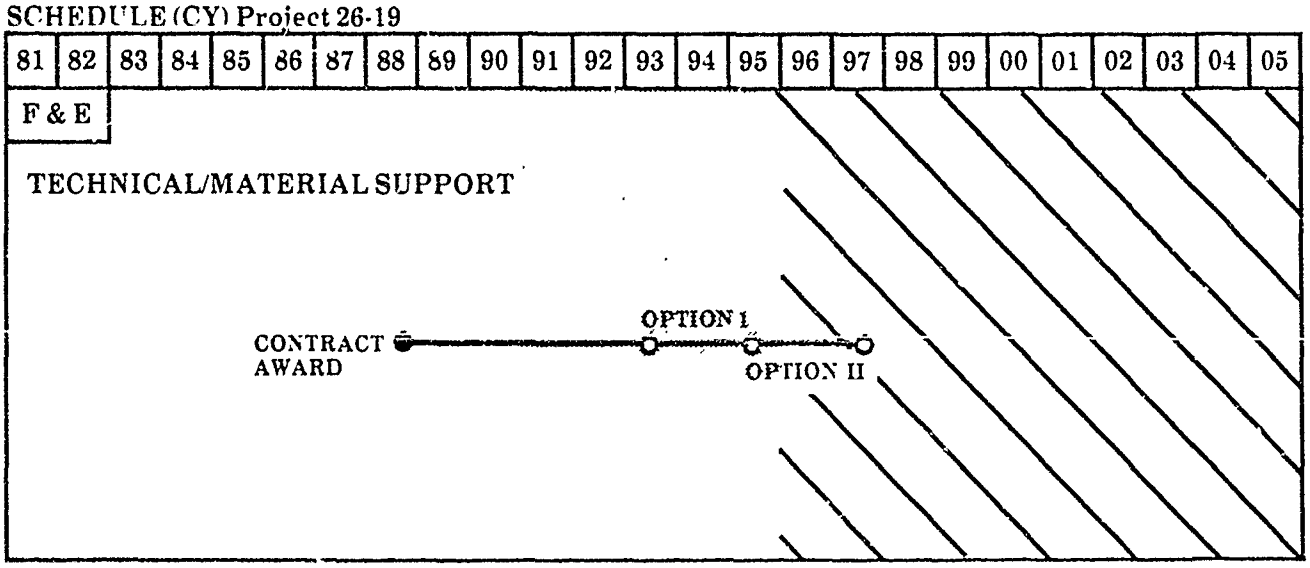
- Projects in progress or completed under TSSC total over $72M with an estimated 400 employee-years of effort.

Related Projects/Activities: Potential support to any F&E project

List of Contractors:

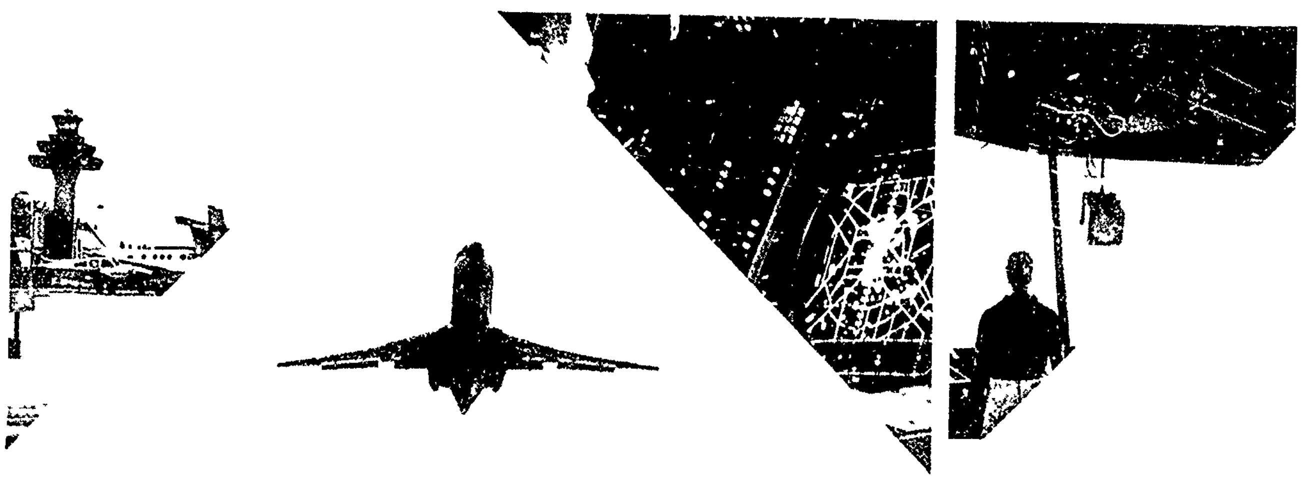
- Raytheon Service Company
  (technical services and material)
  Washington, District of Columbia

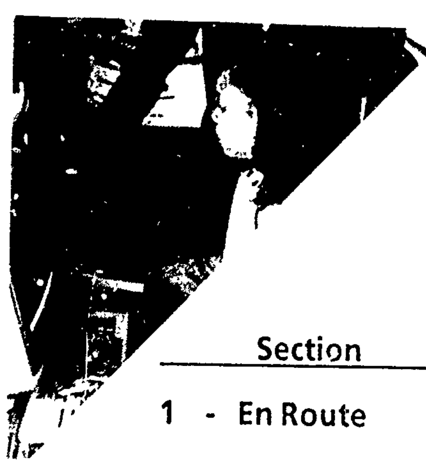
SCHEDULE (CY) Project 26-19

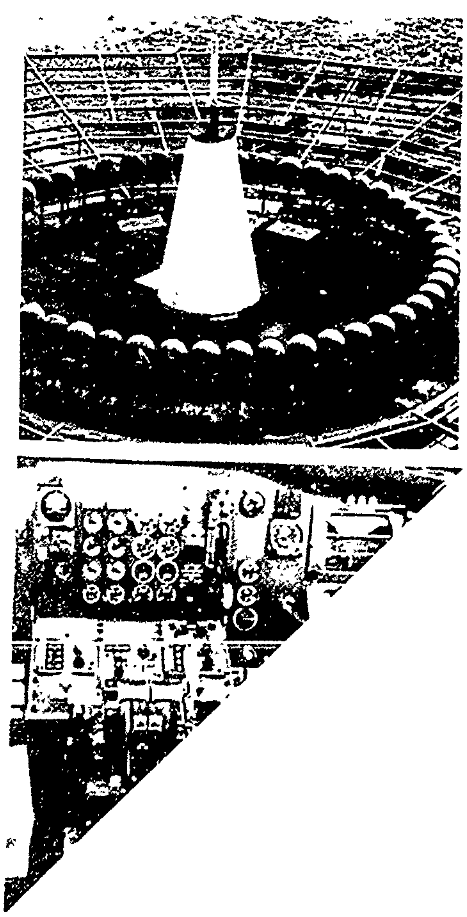


Chapter 3: Growth

The Growth chapter describes those requirements that expand, relocate, or consolidate existing facilities/equipment.







Section	Page Numbers
1 - En Route	(3-1-1 thru 3-1-2)
2 - Terminal	(3-2-1 thru 3-2-16)
3 - Flight Service and Weather	(3-3-1 thru 3-3-2)
4 - Ground-to-Air	(3-4-1 thru 3-4-12)
5 - Interfacility Communications	(3-5-1 thru 3-5-2)
6 - Maintenance and Operations	(3-6-1 thru 3-6-4)

CHAPTER 3

GROWTH

Growth results from changes in demand, requirements, or goals of the National Airspace System (NAS). This chapter identifies areas and items that respond to actual or forecasted growth. These items represent those efforts/activities being planned or carried out external to the FAA. A good example is currently underway in Orlando and Las Vegas. These cities are expanding their facilities, roadways, and transportation systems to accommodate increases in travel requirements. It is these types of unusual growth patterns that will increase demand on NAS Air Traffic Control (ATC) requirements. This increased demand will impact system capacity, safety, and operability.

In addition, this chapter identifies long-range items that may also lead to increased demand on the system. These emerging requirements are being evaluated and, until firm requirements are established, will only be addressed in the introductory narrative. Schedules are included for decisions to be made at future dates.

Growth also results from increases in the number of air traffic or air carrier operations and enplanements. Growth raises requirements for new airports and new runways. It also causes new requirements to support other agencies and to develop and implement new FAA concepts, apply new technologies, reduce costs, and make other changes to meet user demand.

The ATC system is generally adequate for today's demand. The National Plan of Integrated Airport Systems (NPIAS) 1989-1998, however, lists 20 major commercial airports experiencing capacity problems, and 46 additional airports with projected capacity problems by the year 2000. Tables 3-1 and 3-2 list these airports.

Table 3-1. Airports Currently Experiencing Capacity Problems

(As of Calendar Year 1989)

Atlanta, GA	Hartsfield	Newark, NJ	International
Burbank, CA	Burbank	New York, NY	Kennedy
Boston, MA	Logan	New York, NY	LaGuardia
Chicago, IL	O'Hare	Philadelphia, PA	International
Dallas/Fort Worth, TX	International	Phoenix, AZ	Sky Harbor
Denver, CO	Stapleton	Raleigh, NC	Raleigh-Durham
Houston, TX	Intercontinental	San Francisco, CA	International
Las Vegas, NV	McCarran	Santa Ana, CA	John Wayne
Long Beach, CA	Dougherty Field	St. Louis, MO	Lambert
Los Angeles, CA	International	Washington, DC	National

Table 3-2. Additional Airports Forecasted to Have Capacity Problems by the Year 2000

(As of Calendar Year 1989)

Albuquerque, NM	International	*Milwaukee, WI	General Mitchell Field
Austin, TX	Robert Mueller	Minneapolis, MN	Wold-Chamberlain
Baltimore, MD	Balt-Wash Int'l	Nashville, TN	Metropolitan
Birmingham, AL	Municipal	New Orleans, LA	Moisant Field
Charlotte, NC	Douglas	*Oakland, CA	Metro Oakland International
* Charleston, SC	AFB/International	*Ontario, CA	International
Chicago, IL	Midway	Orlando, FL	International
Cincinnati, OH	Greater Cincinnati	Pittsburgh, PA	International
Cleveland, OH	Hopkins	Portland, OR	International
Columbus, OH	Port Columbus	Reno, NV	Cannon International
Dallas, TX	Love Field	Sacramento, CA	Metropolitan
* Dayton, OH	James M. Cox International	Salt Lake City, UT	International
Detroit, MI	Metropolitan	San Antonio, TX	International
Ft. Lauderdale, FL	International	San Diego, CA	Lindbergh
* Honolulu, HI	International	San Jose, CA	Municipal
Houston, TX	Hobby	Sarasota, FL	Sarasota/Brandenton
Indianapolis, IN	International	Seattle, WA	Sea-Tac International
Islip, NY	MacArthur	Tampa, FL	International
Kansas City, MO	International	Tucson , AZ	International
Louisville, KY	Standiford	Washington, DC	Dulles International
Little Rock, AR	Adams Field	West Palm Beach, FL	International
Memphis, TN	International	White Plains, NY	Westchester County
Miami, FL	International	*Windsor Locks, CT	Bradley International

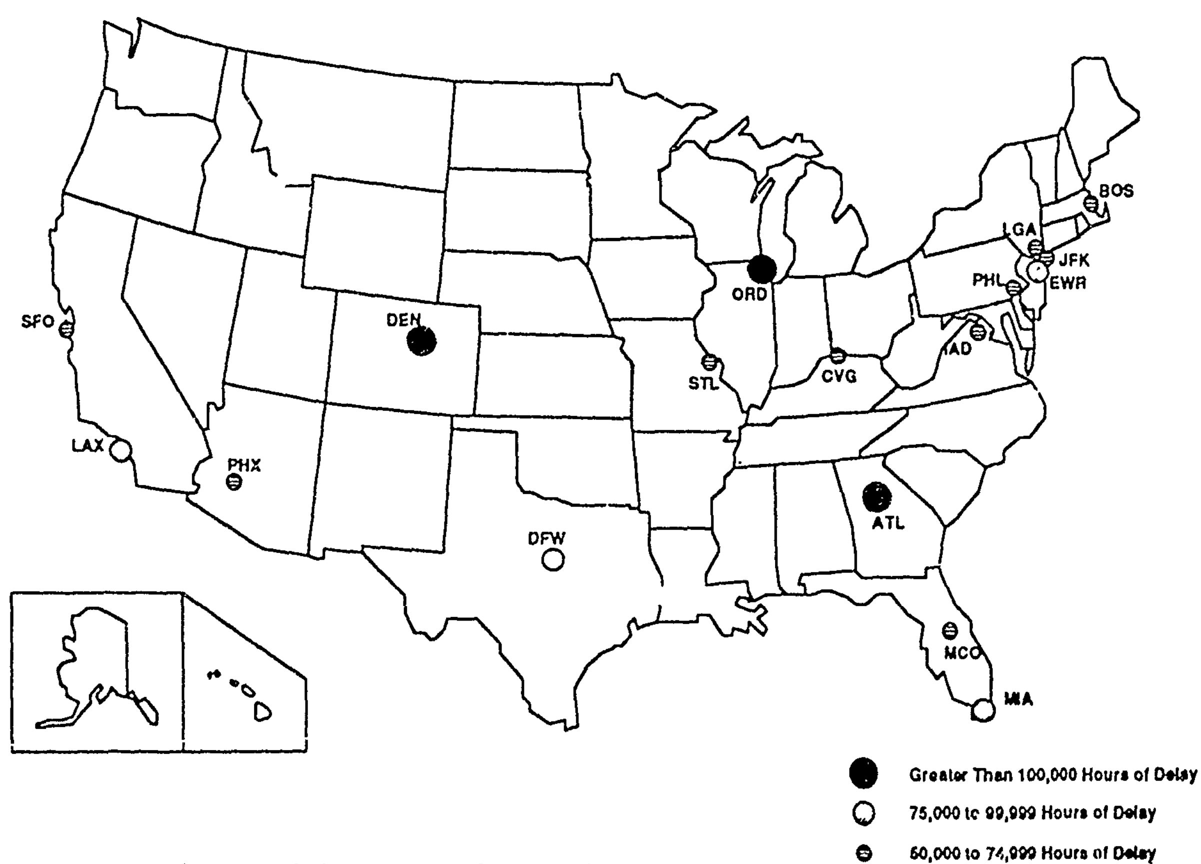
* Airports handling substantial numbers of air carrier operations or where aircraft delays were five minutes.

Today, five airports experience delays exceeding 50,000 hours per year. Chicago O'Hare airport has more than 100,000 hours of delay each year. By 1997, it will be joined by Atlanta Hartsfield and Denver Stapleton, assuming no capacity improvements are made. An estimated total of some 17 airports will have more than 50,000 hours annual delay in 1997. See Figure 3-1.

To meet increased demand and reduce congestion, a major new airport is being constructed in Denver. FAA must plan to equip and maintain the new ATC systems at this location. New airport planning is progressing in Los Angeles, San Diego, Austin, and Chicago. Major airport improvements (Airport Improvement Program and local airport authority expenditures in excess of $300 million between 1987 and 1997) are planned at Dallas/Fort Worth, Chicago Midway and O'Hare, Atlanta, Newark, Boston, St. Louis, Detroit, Honolulu, Washington National and Dulles, Philadelphia, New York JFK, San Diego, Memphis, and New Orleans. New hubs are being expanded or developed at Charlotte, Nashville, Memphis, Raleigh-Durham, and elsewhere. Further, some Department of Defense (DOD) ATC operations will transfer to the FAA. By the year 2000 there will be more civil use of military airfields. Some military airfields may be transferred to the civilian aviation system entirely.

FAA has identified five major areas of growth: DOD to FAA ATC Operations Transfer, Civil Use of Military Airfields, Major New Airports, Major Airport Expansion, and Hubbing.

The FAA, as owner and operator of the ATC system, must acquire facilities and equipment to handle the added requirements from the aforementioned growth areas.



(Source - Airport Capacity Enhancement Plan, 1989)

Figure 3-1. Projected Airports with over 50,000 Hours Annual Delay in 1997

DOD TO FAA ATC OPERATIONS TRANSFER

The DOD currently has responsibility for 60 Terminal Radar Approach Control (TRACON) facility operations in the NAS. In accordance with the DOD/FAA Memorandum of Agreement (MOA) of 1988 and its associated interagency agreements, responsibility for 17 of the DOD terminal approach control operations will transfer to the FAA by the year 2000. In addition, a small number of current FAA approach control operations will be accomplished by modernized military approach control facilities. It is expected that these consolidations will enlarge the FAA's NAS architecture.

Two of the agreed-upon Air Force Base (AFB) consolidations will be accomplished earlier than originally scheduled Pease AFB, NH, is scheduled for closure, and it is anticipated that the facilities will be converted for civil aviation use. Although Scott AFB, IL, will remain open, the approach control functions are expected to be absorbed by the St. Louis TRACON. The remainder of the consolidations will be accomplished during the assumption of FAA approach control functions by the Area Control Facilities (ACFs) as part of an integrated schedule.

A comprehensive transition plan is being developed jointly with the DOD to identify facilities and functions to be transferred and services to be provided. Table 3-3 lists those facility operations identified for consolidation. Additional consolidations of three DOD Alaskan approach controls at Shemya, King Salmon, and Galena into the planned Anchorage ACF are under study and discussion. These will be incorporated as the decisions dictate.

Activity is underway on a site-by-site basis to identify the facilities and equipment needed to support this effort. As the planning efforts mature, the facilities and equipment needed to support this growth will be identified and listed in this chapter.

Table 3-3. Planned DOD to FAA ATC Operations Transfer

(1)	Pease, NH	to	Manchester TRACON
	Scott, IL	to	St. Louis TRACON
	Dover, DE	to	Washington ACF
	McGuire, NJ	to	New York ACF
	Grand Forks, ND	to	Minneapolis ACF
	Grissom, IN	to	Indianapolis ACF
	Selfridge, MI	to	Cleveland ACF
	Minot, ND	to	Minneapolis ACF
	Brunswick, ME	to	Boston ACF
	Eaker, AR	to	Memphis ACF
(2)	Whiteman, MO	to	Kansas City ACF
	Travis, CA	to	Oakland ACF
	Patrick, FL	to	Miami ACF
	Point Mugu, CA	to	Los Angeles ACF
	Wurtsmith, MI	to	Minneapolis ACF
(2)	Loring, ME	to	Boston ACF
	K.I.Sawyer, MI	to	Minneapolis ACF

(1) Pease AFB approach control to be staffed at Pease by detailed controllers from Manchester TRACON.

(2) Approach control functions to be accomplished by military controllers at the ACF sites.

CIVIL USE OF MILITARY AIRFIELDS

Civil use of military airfields, either through joint use agreements or surplus property agreements, can have a significant effect on the demand for support facilities and services. A joint use agreement is being negotiated for Scott AFB, 18 miles east of St. Louis, for development of a new civil runway. Surplus property agreements are being developed for six military airfields. See Figure 3-2. The agreements are part of a military base closure process that must be completed by September 30, 1995. The growth of civil activity at these airfields is likely to be gradual, and the FAA's major challenge is to develop a smooth transition plan for military to civil support of radar, Instrument Landing Systems (ILSs), and other facilities/systems.

This plan considers the possible effects of civil use of military airfields, including the redistribution and relocation of air traffic, the assumption or replacement by FAA of essential radar and other facilities previously provided by the military, and the requirement for new facilities, equipment, and services.

It is important to review the status of military airfields on a regular basis. Changing military missions and budget constraints may result in additional base closures in the future. There generally is a transition period of 2-to 5-years from the time a base closure is announced until termination of the military use of the facility. The FAA uses this time to work with the civil aviation community to plan the transition to civil use.

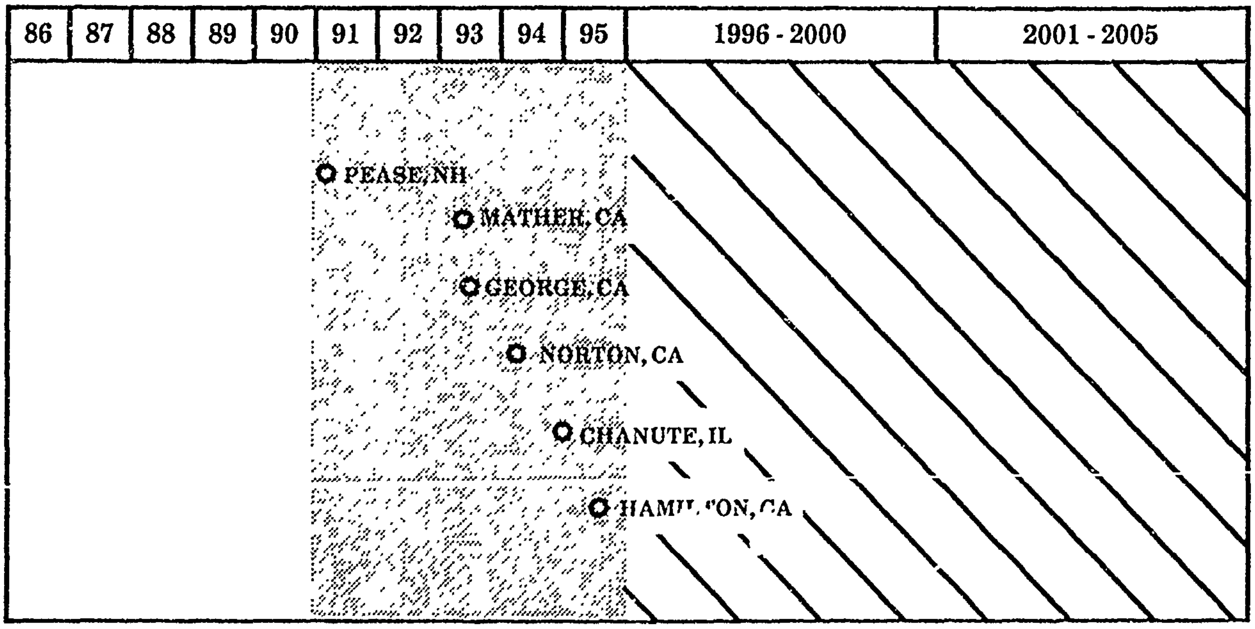


Figure 3-2. Military Airfields Available for Civil Use

MAJOR NEW AIRPORTS

Major new airports will create significant demands for ATC equipment. The airports, which are constructed by local communities, will require the establishment, modernization, and relocation of a variety of facilities and equipment. A project has been included in this plan for the FAA facilities and equipment required to support the airport construction in Denver. Additional airports are anticipated in the future, including commercial service airports for the Chicago, Los Angeles, San Diego, New Orleans, Minneapolis, Boston, Miami, and Austin areas.

The FAA office responsible for program management, working jointly with the appropriate regional offices, will provide for the planning, engineering, procurement, installation, and integration of the FAA facilities and equipment required to support the establishment of new airports. Total project funding is being requested and provided on a multiyear basis for each individual airport. Necessary acquisitions will be accomplished through existing projects for facilities and equipment described in various chapters of this plan.

A summary description of new and proposed airports follows, and detailed information is provided on individual project sheets contained in this chapter.

Denver, Colorado

The city and county of Denver are constructing a major new international airport to replace the existing Stapleton Airport. The new airport will function as a major airline transfer point for east/west traffic, providing increased capacity to support the growing needs of the air transportation system. Initially, the airport will have six runways and may eventually grow to 12.

Austin, Texas

Austin is one of the fastest growing communities in the southwest, and air travel in that area has increased to a point of near saturation. The growth has exceeded the official forecasts to the point of unacceptable conditions during peak demands.

Although the city of Austin is increasing the number of air carrier gates, any further increase to the present Robert Mueller Airport will have an adverse environmental impact on the city. A redesign of the Austin terminal airspace will improve several existing airspace problems. A new airport will allow for increased capacity and efficiency of aircraft operations. This will include more frequent airline flights and nonstop service to distant destinations.

Chicago, Illinois

Expansion of the existing Chicago O'Hare International Airport is required to meet current airport operations and accommodate forecasted growth for the future. However, due to physical constraints and environmental concerns, this expansion is not practical.

Establishment of a third major airport in the Chicago area will increase the air traffic system capacity, reduce delays, enhance air traffic safety, and provide for future expansion. It is imperative for the FAA to plan and start design for the facilities and equipment requirements. Initial actions to effect the development include the necessary engineering studies, design application, and program support. The anticipated planning start for this new airport is FY 92.

MAJOR AIRPORT EXPANSION

The expansion of existing airports normally requires new approach aids and relocation of existing facilities. This plan provides for monitoring the progress of new runways to provide FAA support for facilities and services.

Precise timing of new runway construction depends on several favorable factors, including environmental acceptability, availability of funding, and, in some cases, the concurrence of airlines. It takes about two years between the commitment to build and the actual commissioning of a new runway. This is a relatively short time for facilities and equipment programming purposes, so it is important to provide a certain amount of flexibility to adjust or reprogram needed facilities when runway construction schedules change.

New runways are proposed or under construction at a number of major airports including Baltimore, Charlotte, Cincinnati, Colorado Springs, Dallas/Fort Worth, Detroit, Houston, Indianapolis, Kansas City, Louisville, New Orleans, Orlando, Philadelphia, Phoenix, Pittsburgh, Raleigh-Durham, St. Louis, Salt Lake City, and Washington Dulles. Figure 3-3 shows the current estimates for construction of those runways.

Some new runways are planned to correct situations where parallel runways were developed so close together that they cannot be fully used during adverse weather. For example, the proposed runways in Philadelphia and St. Louis are intended to permit independent approaches to parallel runways during all weather conditions, correcting a current inbalance between Visual Meteorological Conditions (VMC) and Instrument Meteorological Conditions (IMC) capacities.

Most new runways are intended to accommodate a gradual increase in activity which may be due to airline hub operations (Baltimore, Charlotte, Cincinnati, Dallas/Fort Worth, Pittsburgh, Raleigh-Durham, and Salt Lake City), the growing travel demands of metropolitan areas (Houston, Phoenix, and Washington Dulles), to attract hubbing operations (Kansas City and Louisville), or to support tourism (New Orleans and Orlando).

The increase in aircraft operations is usually gradual, and is forecast to average approximately three percent annually. In response to this increase, FAA acquisitions of facilities and equipment will be accomplished through projects in various chapters in this plan. Major efforts, such as Dallas/Fort Worth, will have individual projects developed because of their significant impact on multiple components of the NAS. These efforts can be characterized by major facility expansion/relocation and extensive airspace realignment.

HUBBING

The greatest increase in airport activity during the past ten years occurred at airline hubs. Airlines concentrate a large number of flights at these airports within a short time to facilitate passenger transfers. The connecting flights involve as many as 60 jet transports and dozens of smaller commuter aircraft, offering passengers a wide choice of destinations. Airline decisions to hub at particular airports have a significant impact on the FAA, increasing ATC workload and requiring additional facilities and services. These airline decisions are difficult to anticipate because they are made discretely and quickly in a competitive business environment.

Hubbing will continue to affect FAA requirements in the future. A number of hubs are not yet fully used, and airlines will add flights as demand grows and additional aircraft are purchased. The growth at these airports will be gradual and to some degree predictable. The FAA will monitor these airports to anticipate resource requirements. Among the hubs being monitored are Raleigh-Durham, with 133 percent expected increase in air carrier operations between 1988 and 2000, Memphis with 31 percent, Cincinnati with 42 percent, Milwaukee with 117 percent, Salt Lake City with 63 percent, and Orlando with 109 percent.

Additional hubs are expected, but a shortage of suitable aircraft suggests that this will not occur before 1992. The development of new hubs will be carefully monitored, but will inevitably involve short notice to the FAA, so a certain amount of flexibility must be maintained to effectively respond to unexpected developments.

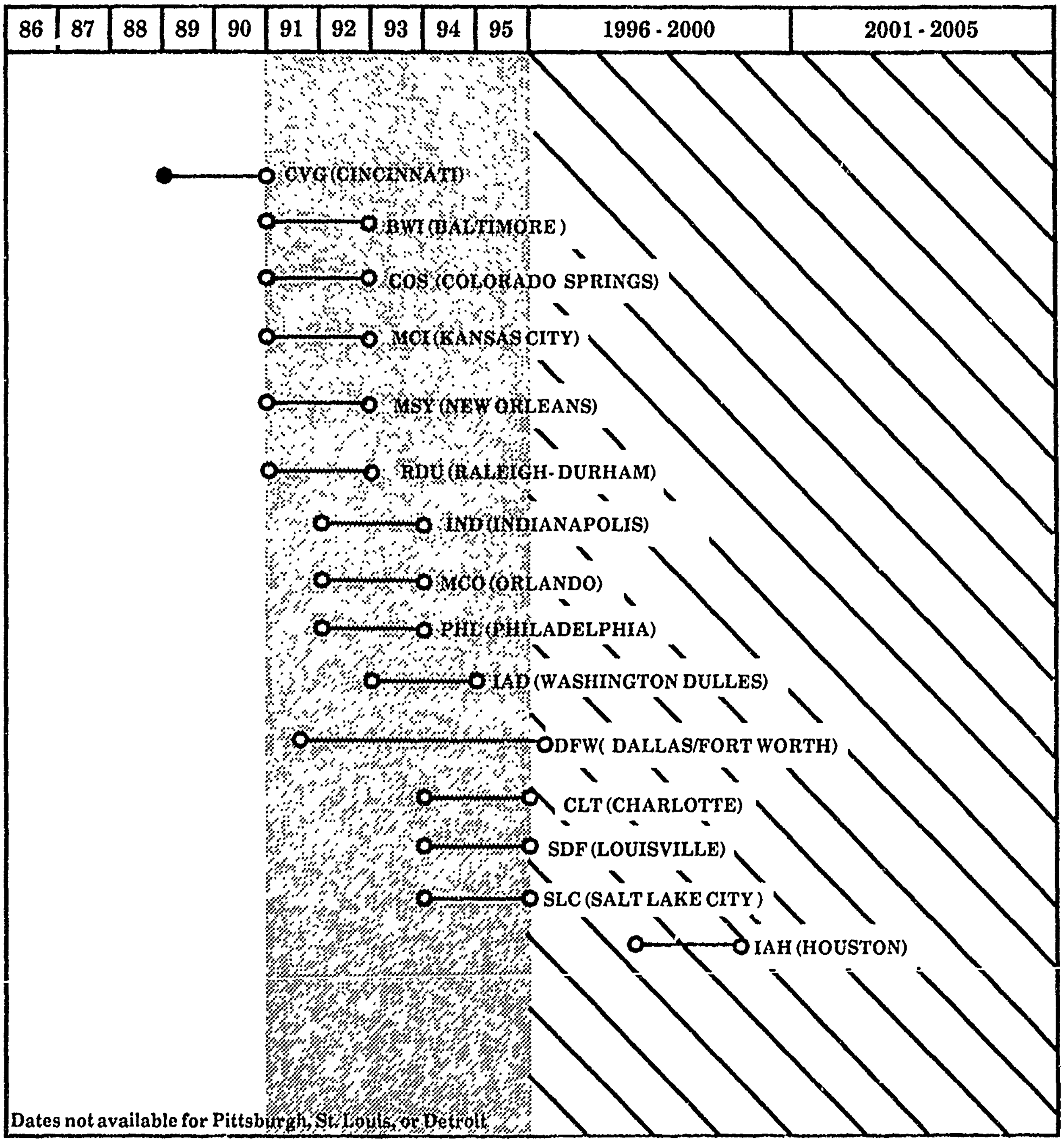


Figure 3-3. Estimated Construction of Major New Runways

RESERVED

No En Route projects contained in this chapter.

PROJECT 32-06: Expand Automated Radar Terminal System (ARTS) IIA Capacity and Provide Mode C Intruder (MCI) Capability

Purpose: With the deregulation of the airline industry and the use of traffic hubbing at selected airports, aviation has undergone significant growth in recent years. This project will provide additional ARTS IIA peripheral processors to support increases in aircraft tracking and transponder equipage, and the addition of an MCI capability.

Approach: To increase ARTS IIA processing capability, a state-of-the-art peripheral processor using reduced instruction set computer technology will be added to the ARTS IIA system. Software will be provided to alert controllers to Mode C intruders. Modifications will be made to ARTS IIA displays to satisfy increased data requirements.

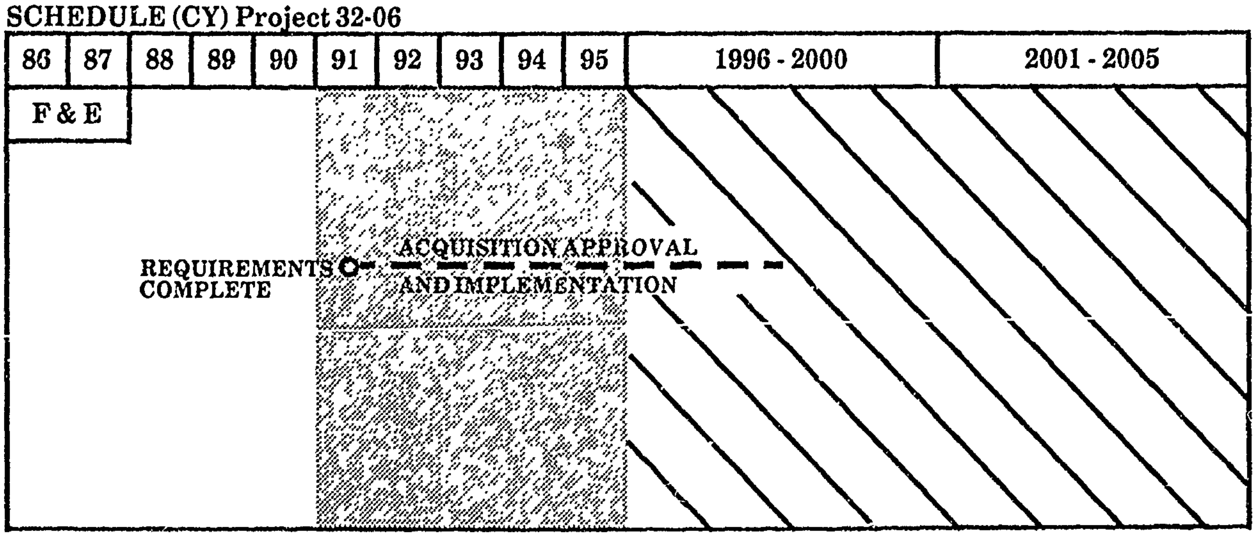
Products:

- MCI software for ARTS IIA locations.
- Peripheral processors.
- Modifications to ARTS II displays.

Related Projects/Activities: 22-06 ARTS IIA Enhancements and 46-30 ISP. Products will be procured through related projects and contracts to the extent possible.

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 32-06



PROJECT 32-13: Airport Traffic Control Tower (ATCT) Establishment

Purpose: Based on air traffic requirements, this project will provide for the establishment of new terminal ATC facilities, and the assumption by the FAA of ownership and maintenance of sponsor-owned towers that meet airway planning standards cost-effectiveness criteria. These are in addition to FAA requirements in support of those growth items identified elsewhere in this chapter (e.g., major new airports and assumption of bases being closed by DOD).

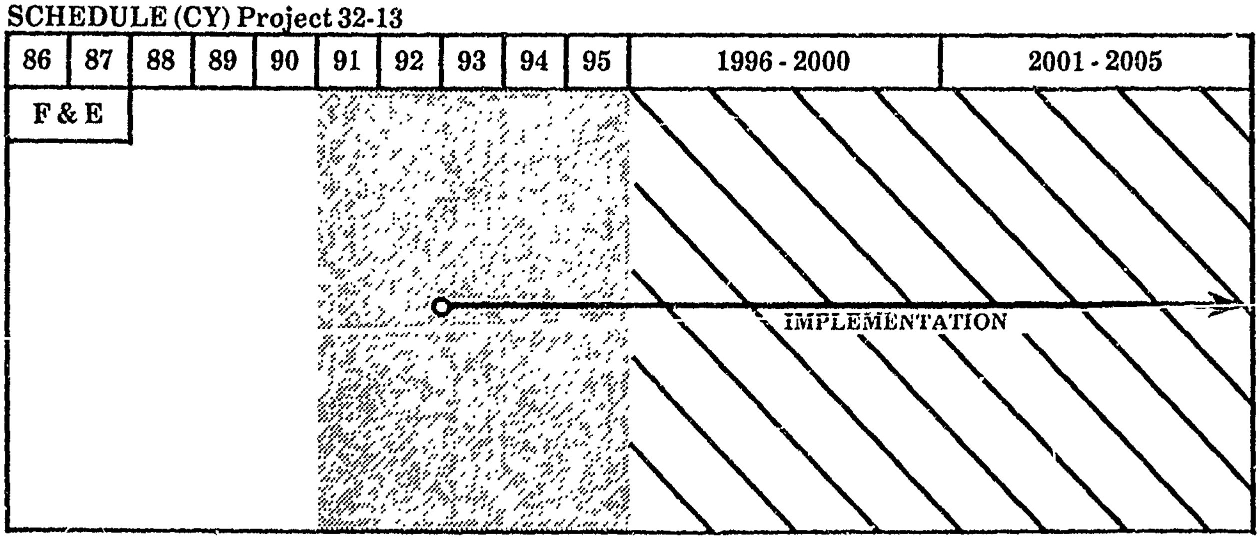
Approach: FAA Headquarters develops national standards and makes national equipment support buys. Construction will be accomplished at the regional level by regional contractors, and national architectural and engineering support will be provided for site-specific designs.

Products: Historically, one or two locations per year have qualified for establishment of a new tower or FAA assumption of ownership of an existing facility.

Related Projects/Activities: 21-15 ACF (Tower Position Consoles), 22-12 TCS, 22-13 ATCT/TRACON Establishment, Replacement, and Modernization, 23-13 ICSS, 42-13 ATCT/TRACON Modernization, and 42-14 ATCT/TRACON Replacement.

List of Contractors: Multiple construction and design contracts to be determined by the regions.

SCHEDULE (CY) Project 32-13



PROJECT 32-16: Establish/Expand Digital Bright Radar Indicator Tower Equipment (DBRITE)

Purpose: This project will provide additional DBRITE systems to support the requirement to establish radar displays and interface capabilities for satellite ATCTs that do not currently have radar. Systems will also be provided to expand service at those sites currently operational with DBRITE.

Approach: Procure DBRITE systems through the exercise of an option on the current DBRITE contract. This procurement is a joint FAA/DOD procurement with the USAF as the procuring agency. The FAA is scheduled to assume contractual responsibility and will continue to provide joint FAA/DOD Logistics Center support for DBRITE. Television Microwave Links (TMLs) (both terminal and repeaters, as required) will be procured to provide service to the satellite towers.

Products:

- Establish DBRITEs for satellite ATCTs: (55 systems).
- Expand current DBRITE systems: (75 systems).

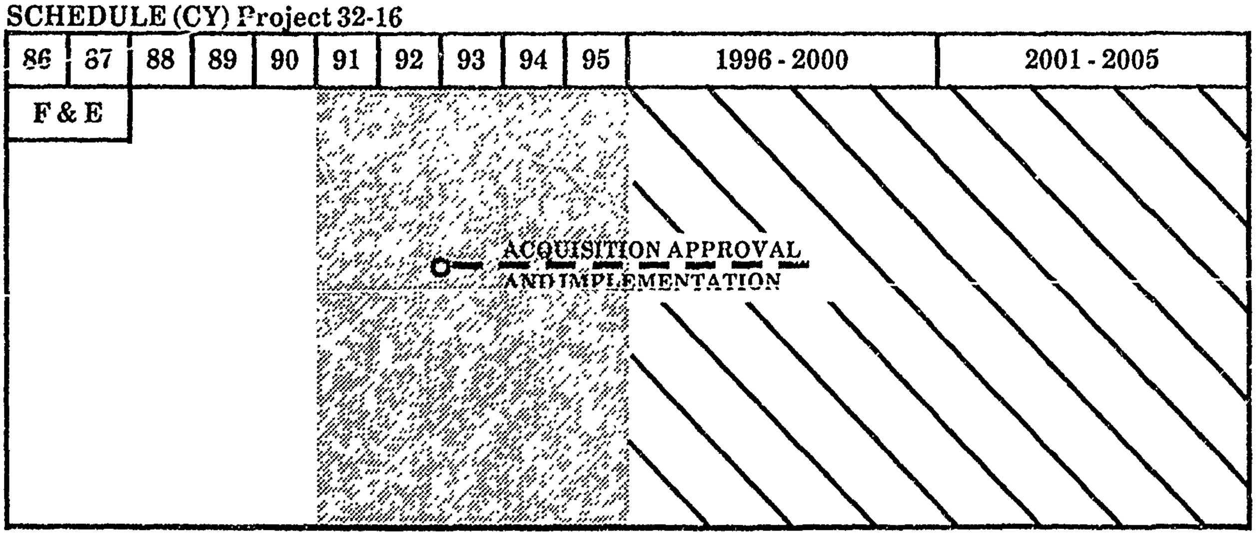
Progress/Activity from October 1989 through November 1990:

- Establishment requirements have been defined.
- Expansion requirements have been estimated.

Related Projects/Activities: 22-16 BRITE, 46-30 ISP, and various other projects in Chapters 3 through 6.

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 32-16



PROJECT 32-20: Expand Automated Radar Terminal System (ARTS) IIIA Capacity and Provide Mode C Intruder (MCI) Capability

Purpose: With the deregulation of the airline industry and the use of traffic hubbing at selected airports, aviation has undergone significant growth in recent years. This project will provide additional ARTS IIIA Input/Output Processors (IOPs) to support increases in aircraft tracking and transponder equipment, including the addition of an MCI capability.

Approach: To increase ARTS IIIA processing capability, two to four IOPs will be added to the current system. MCI software will be procured and implemented into existing ARTS IIIA systems. Ancillary ARTS IIIA hardware (including logistics support) will also be procured to support MCI.

Products:

- MCI software for ARTS IIIA locations.
- 276 input/output processors.
- 62 communications multiplexer controllers (option).

Progress/Activity from October 1989 through November 1990:

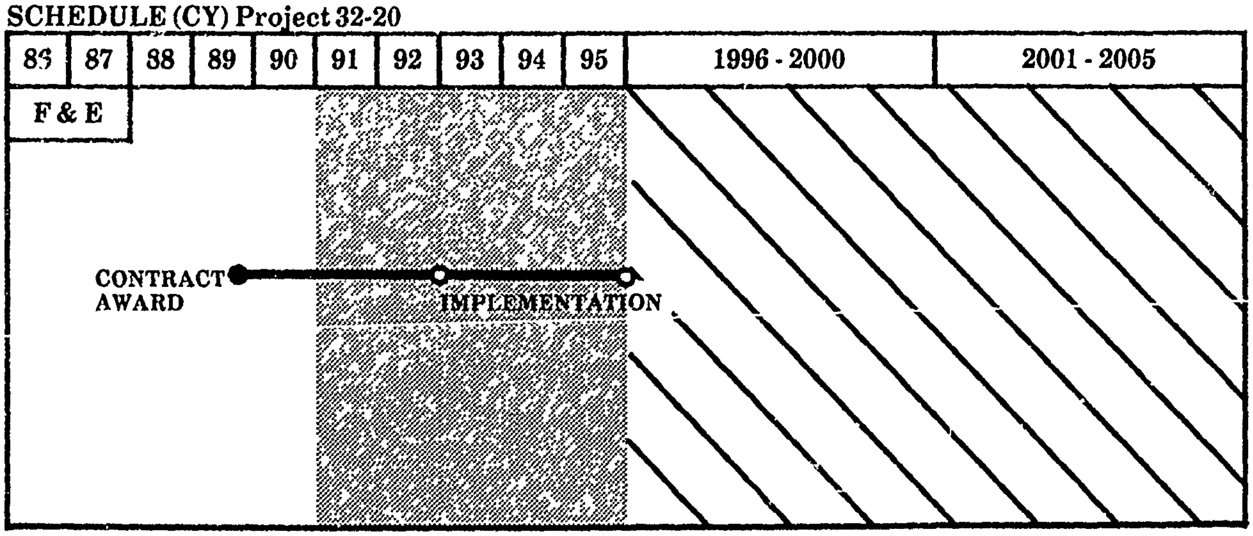
- A contract was awarded to Unisys Corporation.

Related Projects/Activities: 46-30 ISP.

List of Contractors:

- Unisys Corporation
  Computer Systems Division
  (hardware and software)
  St. Paul, Minnesota

SCHEDULE (CY) Project 32-20



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PROJECT 32-21: New Airport Facilities, Denver, Colorado

Purpose: The city and county of Denver are constructing a major new airport to replace the existing Stapleton Airport. This project implements improvements needed to service actual and forecasted air traffic growth.

Approach: A project this complex requires a dynamic plan with processes in place to address transition, resource availability, operations, architectural and engineering design requirements, etc.

The FAA F&E required will be planned, engineered, procured, installed, and integrated to support the use of the new commercial service airport.

Construction of FAA facilities, as well as acquisition and installation of equipment, although funded under this project, will be obtained through various projects contained in other chapters of this plan.

This regional project is jointly managed at the local level by a regional project manager, with national activities managed by a headquarters project manager.

Products: FAA facilities and equipment (e.g., ATCT, TRACON, navigation, landing, power, communications, weather and surveillance systems etc.) for the new commercial service airport at Denver, Colorado.

Progress/Activity from October 1989 through November 1990:

- Program Master Plan was issued.

Related Projects/Activities: 21-15 ACF, 22-11 Multichannel Voice Recorders, 22-12 TCS, 22-13 ATCT/ TRACON Establishment, Replacement, and Modernization, 22-16 BRITE, 23-12 LLWAS, 24-03 VORTAC, 24-08 RVR, 24-09 Visual Navaids, 24-13 ASR, 24-14 ASDE, 24-18 TDWR, 26-05 Large Airport Cable Loop Systems, 34-06 ILS, 46-30 ISP, and interfacility communications.

List of Contractors:

<u>Regional Contracts</u>

- KJO Enterprises, Inc.
  (engineering and program management)
  Lanham, Maryland

- Howard, Needles, Tammen and Bergendorf, Inc.
  (architectural and engineering)
  Bellevue, Washington

  - Sailor, Johnson & Associates
    Aurora, Colorado

  - Chen-Northern, Inc.
    Denver, Colorado

  - Design Core, Ltd.
    Englewood, Colorado

  - William Caruso & Associates
    Lakewood, Colorado

  - Towne, Richards & Chaudiere, Inc.
    Seattle, Washington

<u>National Contracts</u>

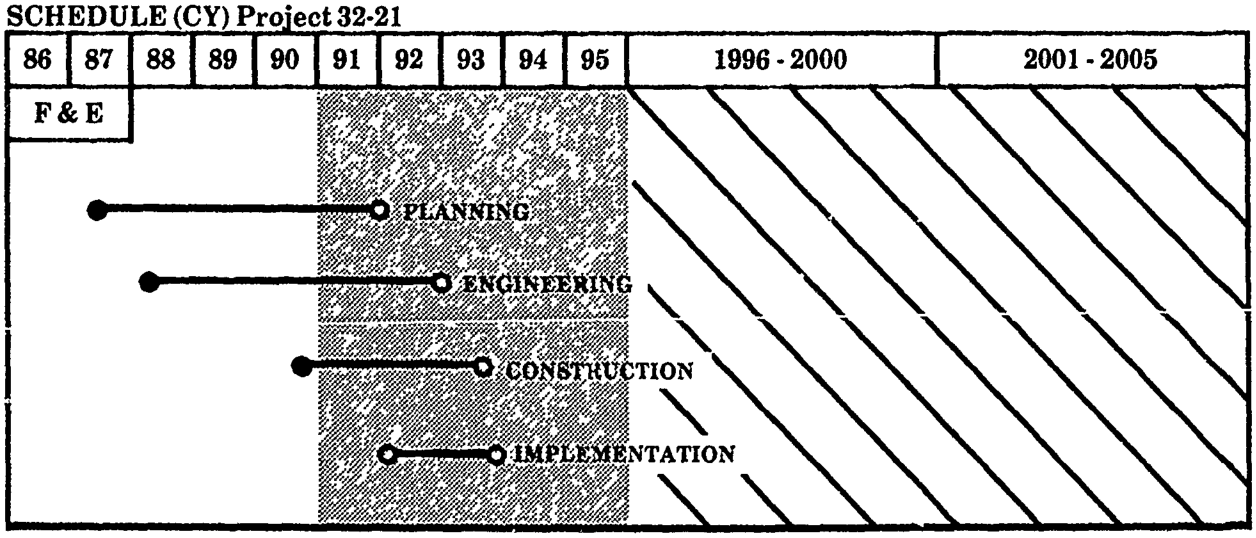
- Raytheon Service Corporation
  (technical support services)
  Seattle, Washington

- Automated Information Management, Inc.
  (logistic support services)
  Lanham, Maryland

- Leo A. Daly Co.
  (architectural and engineering)
  Omaha, Nebraska

- ATAC
  (computer simulations)
  Mountain View, California

SCHEDULE (CY) Project 32-21



PROJECT 32-22: Dallas/Fort Worth Metroplex

Purpose: A Dallas/Fort Worth (DFW) metroplex air traffic system plan has been developed to describe improvements needed to DFW airspace for actual and forecasted air traffic growth. This project provides for establishment, expansion, and modernization of FAA F&E as needed to implement the plan and allow for increased capacity and efficiency of aircraft operations.

Approach: A project this complex requires a dynamic plan with processes in place to address transition, resource availability, operations, program master plan, etc.

The FAA F&E required will be planned, engineered, procured, installed, and integrated to support the use of new/expanded commercial service airports in the DFW area. A total of 12 reliever airports capable of turbo-jet operations will benefit as a result of implementation of this plan. Airport traffic control towers and terminal approach control facilities will be constructed and communications, navigation, landing, surveillance, and automation equipment will be purchased and installed.

Construction of FAA facilities, as well as acquisition and installation of equipment, including logistics support, although funded under this project, will be obtained through established projects described in various chapters of this plan.

This regional project is jointly managed at the local level by a regional project manager with national activities managed by a headquarters project manager.

Products: FAA facilities and equipment (e.g., ATCT, TRACON, terminal automation, approach and landing aids, navigational aids, communications, weather, and surveillance systems etc.) to improve the terminal air traffic control system in the DFW, Texas area.

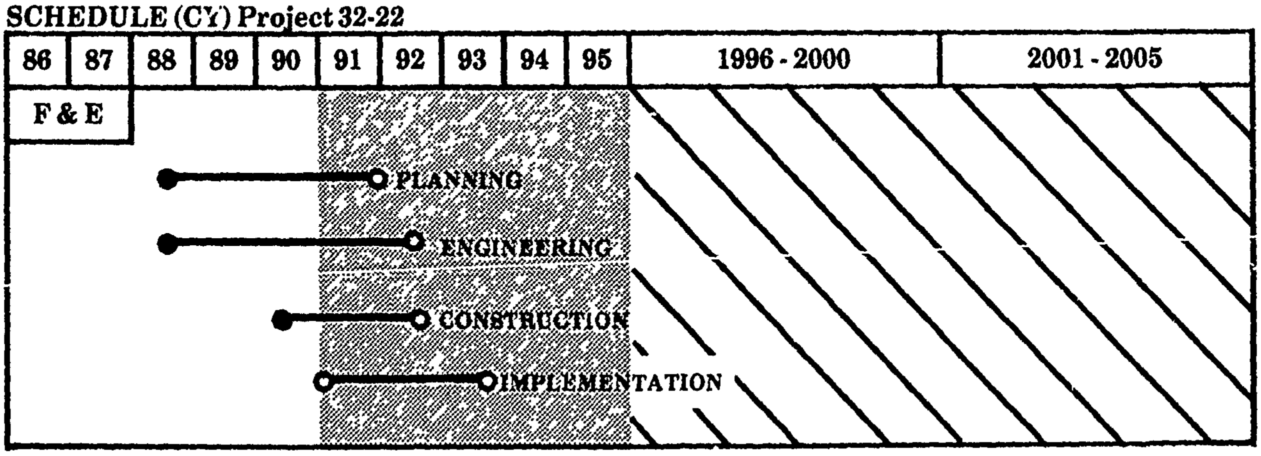
Progress/Activity from October 1989 through November 1990:

- The DFW Metroplex Plan impact analysis was completed using NAS Performance Analysis Capability (NASPAC) and Airspace and Airport Simulation Model (SIMMOD) simulation tools.
- Airspace coordination with first-tier facilities was completed (centers and towers).
- Triple/quadruple ILS simulation was completed.
- Selection and testing of cornerpost Very High Frequency Omnidirectional Range collocated with Tactical Air Navigation (VORTAC) sites were completed.
- Land lease for off-site VORTAC was completed.
- Site selection for east and west ATCTs was completed.

Related Projects/Activities: 21-12 AAS, 21-15 ACF, 22-13 ATCT/TRACON Establishment, Replacement, and Modernization, 24-03 VORTAC, 24-08 RVR, 24-09 Visual Navaids, 24-13 ASR, 34-06 ILS, 46-30 ISP, and interfacility communications.

List of Contractors: This effort is planned to be accomplished in-house. Regional architect/engineering contractors will be used for design work. Equipment/facilities will be provided in conjunction with other CIP projects.

SCHEDULE (CY) Project 32-22



PROJECT 32-24: Establish New Chicago Terminal Radar Approach Control (TRACON) Facility

Purpose: As part of an ongoing effort to enhance overall aviation safety, and to accommodate growth, the FAA performed a System Safety and Efficiency Review of the Chicago airspace system. A total of 102 recommendations came from this review, one of which was the relocation of the existing Chicago O'Hare TRACON to an off-airport site.

This relocation will provide significant operational benefits. Additionally, physical constraints precluded growth at the present facility with its 18 operational displays. Based on projected traffic growth studies, the Chicago TRACON will need a minimum of 26 operational radar displays with associated handoff positions by 1993. This project will result in fewer flight delays, increased efficiency, and enhanced safety.

Approach: Acquire sufficient land and construct a new modular TRACON away from the Chicago O'Hare Airport. The building will be expandable to support a stand-alone TRACON facility or a consolidation of other approach control facilities within the greater Chicago area. Planned activities include:

- Siting and construction of a new TRACON.
- National and regional procurement and installation of systems and equipment.
- Installation and engineering to relocate existing systems.
- Interface to a planned Metropolitan area Network (METRONET) to provide an independent communication system.
- Engineering and installation of television microwave link systems for Digital Bright Radar Indicator Tower Equipment (DBRITE) remoting.

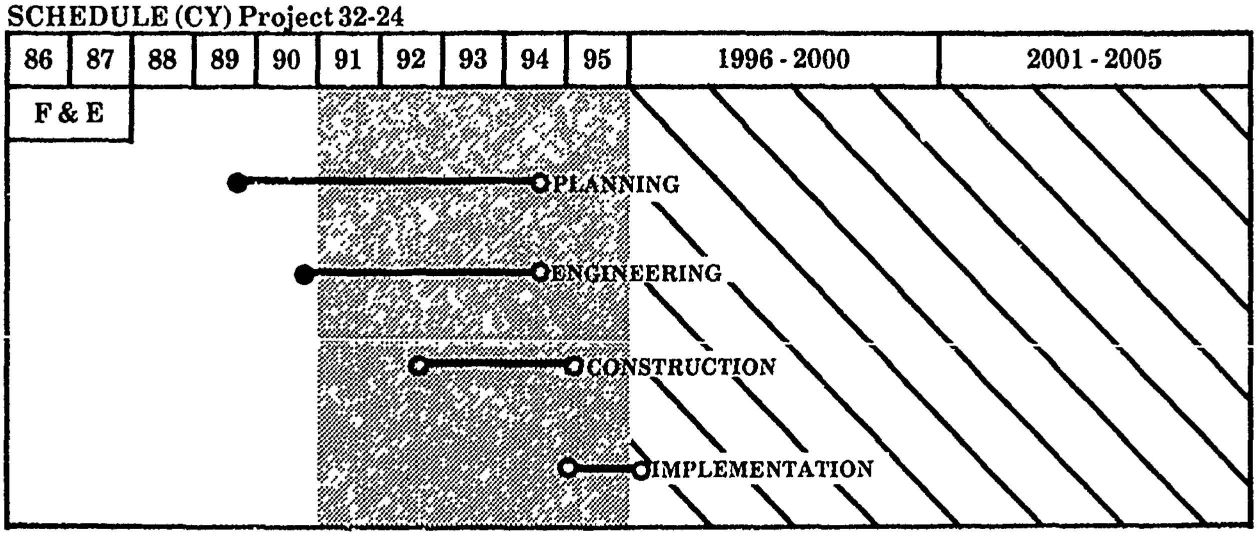
Products: A new TRACON located at an off-airport site away from the existing location at O'Hare.

Progress/Activity from October 1989 through November 1990:

- A study documenting the need for relocating the Chicago TRACON has been completed.
- Began working on the program management plan.

Related Projects/Activities: 21-11 VSCS, 21-12 AAS, 21-15 ACF, 22-13 ATCT/TRACON Establishment, Replacement, and Modernization, 24-07 MLS, 24-09 Visual Navaids, 24-13 ASR, 26-05 Large Airport Cable Loop, 34-06 ILS, 34-08 RVR Establishment, 46-30 ISP, and interfacility communications.

SCHEDULE (CY) Project 32-24



PROJECT 32-25: New Austin Airport

Purpose: Austin is one of the fastest growing communities in the Southwest. Growth has exceeded official forecasts, causing unacceptable conditions during peak demands. Although Austin is increasing the number of air carrier gates, any further increase to the present Austin Airport will have an adverse environmental impact and will increase airspace problems resulting from its proximity to Bergstrom AFB. This generates the need for a new commercial service airport to be built to replace the existing Robert Mueller Airport. The new airport would provide increased capacity to support the growing needs of the air transportation system.

Approach: The FAA facilities and equipment required will be planned, engineered, procured, installed, and integrated to support the use of the new airport.

The FAA's study regarding expansion at Robert Mueller airport showed that the expansion will not provide acceptable improvement of the airspace system and FAA could not give favorable consideration for federal discretionary funding. Austin retained an independent contractor to conduct an environmental impact study on 24 prospective sites. As a result of this study, the city of Manor was identified as an excellent airport location.

With the recent proposal to close the nearby Bergstrom AFB, studies have been initiated to ascertain the local impact and to determine whether the new civilian airport should be located at the previously selected site or at Bergstrom.

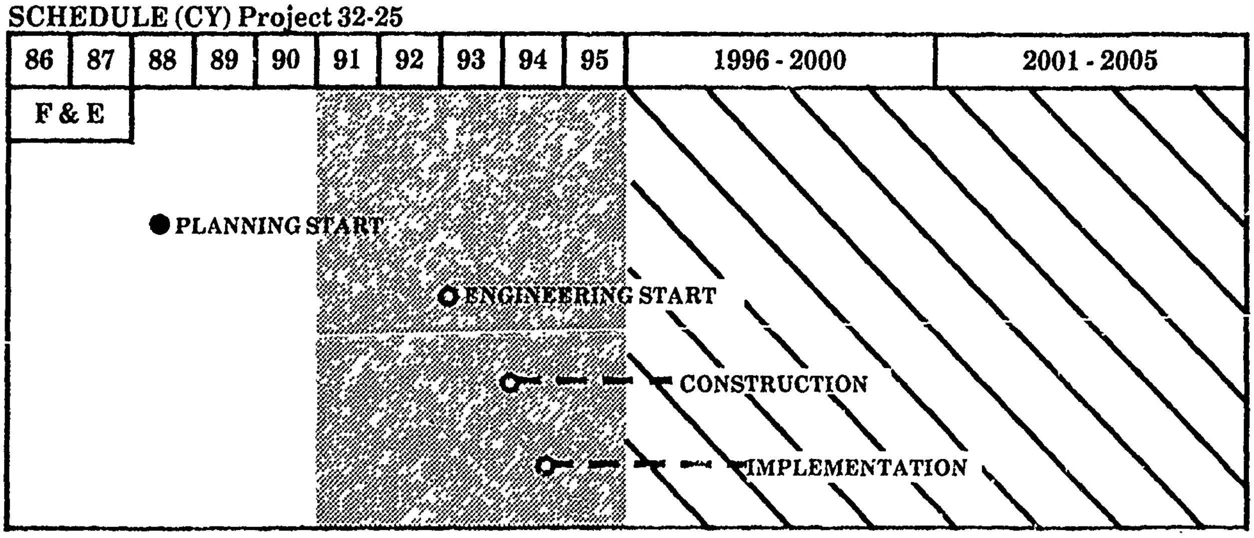
Products: FAA facilities and equipment for a new major commercial service airport in the Austin area.

Progress/Activity from October 1989 through November 1990:

- Airport site selection and environmental assessments are being conducted.

Related Projects/Activities: Equipment/facilities will be provided through various CIP projects.

SCHEDULE (CY) Project 32-25



PROJECT 32-26: Southern California Terminal Airspace Realignment (STAR)/Southern California TRACON (SCT)

Purpose: This project will provide improved service to users of the airspace in the southern California area, increase airspace capacity, and allow for improvement of ATC operations. Combining several southern California area TRACONs will provide real-time traffic management, reduce delays, and enhance air traffic safety.

Approach: The STAR phase of the program involved major restructuring of the southern California area airspace using present navaids and existing TRACONs. Some additional sector equipment including displays, communication, and other operational components were acquired to support the initial endeavor.

The SCT portion of the project involves activities necessary to consolidate four southern California area ARTS III TRACONs into a common ATC facility. Los Angeles, Coast, Ontario, and Burbank TRACONs are identified for consolidation based on traffic volume and operational interconnectivity. Establishing this common ATC facility requires extensive planning, engineering, procurement, installation, integration, and transition activities. Automation, communications, and surveillance equipment must be provided to the physical facility in addition to logistics support. Extensive coordination of the human resource element must be accomplished.

Products:

- Restructured airspace and associated ATC operational equipment to improve management of air traffic in the southern California area.

- Construction of facilities, as well as acquisition and installation of equipment to support the establishment and operation of a common TRACON for the southern California area.

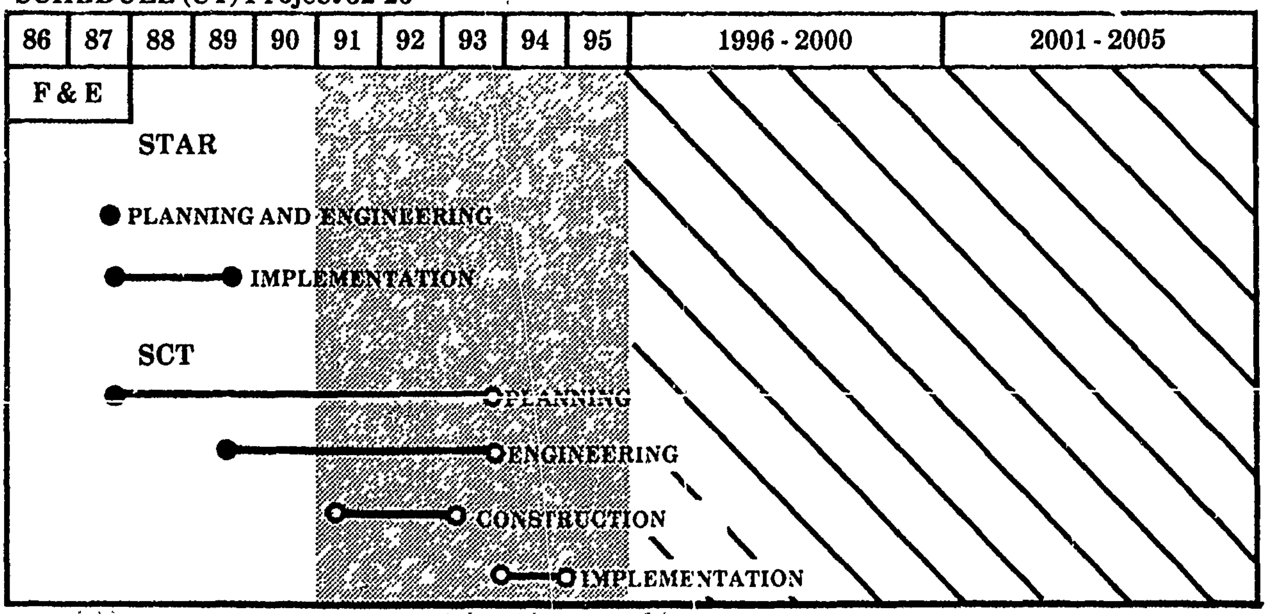
Progress/Activity from October 1989 through November 1990:

- San Diego was identified as the site location for the new common TRACON building.

- Regional assessment is being conducted of the potential requirement to include the existing San Diego approach control facility into the new SCT configuration.

Related Projects/Activities: 21-11 VSCS, 21-12 AAS, 21-15 ACF, 22-11 Multichannel Voice Recorders, 25-03 RML Replacement and Expansion, 25-08 RCE. Products will be produced through related projects and contracts to the extent possible.

SCHEDULE (CY) Project 32-26



PROJECT 32-27: DOD/FAA Air Traffic Control Facility Transfer/Modernization

Purpose: This project will provide for the absorption of two DOD approach control facilities into existing FAA facilities, the consolidation of 15 additional DOD approach control facilities into the FAA ACFs, and the modernization of the Guam Combined Center Radar Approach Control (CERAP) and the Edwards AFB Radar Approach Control (RAPCON) facility. The establishment of the ACF and the consolidation of the associated DOD approach control functions into ACFs will save significant operational costs through realignment of air traffic control assets.

Approach: The two DOD approach control facilities at Pease and Scott Air Force Bases will be absorbed into the existing FAA approach control facilities at Manchester NH and St. Louis MO, respectively. The functions of 15 additional DOD approach control facilities will be absorbed into the FAA ACFs. Services to 13 of the military airfields will be provided by FAA controllers in the ACFs using the full capabilities of the Advanced Automation System (AAS). Services to the other two will be accomplished in the same manner by military controllers from military sectors within the ACFs. Consolidation of the DOD facilities constitutes a growth in the FAA's NAS architecture. Additional digitized radar and communications facilities will be procured to provide services to the military and to civil aviation. Joint FAA/DOD allocation of resources will be used as appropriate. The absorption of the DOD facilities will occur during the consolidation of the FAA approach control facilities as part of an integrated schedule. Schedules and approaches for the modernization of the Guam CERAP and the Edwards AFB RAPCON are still under discussion. Three additional USAF approach control facilities in Alaska, not covered under the current agreements, may also be consolidated.

Products:

- Elimination of 17 military approach control facilities and absorption of services in the FAA ACFs.
- Two modernized facilities at DOD locations. Three additional USAF facilities may also be absorbed within the current ACF approach control consolidation schedule.

Progress/Activity from October 1989 through November 1990:

- Interagency agreement signed.
- Gulf Coast and Alaska studies initiated.

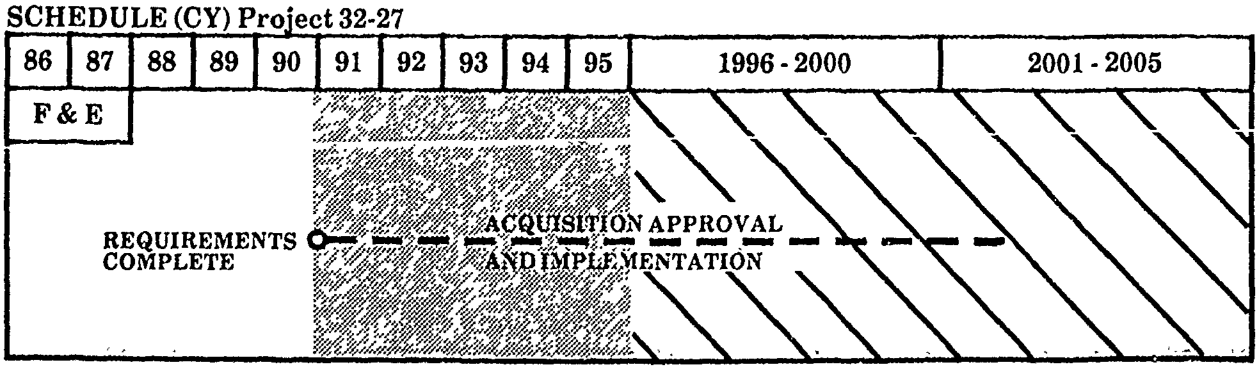
Related Projects/Activities: 21-12 AAS, 21-15 ACF, 24-02 Communications Facilities Consolidation/Network, 24-12 Mode S, and 34-13 Terminal Radar Digitizing, Replacement, and Establishment.

List of Contractors:

- Contractors will be those associated with the list of related projects/activities.
- Planning assistance is being provided by contract with the MITRE and Martin Marietta Corporations.

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 32-27



PROJECT 32-29: Establish Additional Radar Positions

Purpose: To provide the necessary equipment at major Level IV and V automated TRACON facilities to meet growth and capacity requirements. The equipment will also be used to provide position support for parallel instrument approach procedures, Enhanced Target Generator (ETG) training laboratories, and maintenance functions. Some facilities will require digital display capability.

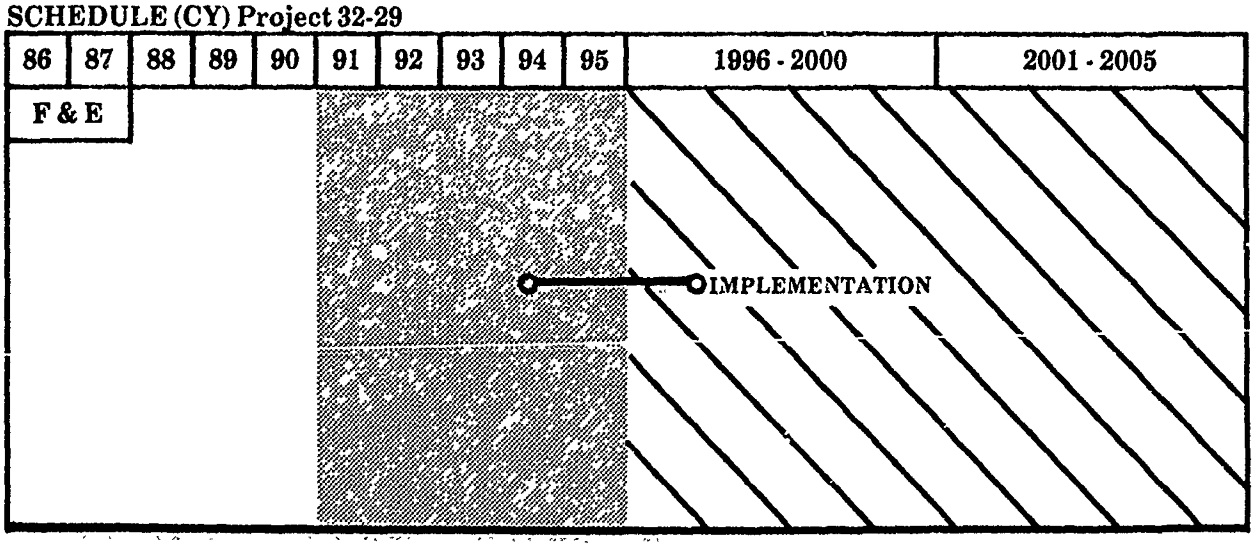
Approach: This equipment is a critical link in sustaining terminal approach control requirements. Additional Full Digital ARTS Displays (FDADs) and the associated communications and other peripheral equipment will be procured by exercising options in existing contracts, when possible. Requirements for this equipment are ongoing until such time as the AAS comes on line.

FDADs will be installed in TRACONs located at Chicago, Atlanta, Oakland, San Diego, Detroit, Andrews Air Force Base, and New York TRACON. The old ARTS III displays removed from these facilities will be refurbished and distributed to other ARTS facilities.

Products: Up to 150 additional FDADs.

Related Projects/Activities: 22-13 ATCT/TRACON Establishment, Replacement, and Modernization.

SCHEDULE (CY) Project 32-29



PROJECT 32-31: Base Buildings for Airport Traffic Control Towers (ATCT)

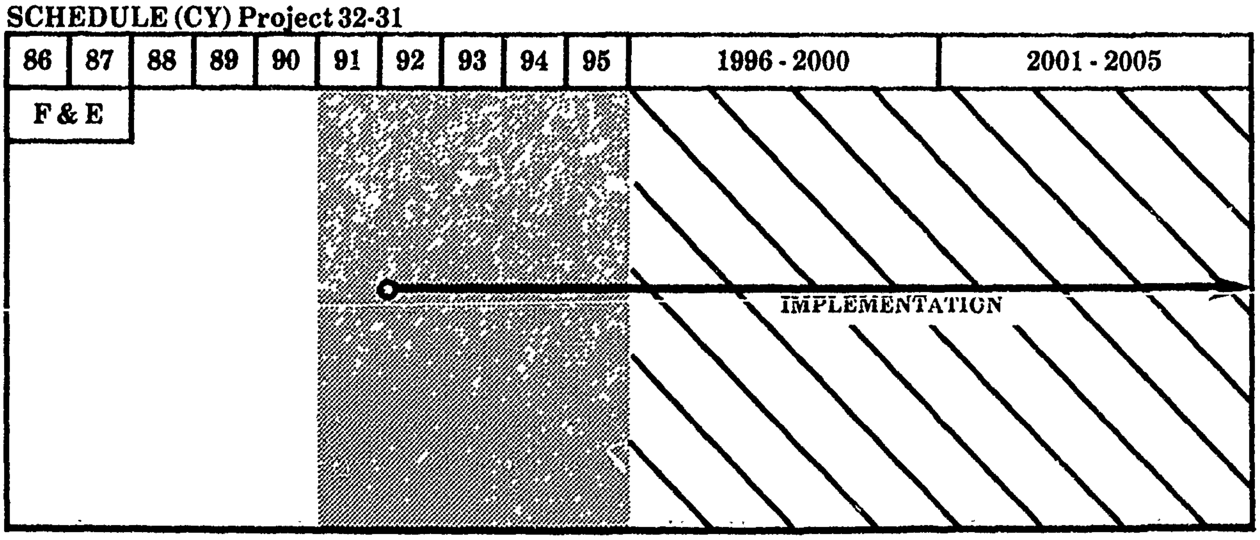
Purpose: Base buildings at present faciliti re not sufficient to sustain the growing services ι performed at an ATCT facility. Many faci ıs ı'ı not have base buildings, which compouno .ne problem. Space is required for staff support functions, Airway Facilities offices, and secretarial/ administrative support. As the nation's air traffic system grows, new requirements are established for base buildings with sufficient room to accommodate all of the associated ATC functions needed in a modern ATC facility.

Approach: This is an ongoing project to provide additional space at existing ATCTs by construction of new, or expansion of existing base buildings. Locations and structure sizes are proposed by the regions, and validated and prioritized by headquarters. Construction is accomplished by regional contracts. National standard designs are available for use where appropriate. Equipment will be provided under ATCT modernization or equipment development and replacement projects.

Products: Increased space at ATCTs to provide for the growing staff, administrative support, and equipment requirements necessary to operate the expanding NAS.

Related Projects/Activities: 22-13 ATCT/ TRACON Establishment, Replacement, and Modernization, 42-13 ATCT/TRACON Modernization, and 42-14 ATCT/TRACON Replacement.

SCHEDULE (CY) Project 32-31



PROJECT 32-32: New Airport and Other Facility Planning

Purpose: Forecasted growth, system saturation, and increases in air traffic have necessitated the establishment, expansion, or consolidation of airports/other major FAA facilities. In tandem with other Agency planning, this project will provide facility and equipment related studies to assess the feasibility, viability, and optimization of mission requirements.

Approach: Many airport and facility requirements involve increasingly sophisticated systems and procedures. Therefore, more advanced planning is necessary to optimize resources prior to making program/funding commitments. Activities required to support the development of comprehensive technical and operational plans include:

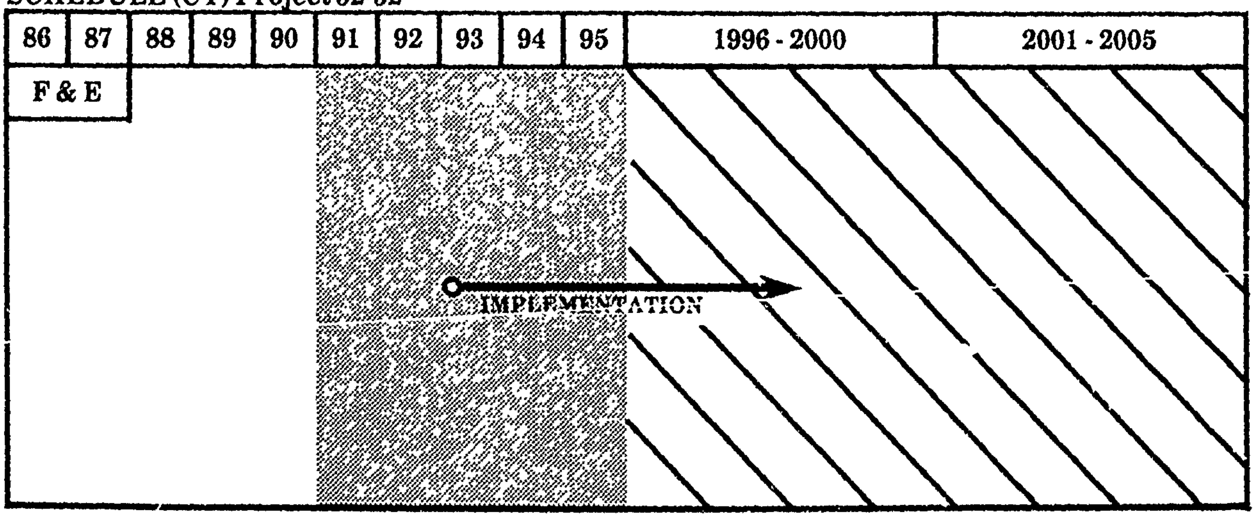
- Study of airspace and airport configuration for siting new ATCTs.
- Engineering studies of terrain and facility radiation characteristics for locating surveillance radars.
- Planning studies to determine the number and types of FAA facilities that will be needed to support new airports and major airport expansions.
- Feasibility studies to determine type and location of approach, landing, and navigation systems.
- Communication studies such as networking, equipment replacement, spectrum analyses and area coverages.
- Preliminary environmental studies to determine if proposed FAA facilities can be constructed and operated satisfactorily to meet NAS requirements and also meet environmental regulations and requirements for the intended life of the facilities.

Results of these studies will be used to formulate budget estimates, procurement, construction, installation, and integration plans of new FAA facilities and equipment.

Products: Alternatives and recommendations, interface requirements, cost/benefit analyses, environment impact statements, hardware/software requirements, site location identification, and schedules.

Related Projects/Activities: Major airport or facility projects contained in, or to be considered for inclusion into, the CIP.

SCHEDULE (CY) Project 32-32



PROJECT 33-01: Direct User Access Terminal (DUAT) Service Geographic Expansion

Purpose: To expand DUAT service to include Alaska, Hawaii, and Puerto Rico, and incorporate new Air Traffic Service requirements in the existing DUAT service.

Approach: This service will expand the user access to weather information and flight plan filing and will be leased from commercial vendors to meet a schedule compatible with system installations.

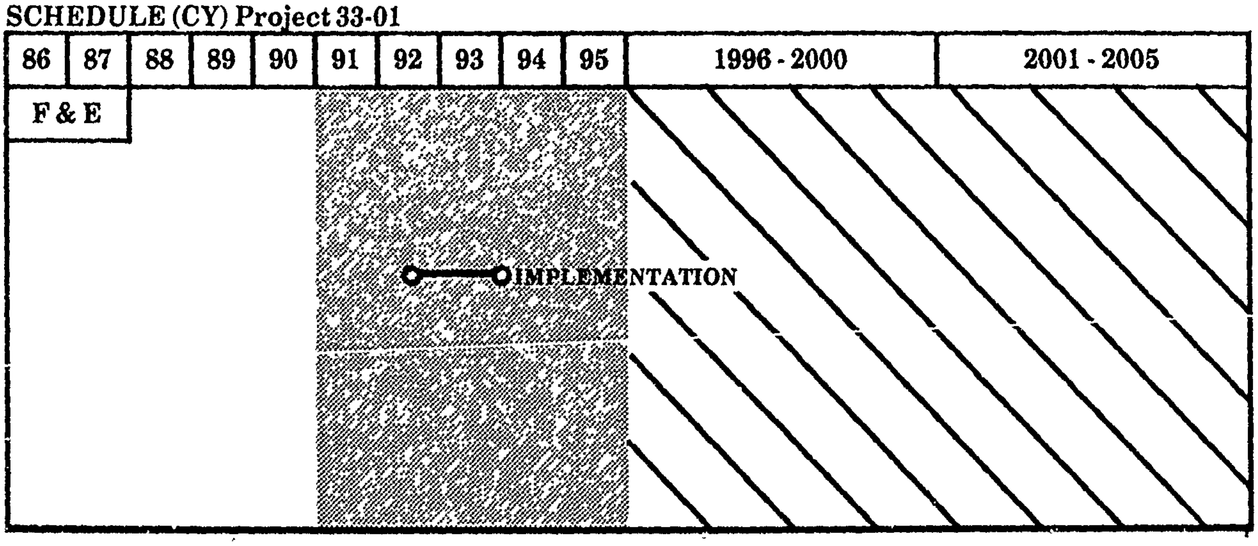
Products: Establish one to three five-year service contracts with options for two additional years to provide DUAT capability in Alaska, Hawaii, and Puerto Rico.

Progress/Activity from October 1989 through November 1990:

- A requirements analysis and cost-benefit study was initiated by the Alaskan Region with FAA DUAT project support.

Related Projects/Activities: 23-01 FSAS.

SCHEDULE (CY) Project 33-01



PROJECT 33-08: Hazardous In-Flight Weather Advisory Service (HIWAS) Expansion

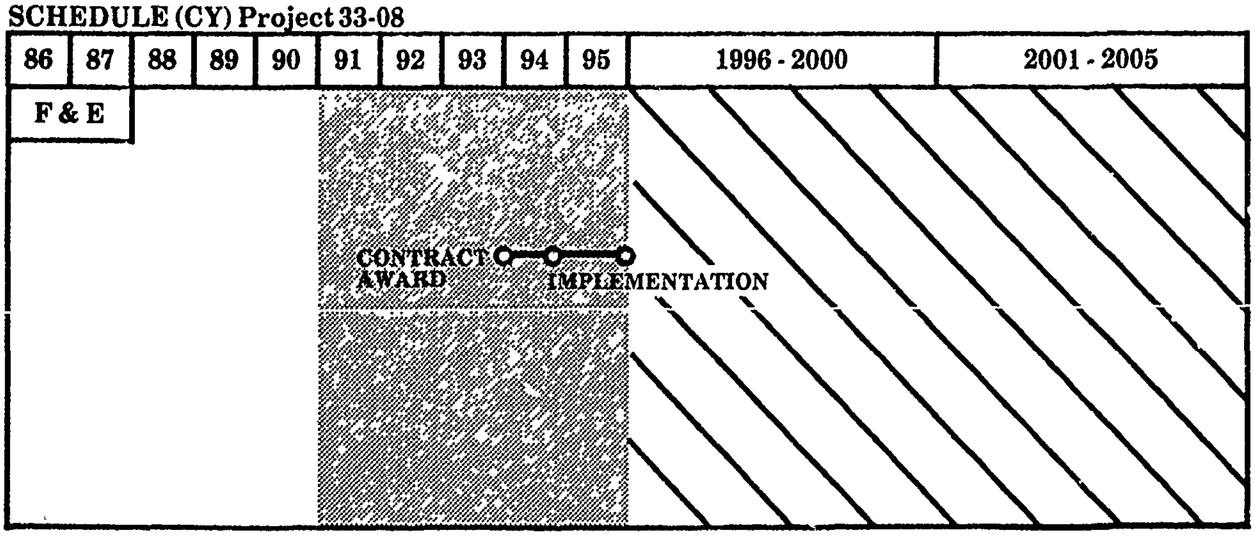
Purpose: This project provides for additional HIWAS over selected Very High Frequency Omnidirectional Ranges (VORs). HIWAS will relieve flight service specialists from the labor-intensive task of manual weather broadcasting through the use of continuous prerecorded weather advisory broadcasts over the VOR.

Approach: Initial HIWAS production was completed in 1989, with delivery of all production units to the FAA Logistics Center. Additional HIWAS units are needed to meet new growth requirements.

Products: Eight HIWAS units for Alaska.

Related Projects/Activities: 23- 1 FSAS.

SCHEDULE (CY) Project 33-08



PROJECT 34-04: Establish Locator Outer Markers (LOM)

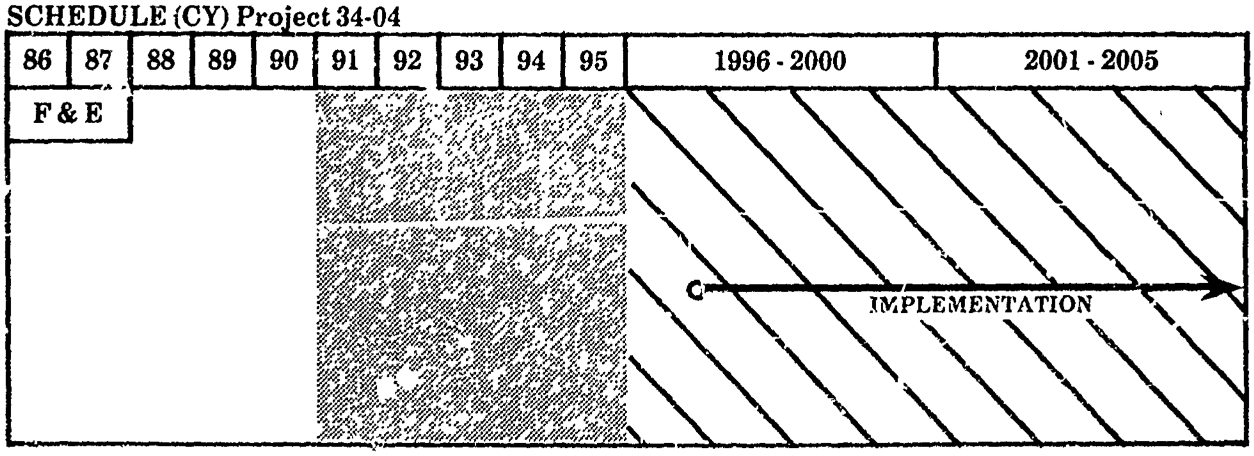
Purpose: This project will provide for additional LOMs using an NDB for existing and planned ILS installations. Additional LOMs are needed for existing and planned ILS installations to provide fixes and transition routes for ILS/MLS approaches. MLS will require a like facility in some cases if DME is absent. In addition, many of the planned MLS installations will need LOMs for course guidance in areas that are impacted by shadowing and multipath errors, such as mountainous regions where DME may not exist or provide enough coverage.

Approach: Additional off-the-shelf LOMs will be acquired. Approximately 10 LOMs per year are planned.

Products: 100 solid-state LOM units.

Related Projects/Activities: 24-03 VORTAC, 24-07 MLS, 26-15 NAS Spectrum Engineering, and 34-06 ILS.

SCHEDULE (CY) Project 34-04



PROJECT 34-06: Instrument Landing System (ILS)

Purpose: This project will establish new, partial, and full ILSs, and upgrade existing ILS facilities. New ILS qualifiers in all categories will result from new airport construction and the need for increased landing capacity at existing airports. These new systems will provide precision approach guidance for new installations until the transition to MLS.

Approach:

- New Establishments
  - Category (CAT) I, II, and III ILS will be qualified per the requirements of the Airway Planning Standard (APS-1) for new airport construction or the need for increased landing capacity at existing civil or assumed military airfields.
  - New system installation will be in accordance with Agency policy and plans established for the implementation of the MLS. Requirements for ILSs will continue during MLS transition. New systems will have embedded Remote Maintenance Monitoring (RMM) capability and will be implemented along with a medium-intensity approach lighting system, with runway alignment indicator lights, provided by the Visual Navaids project.
- Upgrades
  - Acquire the necessary equipment, including logistics support, to provide glide slopes and middle marker beacons to enable full ILS capability, thereby enhancing safety and system capacity.
  - Provide for upgrading of CAT I ILS to CAT II or CAT III through the procurement of additional modules to provide increased airport capacity. The runway environment and lighting systems will also be upgraded in accordance with Agency standards.

Products:

- New Establishments
  - Ongoing contract for 59 CAT I ILSs are being installed at identified locations.
  - An additional 100 CAT I ILS will be installed over the next 10 years (10 per year).
  - 150 partial ILSs will be installed over the next 10 years (15 per year).
- Upgrades
  - 120 existing localizer-only facilities will be upgraded to full ILS through the acquisition of glide slopes and middle marker beacons.
  - Approximately 50 existing CAT I ILSs will be upgraded to CAT II or CAT III ILSs to meet the needs of expanding airports.

Progress/Activity from October 1989 through November 1990:

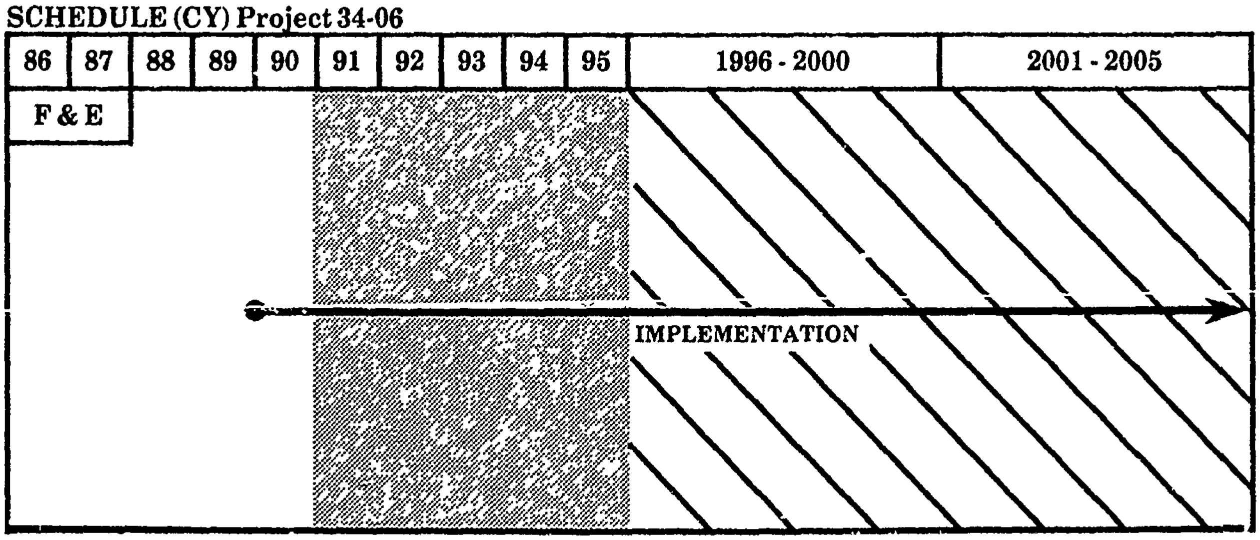
- 7 CAT I ILS new establishments have been commissioned.

Related Projects/Activities: 24-07 MLS, 24-08 RVR, 24-09 Visual Navaids, 26-01 RMMS, 26-15 NAS Spectrum Engineering, 32-21 New Airport Facilities, Denver, Colorado, 32-22 Dallas/Fort Worth Metroplex, and 44-20 AN/GRN-27 ILS Replacement.

List of Contractors:

- Wilcox Electric Inc.
  (category I ILSs)
  Kansas City, Missouri.

SCHEDULE (CY) Project 34-06



PROJECT 34-07: Microwave Landing System (MLS) - Production Phase II

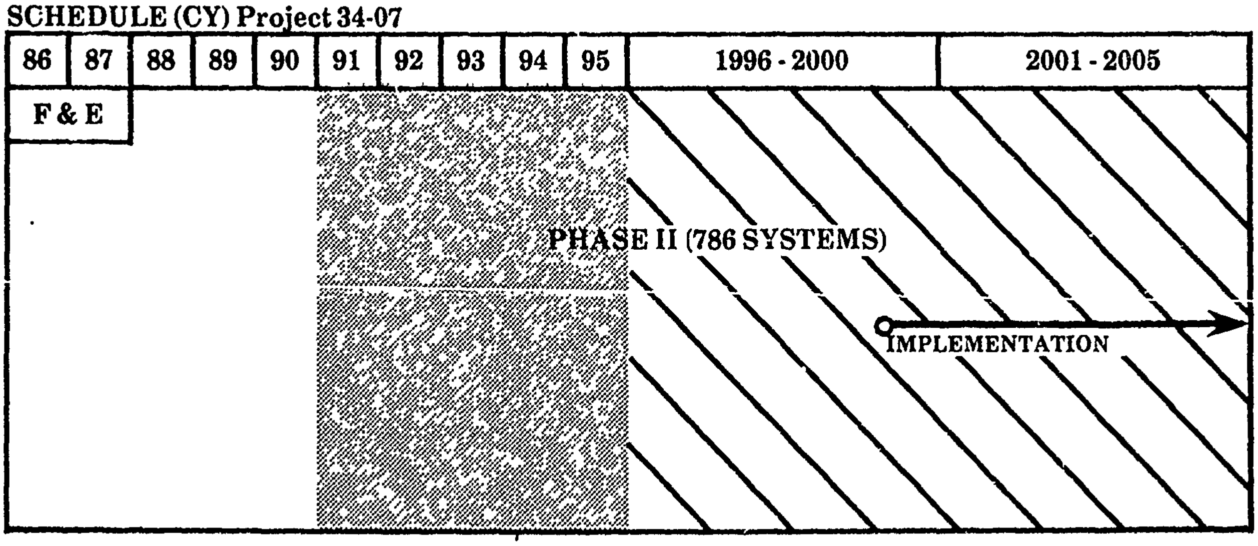
Purpose: This project establishes a Phase II production activity for the MLS program. When the 786 systems from this project are combined with the 464 systems contained in Phase I (project 24-07), 1,250 total systems will have been procured. This will provide for an MLS at each ILS site, plus an additional 350 to 400 newly qualifying locations.

Approach: This project will provide the 786 MLS systems between 1999 and 2008. Acquisition of these systems will be a follow-on to the MLS first procurement.

Products: 786 MLSs.

Related Projects/Activities: 24-07 MLS, 24-08 RVR, 24-09 Visual Navaids, and 34-06 ILS.

SCHEDULE (CY) Project 34-07



PROJECT 34-08: Runway Visual Range (RVR) Establishment

Purpose: The project will establish additional RVRs at locations qualified through increased operations and new qualifying airport locations arising from the construction of new airports, new runways, and runway extensions. The RVRs will support the new ILSs, assumption of military airfields, and MLS requirements on precision approach runways. The project will also provide airport capacity enhancements through RVR installations on nonprecision approach runways.

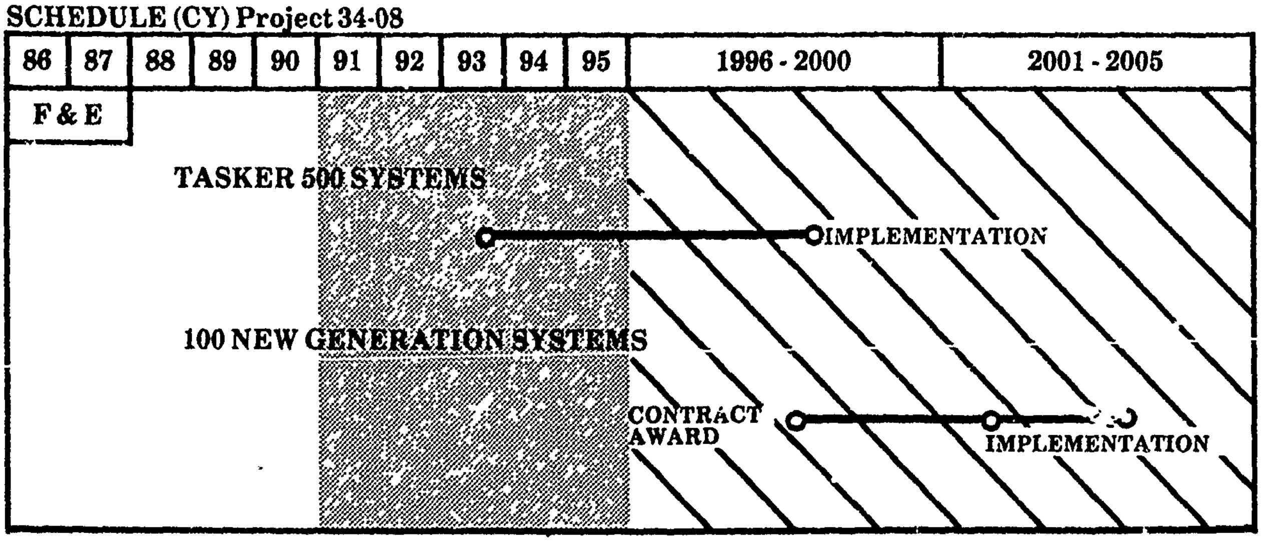
Approach:

- Refurbish and reinstall surplus Tasker 500 systems at new locations based on new requirements.
- Provide an additional 100 new generation RVR's through a follow-on contract with multi-year option quantities.

Products: 100 new RVR systems and refurbished Tasker 500 systems.

Related Projects/Activities: 21-12 AAS (TCCC), 23-09 AWOS (ASOS), 24-08 RVR, 26-01 RMMS, 32-21 New Airport Facilities, Denver, Colorado, 32-22 Dallas/Fort Worth Metroplex, 32-25 New Austin Airport, 32-26 STAR/SCT, 34-06 ILS, 34-07 MLS, and 44-29 RVR Replacement.

SCHEDULE (CY) Project 34-08



PROJECT 34-09: Establish Visual Navaids for New Qualifiers

Purpose: This project will provide safety-related facilities and enhancements at airports to match air traffic growth requirements. Equipment for the establishment of remote radio control for the visual navaids identified in this project are included as required.

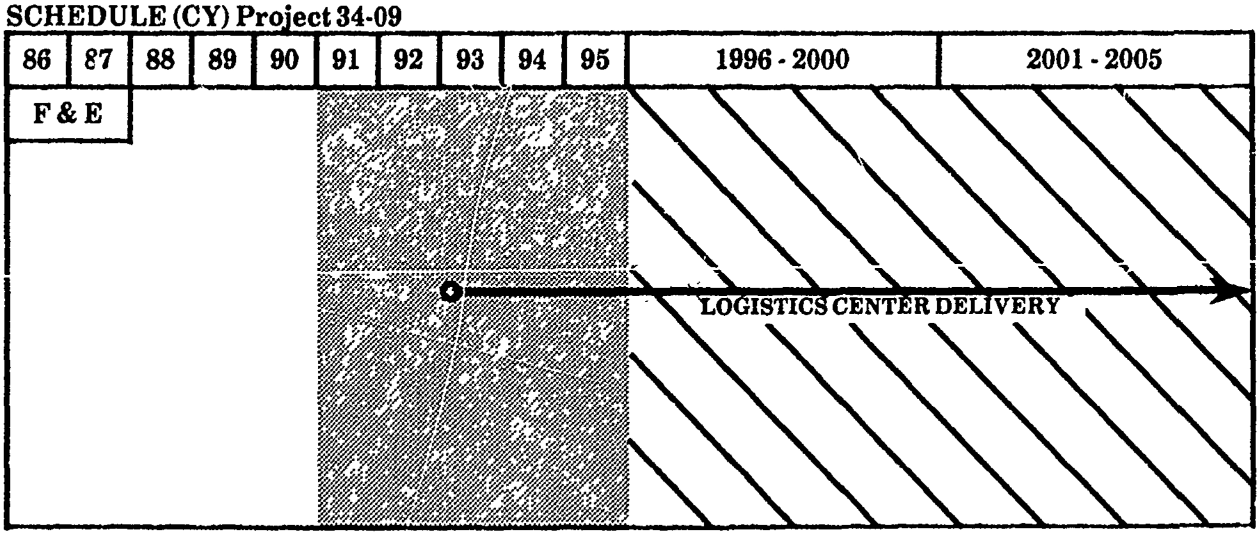
Approach: Visual navaids will be installed in conjunction with other related projects where possible. Medium-Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) and High-Intensity Approach Lighting System with Sequence Flashers (ALSF-2) will be installed with ILSs in accordance with Agency standards. These visual navaids will not be duplicated for a subsequent MLS installation on the same runway. Runway-End Identification Lights (REIL), Precision Approach Path Installations (PAPI), and Omnidirectional Approach Lighting Systems (ODALS) will be qualified in accordance with Airway Planning Standards.

Products:

- ALSF-2: 20 systems.
- MALSR: 200 systems.
- REILS: 300 systems.
- PAPI: 400 systems.
- ODALS: 200 systems.

Related Projects/Activities: 24-07 MLS, 24-09 Visual Navaids, 26-01 RMMS, 34-06 ILS, and major new airports/expansions.

SCHEDULE (CY) Project 34-09



PROJECT 34-12: Air Traffic Control Beacon Interrogator (ATCBI) Establishment

Purpose: ATC surveillance of aircraft by ground-based equipment will be required well into the next century. This project will establish surveillance capability at new qualifying ATC facilities.

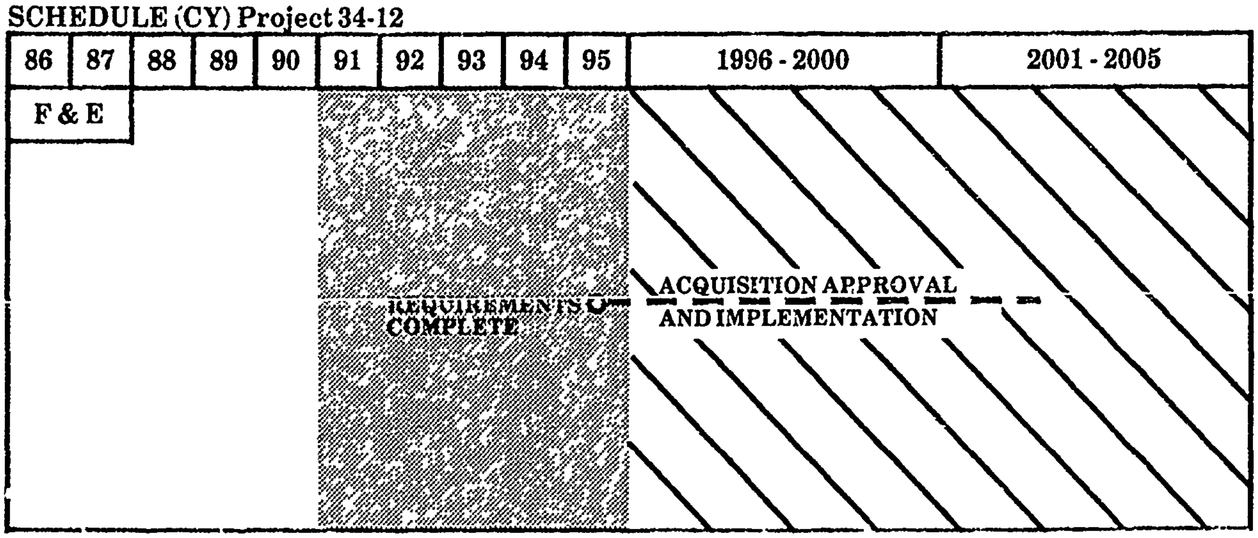
Approach: Ground-based ATCBI surveillance units will be procured to support new establishments through existing contracts.

Products: Secondary radar units at new sites (quantity and locations to be determined).

Related Projects/Activities: 24-12 Mode S, 26-01 RMMS, 26-15 NAS Spectrum Engineering, 32-21 New Airport Facilities, Denver, Colorado, 32-22 Dallas/Fort Worth Metroplex, 32-25 New Austin Airport. This project shares a production contract with the ATCBI Replacement project 44-46.

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 34-12



PROJECT 34-13: Terminal Radar Digitizing, Replacement, and Establishment

Purpose: This project will provide digitized radar data suitable for use in ATC facilities with AAS equipment where the approach control function will be performed. Digitized radar will be provided for terminals which require radar replacement and for terminals expected to qualify for radar approach control by the year 2000. This project also supports relocation of terminal radars as necessary to maintain coverage.

Approach: FAA will meet its needs for terminal radar through acquisition of a radar system functionally equivalent to the ASR-9 radar system.

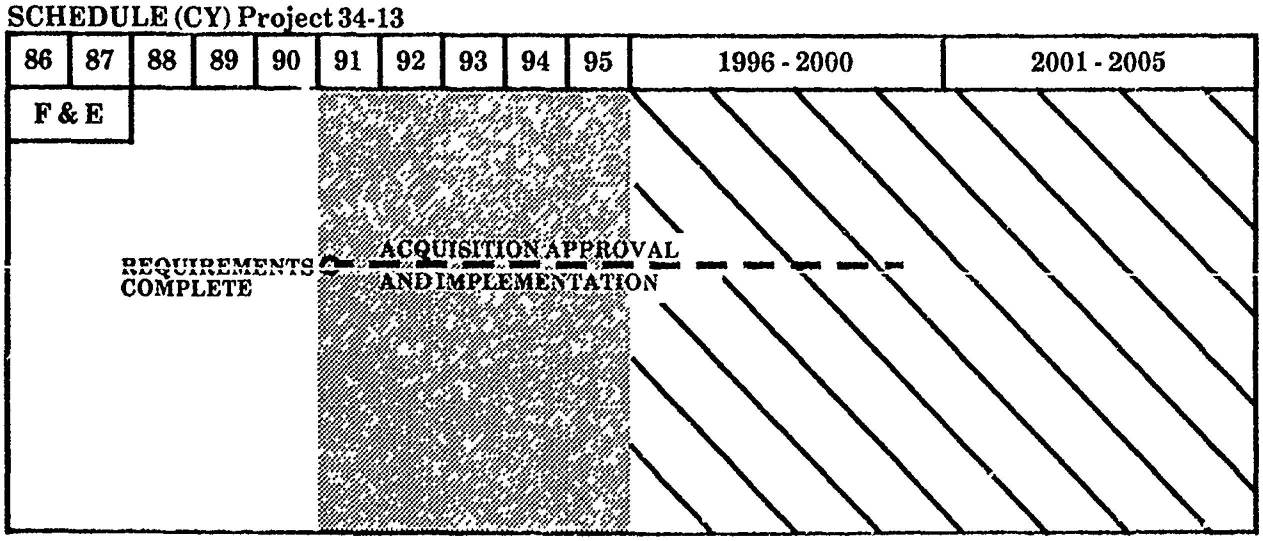
Products: Current plans envision:

- Terminal radars to replace ASR-7/8 radars, establish new qualifiers, provide DOD terminal control, and provide FAA support systems.
- Terminal radars to provide gap-fillers for existing FAA and military coverage, and provide mobile radar units.
- Terminal radars necessary in support of the DOD to FAA ATC facility transfer/modernization.

Related Projects/Activities: 21-12 AAS, 21-15 ACF, 24-13 ASR, 26-01 RMMS, 26-15 NAS Spectrum Engineering, 32-21 New Airport Facilities, Denver, Colorado, 32-25 New Austin Airport, 34-12 ATCBI Establishment, and 44-46 ATCBI Replacement.

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 34-13



PROJECT 34-14: Additional Airport Surface Detection Equipment (ASDE) Establishment

Purpose: This project will provide surveillance of aircraft and ground vehicles on the airport surface at newly qualifying locations. At high-activity airports, radar monitoring of airport surface operations is required to provide an effective and expeditious means of directing and moving surface traffic. This is critical during periods of low visibility, such as rain, fog, and night operations.

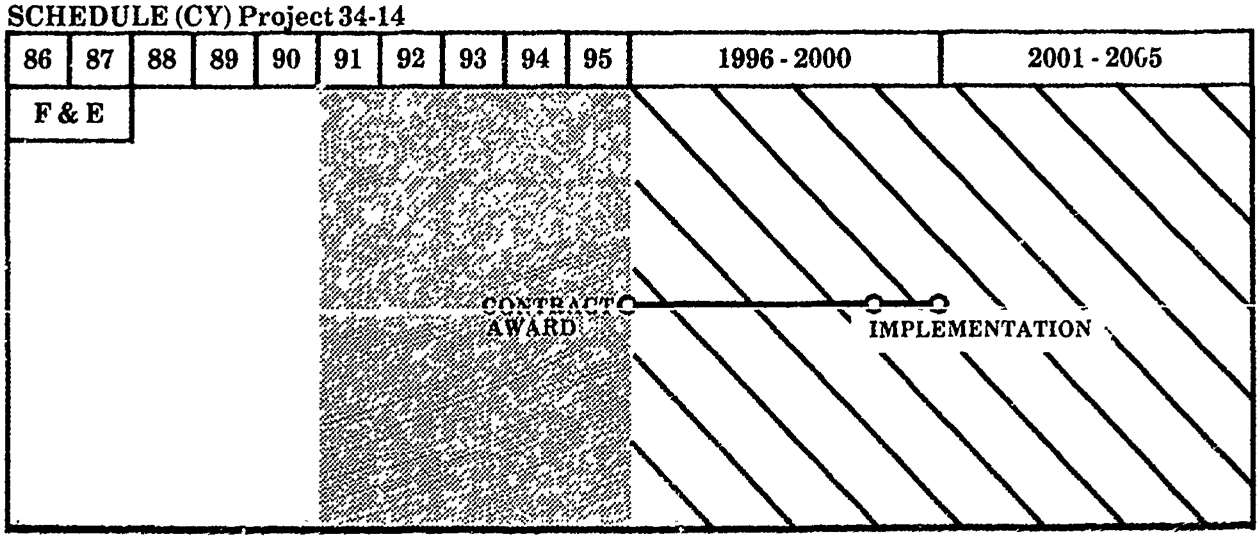
Approach: Additional ASDE radars will be procured, which will also include runway incursion detection capability. Candidate locations must meet established criteria which are based on airport activity and weather.

The ASDE antenna may be located on top of the ATCT which may require structural modification. Some installations may require a separate remote tower.

Products: Seven system establishments are currently projected.

Related Projects/Activities: 24-14 ASDE-3, 26-01 RMMS, and 26-15 NAS Spectrum Engineering.

SCHEDULE (CY) Project 34-14



PROJECT 34-20: Surveillance System Enhancements

Purpose: This project improves the timing, tracking, and display of aircraft position data, and the orderly transition of the ATC system from the present configuration to the ACF environment.

Approach: This project improves surveillance system capability through two related enhancements that collectively improve radar accuracy for target positioning, conflict alert, and minimum safe altitude warning (MSAW); reduce track-swapping; and allow full use of the Mode S discrete addressing capability.

The first enhancement, the Integrated Radar Beacon Tracker (IRBT), will be developed and installed at those locations equipped with both primary and Mode S secondary radars. The IRBT will simultaneously correlate Mode S and primary reports at the radar site into a single track report, thus reducing the processing time required later at the ATC facility and improving the accuracy of the reported aircraft position.

The second enhancement, the advanced message format, is required to transmit IRBT reports to the ATC facility. Specifically, the advanced format will allow the transmission of more accurate range and azimuth data, surveillance/beacon file numbers, radar quality, confidence and validity information, Mode S address, and velocity interpolated from Doppler returns.

The Mode S, ASR-9, and Air Route Surveillance Radar-4 (ARSR-4) will incorporate the capability to operate with advanced format and IRBT information. These enhancements will allow each sensor and combinations of sensors to use full design capability. ARSR-3 radars will be provided with the capability to interface with Mode S units. Both advanced and current formats selectively will be required to support transition.

Products: IRBT/advanced format capability for Mode S, ASR-9, and ARSR-4 sensors.

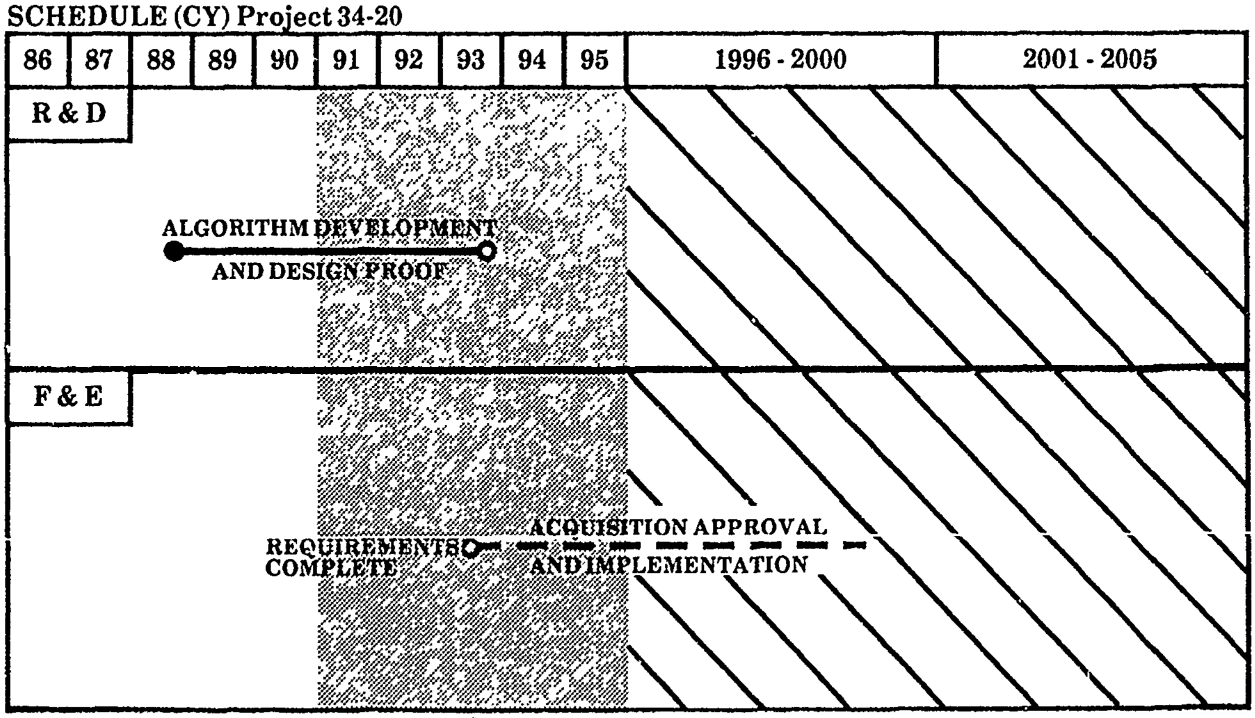
Progress/Activity from October 1989 through November 1990:

- Detailed requirements are being prepared.

Related Projects/Activities: 21-12 AAS, 21-15 ACF, 24-12 Mode S, 24-13 ASR, and 24-15 LRR.

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 34-20



PROJECT 34-22: Oceanic Satellite Communications

Purpose: This project will provide direct operational two-way voice and data communications between pilots and controllers over the ocean, using newly-available commercial communications satellites. The use of satellite communications instead of the existing high frequency radio will improve accuracy and timeliness in communications, enabling more efficient aircraft routing, reduced oceanic aircraft spacing, and increased safety.

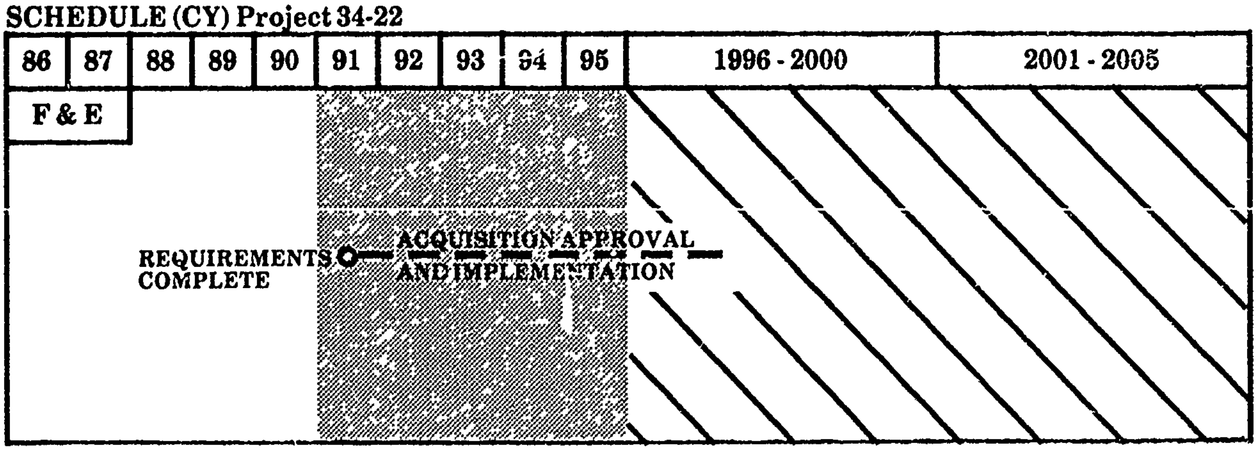
Approach: The International Martime Satellite Organization (INMARSAT) is establishing a commercial aeronautical communications satellite network for over-ocean coverage (except Polar regions). Cost and performance studies will be conducted to determine the best use of this commercial satellite network to meet expanding oceanic demand for ATC services. These studies will consider, among other issues, the types and quantity of information to be exchanged (e.g., position reports, requests for flight path changes) and the best technical means to achieve the operational capability.

Products: ATC satellite communications capability over the Atlantic/Pacific Oceans.

Related Projects/Activities: 21-05 ODAPS, 63-05 Aeronautical Data Link Communications and Applications, 64-29 ATC Applications of ADS, and 65-22 Aeronautical Telecommunications Network (ATN).

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 34-22



PROJECT 34-23: Communications Facilities Expansion

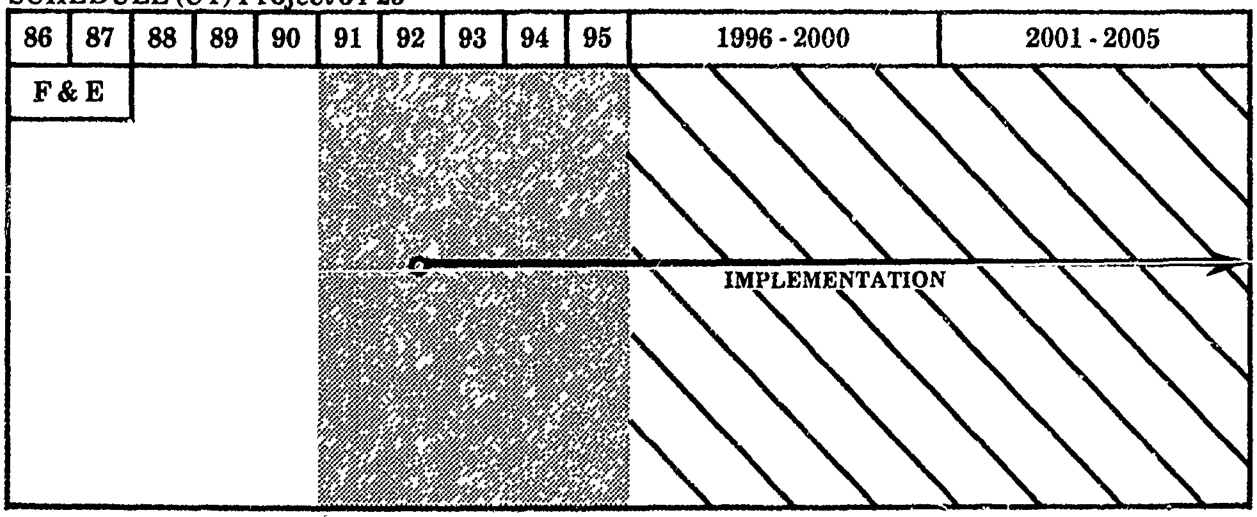
Purpose: This project will establish additional remote communications capabilities from RCFs, including Remote Center Air/Ground (RCAG) communications facilities, Remote Communications Outlets (RCO), and Remote Transmitter/Receiver (RTR) facilities to satisfy air traffic demands. Increasing air traffic operational needs for Air/Ground (A/G) communications coverage has made it essential to expand existing RCFs by adding A/G communication frequencies and relocating owned/leased facilities for proper communication coverage. Due to their direct impact on air traffic operations, these projects require a responsive reaction to establish, relocate, or expand an RCF.

Approach: Each region must complete a cost/benefit analysis for each proposed expansion project.

Products: For planning purpose, 165 facilities are being used as an initial estimate for coverage improvements for all regions.

Related Projects/Activities: 21-11 VSCS, 21-15 ACF, 22-12 TCS, 23-13 ICSS, 25-08 RCE, 32-27 DOD/FAA ATC Facility Transfer/Modernization, Civil Use of Military Airfields, Major New Airports, Major Airport Expansion, and Hubbing.

SCHEDULE (CY) Project 34-23



PROJECT 35-07: National Airspace Data Interchange Network (NADIN) II Continuation

Purpose: This project will provide for the growth of the NADIN II Packet Switched Network (PSN), thus supporting new requirements for network expansion/enhancement not supported under Phase II of project 25-07. The initial PSN will be installed and operating, and the products of this project will add capacity and functionality with features such as T-1 interfaces, interface ports, new protocols, multicast functions, and satellite interfaces. It will also meet requirements for new PSN nodes to support future network interfaces to various systems in the NAS such as SCT and TCCC.

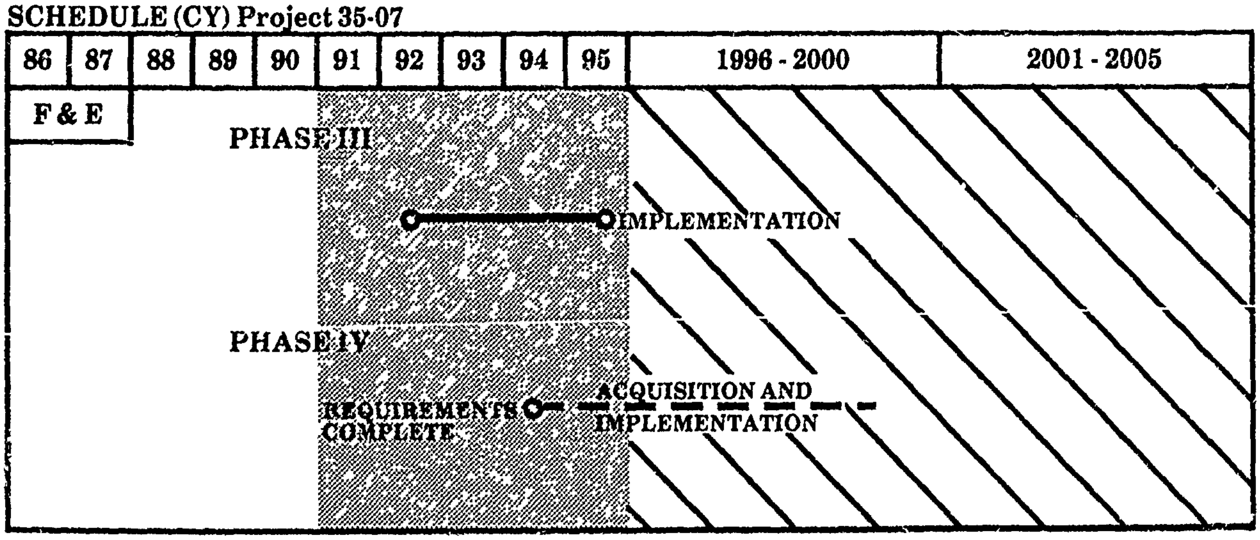
Approach: Phases I and II of the NADIN II contract contain adequate scope to permit acquisition of the above enhancements, but items must be ordered by mid-FY 94. Requirements identified thereafter must be obtained via new contracts. This project will include a Phase III for new requirements obtainable under the existing contract, and Phase IV for meeting subsequently identified requirements.

Products: Provide T-1 (1.54 Mbit/sec) interfaces for trunk network, multicast (broadcast) capability to network users, satellite interface capability, new interface protocols, expanded interface port capacity as required, and PSN nodes to support new systems.

Related Project/Activities: The NADIN PSN will interface with virtually all operational systems in the NAS requiring interfacility data switching service. Future communications needs for 21-12 AAS and 21-15 ACF Host computer systems will be met by NADIN II (25-07). The PSN will be used to switch maintenance management and traffic management system communications. This project will require interfacility communications service from the NAS Interfacility Communications System. The RML Replacement and Expansion Program (25-03) will provide a significant portion of the backbone trunk transmission service for NADIN II.

Project Status: Phase IV of this project is currently in the advanced planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 35-07



Section 5

PROJECT 35-20: Interfacility Data Transfer System for Edwards AFB RAPCON

Purpose: This project will provide interfacility data transfer between the Edwards RAPCON and the Los Angeles ARTCC. The implementation of new software for the Edwards AFB Mosaic Tracking Direct Access Radar Channel (MDARC) system will improve ATC facility transfer and control of flights operating in the R-2508 complex. This software improvement will also allow Edwards RAPCON to continue with the national program of expanding tower and en route control.

Approach: Software will be developed to provide interfacility data transfer through emulation of an ARTS IIIA by MDARC. This program will contribute to controller productivity in many ATC facilities in the southern California area, thereby increasing safety and efficiency of the ATC process.

The software effort is being performed in two stages: an interim software version (Mosaic Tracking DARC Architecture - version D (MAD)), followed by the final (Mosaic Tracking DARC Architecture - Version E (MAE)) software release. Furthermore, as a parallel effort, additional hardware modifications and enhancements will be developed to support newly identified operational capabilities.

Products:

- Software releases for MAD and MAE.
- Refurbished disk drives.
- Replacement printed circuit assemblies.
- Cable assemblies for interconnection of en route automation components.
- Enhanced DARC (EDARC) tape drives.

Progress/Activity from October 1989 through November 1990:

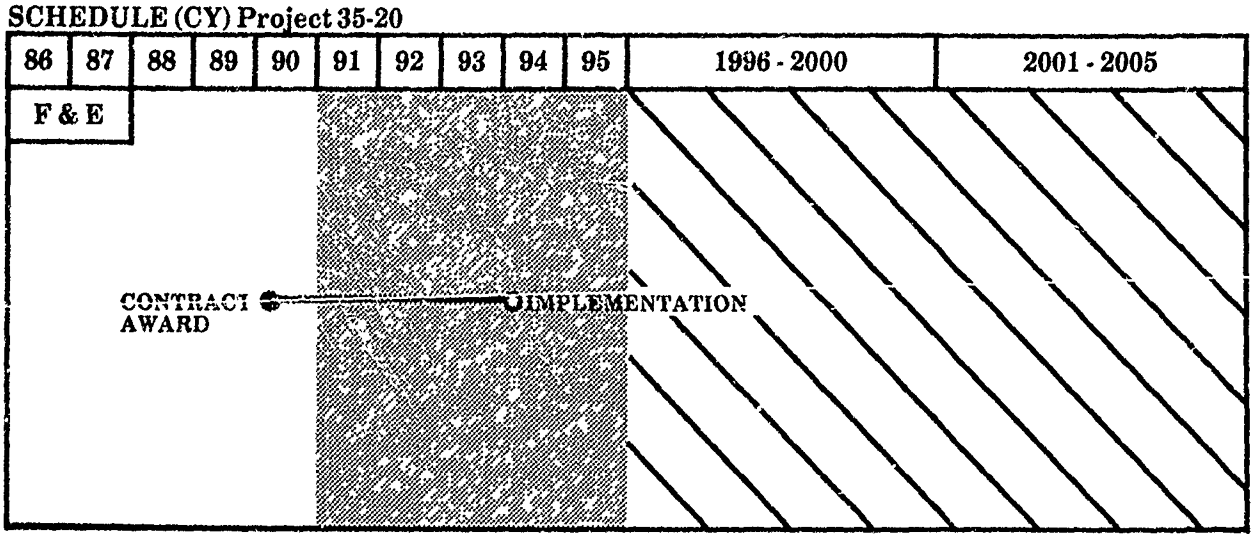
- A task order has been issued for MAD software development.

Related Projects/Activities: None.

List of Contractors:

- Dimensions International, Inc. (software)
  Alexandria, Virginia
  - RMS Technologies
    Marlton, New Jersey

SCHEDULE (CY) Project 35-20



PROJECT 36-13: Capital Investment Plan (CIP) System Engineering and Program Management Support

Purpose: This project provides expertise in system management, engineering, and program management of CIP implementation. The requirements for system engineering and program management expertise cannot be met with the available FAA staff. Contractual support is required to augment declining resources under the current System Engineering and Integration Contract (SEIC).

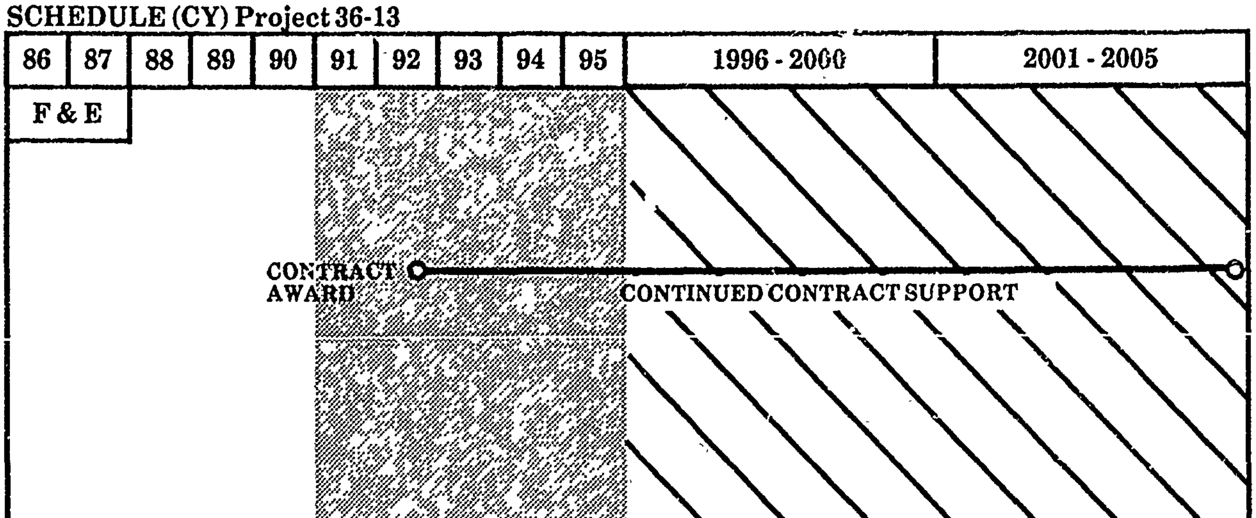
Approach: One or more contracts will be awarded to provide the skills and support tools necessary for implementation of the CIP.

Products:

- CIP annual updates.
- System engineering support to translate general performance requirements established by users into final, workable systems. This includes system designs, integration, and implementation strategies.
- Program management support for CIP projects to ensure efforts are accomplished within acceptable parameters of cost, schedule, and technical performance.

Related Projects/Activities: All projects within the CIP.

SCHEDULE (CY) Project 36-13



PROJECT 36-20: ARTCC/ACF Support Space

Purpose: This project will provide the additional ARTCC/ACF space required to accommodate increased staffing levels and functional requirements. These additions will resolve shortfalls within the current ARTCC buildings and provide for future space requirements.

Regional studies were reviewed and an independent study was conducted by the System Engineering and Integration Contractor (SEIC) to determine existing capabilities and validate future ACF requirements.

Approach: The objective of space management is to make optimum use of space at existing NAS facilities. This is accomplished by logically preparing and scheduling construction of new areas, and by managing the configuration and utilization of facility and building space with respect to hardware, environment, operations, and maintenance personnel. All user requirements for space are included as well as applicable standards for allotment of space to equipment, people, and operations.

ACF estimates were based on a consolidated configuration, with staffing levels and authorized space requirements generated from guidelines established in Agency directives and orders.

Current/interim/future ARTCC Airway Facilities and Air Traffic administrative and support space shortfalls have been identified in the following areas.

- Operational basement wing. (space lost to new/replacement systems) including administrative offices and storage space, Airway Facilities workshop and maintenance areas, calibration laboratories, Air Traffic Flight Data office, Traffic Management Unit, and playback room.
- Air Traffic/Airway Facilities training classrooms, briefing rooms, dynamic simulation capability in ARTCCs, computer based instruction, and office space, software maintenance, and administration.

Site-by-site requirements will be identified through detailed analysis of the variables within the 18 "standard" and four "unique" ARTCCs and the New York TRACON. These requirements will be integrated with other construction projects at specific ARTCCs.

Products:

- 18 updated standard ARTCC/ACF environments providing space for personnel and support activities needed to manage the ACF concept.
- Four updated unique ARTCC/ACF environments and the New York TRACON/ACF.

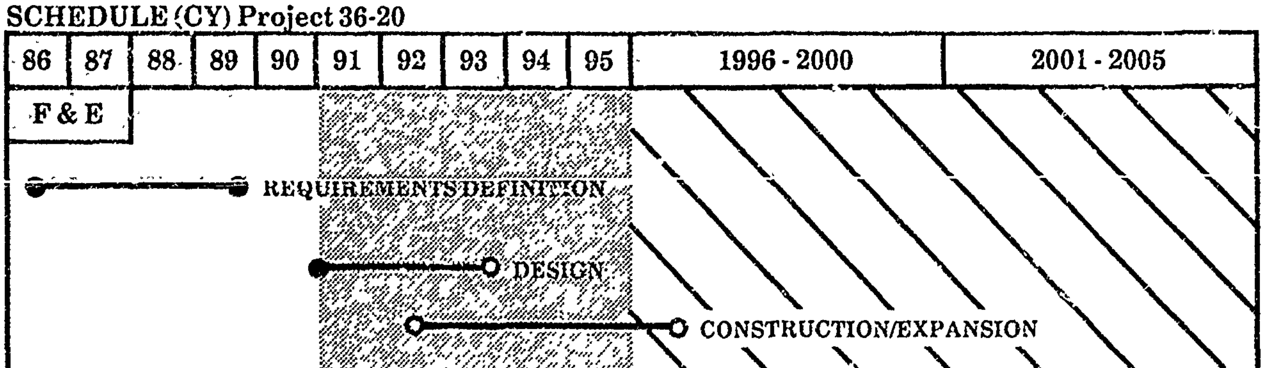
Progress/Activity from October 1989 through November 1990:

- The Interim Operational Support Space Requirements Validation Team visited five ARTCCs and validated the space shortfall.

Related Projects/Activities: The expansion and reallocation of space within the ARTCC will require coordination with other activities scheduled to transition into the ARTCC. Requirements for 26-09 ARTCC Plant Modernization, including relocation of equipment, asbestos removal, and upgrade/expansion of power systems will be accomplished under separate projects contained in the various chapters of this plan.

List of Contractors: Multiple construction contracts will be awarded by the regions.

SCHEDULE (CY) Project 36-20



PROJECT 36-23 NAS In-Plant Contract Support Services (NAS/IPCSS)

Purpose: This project provides experienced procurement and production resources to represent FAA interests during the award and performance of critical CIP contracts.

Approach: A contract will be awarded for providing services in the areas of procurement, including cost analysis and production surveillance. Most of these services will be performed on-site at selected contractor plants, and will include functions such as:

- Assisting the contracting officer in the review and evaluation of contractor proposals, and furnishing recommendations as appropriate.
- Performing production support, surveillance, and status reporting of potential and actual slippages in contract delivery schedules, and reporting as appropriate to FAA representatives.
- Reporting inadequacies to the contracting officer in compliance with the contract specifications, terms, and other conditions.

The contractor will provide thorough contract administration and effective oversight of the production activities and potential problem areas. In addition, an on-site presence provides the FAA with better data to assess contract and production activities, and to evaluate planned versus actual contract progress.

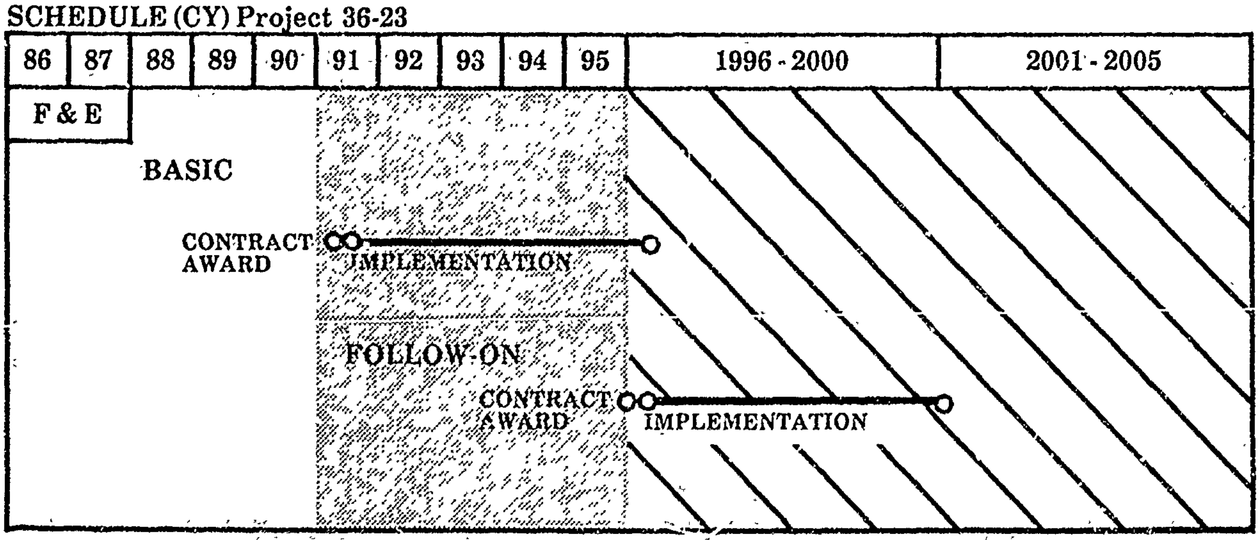
Products: Monthly status reports to the contracting officers of selected programs; administrative assistance for selected cost analyses, contract administration functions, and production surveillance; and monthly briefings to senior management on the status of selected contracts.

Progress/Activity from October 1989 through November 1990:

- Contract administration and production surveillance support personnel are on-site at contractor plants involved in major programs.
- Cost analysis resources have been provided in supporting several programs.

Related Projects/Activities: Any FAA project/program requiring procurement support services.

SCHEDULE (CY) Project 36-23



PROJECT 36-24: NAS Regional/Center Logistics Support Services

Purpose: This project provides procurement, real estate, material management, and automated data processing support resources to support FAA regional/center logistics personnel in the implementation of CIP contracts.

Approach: A contract will be awarded for providing expert services in the above areas. Most of these services will be performed on-site at FAA region/center logistics offices, and will include functions such as:

- Assisting the contracting officer in various functions related to the solicitation, award, and administration of field contracts.
- Preparing documentation for real property and surplus property reports, processing capitalizations, and reviewing project materiel reports.
- Preparing leases and renewals, appraisals, site surveys, and lease versus purchase studies.

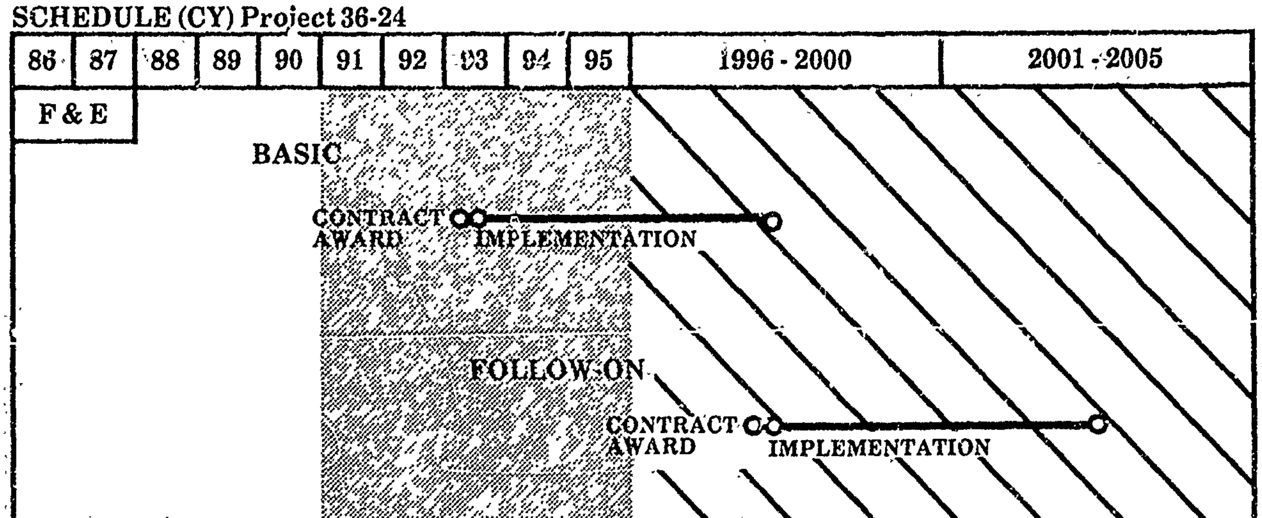
These will assure that planned preparation activities for receipt of new systems are accomplished in a timely manner. In addition, they will provide for timely and comprehensive preparation of reports, studies, and procurement-related documents.

Products:

- Status reports to the contracting officers of various CIP procurements.
- Administrative assistance in the performance of various logistics functions.
- Pre-award and post-award contract assistance.
- Automated data processing support relative to the use of logistics databases and software.

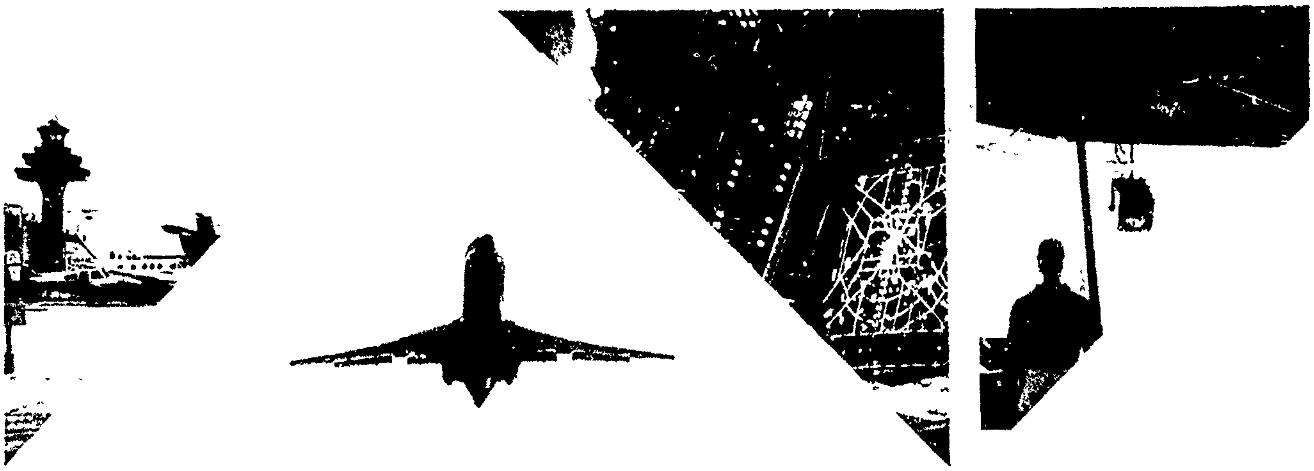
Related Projects/Activities: Any regional activity requiring procurement support services.

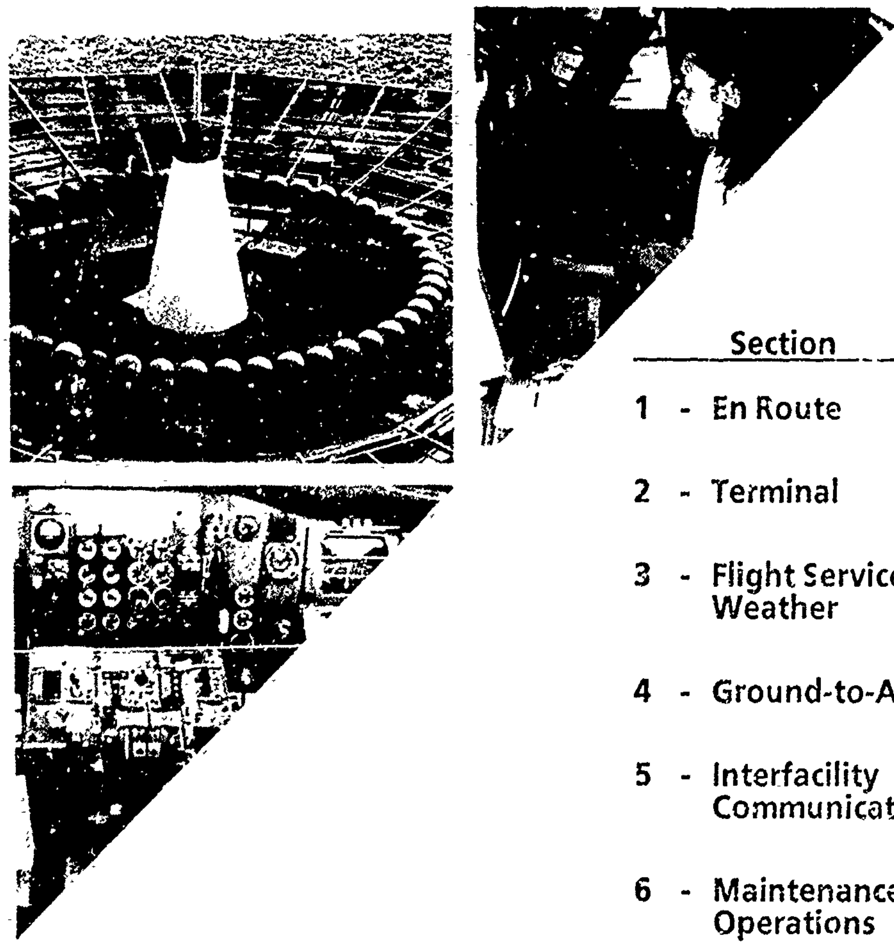
SCHEDULE (CY) Project 36-24



Chapter 4: Infrastructure Replenishment

The Infrastructure Replenishment chapter covers additional items identified since development of the original NAS Plan. This chapter presents projects that refurbish structures, replace obsolete equipment, or relocate facilities to maintain service, improve effectiveness, or reduce cost.





Section	Page Numbers
1 - En Route	(4-1-1 thru 4-1-2)
2 - Terminal	(4-2-1 thru 4-2-8)
3 - Flight Service and Weather	(4-3-1 thru 4-3-8)
4 - Ground-to-Air	(4-4-1 thru 4-4-20)
5 - Interfacility Communications	(4-5-1 thru 4-5-8)
6 - Maintenance and Operations	(4-6-1 thru 4-6-14)

CHAPTER 4

INFRASTRUCTURE REPLENISHMENT

Infrastructure replenishment projects are necessary for the continued economical operation of the existing National Airspace System. They include the refurbishment, modernization, or replacement of existing buildings, structures, and plants that house operational air traffic control, navigation, surveillance, and communication equipment. In addition, projects are included that relocate equipment and facilities to maintain the current level of service, improve effectiveness, or reduce operational costs. A discussion of the expansion and modernization of interfacility communications equipment and facilities is included in this chapter.

For purposes of explanation, the projects are categorized below in the context of the major functional area that each supports. However, these major system areas are highly interrelated, so that many projects (e.g., Interim Support Plan) actually support several different functional areas.

AUTOMATION

These projects sustain or replace those NAS sub-systems that provide assistance to controllers to satisfy airspace user needs for service, including the provision of separation services, accommodation of increasing demand, desire for user-preferred routes/altitudes, and delivery of improved weather services. Some specific projects include:

- The Combined Center Radar Approach Control (CERAP) at San Juan will be sustained until consolidation into the Miami Area Control Facility (ACF). The San Juan International Flight Service Station (IFSS) will be upgraded to an automated IFSS.
- Interim support action is required to assure continuation of Air Traffic Control (ATC) operations. This support will help maintain system operations, increase capacity, and establish new capabilities at several ATC facilities.
- The tower integration project will ensure that all projects that interface with the Airport Traffic Control Tower (ATCT) are properly integrated.
- The Flight Service Automation System (FSAS) computer replacement project will be completed for all 61 Automated Flight Service Stations (AFSSs), 23 Flight Service Data Processing Systems (FSDPSs), and two Aviation Weather Processors (AWPs).

SURVEILLANCE

These projects sustain or replace those NAS sub-systems that provide the position/velocity of aircraft in U.S. airspace, on the airport surface, and over the ocean. Some representative projects include:

- Air Route Surveillance Radars (ARSRs) will be relocated to improve air space coverage to meet requirements.
- Airport Surveillance Radars (ASRs) will continue to be replaced at high-density airports.
- Aging and obsolete ATC Beacon Interrogator (ATCBI) equipment will be replaced by modern Mode S units.
- Radar pedestals will receive vibration monitoring sensors which will provide information on impending pedestal problems.
- AN/FPS-117 radars in Alaska will be modified for improved performance.
- The LRR radome replacement is necessary because present radomes are past the end of their economic life and not compatible with the new Mode S monopulse antenna system.

TELECOMMUNICATIONS

These projects sustain or replace sub-systems that provide the capability for the air/ground and ground/ground voice and data communications, and the interfacility communication of information, such as aircraft surveillance data.

- Remote communication facilities will receive modern equipment to improve operational performance in a crowded radar frequency spectrum.

- Many interfacility communication projects expand/enhance present facilities. Two satellite communication projects will be completed during this period.

- Support will be provided to reduce cost of voice and data transmissions.

- NAS communications will be updated to assure Agency command and control during crisis or national emergency.

WEATHER

These projects sustain or replace those NAS sub-systems that provide pilot and controller with the meteorological information necessary to ensure safe and efficient aircraft and system operation. This includes knowledge of weather phenomena, such as severe weather, wind shear, clear air turbulence, microbursts, wake vortex, winds aloft, precipitation, and icing.

- The commercial Automated Weather Observing System (AWOS) units will be upgraded to detect precipitation type, occurrence, and accumulation. This enhancement will make the commercial AWOS functionally compatible with the Automated Surface Observing System (ASOS).

- Existing Low-Level Wind Shear Alert System (LLWAS) units will be modified to a Phase III configuration to significantly increase system effectiveness.

- Aging Digital Altimeter Setting Indicators (DASIs) at ATCTs will be replaced with dual sensor units.

NAVIGATION AND LANDING

These projects sustain or replace sub-systems that provide pilots with accurate knowledge of their aircraft's position so that they can properly navigate the aircraft in all weather conditions. Some representative projects include:

- Aging second-generation Very High Frequency Omnidirectional Range/Tactical Air Navigation/Distance Measuring Equipment (VOR/TACAN/DME) will be sustained with state-of-the-art equipment which provides enhanced Remote Maintenance Monitoring (RMM) capabilities and improved operational performance.

- Obsolete Direction Finders (DFs) will be replaced in existing AFSSs.

- Several projects require the replacement of existing equipment: Tactical Air Navigation (TACAN) antennas, Runway Visual Range (RVR) units, Distance Measuring Equipment (DME), and Nondirectional Beacons (NDBs).

- All Instrument Landing System (ILS) localizer traveling wave antennas and their power distribution networks will be replaced.

MAINTENANCE AND OPERATIONS

These projects sustain or replace those NAS sub-systems and facilities that collectively support or enhance high quality service and provide continued operation of the various system elements through monitoring, control, maintenance, and testing of hardware and software components.

- The Remote Maintenance Monitoring System (RMMS) will be expanded, and Maintenance Control Centers (MCCs) in each sector will be enhanced/ upgraded.

- Construction efforts will be completed at Level III, IV, and V airports for new cable loop systems.

- Airport Traffic Control Towers (ATCTs) will be upgraded to current OSHA fire safety standards.

- The congressionally mandated fuel storage tank project will replace/repair all leaking underground petroleum tanks and install leak detectors to prevent further environmental pollution.

- Minor national or local items will be addressed by the continuing general support project.

PROJECT 41-21: En Route Software Development Support

Purpose: Support is required for the development, integration, and implementation of NAS en route software changes to correct operational problems and provide systems enhancement.

Approach: Requirements for software services exceed in-house capabilities. Continued contractor support will be required until the Advanced Automation System begins implementation. The contractor will develop software functions and provide support services to implement and maintain en route software as per the following current and future needs:

- Implementation of time-critical corrections to system problems.
- Increasing system capacity by activities such as COMPOOL resizing (memory for data storage/radar database tables) due to software updates.
- Reducing system vulnerability by improving system security.
- Continued development of Conflict Resolution Advisory (CRA) and Host Data Link (HDL).
- Other tasks, as assigned, to develop software functions and provide support services to implement and maintain en route software.

Products: The contractor will develop software functions and provide support services to implement and maintain en route software as per the following recurring and nonrecurring tasks:

- Recurring projects
  - Suppport for NAS en route system releases.
  - FAAAC support.
  - Project requirements analysis.
- Nonrecurring projects
  - Three-level weather.
  - Flight Plan Communications Link (FPCL).
  - San Juan FDIO.

Progress/Activity from October 1989 through November 1990:

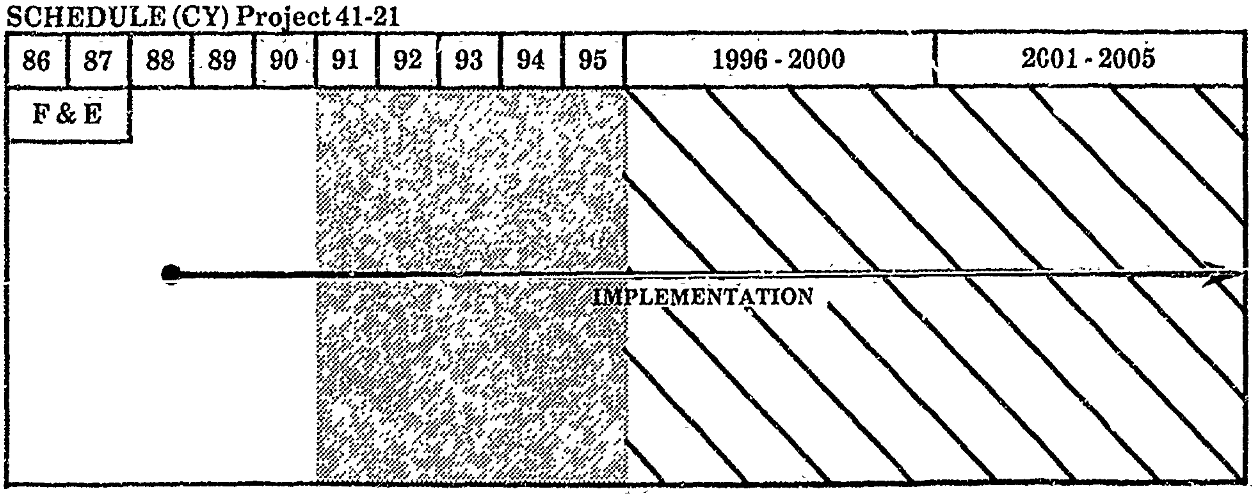
- Conducted system requirements reviews for FPCL.
- Incorporated three-level weather in the Host A4e0.3 system.
- Validated and prototyped San Juan FDIO.

Related Projects/Activities: 21-03 DARC, 21-06 TMS, and 21-09 CRA.

List of Contractors:

- Computer Sciences Corporation
  (testing and software support)
  Silver Spring, Maryland

SCHEDULE (CY) Project 41-21



PROJECT 41-22: Relocate Air Traffic System Command Center (ATSCC)

Purpose: This project will consist of physically relocating the AT System Command Center from FAA Headquarters to a future national airspace management facility site location.

Approach: All existing functions of the ATSCC will be relocated as will the National Flight Data Center and the United States NOTAM System workstations.

Products: A new national facility will be established that is capable of incorporating new functions and equipment to improve the efficiency of managing the national airspace.

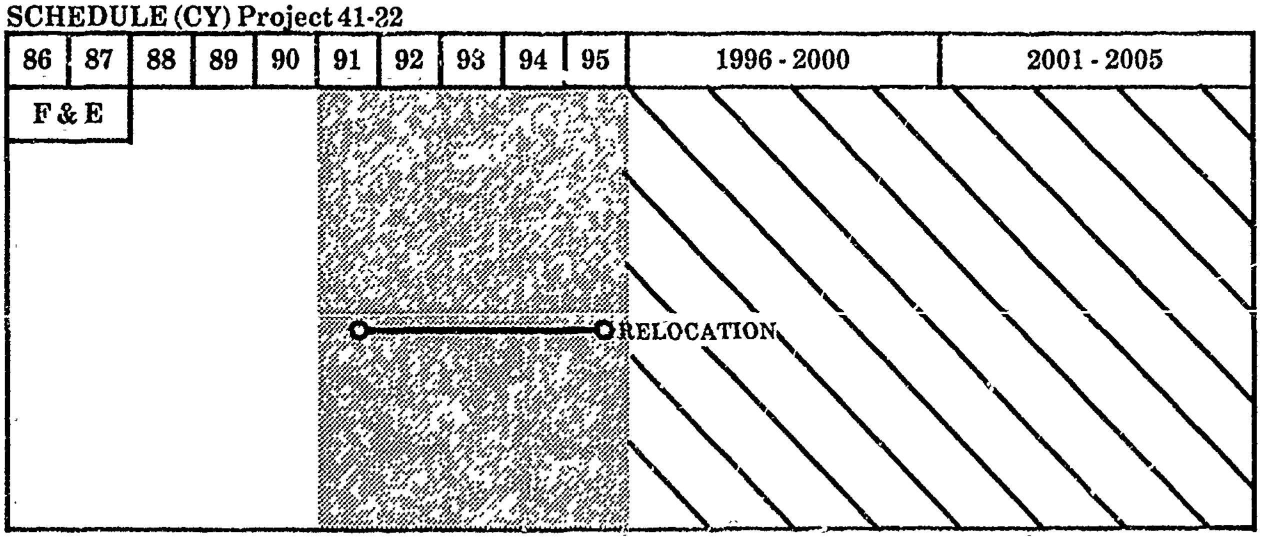
Progress/Activity from October 1989 through November 1990:

- A feasibility study was completed.

Related Projects/Activities. 21-06 TMS and 62-22 NAMFAC.

List of Contractors: Multiple vendors will be used to provide planning, implementation, and transition plans.

SCHEDULE (CY) Project 41-22



PROJECT 42-13: Airport Traffic Control Tower (ATCT)/Terminal Radar Approach Control (TRACON) Modernization

Purpose: This project modernizes terminal facilities by increasing tower cab height to improve visibility, replacing aged equipment, and rehabilitating space in support of growth and expansion. It includes modernization of existing towers to provide for support of additional operating positions, training space, etc., and replacement of obsolete or unreliable items of concern such as engine generators, uninterruptible power supplies, batteries, and HVAC systems.

Each year a number of facilities pass their planned design life. Major efforts need to be initiated to upgrade environmental systems and rehabilitate operational and administrative spaces. This project will implement a modified system architecture with equipment and rehabilitation changes to satisfy ongoing Air Traffic requirements.

Approach: Regions recommend ATCTs to be modernized annually. FAA Headquarters validates and prioritizes the recommendations. The number of ATCTs to be modernized depends on funding availability. FAA Headquarters will develop national standards and make national environmental support buys. Renovation and refurbishment will be accomplished at the regional level. Construction will be by regional contracts supported by national architectural engineers for site adaption of national designs.

Products: Approximately 20 facilities per year will receive some level of major modernization, and over 100 facilities per year will need some level of minor modernization, (e.g. tower console, wind instruments, clocks). In addition, seven mobile ATCTs will be acquired for basing within certain regions and the FAA Logistics Center. These units will be used for spontaneous response to disasters, shutdowns, asbestos removal, and events such as airshows and fly-ins at nontowered airports.

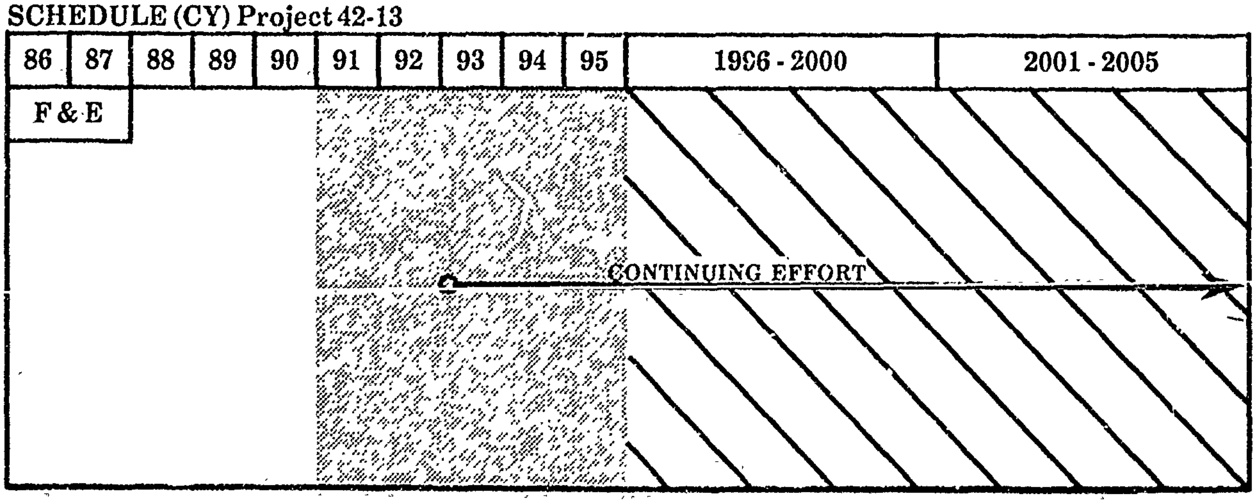
Related Projects/Activities: 22-12 TCS, 22-13 ATCT/TRACON Establishment, Replacement, and Modernization, 23-13 ICSS, 32-13 ATCT Establishment, 42-14 ATCT/TRACON Replacement, 42-20 ATCT System Intra-Connectivity, and the NAS Interfacility Communications System (NICS).

List of Contractors:

- Multiple contracts will be determined by the regions.

- Holmes & Narver, Inc.
  (architectural and engineering services)
  Orange, California

SCHEDULE (CY) Project 42-13



PROJECT 42-14: Airport Traffic Control Tower (ATCT)/Terminal Radar Approach Control (TRACON) Replacement

Purpose: This project replaces ATCT/TRACON facilities in accordance with Agency cost/benefit criteria.

The economic life-cycle of a majority of the 430 ATCT/TRACON facilities has been exceeded. We estimate that within the next ten years nearly 150 facilities will need to be replaced to enhance air safety and meet operational requirements.

Approach: FAA Headquarters develops national standards for the replacement of ATCTs and TRACONs in accordance with their nominal categories, i.e., low, intermediate, and major levels of activity. Construction will be by regional contracts supported by national architectural engineering for site-specific designs. Major consideration in establishing the project scope is the effective management of increasing volumes of traffic, changing airport configurations, enhanced equipment/software developments, additional operating positions, increased staffing levels, and expanded administrative space requirements.

This project does not include replacement of TRACON base buildings due to be phased out under the ACF program. Unusual circumstances or overriding operational considerations may dictate deviation from this approach. When such circumstances occur and supporting justification is made, site-specific proposals for TRACON replacement or relocation will be considered.

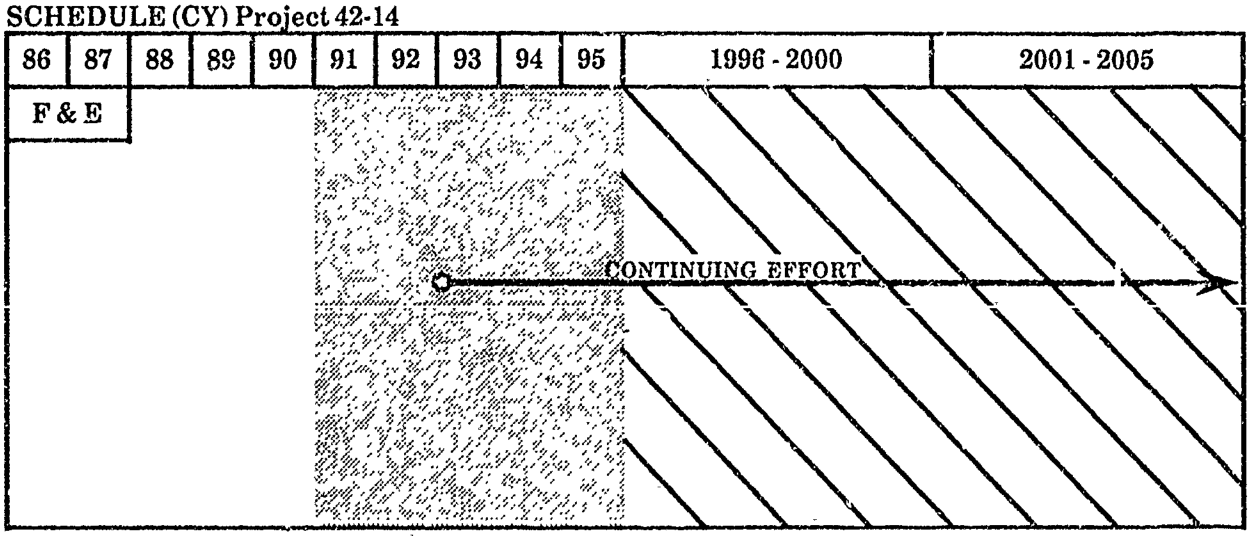
Products: Approximately 15 ATCT facilities will be replaced each year.

Related Projects/Activities: 22-12 TCS, 22-13 ATCT/TRACON Establishment, Replacement, and Modernization, 23-13 ICSS, 32-13 ATCT/TRACON Establishment, 42-13 ATCT/TRACON Modernization, 42-20 ATCT System Intra-Connectivity, and the NAS Interfacility Communications System (NICS).

List of Contractors:

- Multiple construction contracts will be determined by the regions.
- Holmes & Narver, Inc.
  (architectural and engineering services)
  Orange, California

SCHEDULE (CY) Project 42-14



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PROJECT 42-20: Airport Traffic Control Tower (ATCT) System Intra-Connectivity

Purpose: This project will integrate all projects which are to interface with the ATCT. It will provide the focal point for all system transition planning, including system requirements, deployment, and implementation. The project will ensure that the ATCT configuration is defined and maintained. This project will provide:

- Human factor studies for the most effective positioning of new air traffic controller display equipment.
- Integration of existing tower cab display systems into a consolidated display to allow tower cab space for new ATCT display systems.
- Tower cab equipment integration design and implementation.
- Tower equipment room system integration design and implementation.
- Upgrade of existing tower internal communications and data links for capability with TCS, TCCC, and other airport system upgrades.
- Temporary shelters and associated power, heating, and cooling for temporary electronic equipment space while present equipment rooms are being renovated.
- Relocation of existing ATCT complex equipment during equipment room renovation.
- Design and installation of ATCT physical security systems.

Approach: There are many projects progressing concurrently in the tower, terminal, en route, and flight service areas that will lead to an integrated ATCT/ACF environment. With the assistance of computer-aided engineering graphics and engineering mockups, various types of tower equipment (air traffic controller displays and backroom equipment) layouts will be devised and evaluated for air traffic controller efficiency, serviceability, and maintainability of the equipment. Work would include the definition and purchase of materials, equipment, and associated transition support items necessary to integrate the new systems into existing or new ATCTs. The project will be accomplished in two phases.

Phase I: Tower cab position layouts will be developed to enhance the standardization of air traffic controller positions. These positions will be developed so that all equipment to be installed in the automated ATCTs can be integrated. This will improve the air traffic controllers' functional efficiency. Human factors engineering analysis will be completed on both the position layouts and selected layouts of individual ATCT integrated cabs and equipment rooms. Based on these analyses for each individual ATCT layout plan:

- Final generic designs will be provided as guidelines to the regional offices.
- Definition of the required internal tower complex communication and data link upgrades will be defined and procured.
- Design and purchase of physical security systems will be accomplished.
- Definition and purchase of transition support equipment will be accomplished.
- Integration of pre-TCCC equipment which is to be installed in the automated ATCTs will be effected during this period to permit proper use of existing and transitional space in the ATCT.
- Guidance and plans will be developed to ensure safe and efficient transition to the new ATCT systems.

Phase II: The standardized designs for the tower cab and backroom will be implemented in accordance with the completed planning.

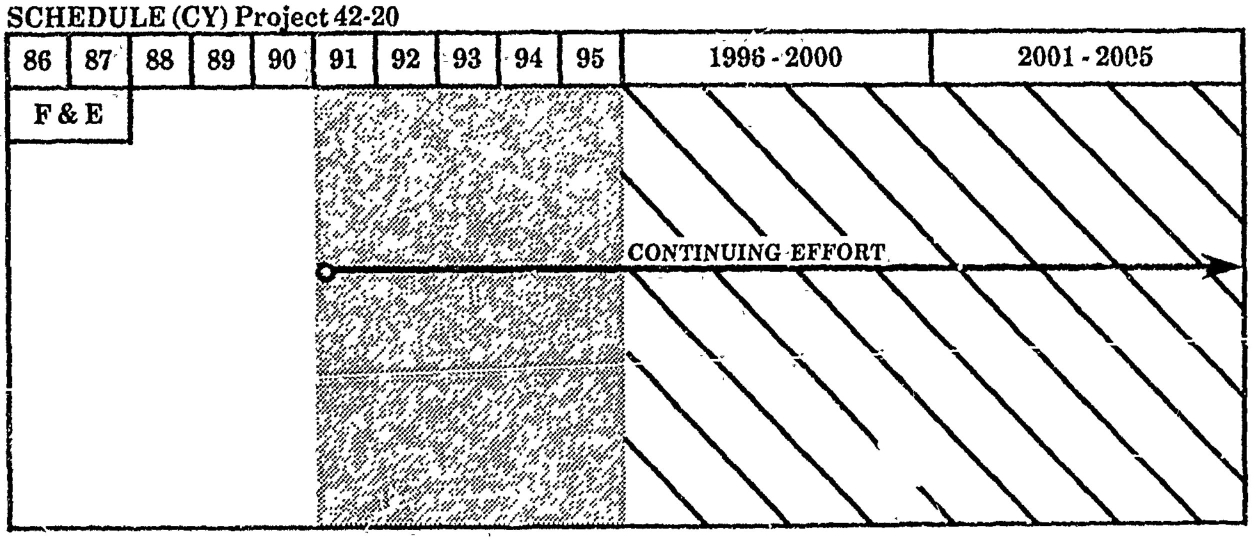
Products: Several integration designs and associated transitional support, internal tower communication and data link upgrades, and physical security upgrades for up to 430 FAA ATCTs, plus support for 216 DOD-owned ATCTs in the NAS.

Progress/Activity from October 1989 through November 1990:

- Phase I began with an assessment of the tower cab and equipment room configurations of several existing ATCTs. A study was also begun to assess the required tower cab space for the integration of new systems now under development.
- A detailed ATCT complex transition planning effort was begun.

Related Projects/Activities: 21-06 TMS, 21-12 AAS, 22-12 TCS, 23-05 Aeronautical Data Link, 23-13 ICSS, 24-14 ASDE, 25-07 NADIN II, 25-08 RCE, 26-01 RMMS, 42-13 ATCT/TRACON Modernization, 42-14 ATCT/TRACON Replacement, and weather/navaids projects.

SCHEDULE (CY) Project 42-20



PROJECT 42-21: Terminal Software Development

Purpose: Support is required for the development, integration, and implementation of NAS terminal software changes to correct operational problems and provide systems enhancement.

Approach: Requirements for software services exceed in-house capabilities. Continued contractor support will be required until the Advanced Automation System begins implementation. The contractor will develop software functions and provide support services to implement and maintain terminal software as described in "Products" below.

Products: The contractor will provide technical software support services for the following recurring and nonrecurring tasks:

- Recurring projects

  Central support of software.
  New local patch collection.
  Standardization of local casefiles.
  Casefile status information.
  Local patch testing.
  National patch library (NPL) maintenance.
  Update the NPL data file.
  General software development requirements.
  Requirements analysis.
  Configuration management of software documentation and code.
  Software design, development, and test
  Documentation.
  Firmware modifications.
  Terminal system releases.
  NAS system release.
  National deployment.

- Nonrecurring projects

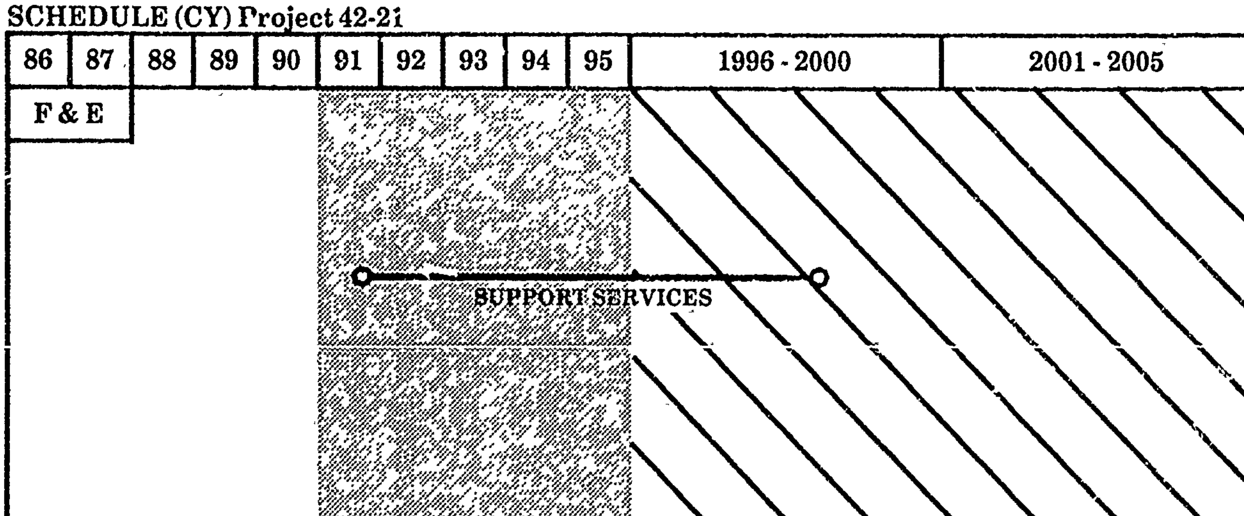
  Terminal NPL creation.
  NPL data file.
  NPL data file summary.
  NPL configuration control.
  NPL status reports.
  Modification of code and development of runstreams.
  Requirements analysis of initial terminal data link.
  ARTS IIIA converging runway ghosting.
  Recode ARTS-IIIE software to higher order language for com[illegible] console application (as an option).

Progress/Activity from October 1989 through November 1990:

- Prepared draft project plan, acquisition procurement request for the delegation of procurement authority, and procurement request.

Related Projects/Activities: None

SCHEDULE (CY) Project 42-21



PROJECT 42-22: Sustain/Consolidate San Juan Facilities

Purpose: This project will replace or upgrade various systems to sustain the CERAP operation until consolidation into an ACF. Also, the IFSS will be upgraded to an automated IFSS.

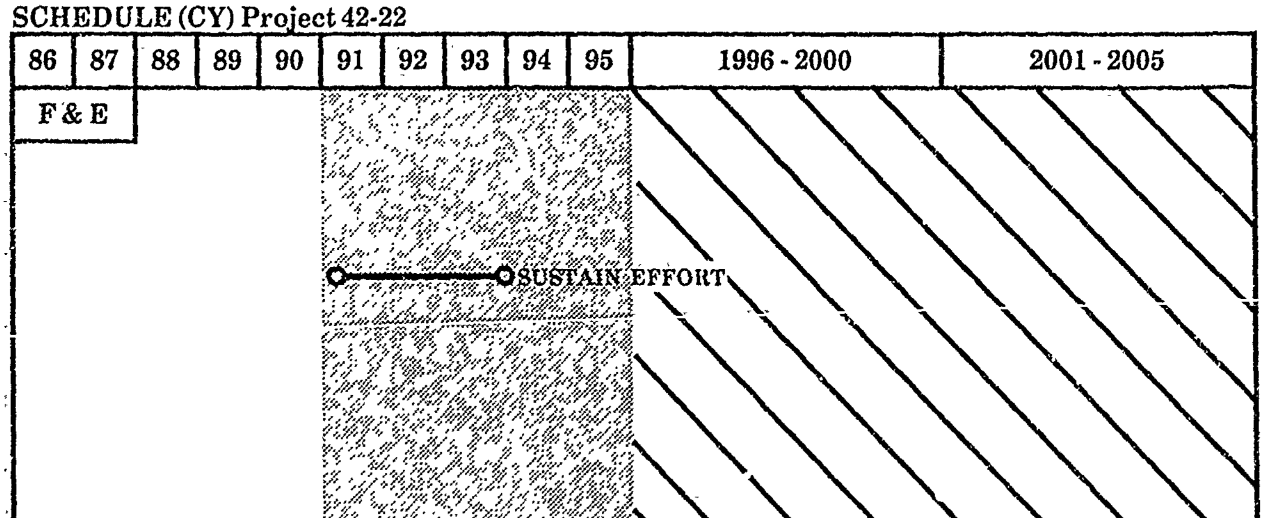
Approach: Replace/upgrade the San Juan CERAP systems until consolidation with the Miami ACF. Convert/upgrade the San Juan IFSS to an AIFSS. Examples of upgrades are listed below.

Products:

- Modernize and sustain CERAP.
  - Replace WECO 301A communications system with ICSS.
  - Replace the RML system from CERAP to Pico with an RCL system.
  - Replace RBDE with DBRITE.
  - Realign 18 existing operating positions and equipment, and remove unnecessary consoles.
  - Establish a workstation for an Airway Facilities system engineer.
- Replace/upgrade environmental systems and facilities for the CERAP and AIFSS.
  - Replace engine generators.
  - Replace/upgrade the chiller and cooling tower system.
- Replace/upgrade the IFSS to an AIFSS.
  - Provide a model 1 full capacity automation system and operational consoles (including operational equipment).
  - Provide a Type III ICSS telecommunication system.
  - Provide weather graphics system.
  - Improve the reliability of telecommunications between San Juan and the mainland.

Related Projects/Activities: 21-04 EARTS Enhancements.

SCHEDULE (CY) Project 42-22



PROJECT 42-24: Replacement of Controller Chairs

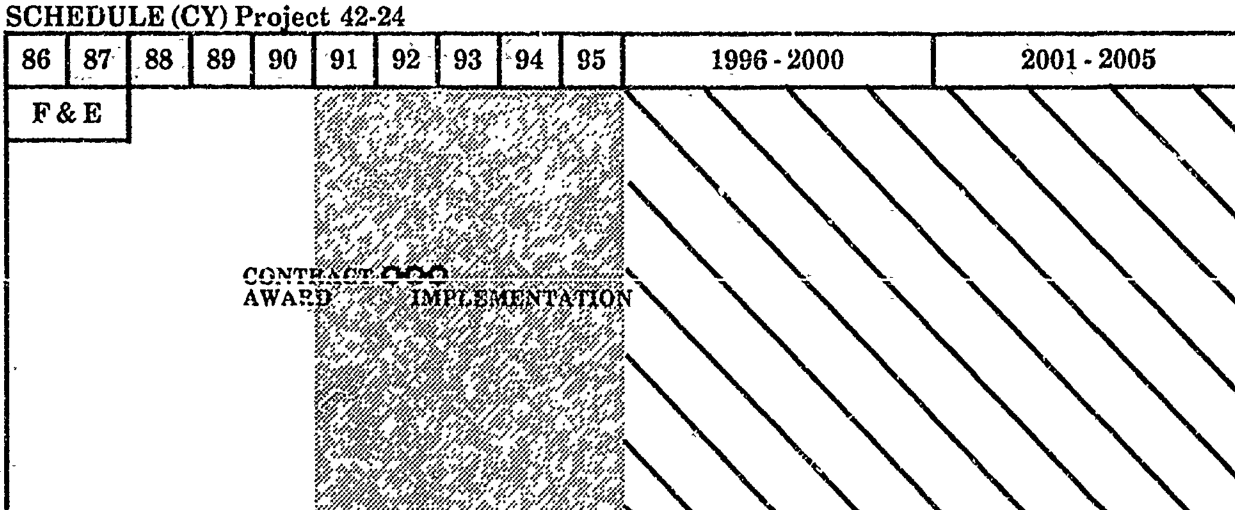
Purpose: This project will replace and or upgrade the operational controller chairs. The replacement is scheduled to begin in 1992.

Approach: Completely replace the operational position chairs in all Air Traffic facilities. A maintenance and parts contract will relieve engineers and technicians from the duties of controller chair maintenance.

Products: This project includes the replacement of controller chairs at all ARTCCs, ATCTs, AFSSs, and FSSs.

Related Projects/Activities: None

SCHEDULE (CY) Project 42-24



PROJECT 43-01: Replace Regional Interim Weather Graphics with National Graphic Weather Display System (GWDS)

Purpose: To acquire a standardized GWDS to replace the mix of nonstandard GWDS configurations installed in the 61 AFSSs and incorporate air traffic safety and product content requirements.

Approach: This procurement will be a full and open competition for GWDS products and services from a commercial-off-the-shelf supplier. The contract will provide for a turn-key configuration. Included are purchase of the hardware, data stream access (weather maps), documentation, training, and maintenance. The contract will be structured to assure that the AFSS flight specialist has uninterrupted access to near real-time weather information 24 hours per day, seven days per week, during the anticipated seven-year contract.

Products: One 5-year service contract with options for 2 additional years at the 61 AFSS facilities. Near real-time weather maps, radar, and satellite data will be supplied to the FAA flight specialist in user-ready format.

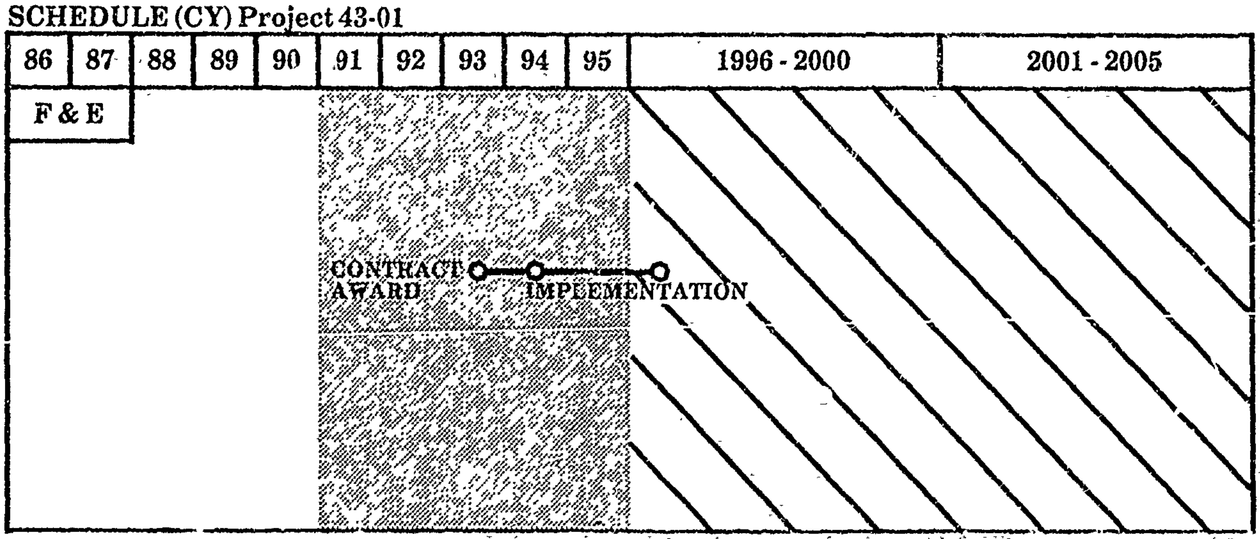
Progress/Activity from October 1989 through November 1990:

- A report on the interim and national GWDS was produced identifying the interim GWDS deficiencies.

Related Projects/Activities: 23-01 FSAS. The contract will be structured to replace, on a facility-by-facility basis, interim GWDS configurations with the national GWDS as interim contracts expire.

Section 3

SCHEDULE (CY) Project 43-01



PROJECT 43-03: Provide Flight Service Automation System (FSAS) Power Conditioning Systems

Purpose: To provide power conditioning and battery backup systems in AFSSs that are subject to frequent power fluctuations due to weather or commercial power outages. Several electronic systems installed at AFSSs are especially sensitive to these fluctuations. When fluctuations occur, they frequently result in temporary loss of service to the flying public.

Approach: This project will provide requirements definition, procurement, site preparation, installation, spare parts, and training needed to properly equip AFSS with the necessary PCS. Each selected AFSS will be modified to establish a critical power distribution system. This critical power distribution system will be connected to PCS and sized to accommodate existing and future loads. In addition to eliminating fluctuations, PCS will allow equipment connected to critical power to operate uninterrupted in the event of power failures lasting up to several minutes.

Modifications to AFSS buildings owned by the government will be accomplished either by contract or by the government work force. Design changes to facilities not owned by the government, but which are under lease to the FAA, will be negotiated with the lessor.

Some facilities may require the installation or replacement of obsolete standby power systems (i.e., engine generators) to allow PCS to operate at maximum efficiency.

PCS will be designed to be compatible with both currently installed and future electronics equipment planned for AFSS. PCS will operate without manual intervention and require only minimal maintenance.

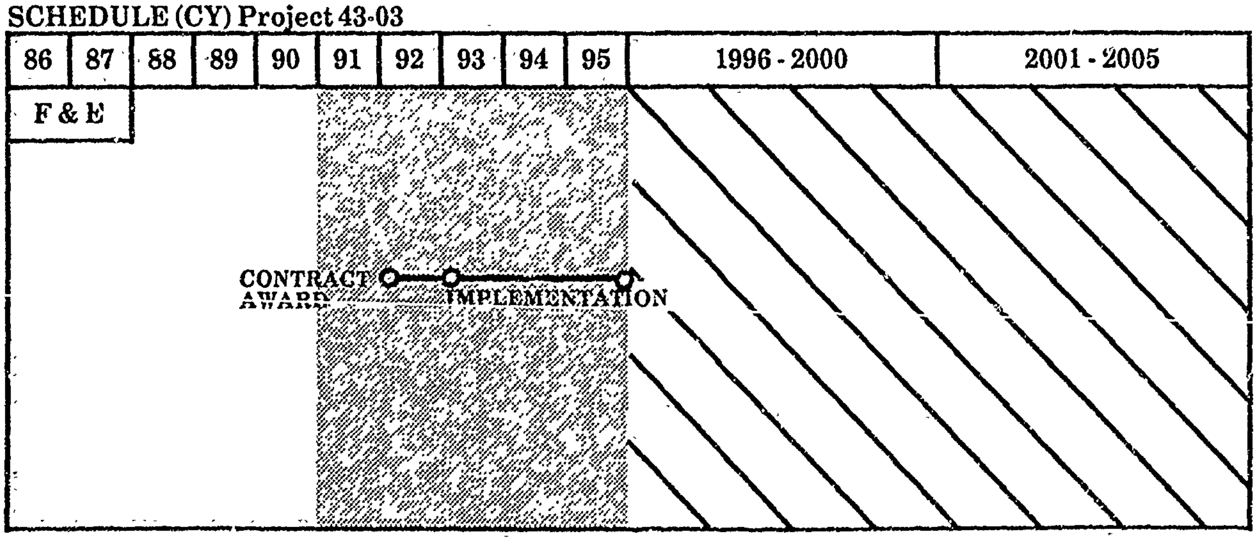
Products: 61 PCSs.

Progress/Activity from October 1989 through November 1990:

- Requirements analysis and preparation of specification for a modification to an existing power conditioning system contract were initiated.
- Power system engineering and design standards for the upgraded AFSS electrical distribution system were established.

Related Projects/Activities: 22-11 Multichannel Voice Recorders, 22-12 TCS, 23-01 FSAS, 26-07 Power Systems, 43-20 AFSS Support Space, weather display systems, and data modems.

SCHEDULE (CY) Project 43-03



PROJECT 43-04: Flight Service Automation System (FSAS) Computer Replacement

Purpose: To develop the requirements and procurement methodology for replacement of current flight service automation system equipment. This includes identification and evaluation of alternatives to automated weather processors (AWPs), flight service data processing systems (FSDPSs), and the automated flight service station (AFSS) consoles. Funding will be required to procure or lease the replacement systems by the end of the supportable life cycle of the model 1 full capacity equipment.

Approach: This project will identify new requirements or alternative solutions to the current system, and develop the specification for the replacement of the AFSS system equipment. This project will continue the operation of the 61 AFSSs with upgraded automation hardware, software, procedures, supply support, and training.

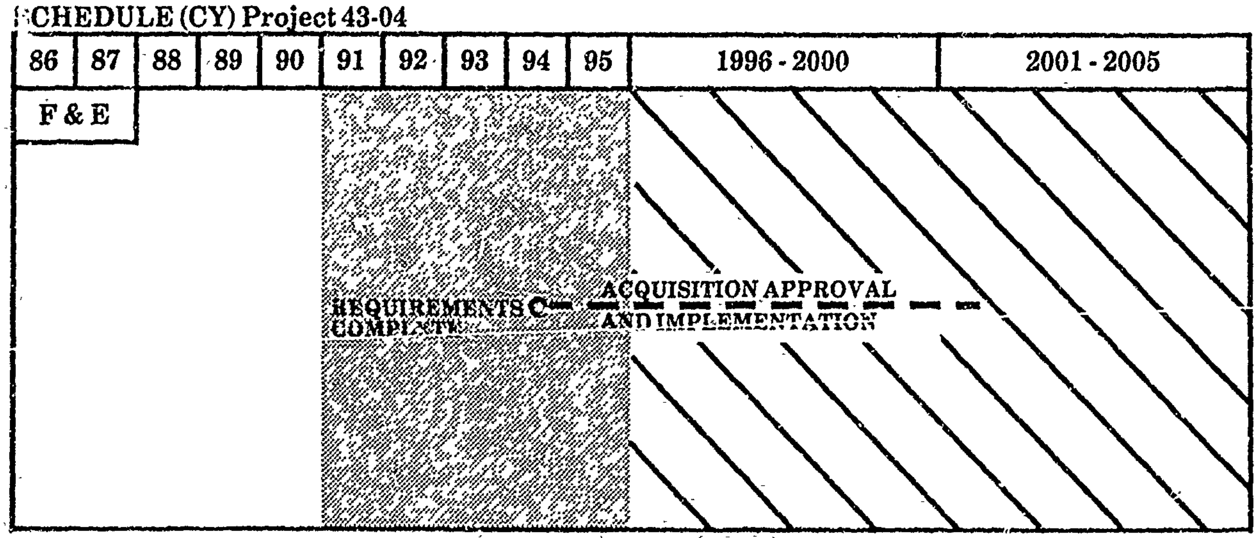
Products: New hardware and software for:

- 23 FSDPSs.
- 2 AWPs.
- 61 AFSSs.

Related Projects/Activities: 23-01 FSAS and 23-13 ICSS.

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 43-04



PROJECT 43-09: Upgrade Commercial Automated Weather Observing System (AWOS)

Purpose: This project provides for the upgrading of commercial AWOS currently deployed in the NAS. These commercial AWOS are not equipped to detect thunderstorms, precipitation type, occurrence, and accumulation as specified in NAS-DD-1000D and project 23-09. Modular retrofit packages have been developed and are commercially available for upgrading the commercial AWOS with the additional sensing capabilities.

The acquisition of 200 commercial-off-the-shelf AWOS units was accomplished, using Advisory Circular (AC) 150/5220-16 as a procurement specification. An update of this advisory circular has been accomplished to include the requirement for detecting thunderstorms, precipitation type, occurrence, and accumulation.

AWOS data will be broadcast over the VOR/NDB networks and through discrete VHF/UHF communications outlets, depending on cost effectiveness and frequency spectrum availability. The AWOS Data Acquisition System (ADAS) will be deployed at the ACFs. ADAS will collect weather messages from the AWOS/ASOS units for distribution within the ACF and throughout the NAS.

Approach: Using commercially available modular retrofit packages, upgrade commercial AWOS units with thunderstorm detection, precipitation type, occurrence, and accumulation sensing capabilities. These enhancements will make the commercial AWOSs functionally compatible with planned FAA/NWS AWOS/ASOS procurements.

Products:

- Revised AC 150/5220-16 to include thunderstorm detection, precipitation identification, occurrence, and accumulation.
- Retrofit 200 commercial-off-the-shelf AWOS units with thunderstorm detection, precipitation identification, occurrence, and accumulation sensing capabilities.

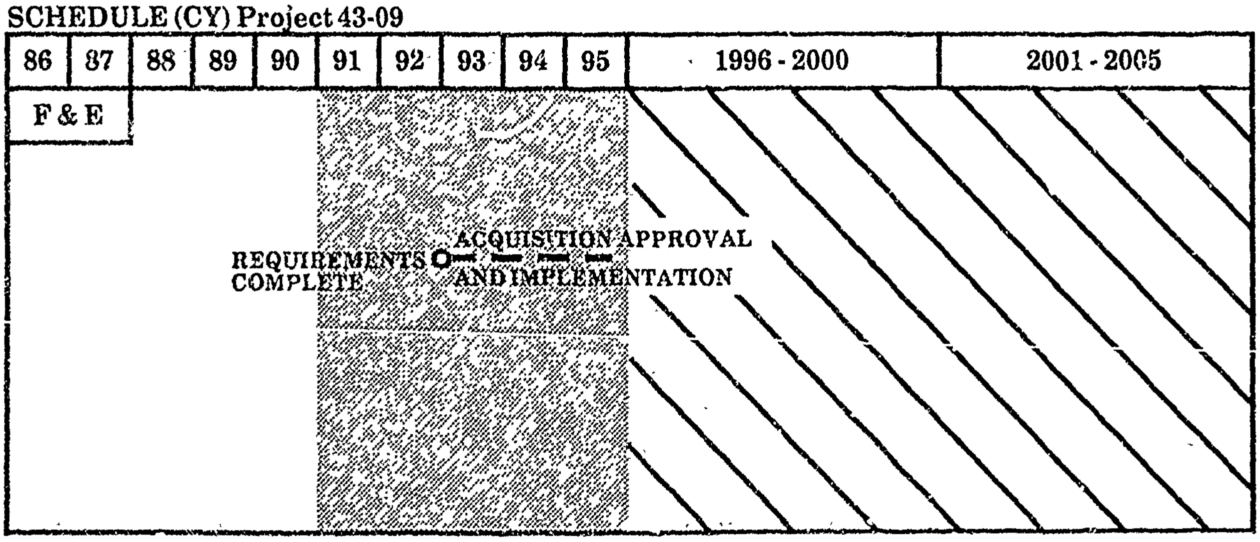
Progress/Activity from October 1989 through November 1990:

- Revision of AC 150/5220-16 was completed.

Related Projects/Activities: 23-09 AWOS and 26-15 NAS Spectrum Engineering.

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 43-09



PROJECT 43-12: Upgrade Low-Level Wind Shear Alert System (LLWAS) to Expanded Network Configuration

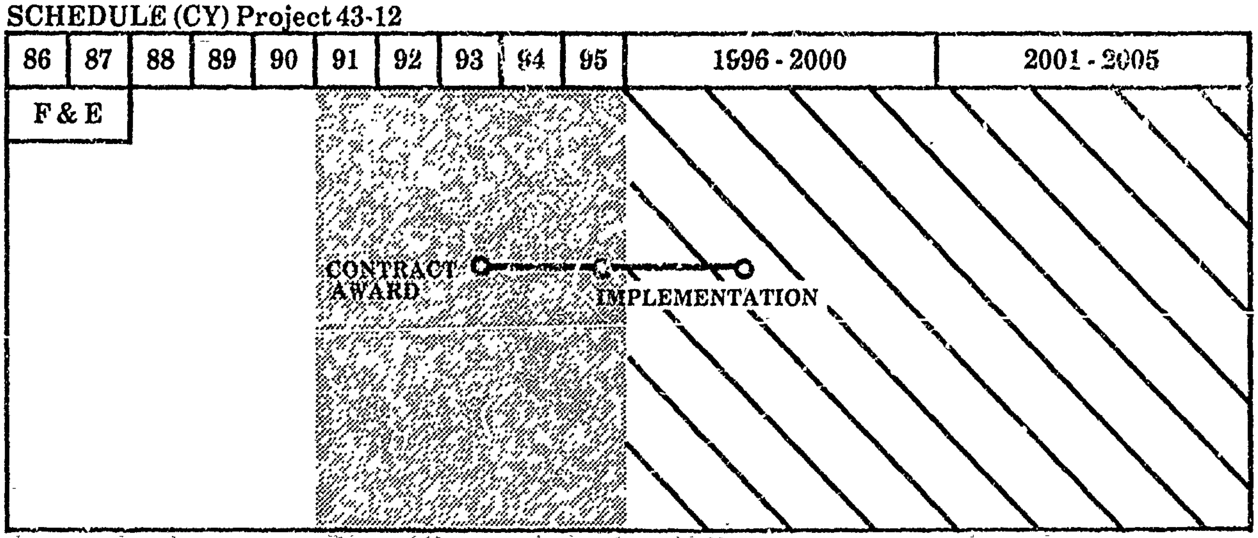
Purpose: LLWAS provides local controllers and pilots with information on hazardous wind conditions on or near airports that create unsafe conditions for aircraft landings or departures. The purpose of expanding the network is to significantly increase system effectiveness.

Approach: Wind shear detection equipment is being implemented through an ongoing program for LLWAS. It is being implemented in three phases. The Expanded Network LLWAS is functionally equivalent to the Phase III LLWAS which is being installed at seven sites. The Expanded Network LLWAS will replace all of the hardware and increase the number of wind sensors at up to 110 sites. The new LLWAS hardware will include integrated logistics support and improved maintenance diagnostics.

Products: Expansion of the six-sensor improvement LLWAS at up to 110 sites.

Related Projects/Activities: 21-12 AAS, 23-12 LLWAS, and 24-18 TDWR.

SCHEDULE (CY) Project 43-12



PROJECT 43-13: Digital Altimeter Setting Indicator (DASI) Replacement

Purpose: DASI provides aircraft altimeter correction numbers. This altimeter setting number allows pilots to adjust their aircraft altimeters to correspond to the airport elevation where they intend to take off or land. Periodic updating of altimeter setting while en route enables pilots to maintain the correct vertical separation between their aircraft, other aircraft, and ground obstructions.

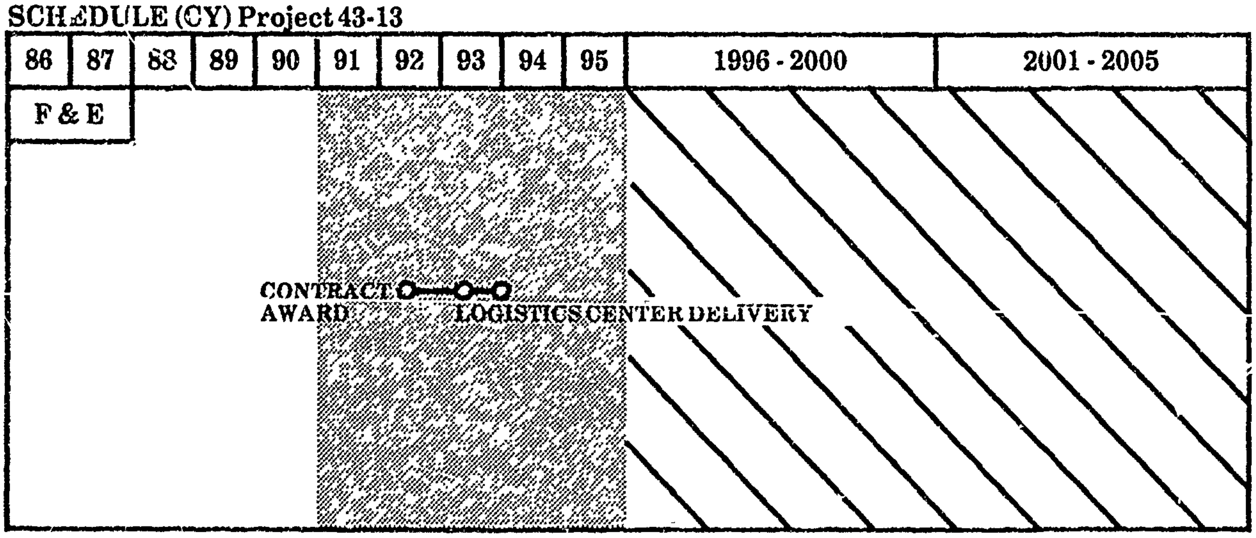
The purpose of this project is to replace 250 aging DASIs at ATCTs. Some of these DASIs have been in service since 1976 and are becoming a maintenance problem.

Approach: This project will be done via an 8(a) set-aside contract.

Products: 250 DASI systems.

Related Projects/Activities: None

SCHEDULE (CY) Project 43-13



PROJECT 43-14: Integrated Communications Switching System (ICSS) Logistics Support

Purpose: This project will transfer site and FAA Logistics Center level logistics support responsibility for Denro ICSSs from the manufacturer to the FAA. The FAA does not currently own site or FAA Logistics Center spare parts, documentation, or test equipment for the ICSS. Spare parts are provided by the manufacturer in the form of site spares. Failed parts are repaired by the manufacturer. It would be more cost effective for the FAA to assume site and depot level logistics support responsibility for the Denro ICSS Type 1 and 3 units now being supported by contracts with the manufacturer.

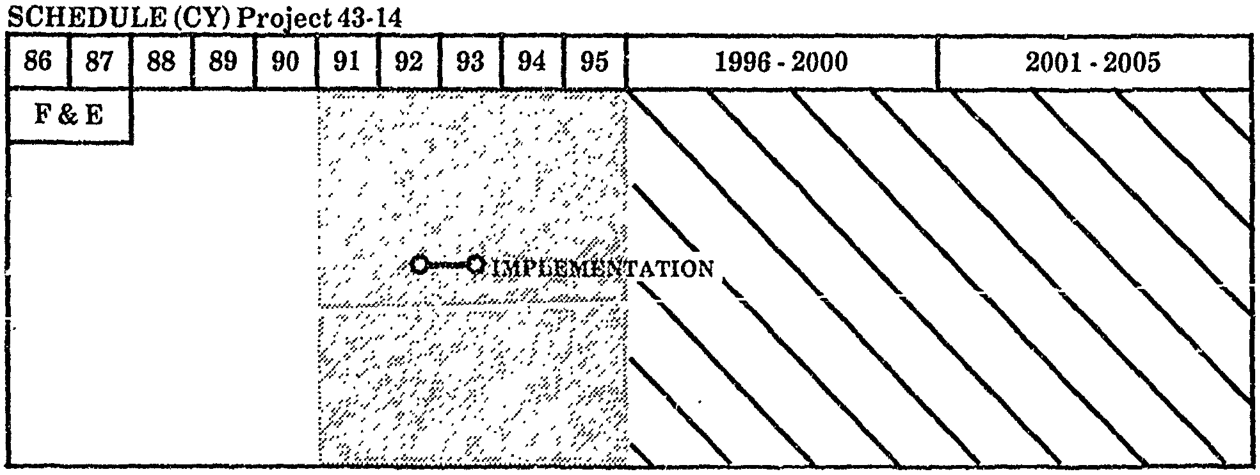
Approach: The current support contract with the ICSS manufacturer (Denro), expires in May 1992. The assumption of site and depot level logistics support responsibility involves the purchase of required site spares, FAA Logistics Center spares, configuration control and training documentation (task analyses, manuals, etc.), and automatic test equipment (including test beds) from the manufacturers. Additionally, all ICSS units must be upgraded to the latest hardware baseline, and appropriate baseline documentation provided to the FAA Logistics Center.

While the normal lead time for implementation of FAA Logistics Center support responsibility is four years, action is currently underway to reduce that lead time significantly. Interim repair of the ICSS units must be funded until the FAA Logistics Center assumes logistics support responsibility.

Products: Automatic test equipment and test bed hardware, configuration and training documentation, and site and depot level spares.

Related Projects/Activities: 23-13 ICSS.

SCHEDULE (CY) Project 43-14



PROJECT 43-20: Automated Flight Service Station (AFSS) Support Space

Purpose: This project increases support space to accommodate growing AFSS needs. These facilities are currently operating in an environment whose concept is over ten years old and whose scope has transitioned to a new era of automation, technology, and human resource management. This has resulted in the need for upgrades, enhancements, and expansions to ensure that support of operational requirements will continue uninterrupted to meet future system demands.

Approach: Increase facility space at 61 AFSS locations. The amount of additional support space required is dependent on a variety of factors which include physical layout, total space available, operational levels of service, number of facility personnel, rate of growth, and paralleling support requirements.

Conditions exist at most facilities which restrict effective and efficient use of existing space or preclude their intended use. Examples include multiple use and occupancy of single person/program offices; insufficient storage space; equipment rooms which will not accommodate additional racks or equipment; automation rooms at or nearing maximum capacity; inadequate air handling/ventilation systems, and the inability of administrative office space to accommodate support equipment/personnel.

A space study is needed at all AFSSs to determine overall existing and future space requirements. The study should document the authorized space allowance against the facility space available. After validation of shortfalls, this project will provide for the expansion of AFSS buildings to accommodate additional space requirements.

These requirements can be met through several options. building expansions, external or adjoining buildings, and building modifications.

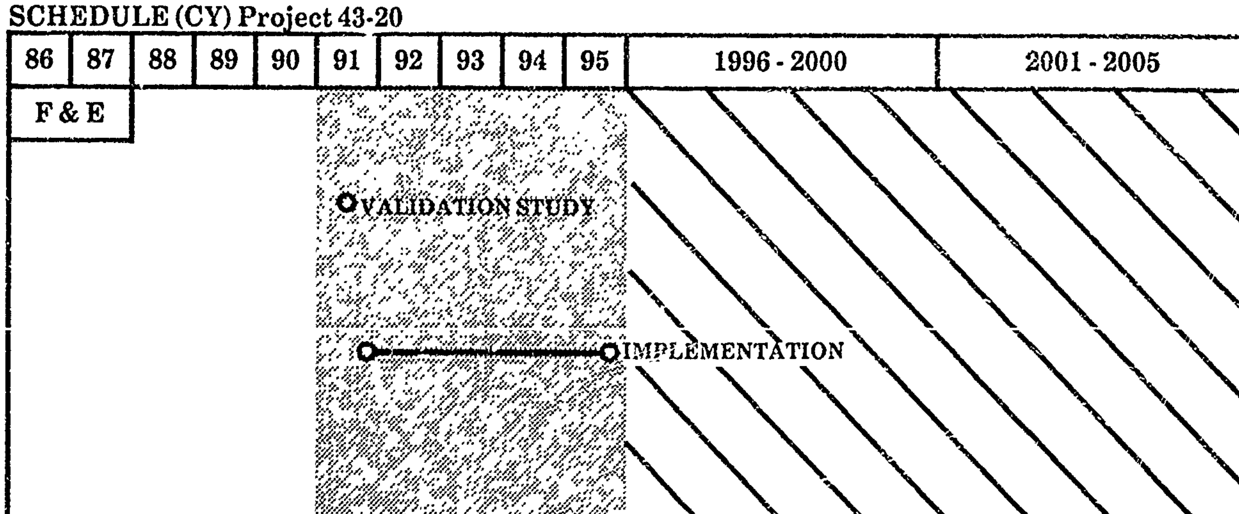
Several options are available when considering existing building expansions. These include single level, split level, and two-story designs. Two-story designs may include sub-level space to provide for storage requirements or internal shelters. Sub-levels may also be considered as a location which would allow limited operation in the event first floor evacuation becomes necessary. Two-story designs may also address the need for expansion capability where limited space is available.

The validation study will be F&E funded by the several varied projects served by this project.

Products: Modernization of 61 AFSSs to meet the growing and changing system demands. Initial documents include an AFSS space study and an AFSS facility expansion program.

Related Projects/Activities: 23-01 FSAS, 23-13 ICSS, 24-17 LORAN C Systems, 26-02 CBI, 33-01 DUAT Service Geographic Expansion, 33-08 HIWAS Expansion, 43-01 Replace Regional Interim Weather Graphics with National GWDS, 43-03 FSAS Power Conditioning Systems, 44-35 LORAN-C Monitors, 45-21 Satellite Communication Circuits, 45-24 ANICS Satellite Network, 56-02 CBI Expansion, and 56-28 CORN.

SCHEDULE (CY) Project 43-20



PROJECT 44-03: Air/Ground Communications Radio Frequency Interference (RFI) Elimination

Purpose: This project will provide selected Remote Communication Facilities (RCFs) with modern radio equipment, and ancillary equipment and software to improve operational performance in an increasingly crowded radio frequency spectrum. The existing equipment does not meet minimun performance requirements for the congested radio frequency spectrum environment. The RCF equipment is used for transmitting and receiving voice between air traffic personnel and aircraft pilots using the numerous RCFs (formerly identified as RCAG, RTR, and RCO facilities). The RCF RFI solution is required to improve air/ground radio communication service for those selected sites that have a persistent RFI problem.

Using multicouplers and combiners to group frequencies will eliminate crowded antenna conditions at RCFs and help reduce receiver desensitization. Grouping multiple frequencies on single antennas will improve antenna separation on existing RCF antenna towers. Ancillary devices such as bandpass and notched filters, insulators, high Q cavities, and hybrid combiner units also serve to correct RFI problems. Solid-state linear power amplifiers will improve maintenance support of those RCFs requiring increased transmitting power. These improvements will provide a reduction in intermodulation products, thus eliminating the major source of RFI at congested sites. This program is an interim measure and will eventually be replaced by the air/ground replacement program. The design of the existing equipment does not meet the current RF spectrum requirements.

Approach: Procure equipment to resolve existing RFI problems. Provide funds at facilities that require extensive installation activity to correct RFI problems. Maintain a depot inventory of products correcting RFI problems for use by our AF maintenance sectors. The products will be procured by indefinite quantity competitve contracts.

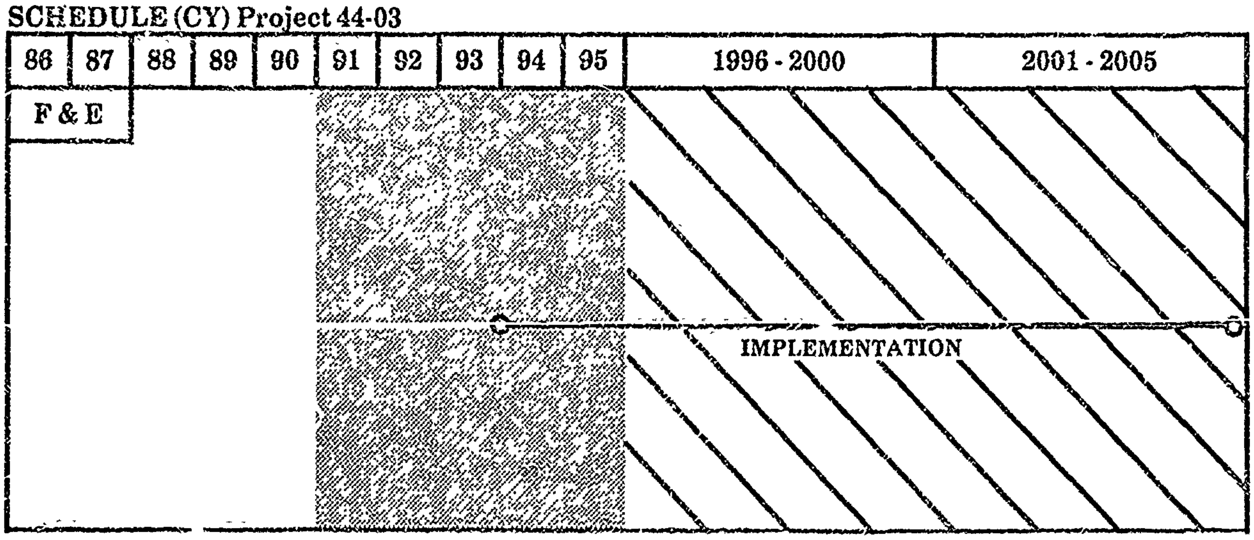
Products: This project will provide an indefinite quantity of multicouplers, combiners, linear power amplifiers, and ancillary devices to reduce and eliminate radio frequency interference.

Progress/Activity from October 1989 through November 1990:

- Multicoupler, combiner, and linear power amplifier solicitations were developed.

Related Projects/Activities: 24-02 Facilities Consolidation/Network, 25-08 RCE, 26-15 NAS Spectrum Engineering, and 34-23 Communications Facilities Expansion.

SCHEDULE (CY) Project 44-03



PROJECT 44-04: Air/Ground Radio Replacement

Purpose: Existing remote communication facilities use solid-state transmitters and receivers which were designed in the mid-1960's. This equipment was deployed in the field starting in 1969 and had a projected life cycle of 15 years. Diminishing resource problems for components to support this design are beginning to occur. In addition, failure rates are increasing due to equipment age.

This project will provide remote communications facilities with state-of-the-art, modular transmitter, receiver, and transceiver equipment. The new radio equipment will provide improved performance including voice quality, and will allow flexibility to meet air/ground voice communications functions and service availability requirements. This communications equipment will replace existing transmitter, receiver, and transceiver equipment currently deployed in the field.

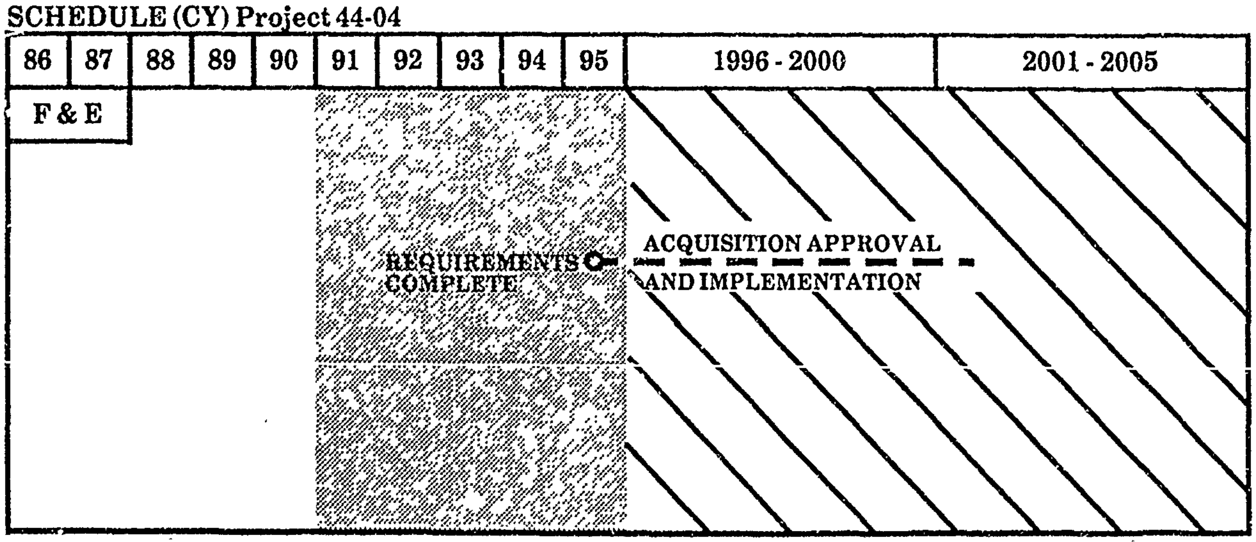
Approach: Procure state-of-the-art, modular radio equipment with appropriate Radio Frequency Interference (RFI) suppression capabilities for the NAS. The new radio equipment which may be turnable and modular, will allow for interchangeability between transceiver devices to provide greater flexibility in meeting dynamic Air Traffic requirements for greater coverage by the year 2000.

Products: A new family of modular, interchangeable, transmitter, receiver, and transceiver communications equipment with high RFI suppression capabilities for use in the NAS.

Related Projects/Activities: 25-08 RCE, 26-01 RMMS, 44-03 A/G Communications RFI Elimination, and 56-26 Frequency Interference Support Resolution.

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 44-04



PROJECT 44-05: Interim Backup Emergency Communications (BUEC) Improvement

Purpose: Provide additional backup emergency communications BUEC capability for Air Route Traffic Control Centers (ARTCCs). The original BUEC system deployment was completed in the late 1970's. Since the system's inception, the operating environment has greatly changed, e.g., loss of alternate leased circuits to air/ground outlets. The loss of air/ground communications has the most severe ATC impact. Lack of the radio link precludes the application of any type of separation or guidance. While fallback to manual procedures is possible during radar failures, the inability to speak with aircraft personnel cancels all options for control. This project will provide additional BUEC type equipment to expand present BUEC coverage, equipment to relocate, and equipment to replace existing sites where maintainability problems are impacting the existing service.

Approach: Procure additional nondevelopmental items such as transceivers and ancillary items to augment the current BUEC capabilities at ARTCCs in response to increased Air Traffic demands for coverage.

The project will be accomplished by documenting requirements, initiating budgetary actions, coordinating specifications, coordinating a procurement package, and implementing delivered products.

Products: Remote transceivers and control equipment will be procured after hardware requirements are determined.

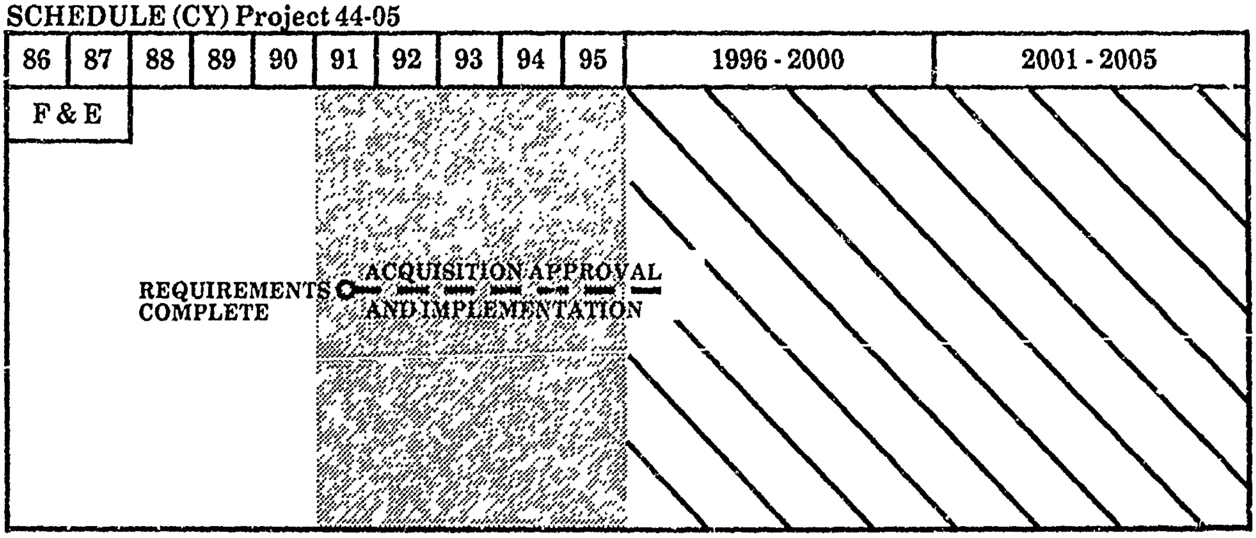
Progress/Activity from October 1989 through November 1990:

- Preliminary project planning was accomplished.

Related Projects/Activities: 21-11 VSCS and 25-08 RCE.

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 44-05



PROJECT 44-07: Emergency Transceiver Replacement

Purpose: This project will provide for the replacement of aging emergency transceiver equipment in ATCT and TRACON facilities. This equipment is required to provide backup emergency transceiver communications capability for critical air traffic operations at these facilities. The majority of emergency equipment now in use in the ATCTs and TRACONs is maintenance-intensive, technologically obsolete, and meets neither minimum performance standards for operation in a congested radio frequency spectrum environment, nor the criteria for Radio Frequency Interference (RFI) elimination.

The FAA is currently experiencing severe logistics support and RFI problems with existing equipment. Much of the equipment is 30 years old and was purchased prior to the implementation of the 25 kHz channel spacing requirement. The obsolete hardware, lack of logistics support, and growing number of RFI problems all contribute to the urgent need to replace this equipment.

Approach: Procure state-of-the-art transceivers for ATCT and TRACON facilities. Transceivers for TRACONs will take into account ACF consolidation.

Products: A total of 2,123 state-of-the-art transceivers may be procured for installation at ATCT and TRACON facilities.

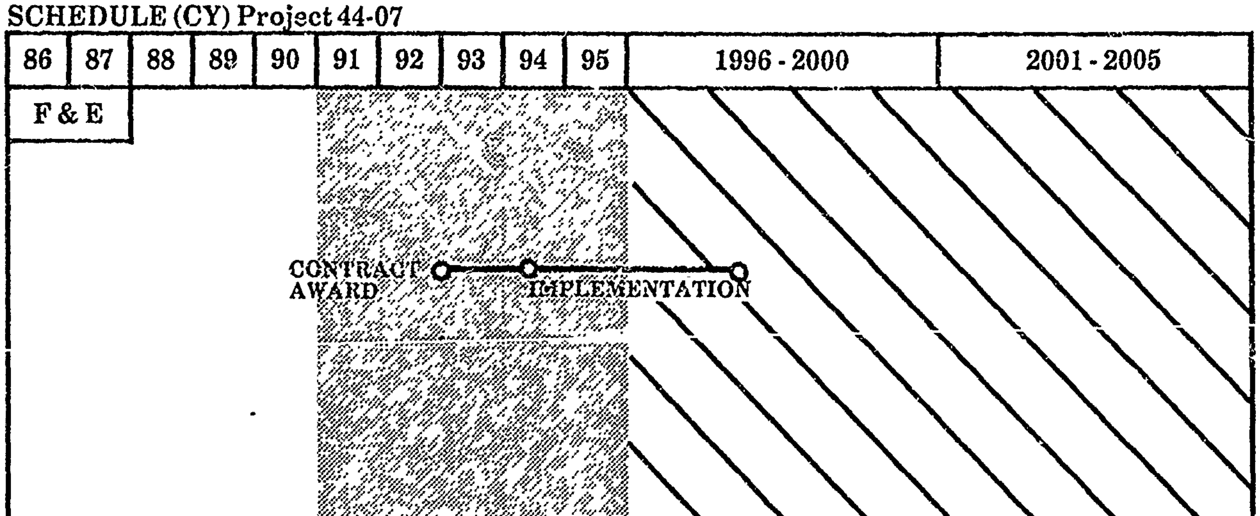
- VHF transceivers (ATCT) - 809
- UHF transceivers (ATCT) - 438
- VHF transceivers (TRACON) - up to 531
- UHF transceivers (TRACON) - up to 345

Progress/Activity from October 1989 through November 1990:

- The specification was completed.
- Prepared equipment solicitation.

Related Projects/Activities: 26-15 NAS Spectrum Engineering.

SCHEDULE (CY) Project 44-07



PROJECT 44-08: Radio Control Equipment (RCE) Enhancements

Purpose: This project will provide RCE with enhanced functions for application in ARTCC/ACF and terminal facilities and their associated remote A/G radio sites. The current RCE uses digital techniques for signaling and remote monitoring; provides analog interfaces with voice switches, radios, and transmission facilities; provides switching for trunks between two sites; and is expandable to 120 channels per system. As other NAS elements evolve and expand, RCE will need to accommodate new interfaces and enhanced functionality. The enhanced RCE will include added channel capacity, digital interfaces, capability to dynamically support the ACF backup and A/G backup concepts, and will provide compatible interfaces with the new family of A/G radios.

Approach: Analyses will be conducted to identify RCE requirements to support evolving programs and concepts such as ACF backup, NMCE, and A/G communications backup guidelines. Operational concepts will be developed as the basis to establish the requirements for enhanced RCE implementation.

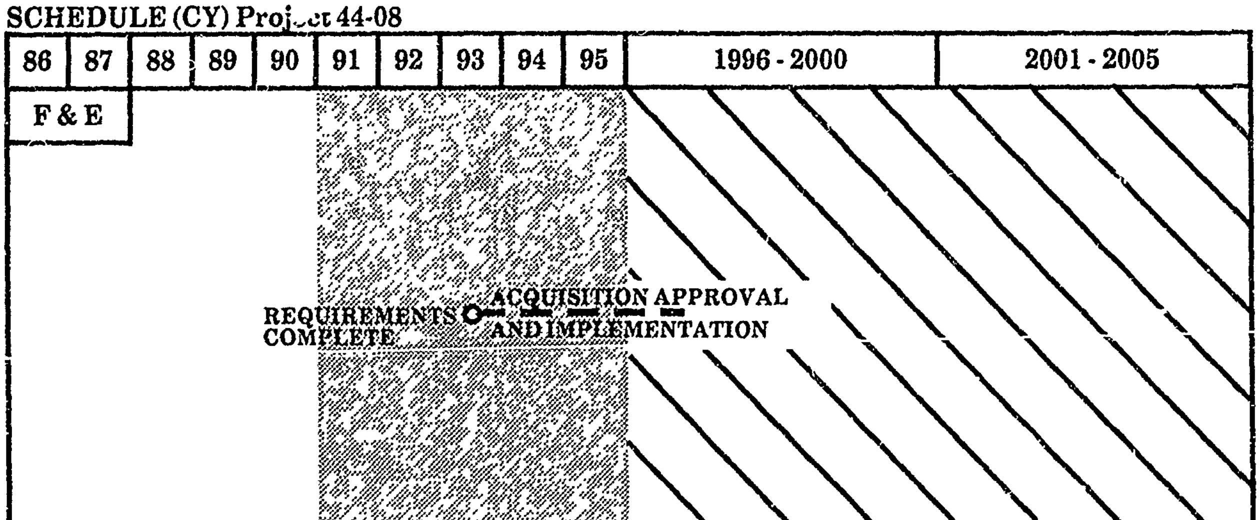
Products:

- Operational concept document.
- Product specification.
- Enhanced RCE channels and systems.

Related Projects/Activities: 21-11 VSCS, 25-08 RCE, 44-03 A/G Communications RFI Elimination, 65-03 NMCE, and ACF Backup.

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 44-08



PROJECT 44-12: Low-Power TACAN Antennas

Purpose: The DOD requires tactical air navigation (TACAN) equipment for air navigation throughout the 1990's. The present TACAN antenna rotating elements are experiencing logistic support problems which compromise TACAN availability.

Replacement of obsolete antennas with low-power consumption TACAN antennas will reduce primary ac input power requirements from 5,000 watts to 250 watts, while maintaining the same RF power output. This reduction removes the requirement for engine-generated power, allows TACAN to operate on batteries when modified by the sustain VOR/VORTAC project, and provides TACAN service regardless of power line interruptions. In addition, the low-power TACAN antenna will be easier to maintain.

Approach: FAA and DOD will jointly fund replacement of the existing mechanical rotating TACAN antennas with new, low-power TACAN antennas. DOD provided funds to acquire 119 low-power TACAN antennas. Future quantities to be replaced will be based on DOD requirements.

Products: Procurement of up to 497 low-power TACAN antennas is anticipated.

Related Projects/Activities: 24-03 VORTAC and 44-14 Sustain VOR/VORTAC.

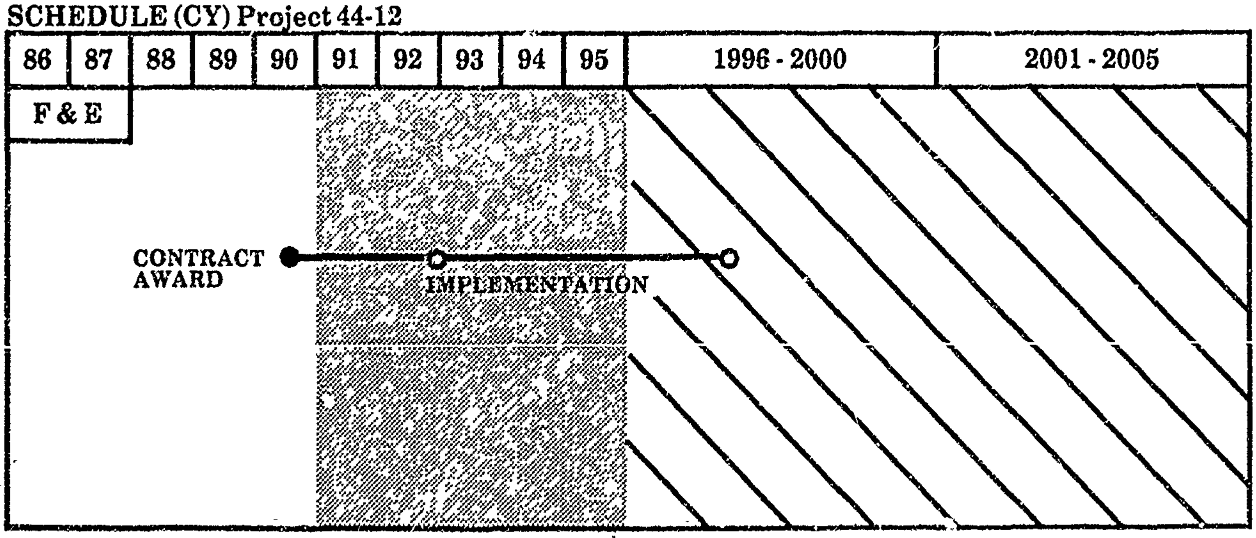
Problems Resulting in Delays. Reassessment of specification requirements.

Delays Minimized by: Expediting specification changes to correct deficiencies identified in reassessment.

List of Contractors:

- J.T.P. Radiation Corporation
  (119 units)
  Salt Lake City, Utah

SCHEDULE (CY) Project 44-12



PROJECT 44-14: Sustain VOR/VORTAC

Purpose: This project will provide for the enhancement of second generation technology for RMM retrofits, facility relocations, Doppler VOR conversions, and modification of TACAN equipment for battery backup and removal of engine generators and associated fuel tanks. This enhancement is needed for the VORTAC to meet NAS operational requirements.

Approach: Provide engineering efforts to improve the VORTAC performance on the following:

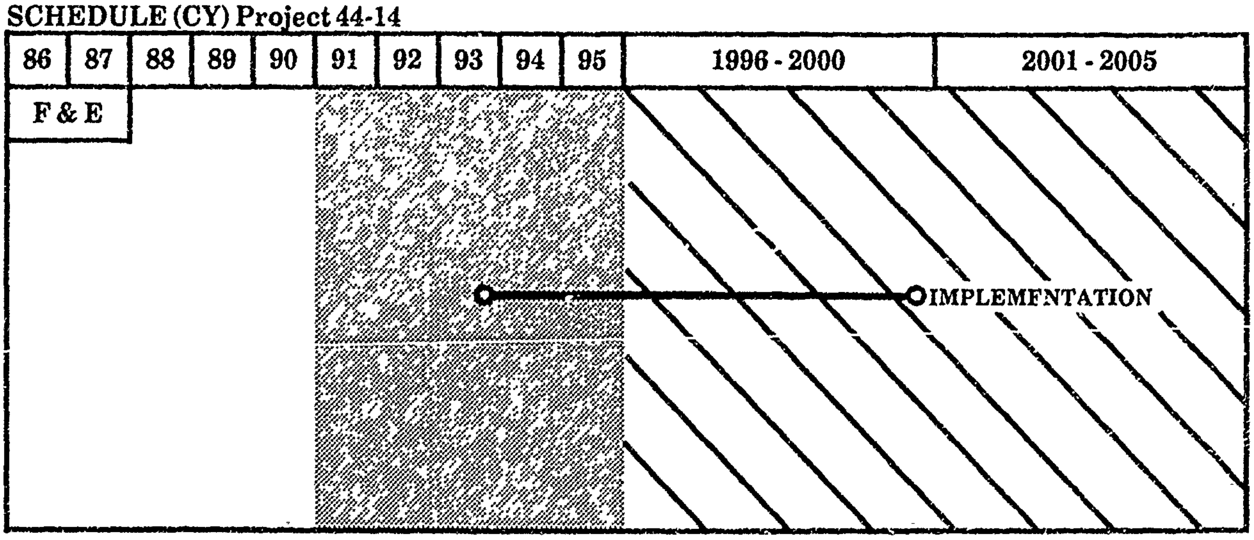
- VORTAC, VOR/DME RMM retrofits to be compatible with MPS.
- Relocation of VORTAC and VOR/DME facilities to accommodate route structure changes, real estate considerations, and site suitability.
- Conversion of conventional VOR's to Doppler VOR's to solve siting problems and obtain required signal coverage.
- Removal of engine generators and associated fuel tank.
- Modification of TACAN equipment for battery backup.

Products:

- Procurement of special test material and equipment.
- 950 RMM retrofit kits.
- 490 TACAN battery backup modification kits.
- 50 DVOR kits.

Related Projects/Activities: 23-09 AWOS, 24-02 Communications Facilities Consolidation/Network, 24-17 LORAN-C Systems, 33-08 HIWAS Expansion, and 44-12 Low-Power TACAN Antennas.

SCHEDULE (CY) Project 44-14



PROJECT 44-20: AN/GRN-27 Instrument Landing System (ILS) Replacement

Purpose: This project will provide for the replacement of the current AN/GRN-27 ILS inventory. Many of these systems, which support Category II and category III operations, have been in service for nearly two decades. These systems are experiencing severe logistics support problems because parts are no longer available from the manufacturer which ceased production of AN/GRN-27 equipment in 1976. Maintenance costs are up sharply as parts must be custom manufactured or refurbished to restore failed systems and subassemblies. Because of their importance in providing all-weather approaches to major airports, these instrument landing systems should be replaced as quickly as possible. This project is intended only to replace the obsolete AN/GRN-27 equipment, antennas, shelter, etc., not upgrade the associated approach or approach lighting system.

Approach: This project will provide for the procurement, site preparation, installation, spare parts, and training needed to equip and operate CAT II, CAT IIIA, or CAT IIIB approaches at replacement locations.

Replacement equipment will incorporate RMM capabilities and require only minimal manual intervention. It will provide improved performance necessary to sustain reliable approach guidance into the next decade until MLS transition occurs.

Obsolete AN/GRN-27 systems will be disposed of in a manner which precludes further use in the NAS.

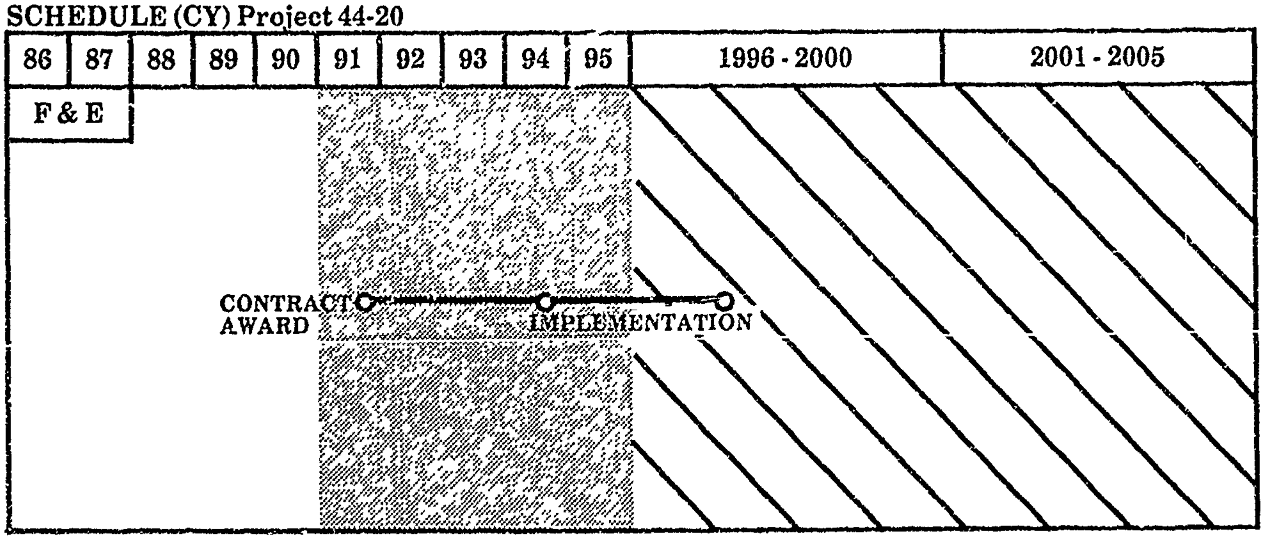
Products: 75 AN/GRN-27 ILS replacement systems.

Progress/Activity from October 1989 through November 1990:

- Solicitation released.

Related Project/Activities: 44-21 Wilcox CAT II/III ILS Replacement.

SCHEDULE (CY) Project 44-20



PROJECT 44-21: Wilcox CAT II/III Instrument Landing System (ILS) Replacement

Purpose: This project will provide for the replacement of the current Wilcox CAT II/III ILS system inventory. These systems, which support CAT II and CAT III operations, are older systems which were not equipped to support remote maintenance monitoring.

Approach: Equipment and logistics support will be procured to replace existing Wilcox CAT II/III facilities to prevent severe logistics support problems, and to maintain the integrity and reliability of these facilities. In addition, allowing for embedded remote maintenance monitoring will reduce the requirement for site visits to approximately one each quarter .

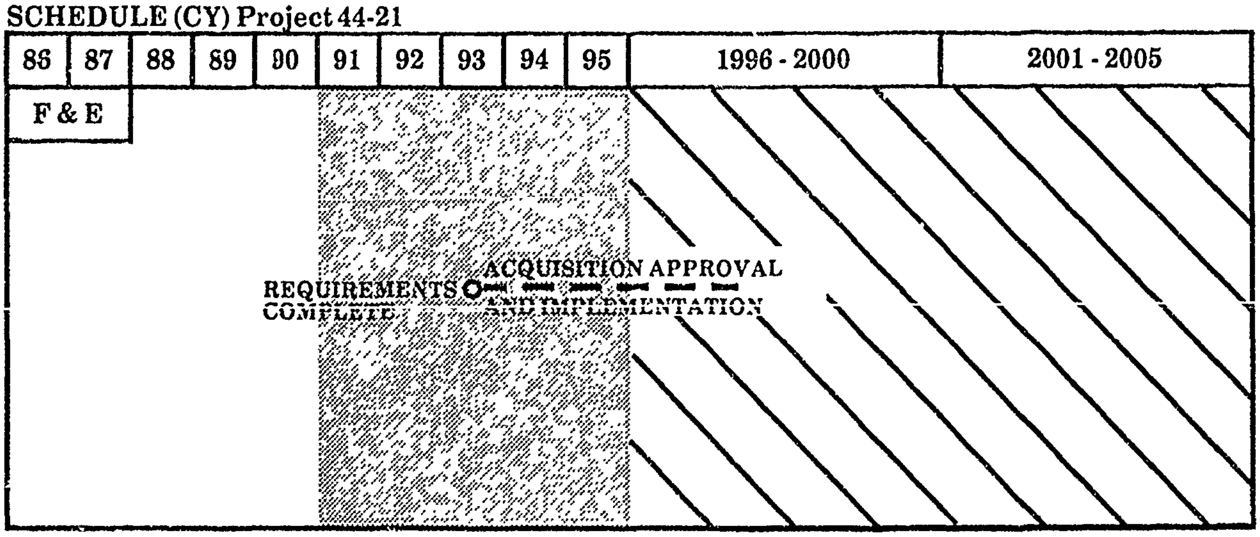
The new equipment will provide improved performance necessary to sustain reliable approach guidance into the next decade until MLS transition occurs.

Products: 25 CAT II/III ILS systems.

Related Projects/Activities: 44-20 AN/GRN-27 ILS Replacement.

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 44-21



PROJECT 44-22: Replace Mark 1A, 1B, and 1C Instrument Landing System (ILS)

Purpose: Approximately 200 older CAT I Mark 1A, 1B and 1C Instrument Landing Systems are nearing the end of their life cycle. These older systems require replacement because of maintenance and supportability problems.

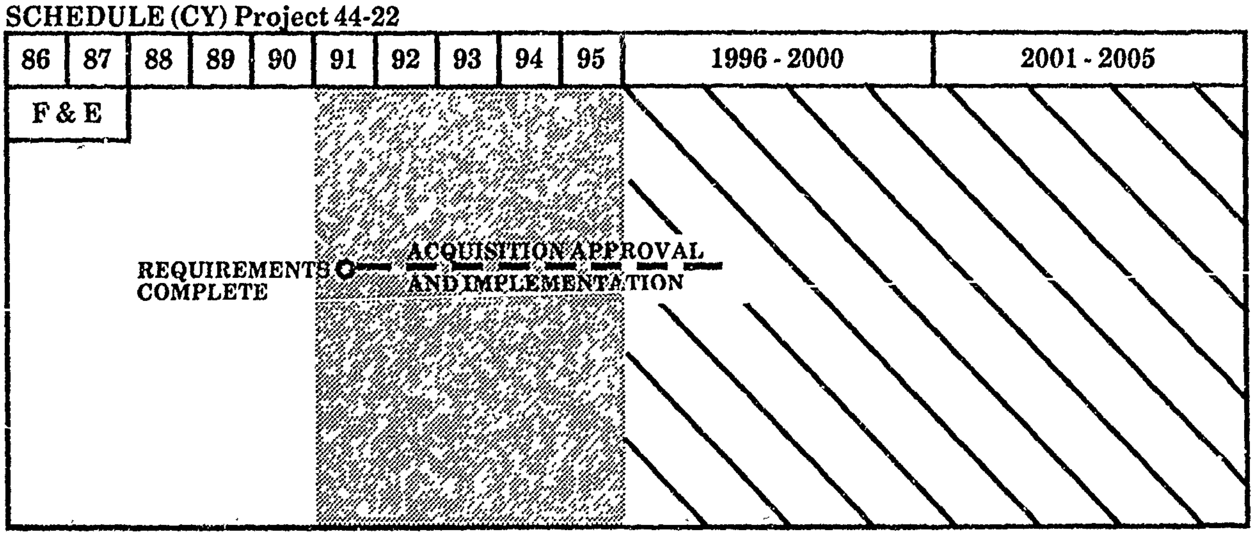
Approach: Multiyear equipment replacement will begin in FY 94 and run through FY 97. The new equipment will provide improved performance necessary to sustain reliable approach guidance into the next decade until MLS implementation occurs.

Products: 200 CAT I Mark 1A, 1B, 1C replacement systems

Related Projects/Activities: 34-06 ILS.

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 44-22



PROJECT 44-24: ILS and Visual Navaids Engineering and Sparing

Purpose: This project provides for the continued engineering support of the deployed instrument landing capabilities. The engineering effort will address technical problems which arise as a result of routine facility establishment, equipment relocations, and restoration. The project engineering effort will apply technological advances to allow ILS and visual aid components to continue to meet safety and capacity requirements, particularly under conditions where difficult environmental/site situations are encountered.

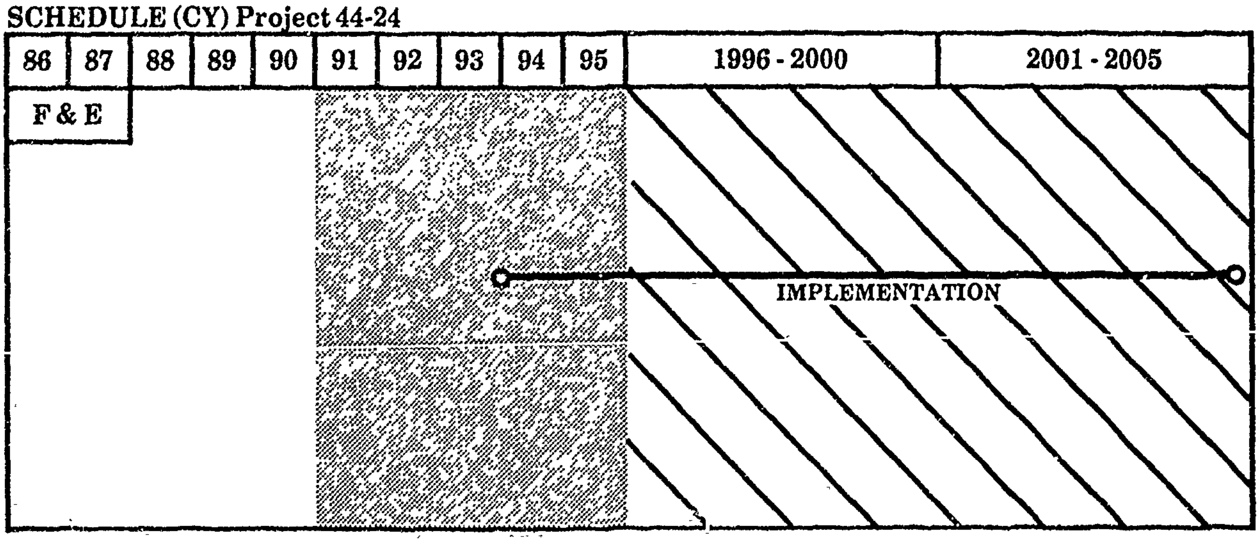
Approach: Engineering evaluations will be conducted to bring advances in technology into use to further reduce the vulnerability of the ILS in demanding site situations, and to improve the reliability and maintainability of the ILS and visual aids. The results of these efforts will be confirmed by field tests. Fixes to technical problems will be developed and components of the ILS and visual aids modified or replaced. The project will replace all localizer Traveling Wave Antennas (TWAs) and associated RF distribution networks. The existing TWAs are reducing localizer reliability and require frequent corrective maintenance.

Products:

- Special test material and equipment.
- Localizer antenna array.

Related Projects/Activities: 24-09 Visual Navaids, 44-20 AN/GRN-27 ILS Replacement, 44-21 Wilcox CAT II/III ILS Replacement, and 44-22 Replace Mark 1A, 1B, and 1C ILS.

SCHEDULE (CY) Project 44-24



PROJECT 44-29: Runway Visual Range (RVR) Replacement

Purpose: This project will satisfy the need for continued replacement of the older, existing RVR systems.

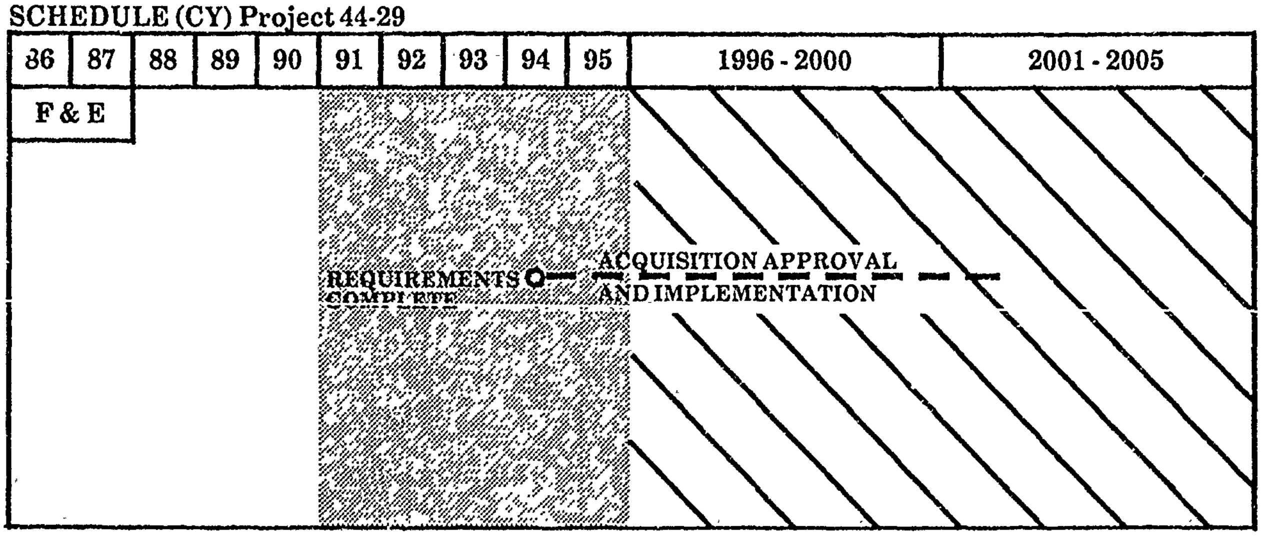
Approach: This project will provide equipment through a follow-on procurement to complete replacement of old Tasker 500 RVRs.

Products: Replace Tasker 500 RVR's with new generation RVRs at 197 locations.

Related Projects/Activities: 23-09 AWOS (ASOS), 24-08 RVR, 26-01 RMMS, 34-06 ILS, 34-07 MLS-Production Phase II and 34-08 RVR Establishment.

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated

SCHEDULE (CY) Project 44-29



PROJECT 44-30: Sustain Distance Measuring Equipment (DME)

Purpose: To replace DMEs collocated with Instrument Landing Systems (ILSs) and terminal Nondirectional Beacons (NDBs) with solid-state equipment. These DMEs are a critical component of the NAS since they are used to support ILS/NDB precision and nonprecision instrument approach procedures.

The majority of DMEs collocated with ILS and terminal NDB systems are obsolete tube-type or older solid-state systems, nearing or having reached the end of their normal life expectancy. As such, these DME are difficult and expensive to maintain since replacement parts are either difficult to obtain or unavailable.

Approach: Maintenance concepts and functional system specifications will be upgraded to enhance DME capabilities at ILS and terminal NDB facilities. Replacement equipment will be procured as required to meet the new specifications for system upgrade. The number of DMEs to be modernized is scheduled to be defined by FY 94.

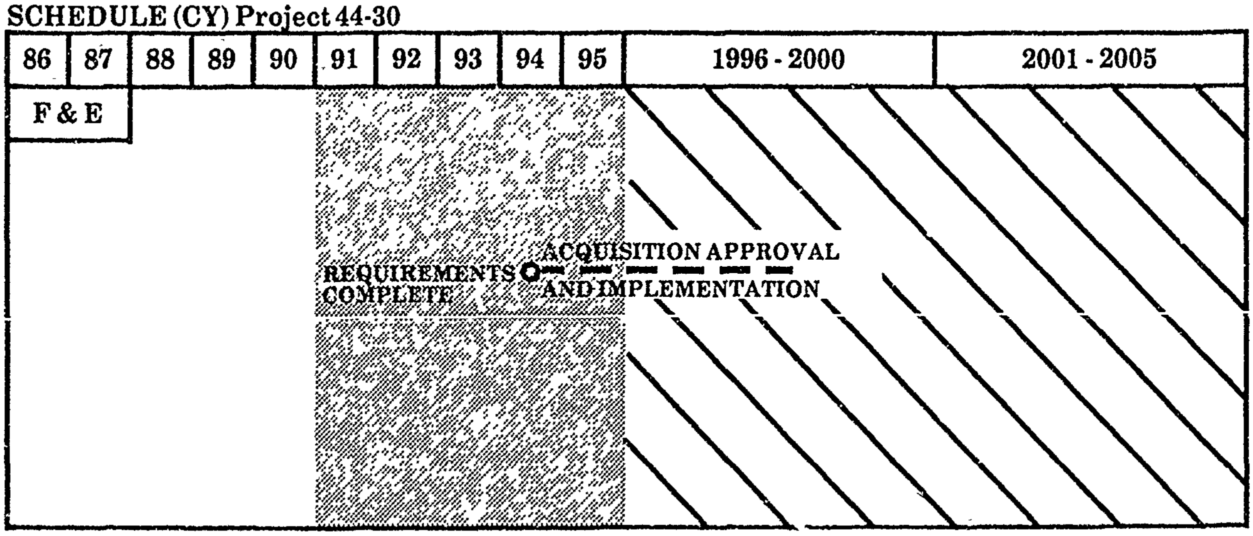
The modernization of DME will provide for the replacement of DME with RMM capabilities which will interface with the Maintenance Processor Subsystem (MPS) and TCCC.

Products: 225 DME are candidates for replacement.

Related Projects/Activities: 26-01 RMMS, 44-20 AN/GRN-27 ILS Replacement, 44-21 Wilcox CAT II/III ILS replacement, and 44-32 Replace NDB.

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 44-30



PROJECT 44-31: Replace Type FA9964 Direction Finder

Purpose: This project replaces obsolete FA9964 Direction Finder (DF) equipment in existing automated flight service stations. The FA 9964 DFs covered by this project are all the remaining DFs in operational use that were not included in the upgrade provided by project 24-11.

DFs are used to guide lost aircraft and to provide pilots position information during inflight emergencies. The aircraft's bearing is determined on the ground by using radio transmissions from the aircraft. Distance of aircraft from given locations (DF antenna) can be determined after establishing two lines of bearing. The guidance information is then transmitted to the aircraft on a voice channel.

This DF modernization program will replace all existing FA9964 DF systems.

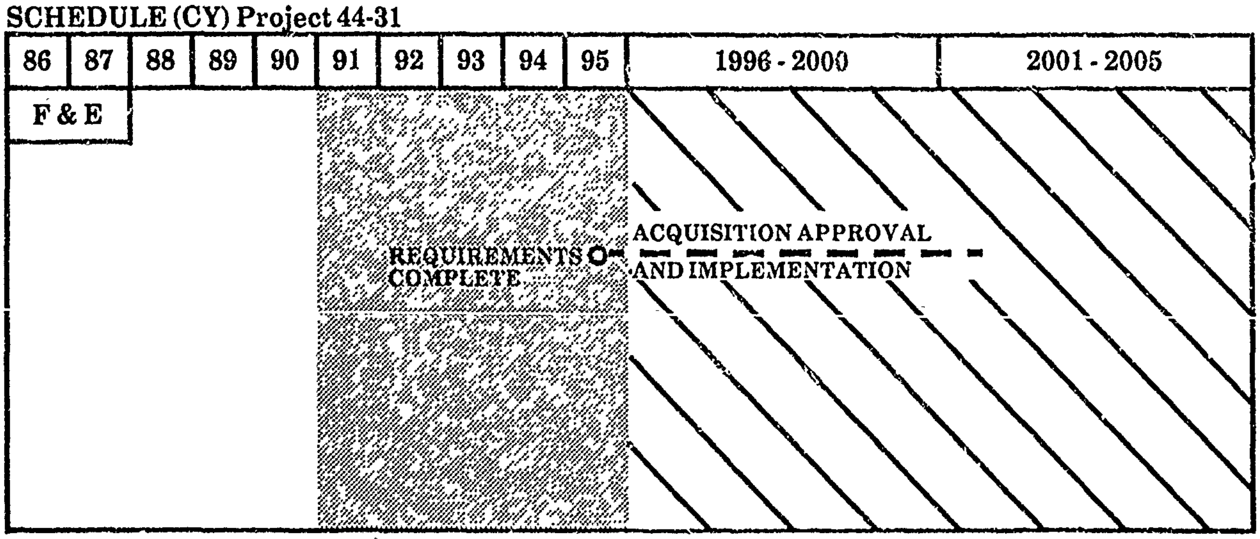
Approach: The quantity and location of equipment to be replaced is scheduled to be defined in FY 95. The project will be accomplished by competitive procurement with installations by regional personnel.

Products: 127 Type FA9964 DFs will be replaced by upgraded solid-state equipment.

Related Projects/Activities: 23-01 FSAS and 24-11 DF.

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 44-31



PROJECT 44-32: Sustain Nondirectional Beacon (NDB)

Purpose: To sustain the NDBs presently in the NAS. These NDBs are a critical component of the NAS since they are used to support some en route airways and NDB nonprecision instrument approach procedures.

The majority of NDBs in the NAS are obsolete tube-type or older solid-state systems, nearing or having reached the end of their normal life expectancy. As such, these NDBs are difficult and expensive to maintain. Replacement parts are often difficult to obtain or unavailable.

Approach: The quantity and location of equipment to be sustained/replaced is scheduled to be defined in FY 95. If NDB equipment is to be replaced, it will be with state-of-the-art NDBs with RMM capability. NDB equipment replacement requirement will be sufficient to sustain NDB operations until these systems are replaced by other systems such as GPS.

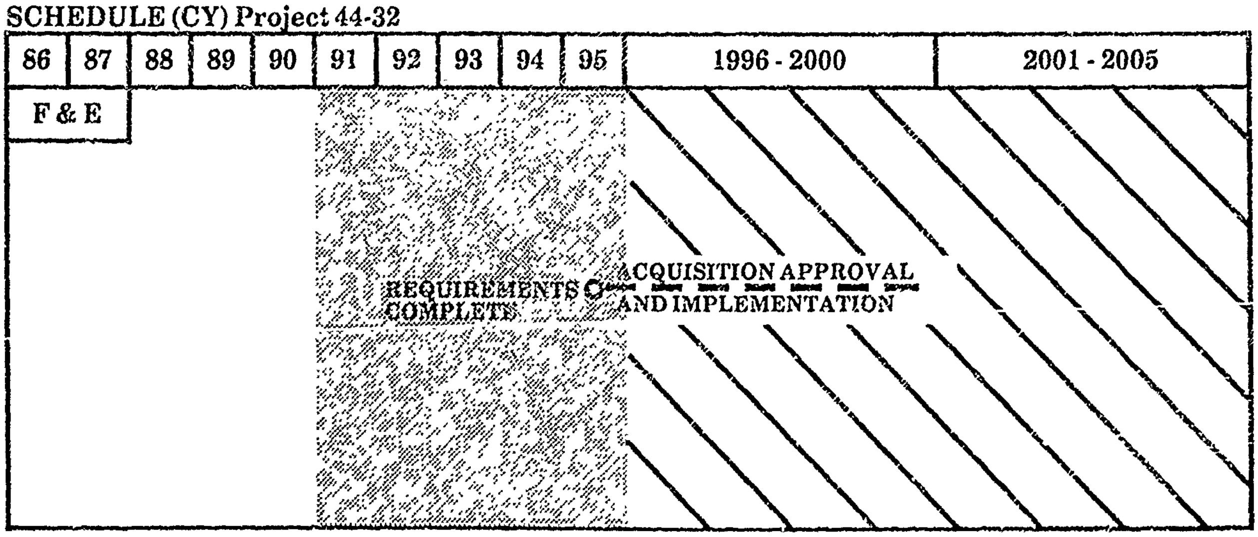
Products: The following NDBs and associated peripherals are candidates for replacement/ sustainment.

- 560 NDB transmitters (mix of low/medium/high power).
- 565 antenna systems (including antenna tuning units).
- 560 monitor receivers.

Related Projects/Activities: 44-30 Replace DME and 56-23 IAPA.

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 44-32



PROJECT 44-33: Approach Lighting System Improvement Program (ALSIP) Continuation

Purpose: This project will modernize airport lighting systems. The modernization will result in improved safety and increased energy efficiency for both the approach light and guidance lighting systems. This is a follow-on of a multi-year program to retrofit existing airport runway approach lighting systems with low-impact resistance approach light supports and other improvements.

Replacement of the existing, rigid tower structures with light-weight and low-impact resistant structures that collapse or break apart on impact will reduce damage to an aircraft should it strike an approach light tower structure during departure or landing. The program will also result in a significant reduction in FAA energy consumption and the replacement of outdated and obsolete equipment.

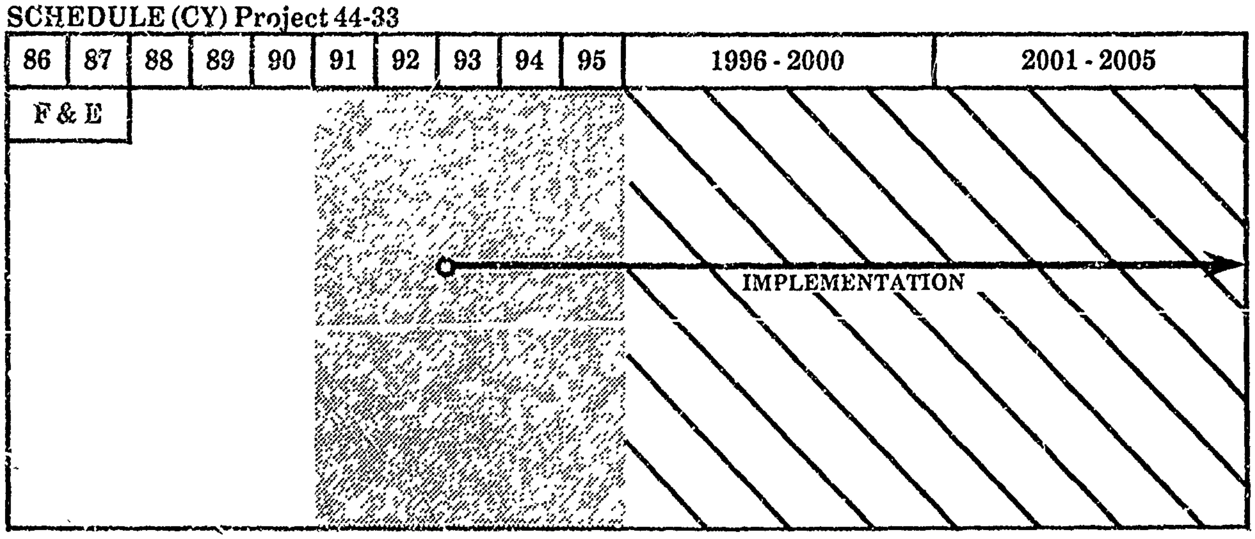
Federal air regulations authorize a pilot to descend below the published minimum descent altitude or decision height, provided that approach lights and threshold lights for the intended runway are distinguishable. The installation of threshold light bars as part of the existing Medium-intensity Approach Lighting System with Runway alignment indicator lights (MALSR) will provide a visual reference to the runway threshold and make the present system more effective in low-visibility conditions. The modification will enhance safety and comply with ICAO minimum requirements.

Approach: This program will retrofit nonfrangible, high-intensity, approach lighting systems on Category I runways with frangible MALSRs. When the program is fully implemented, energy consumption of these systems will have been reduced by 60 percent over FY 76 base-year requirements.

Products: 135 existing rigid MALSRs, SSALF, SSALR, and ALSF-1 systems will be converted to MALSRs on low-impact structures.

Related Projects/Activities: 24-10 ALSIP

SCHEDULE (CY) Project 44-33



PROJECT 44-35: LORAN-C Monitors

Purpose: The purpose of this project is to modify the LORAN-C signal monitors, relocate some of the units for coverage of the two new midcontinent LORAN-C chain, and maximize overall system performance for the benefit of aviation.

The modification must be made to all monitors to include data related to establishment of the midcontinent LORAN-C chains. Without modification, the monitors cannot recognize the existence of the chains and will not provide the intended service to aviation. The two chains did not exist when the monitor procurement contract was awarded in 1986, and the chain parameters needed for the modification were not available until late 1990. Tests by the FAA Technical Center and other organizations have shown that LORAN-C signals do not propagate uniformly over the surface of the earth. The signal analysis work was not adequate to identify exactly how monitor locations should be changed, but does support the expectation that some of the units will have to be relocated after at least one year of collecting seasonal data. The initial installation of monitors is uniform across the NAS. Some modifications to the monitors will enhance their operation.

Approach: Modify all LORAN-C monitor hardware/software to maximize system performance and provide the capability to monitor the new midcontinent LORAN-C transmitter chains.

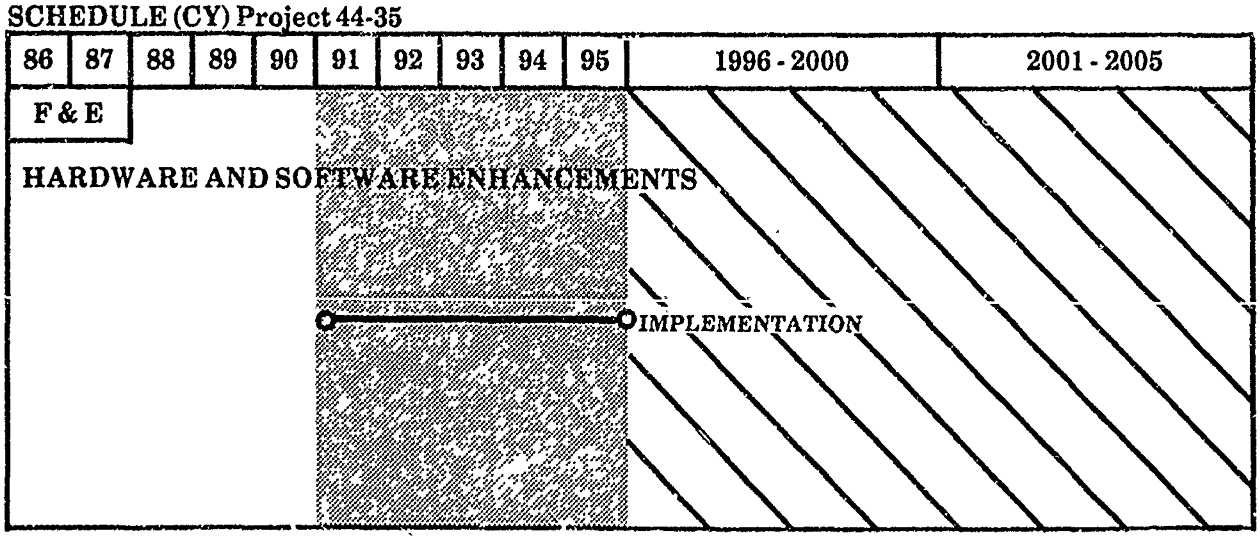
Establishing values for the midcontinent chain parameters, analysis of LORAN-C signal characteristics, and antenna location surveys will be conducted in support of this project. Upon completion of these activities, 212 monitors will be modified and approximately another 50 monitors will be relocated.

Products:

- Modification of 212 monitors.
- Relocation of approximately 50 monitors.

Related Projects/Activities: 24-17 LORAN-C Systems.

SCHEDULE (CY) Project 44-35



PROJECT 44-39: Relocate Air Route Surveillance Radar (ARSR)

Purpose: Relocate existing long-range radars as required to enhance and improve air space coverage to meet Air Traffic requirements.

Approach: The regional inputs will be prioritized and validated at FAA Headquarters. The relocation projects will be coordinated to ensure compatibility with the ARSR-4 leapfrog program and the Joint Radar Planning Group recommendations for ARSR-4 relocations.

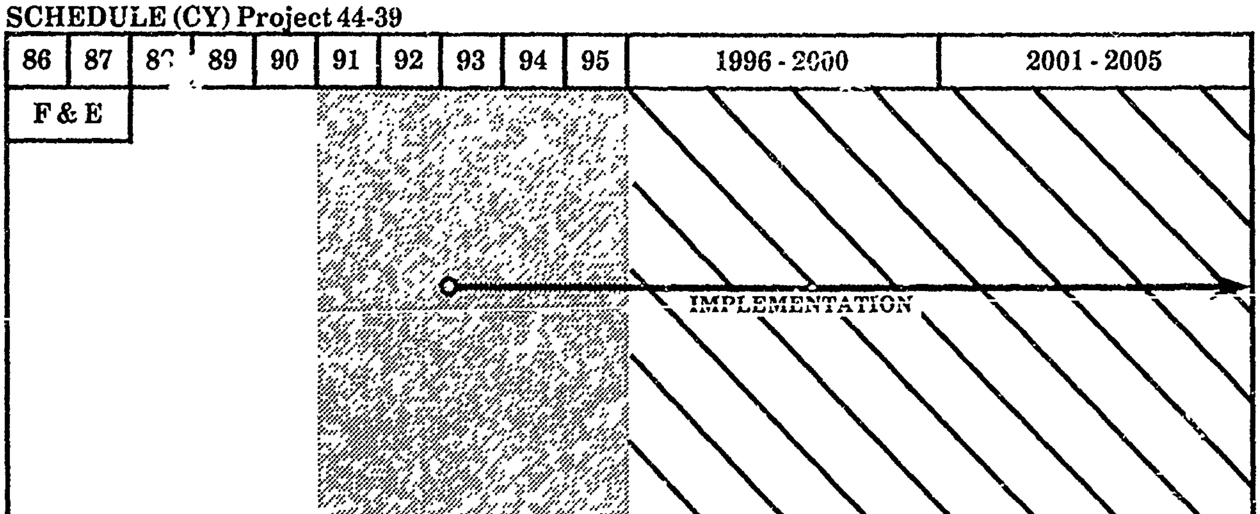
Products: Approximately two sites per year will be relocated, according to Air Traffic national requirements.

Progress/Activity from October 1989 through November 1990:

- The Houston, Texas, ARSR relocation project has been validated. Several projects are under consideration for inclusion in subsequent years.

Related Projects/Activities: 44-45 ATCRBS Relocation and 44-46 ATCBI Replacement.

SCHEDULE (CY) Project 44-39



PROJECT 44-40: Long Range Radar Improvements

Purpose: This project will provide improvements to the current inventory of long range radars to help extend their useful life for up to 15 additional years.

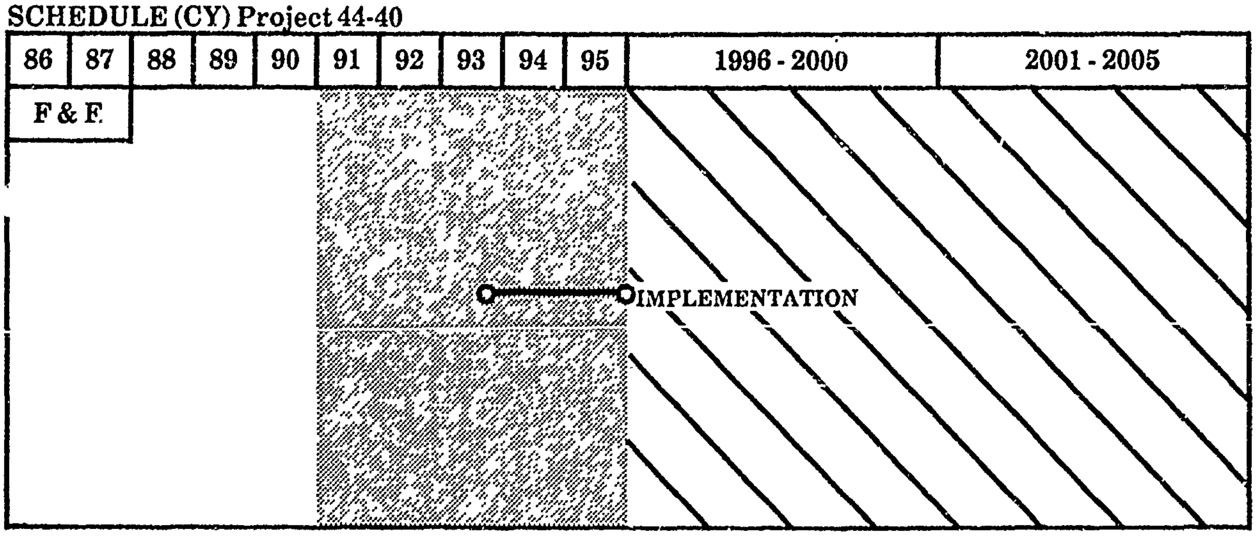
Approach: Improvements will continue to be made to the current older generation of long range radars to ensure their continued satisfactory performance beyond the year 2000. A replacement radar set control will be installed in the ARSR-1/2 radars. Cable trays will be purged of unused cables. Facility grounding will be brought up to current FAA standards.

Products:

- ARSR-1/2 radar set controls.
- Cable tray cleanup.
- Grounding problems resolution.

Related Projects/Activities: 24-15 LRR Program, 44-42 LRR Radome Replacement, 44-43 Radar Pedestal Vibration Analysis, and 56-53 Refurbish AN/FPS-20 Radars.

SCHEDULE (CY) Project 44-40



PROJECT 44-42: Long Range Radar Radome Replacement

Purpose: To replace existing radomes at all Long Range Radar (LRR) facilities currently in the NAS. The majority of the radomes at LRR sites have been in service for 25 to 30 years. These radomes have exceeded their normal life expectancy and the maintenance of these radomes has become labor intensive.

Current radomes are also not compatible with the new Mode S monopulse antenna system. These radomes are too small to physically accommodate the Mode S antenna system. In addition, radar signal interference, such as antenna beam skewing and excessive attenuation, will be minimized as compared to existing radome metal frames and dielectric materials.

Approach: Replace all obsolete and Mode S noncompatible LRR radomes. Radome procurement will be initiated with a Request For Proposals (RFP). The technical specification will require that the new radome be compatible with the Mode S system.

Products:

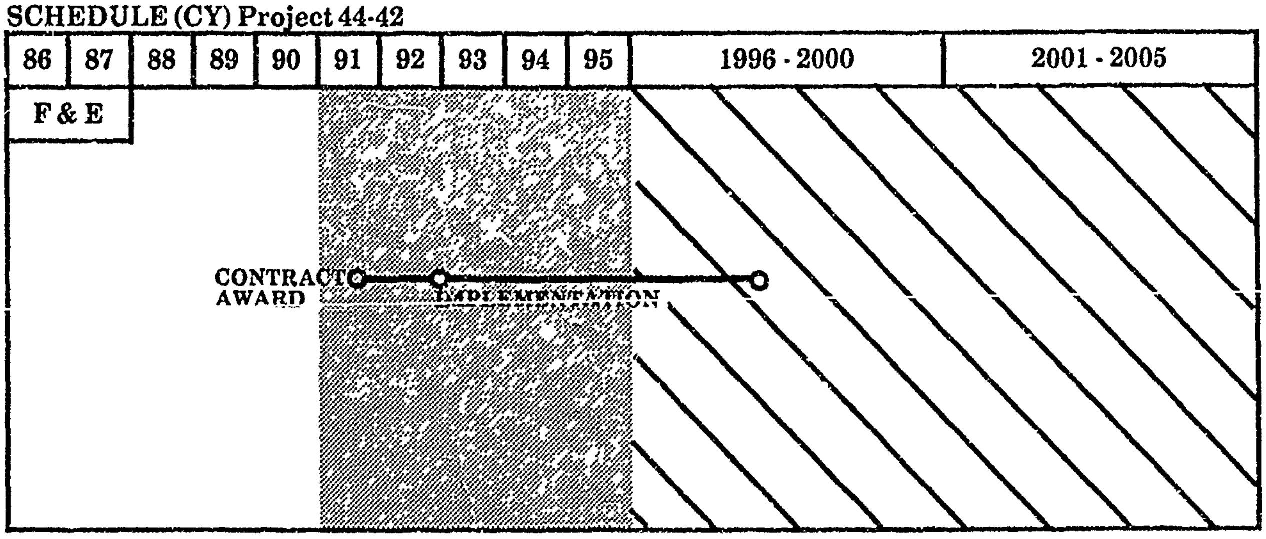
- Phase I - 26 radomes.
- Phase II - 10 radomes.
- Phase III - option for 74 radomes for balance of the LRR facilities.

Progress/Activity from October 1989 through November 1990:

- RFP issued.

Related Projects/Activities: 24-12 Mode S and 24-15 LRR Program.

SCHEDULE (CY) Project 44-42



PROJECT 44-43: Radar Pedestal Vibration Analysis

Purpose: This project will provide vibration monitoring sensors on radar pedestals and vibration analysis equipment to analyze the monitored data. Radar pedestal equipment maintenance is an expensive and labor-intensive activity. There is currently no reliable method of predicting impending failures or monitoring the physical and functional integrity of radar pedestals. The FAA operates a scheduled seven-year overhaul cycle requiring 15 to 18 scheduled overhauls annually. An additional eight to ten emergency pedestal repairs are also performed each year.

Approach: Vibration sensors will be installed on radar pedestals, initially on en route radar pedestals and then on terminal radar pedestals. Vibration analysis equipment will be located at the FAA Logistics Center and selected maintenance centers. Monitoring and analysis will be performed to provide information on impending pedestal problems to eliminate unnecessary overhauls, reduce emergency repair actions, and more accurately budget resources for pedestal maintenance.

Remote maintenance monitoring capability at radar facilities will be analyzed to determine compatibility with pedestal vibration monitoring.

Products:

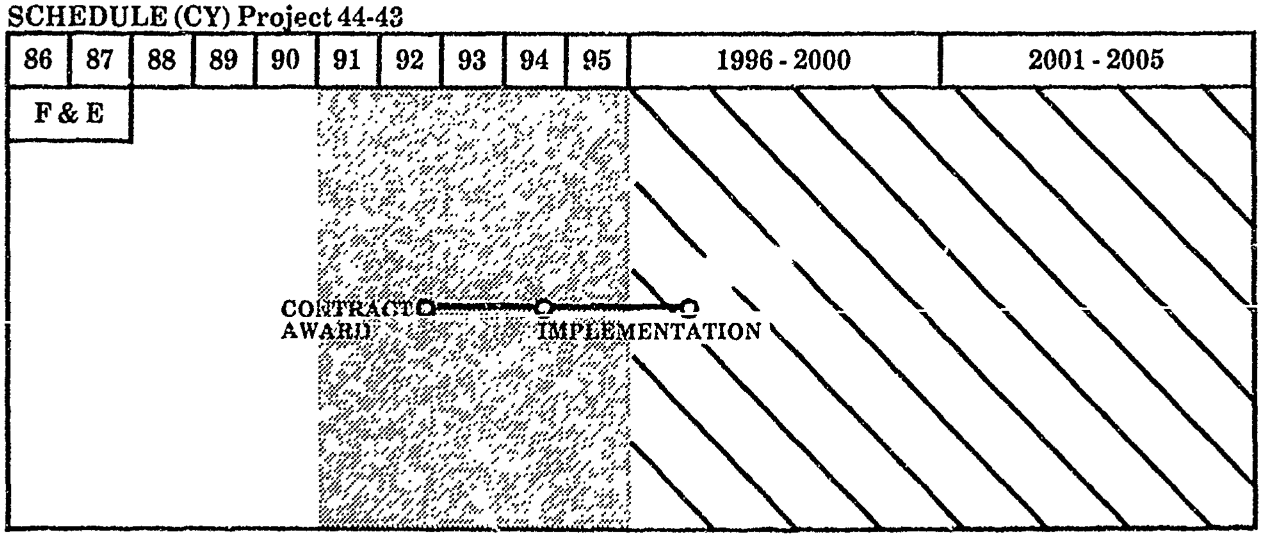
- Radar pedestal vibration sensor installations.
- Vibration analysis equipment.

Progress/Activity from October 1989 through November 1990:

- A report on the feasibility of radar pedestal vibration monitoring was finalized.

Related Projects/Activities: 24-13 Terminal Radar (ASR) Program, 24-15 Long Range Radar Program, 44-40 Long Range Radar Improvements, and 44-60 Sustain/Relocate Airport Surveillance Radar (ASR).

SCHEDULE (CY) Project 44-43



PROJECT 44-45: Air Traffic Control Radar Beacon System (ATCRBS) Relocation

Purpose: To provide continued support for the FAA's ATCRB/ATCBI systems. The project provides relocation of the newer ATCBI systems replaced by Mode S or the "front-end" systems provided by an option in the ASR-9 project to sites which presently use the older vacuum tube-type (ATCBI-3s) as well as provide for Radar Beacon Performance Monitors (RBPMs) at all ATCBI locations. Additionally, this project provides for any immediate or emergency requirements for ATCBI.

Approach:

- The project will consist primarily of technical and engineering services performing "in-place" installation at ATCBI-3 locations. Services will also be performed at sites receiving Mode S or front end systems to prepare and ship assets. Relocated Remote System Monitors (RSMs) will be used for new establishments at locations presently without an RSM.

- Limited procurement for hardware and ATCBI test sets needed to support the relocation program.

- Project includes provisions for storage of assets required for immediate or future ATCBI requirements.

Products: At the completion of the ongoing Mode S procurement, the following systems will have been made available for relocation or re-establishment of new ATCBIs/ATCRBs:

- ATCBI-5: 52 each.

- ATCBI-4: 44 each.

- RBPM : 96 each.

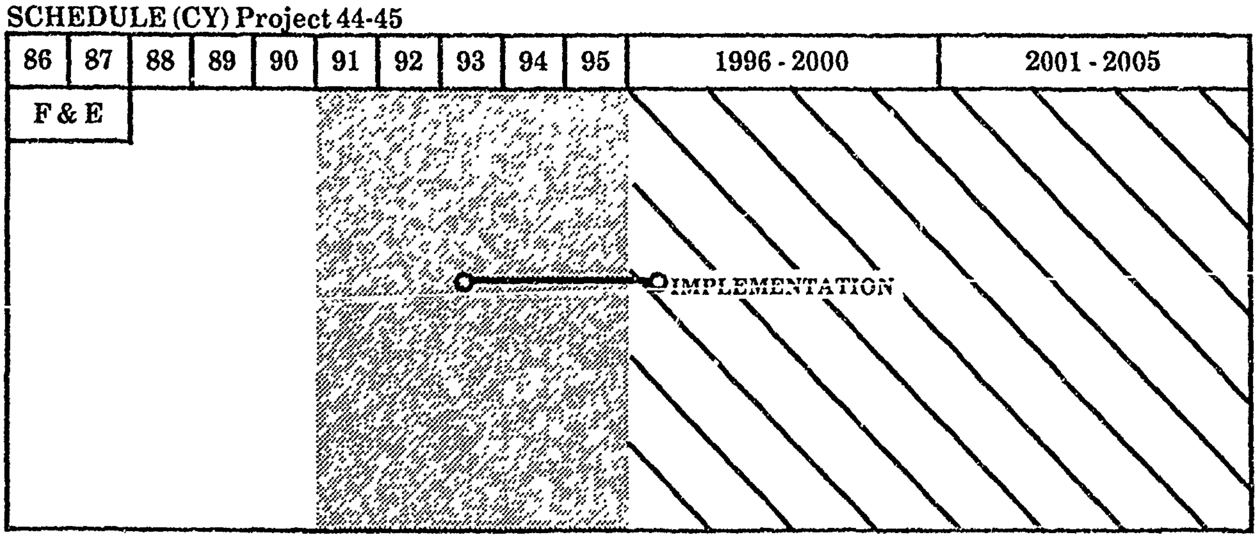
Additional hardware will be needed to support the relocation effort for beacon test sets, line drivers, and site spares.

Progress/Activity from October 1989 through November 1990:

- A study, with recommendations, has been prepared for the ASR-9 front end option.

Related Projects/Activities: 24-12 Mode S, 44-39 Sustain/Relocate ARSR, 44-60 Sustain/Relocate ASR, and the Mode S second buy procurement.

SCHEDULE (CY) Project 44-45



PROJECT 44-46: Air Traffic Control Beacon Interrogator (ATCBI) Replacement

Purpose: Surveillance of aircraft for air traffic control, by ground-based equipment, will be required well into the next century. This project will replace aging and obsolete ATCBI equipment with Mode S-compatible units to establish a complete secondary radar system.

Approach: Ground-based surveillance units will be procured to replace existing ATCBI equipment (338 units). The procurement of Mode S will provide 137 units. There is an option on the ASR-9 project to procure up to 36 secondary radars which could be the front end Mode S. There still exists a requirement for 165 Mode S compatible units for replacement plus any new establishment locations that have been identified.

Products: There is a requirement to purchase enough Mode S compatible systems to meet existing system requirements plus the new locations that qualify for a secondary radar system.

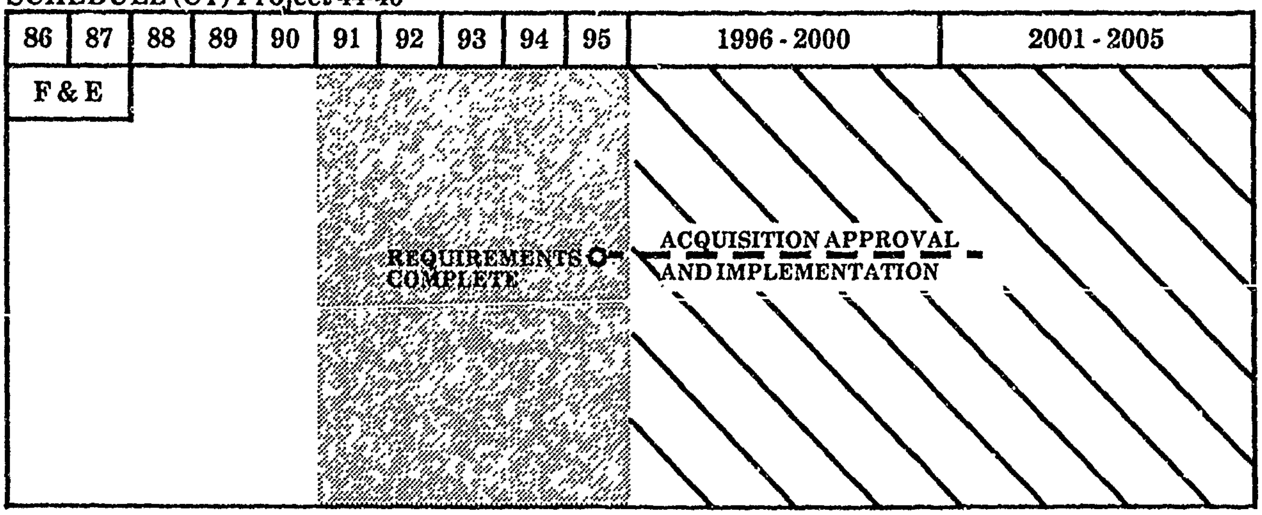
Progress/Activity from October 1989 through November 1990:

- The Mode S contract has been awarded and the system is scheduled to be deployed.
- A staff study has been completed with a recommendation to procure up to 36 front-end Mode S systems on the ASR-9 contract.

Related Projects/Activities: 24-12 Mode S, 24-13 ASR Program, 26-01 RMMS, 26-15 NAS Spectrum Engineering, 44-39 Sustain/Relocate ARSR, and 44-60 Sustain/Relocate ASR.

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 44-46



PROJECT 44-48: AN/FPS-117 Beacon Improvement

Purpose: This project will provide improved beacon radar performance from the U.S. Air Force AN/FPS-117 Minimally Attended Radar (MAR) systems in Alaska. The improvements are needed to allow use of standard air traffic control separation standards within the airspace covered by the FPS-117 beacon radar subsystem.

This project is critically important because the FAA relies on coverage from these Air Force radar sites for the majority of Alaskan airspace. Further international air route structure changes are expected to greatly increase commercial traffic in the airspace covered by the FPS-117 sites in the early 1990's.

Approach: Because the FPS-117 radars are owned and maintained by the Air Force, the responsibility for modification of those radars shall remain with the Air Force. That service will procure and install the modification using FAA funds provided on an interagency agreement.

The King Salmon FPS-117 radar will be modified and used for first-article testing. Fifteen additional radars in Alaska, along with the FPS-117 at Gibbsboro, New Jersey, and an Air Force radar at Sacramento, California, will be modified. The Gibbsboro FPS-117 will then be relocated to Fairbanks, Alaska, and the ARSR-4 from Gibbsboro will be relocated to Murphy Dome, Alaska.

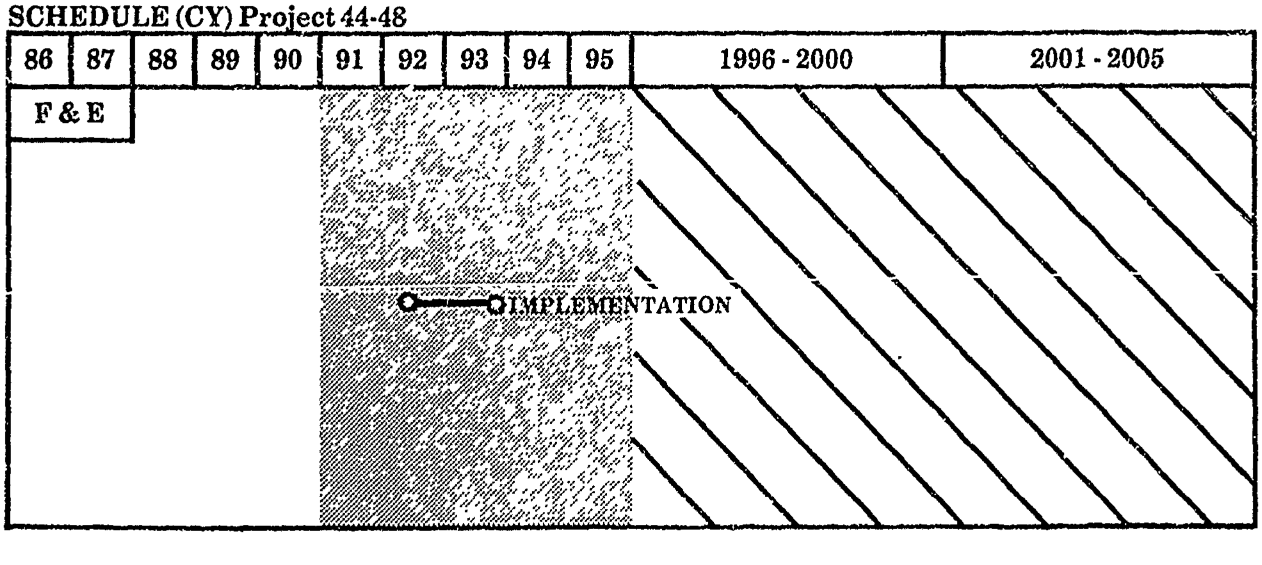
Products: 18 AN/FPS-117 modifications.

Progress/Activity from October 1989 through November 1990:

- Air Force configuration control board approval.

Related Projects/Activities: 24-15 LRR program.

SCHEDULE (CY) Project 44-48



PROJECT 44-60: Sustain/Relocate Airport Surveillance Radar (ASR)

Purpose: This project will provide for relocations and associated refurbishments of terminal radars after initial deployment.

Relocation of existing radars become necessary due to new construction interfering with required radar coverage or to changes in air traffic volume.

Approach: Regions provide candidates for relocation. Headquarters validates priorities and funds relocations through the annual budget process.

Products:

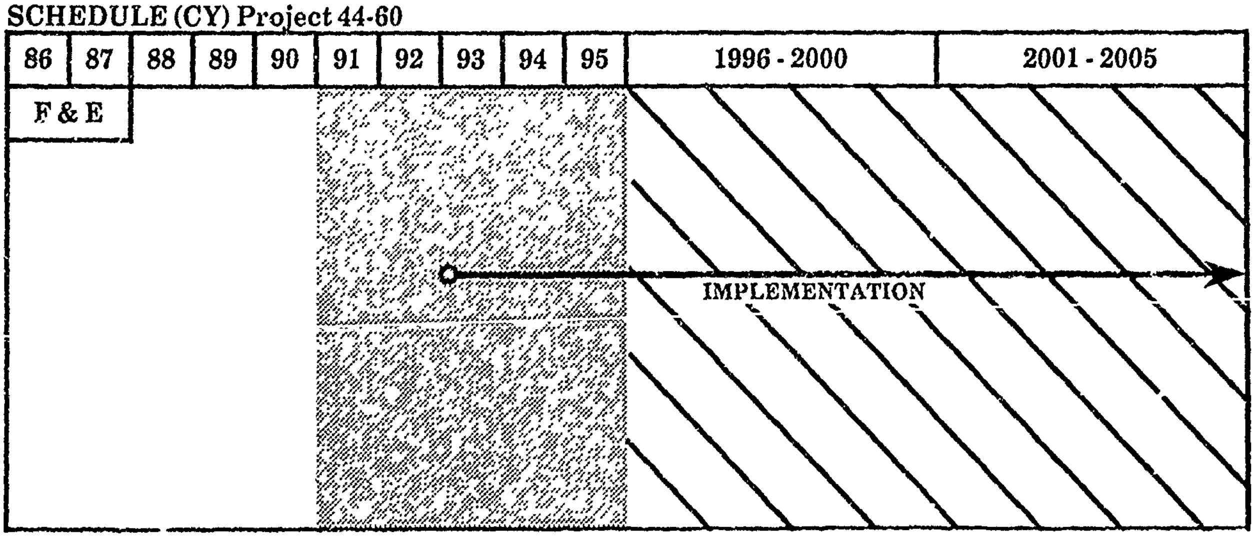
- Relocate the minimum number of additional radars.
- Raise antenna height where required.
- Remote data from some terminal radars based on coverage requirements that will exist prior to ACF implementation.

Progress/Activity from October 1989 through November 1990:

- Regions identify new candidates for relocations.

Related Projects/Activities: 22-06 ARTS IIA Enhancements, 22-09 ARTS IIA Interface with Mode S/ASR-9, 24-12 Mode S, 24-13 ASR, 25-03 RML Replacement and Expansion, 25-02 Data Multiplexing Network, 26-15 NAS Spectrum Engineering, 32-13 ATCT/TRACON Establishment, 34-13 Terminal Radar Digitizing, Replacement, and Establishment, 34-20 Surveillance System Enhancements, 44-43 Radar Pedestal Vibration Analysis, 44-45 ATCRBS Relocation, 44-46 ATCBI Replacement, 56-26 Frequency Interference Support/Resolution, 62-21 ASTA, and 64-13 ASR-9 Modification for LLWAS.

SCHEDULE (CY) Project 44-60



PROJECT 45-02: Data Multiplexing Network (DMN) Continuation

Purpose: The Data Multiplexing Network project provides the NAS with state-of-the-art data communications technologies for cost-effective point-to-point data transmission. These technologies include: (1) data multiplexing, which enables a number of independent transmission requirements to be consolidated onto a single circuit; and (2) automated network monitoring and control, which enables the identification of failed network elements from central locations and circuit restoral in real time. The use of data multiplexing is an integral part of the FAA's strategy for cost-effective interfacility communications transmission.

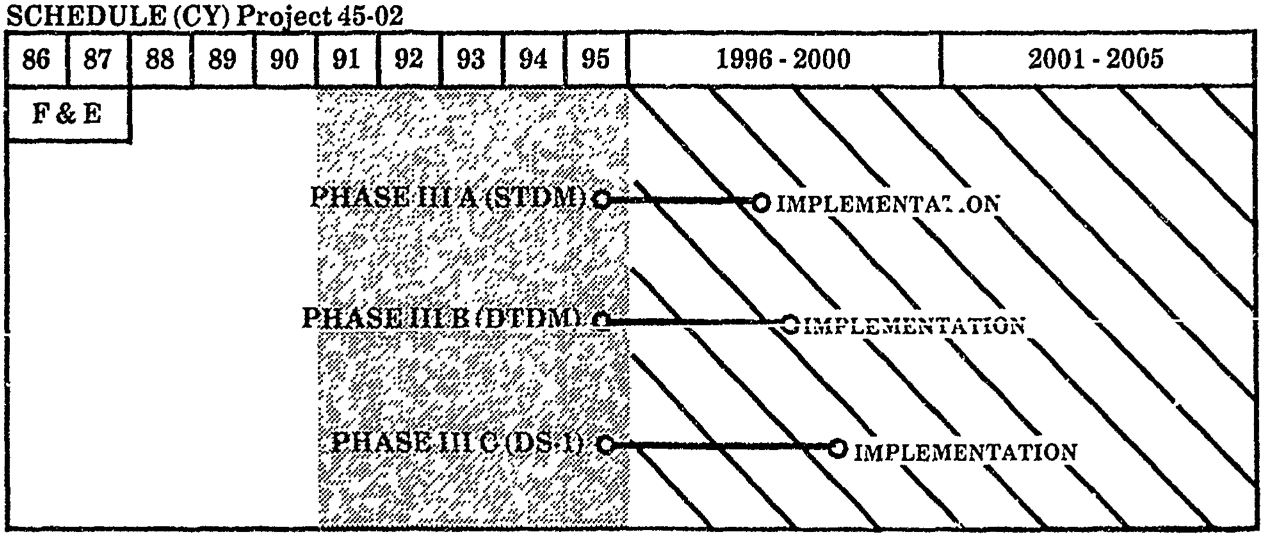
Continuing effort is required to complete installation of Statistical Time Division Multiplexing (STDM) network equipment, Deterministic Time Division Multiplexing (DTDM) network equipment, and DS-1 network equipment.

Approach: This project will provide for the continuation and completion of Phase III of the data multiplexing network effort to provide circuit-end equipment for data transmission requirements.

Products: Continue to acquire modems, multiplexing modems, channel service units/data service units, high-speed time division multiplexer, and automated network management systems for the DTDM procurement and statistical multiplexers for the STDM procurement.

Related Projects/Activities: 21-06 TMS, 23-09 AWOS, 24-12 Mode S, 24-16 Weather Radar Program, 24-17 LORAN-C Systems, 24-18 TDWR System, 25-02 DMN, and 26-02 CBI.

SCHEDULE (CY) Project 45-02



PROJECT 45-05: Expansion/Reconfiguration of Low Density Radio Communications Link (LDRCL)

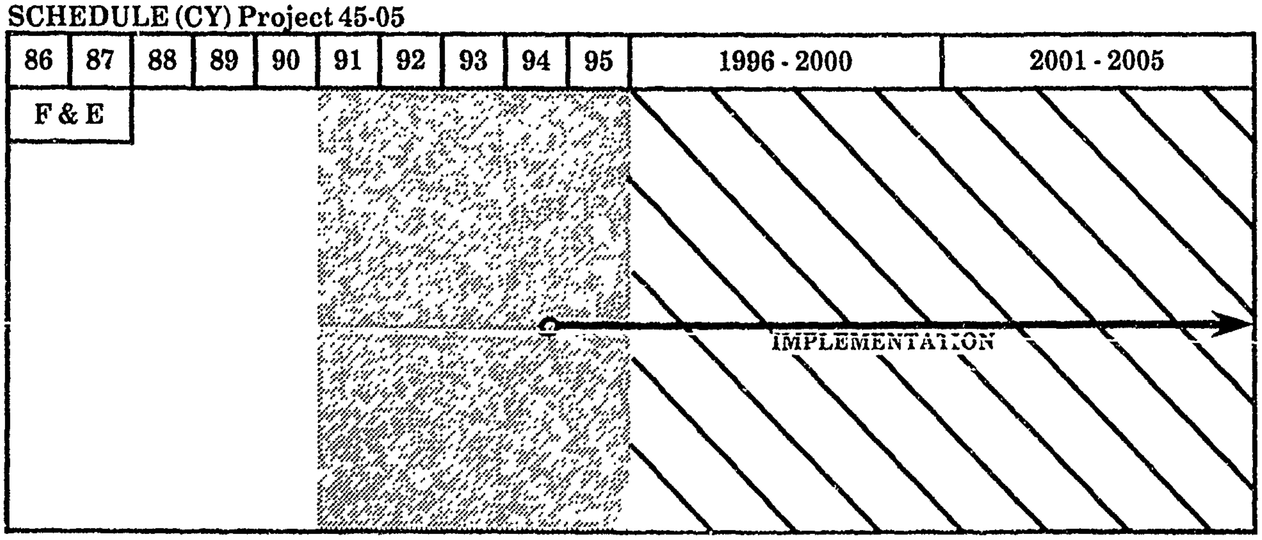
Purpose: As the air traffic system continues to expand and grow, the telecommunications system must expand with it. This project will provide the interfacility communications system with the ability to establish new low-density microwave radio systems in support of new NAS requirements not previously covered under the RML replacement program.

Approach: Analyses will be conducted on alternative transmission methods and network topologies to satisfy interfacility communications. Where economically feasible, LDRCL components will be provided for new spurs, user access networks, or to enhance existing LDRCL segments to provide increased capabilities. Commercial-off-the-shelf equipment will be used.

Products: LDRCL segments.

Related Projects/Activities: 25-03 RML Replacement and Expansion and 45-06 Expansion/Reconfiguration of Routing and Circuit Restoral.

SCHEDULE (CY) Project 45-05



PROJECT 45-06: Expansion/Reconfiguration of Routing and Circuit Restoral (RCR)

Purpose: This project will provide for increased reliability and availability of critical and essential circuits on FAA-owned and leased facilities and improve leased communications cost-effectiveness.

Approach: System design requirements will be based upon requirements to expand the RCR network established under project 25-03. Included will be: automated and semi-automated digital switching of RCL digital and voice frequency circuits; conversion service between the digital data traffic and the analog RCL; and conversion service between the analog multiplexer and the RCR digital switch. Also, COTS hardware will be used to the extent possible.

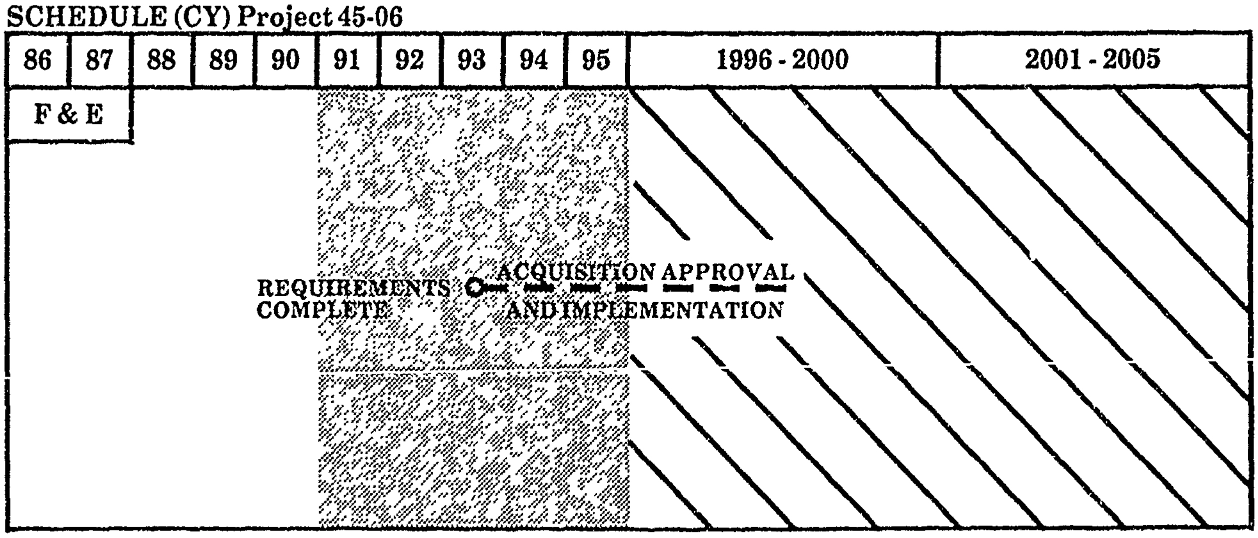
Expansion of the RCR network was established under project 25-03 to include secondary nodes (e.g., terminal facilities, AFSSs, remote site entry points onto the backbone, etc.). Implementation will be accomplished using building blocks common to the RCR project.

Products: Expanded switching capabilities to include leased circuits.

Related Projects/Activities: 21-12 AAS, 21-15 ACF, 23-01 FSAS, 25-03 RML Replacement and Expansion, 26-01 RMMS, 45-05 Expansion/Reconfiguration of LDRCL, and 65-03 NMCE.

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 45-06



PROJECT 45-20: Critical Telecommunications Support

Purpose: As a strategic objective, the FAA is committed to reducing dependence on leased telecommunications to improve reliability, flexibility, and survivability, as well as to control and reduce costs on voice and data telecommunications. The FAA pursues this objective through projects that result in major FAA-owned telecommunications facilities; implementation of FAA-owned airport telecommunications; and the acquisition of engineering services and equipment to support leased communications initiatives to improve service and save costs. This project establishes the resources for follow-on support for these efforts and provides funding to procure upgrades of existing systems.

Approach: Telecommunications project offices and telecommunications management and operations functions will identify specific sustaining telecommunications requirements and upgrades. Procurements are initiated as required.

- Telecommunications facilities operation:
  - Software updates and enhancements.
  - Hardware updates and enhancements.
  - System/component reconfigurations.
  - Performance upgrades.
- Airport telecommunications:
  - Airport telecommunications facilities.
- Leased communications initiatives:
  - Technology improvements.
  - FAA ownership of embedded base equipment.
  - Centralized facility circuit termination equipment.

Products:

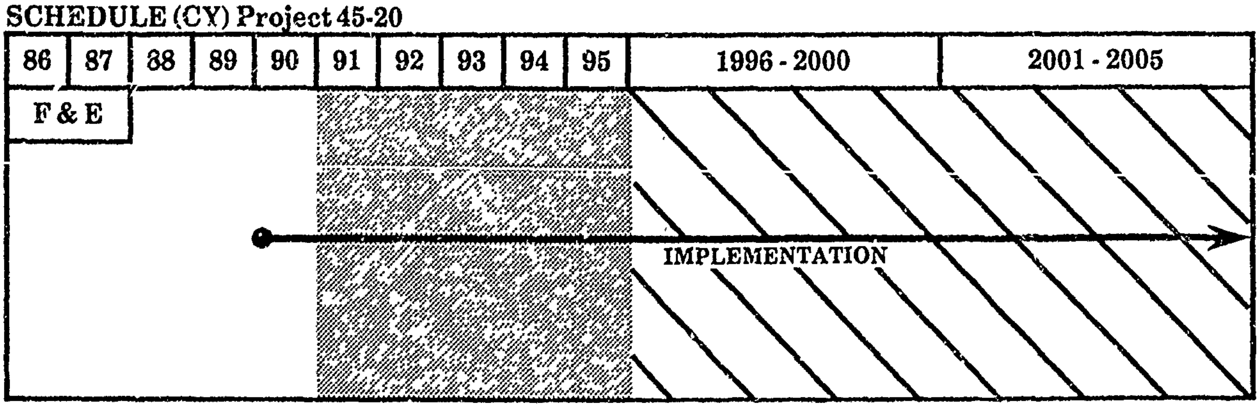
- FY 89 and prior:
  - Boston-Boston MUX expansion.
  - Boston ARTCC master demarc.
  - RCL drop and insertion equipment.
  - RCL network terminal equipment and installations.
  - NADIN IA solid-state drum and Network Control (NETCON) enhancements.
- FY 90 and later:
  - 1000 mini demarc systems.
  - NADIN IA magnetic tape unit, moving head disk, and fixed head drum replacement.
  - Remote user data monitoring subsystem.
  - RCL network terminating equipment.
  - RCL supergroup channel cards for capacity expansion.

Progress/Activity from October 1989 through November 1990:

- Small demarcation system implementation underway. Airport cable loop systems being installed as cable replacements occur.
- Transition from leased to FAA-owned circuits and Customer Premise Equipment (CPE) continuing where feasible.
- Additional NADIN IA support for solid-state drums and network control.

Related Projects/Activities: 21-11 VSCS, 22-12 TCS, 23-13 ICSS, 25-02 DMN, 25-03 RML Replacement and Expansion, 25-07 NADIN II, 45-02 DMN Continuation, 45-06 Expansion/ Reconfiguration of RCR, 45-21 Satellite Communication Circuits System, and 45-24 Establish ANICS Satellite Network.

SCHEDULE (CY) Project 45-20



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PROJECT 45-21: Satellite Communication Circuits System

Purpose: This project will provide FAA-owned satellite interfacility communications systems needed to solve the "tail circuit/last mile" availability problem by providing alternate routes through satellite technology. It will support the FAA's strategy for cost-effective interfacility communication transmission by providing redundant alternatives and avoid single points of failure through circuit diversity to meet NAS service availability and message quality requirements required in the expanding ATC environment.

It will also economically support the increased requirement for communications and data circuits needed to support the Area Control Facility (ACF) and Flight Service Station consolidation programs, particularly in remote areas. It will also support the Enhanced Traffic Management System (ETMS) as well as data multicast and broadcast requirements.

Approach: CIP communication requirements through the year 2000 will be examined, and compared with the FAA's capability to provide such services. Transmission alternatives, including continuing to use leased circuits, microwave, satellites, and fiber optics will be analyzed. A plan will be developed which includes a comprehensive satellite-based network where cost effective.

Satellite services will be implemented in stages, as the need arises, to assure orderly growth and compatible telecommunication services.

A competitive national requirements type contract will be awarded for a contractor-furnished turnkey system. The system will include a Very Small Aperture Terminal (VSAT) system design, production, site preparation, installation, and implementation at the locations to be specified by the FAA.

The central earth station(s) and other earth stations may be acquired on a lease with option to buy or purchased outright. The space segment would be leased. If the earth stations are purchased outright, a separate maintenance service contract would also be procured.

The VSAT project will benefit from experience gained in the development, design, production, installation and implementation, and deployment of Traffic Management System/Aircraft Situation Display Full Duplex Interim Communication Network, currently in progress.

Products:

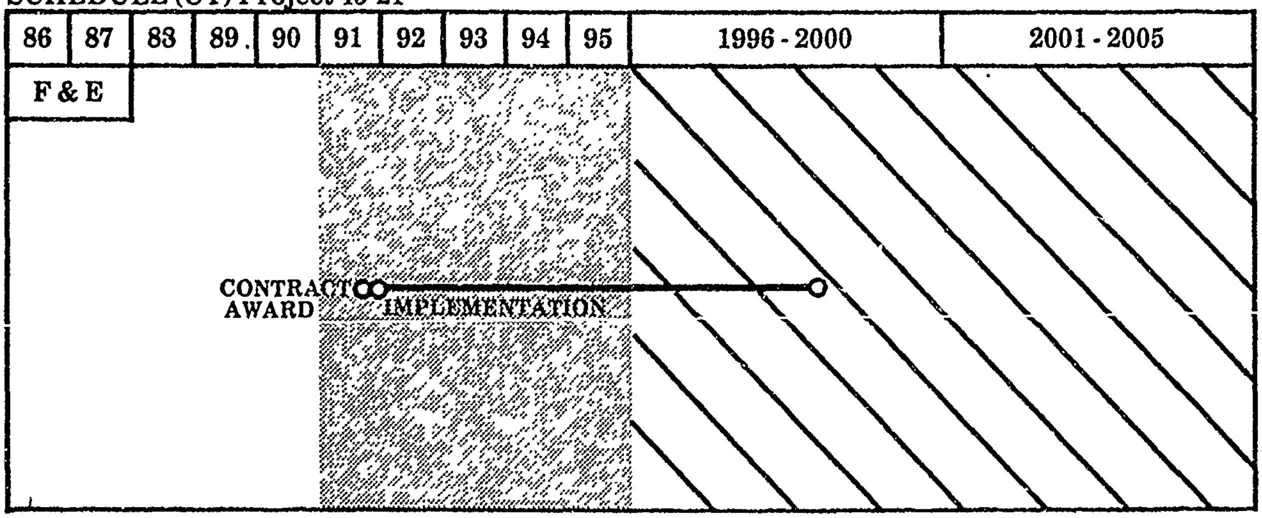
- FY 89 and prior:
  - Satellite propagation delay test.
  - Project implementation planning.
- FY 90 and later:
  - Development of specification and statement of work.
  - 21 hub-to-hub major earth station terminals.
  - Approximately 850 hub-to-small remote earth station terminals.
  - Network management and control system.
  - Limited number of vehicle transportable earth stations for temporary service requirements, disaster recovery, and interim provisioning response.
  - Communication systems connecting 23 ACFs and the Central Flow Control Facility (CFCF).

Progress/Activity from October 1989 through November 1990:

- Completion of voice delay test.
- Verification of specific requirement by period.
- Development of specifications and statement of work.
- Development of project implementation plan.

Related Projects/Activities: 21-06 TMS, 21-15 ACF, 23-09 AWOS, 24-12 Mode S, 26-01 RMMS, and 26-02 CBI.

SCHEDULE (CY) Project 45-21



PROJECT 45-24: Establish Alaskan NAS Interfacility Communications System (ANICS) Satellite Network

Purpose: This project provides for the establishment of an FAA-owned backbone interfacility communications system within the Alaskan Region using satellite earth station technology. It will support the FAA's strategy for cost-effective interfacility communication transmission by providing redundant alternative routes, and avoid single points of failure through circuit diversity to meet NAS service availability and message quality requirements in the expanding ATC environment. This system parallels the Radio Communications Link (RCL) system function.

Specific applications are: radar data from sites to ACF/ARTCC; radio air-to-ground voice communications between RCAGs/RCFs and ARTCC/ACF/AFSSs; flight data between ATCT/ARTCC/ACF/AFSSs; navaids-to-ACF/SFO/AFSS data; NEXRAD to ACF data; FSDPS data between ACF and AFSSs; and associate operational support voice and data communications.

Approach: Initially, readily available off-the-shelf satellite earth station and associated equipment will be used to establish a voice and data network in Alaska to meet NAS telecommunications requirements. A network monitoring and control system will be provided to allow for rerouting circuits, monitoring the quality of the circuits, and for initial circuit establishment and termination. The network control center will be located in the Anchorage ARTCC.

The Alaska network will be established in four phases: Phase I establishes dual-satellite earth stations at 53 critical locations needed to support the IFR portion of the Alaska ATC system. Phase II implements the FAA operational support communications requirements using the network established in Phase I, and sets up the permanent network control center in the Anchorage ARTCC to support NAS facility monitor and control functions. Phase III introduces additional earth stations into the network, and Phase IV implements non-FAA circuit station requirements from other eligible government agencies.

Products: Provide reliable and cost-effective telecommunications for Alaskan Region facilities to meet all present and future NAS requirements.

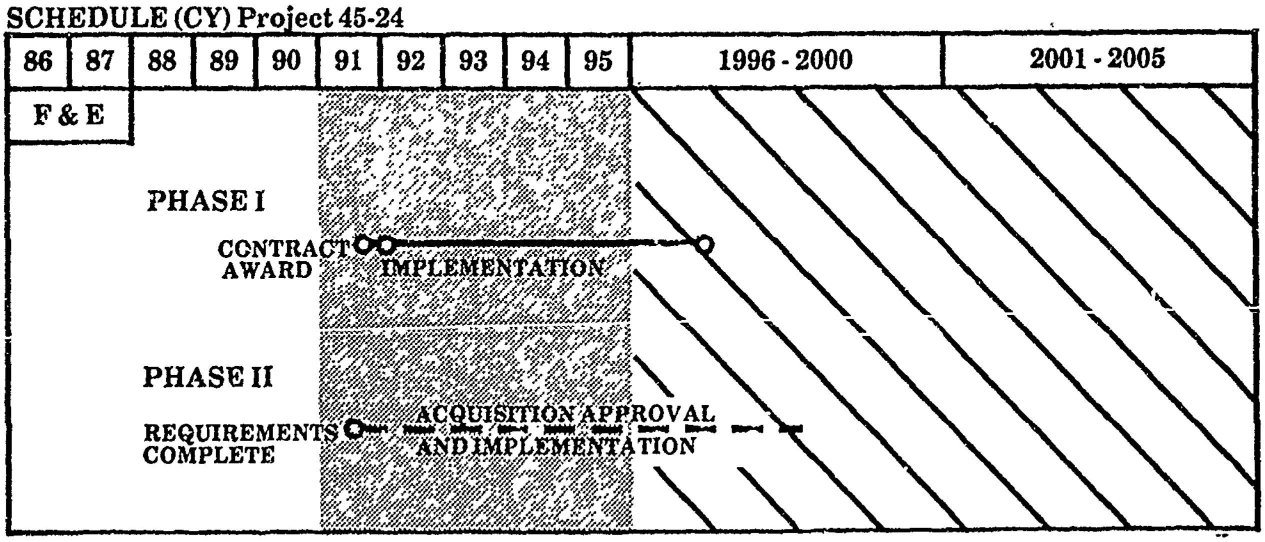
Progress/Activity from October 1989 through November 1990:

- Draft specification released to industry for comment.
- RFP released.

Related Projects/Activities: 23-09 AWOS, 24-12 Mode S, 26-01 RMMS, and 26-02 CBI.

Project Status: Phase II of this project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 45-24



PROJECT 46-01: Sustain Remote Maintenance Monitoring System (RMMS)

Purpose: This project will expand the existing RMMS network, replace aging Commercial-Off-The-Shelf (COTS) components, and enhance/upgrade existing maintenance automation software. The modernization will sustain work force productivity achieved through the implementation of RMMS capability, and will maintain system currency with technology.

Approach: Maintenance concepts and functional system specifications will be upgraded to enhance the RMMS implemented prior to 1992 under projects 26-01 RMMS and 26-04 MCC. Replacement hardware and software will be procured as required to meet the new specifications for system upgrades, and rehosting of software will be considered where appropriate.

The modernization of the RMMS will provide for the replacement or enhancement/upgrade of the Maintenance Processor Subsystem (MPS) and its related peripheral equipment, application software, and interfaces with both the Area Control Facility (ACF), Maintenance Control Center Processor (MCCP), and the General NAS Sector Maintenance Control Center (GMCC).

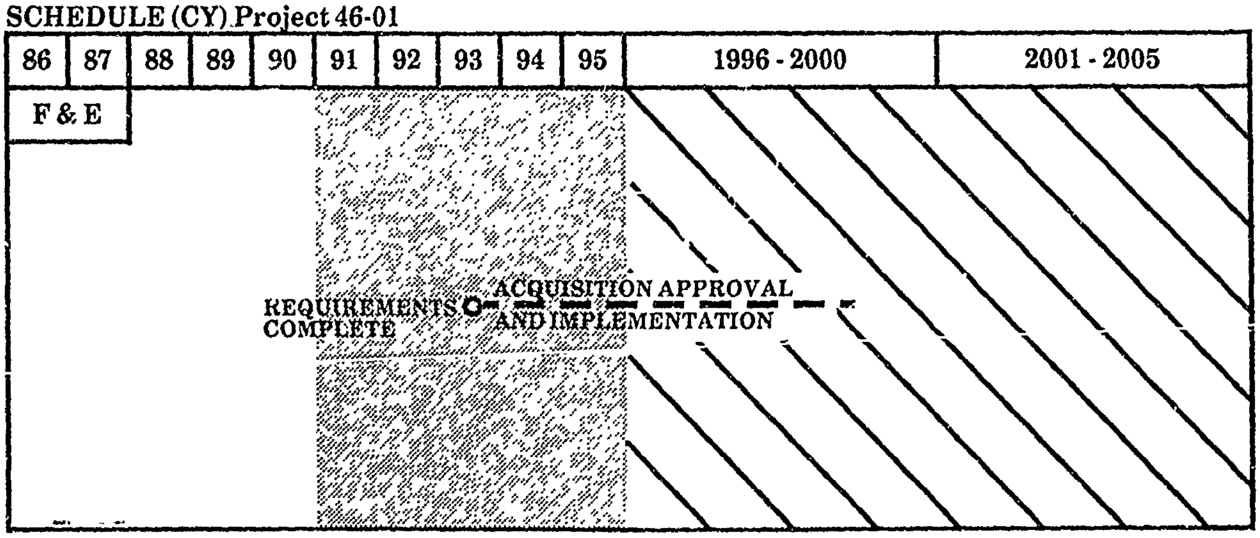
Products:

- New generation processors and required peripherals will be provided to replace/update:
  - Up to 28 Maintenance Processor Systems (MPSs).
  - Up to 750 Remote Monitoring System Concentrators (RMSCs).
  - Up to 5,000 Maintenance Data Terminals (MDTs).
- Rehost existing maintenance automation software to include Maintenance Management System (MMS), Monitoring/Control Software (MCS), and MDT applications.
- Expand the RMMS network to accommodate systems not previously included.

Related Projects/Activities: 26-01 RMMS, 26-04 MCC, and 46-04 MCC Enhancement.

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 46-01



PROJECT 46-04: Maintenance Control Center (MCC) Enhancement

Purpose: This project will enhance/upgrade the MCCs in each Airway Facilities Sector. The MCC serves as the focus for facility maintenance and restoral activities within a specific jurisdiction. The final configuration will be the result of an evolutionary process incorporating new equipment additions to the NAS and maturing operational requirements.

Approach: Aging Commercial-Off-The-Shelf (COTS) components of the MCC hardware and software systems will be replaced, enhanced, or upgraded. The modernization will sustain work force productivity achieved through the implementation of RMMS capability, and will maintain system currency with technology.

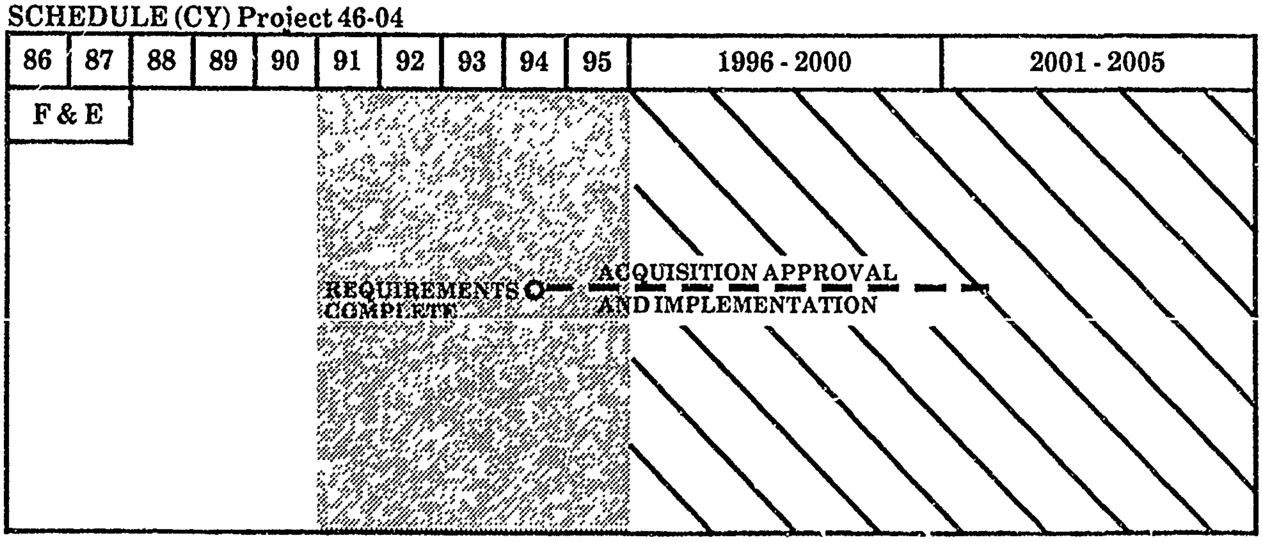
Systems implemented by this project will use capabilities provided by the remote maintenance monitoring system and will require interfaces and coordination with all project activities implementing RMM capabilities.

Products: Upgraded/enhanced hardware and software components of the MCC.

Related Projects/Activities: 26-01 RMMS, 26-04 MCC, and 46-01 Sustain RMMS.

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 46-04



PROJECT 46-05: Large Airport Cable Loop Systems Sustained Support

Purpose: Newly planned construction efforts will continue at activity Level III, IV, and V airports beyond the year 2000. Airport cable replacement and repair is an ongoing effort. Cable loop systems are used at several airports. They are reliable and allow increased capacity of signal transmission. Fiber-optic cable is cost effective when installed with power cable since it may be placed in the same trench without any adverse effects.

This project provides for the continuance of the airport cable loop project and will update existing systems when required.

Approach: This project will provide for both installations of new replacement cable and expansion or update of existing airport cable loop projects. The regions will continue to define requirements for new, expanded, and updated facilities. Signal and power cable will be reconfigured from radial to loop systems where practical. Spare cable, repair tools, and kits must be provided to meet the needs of the NAS through the year 2005.

Products:

- Reliable and flexible power and/or signal distribution systems.
  - FY 89 and prior: 24 systems
  - FY 90 and later: 130 systems

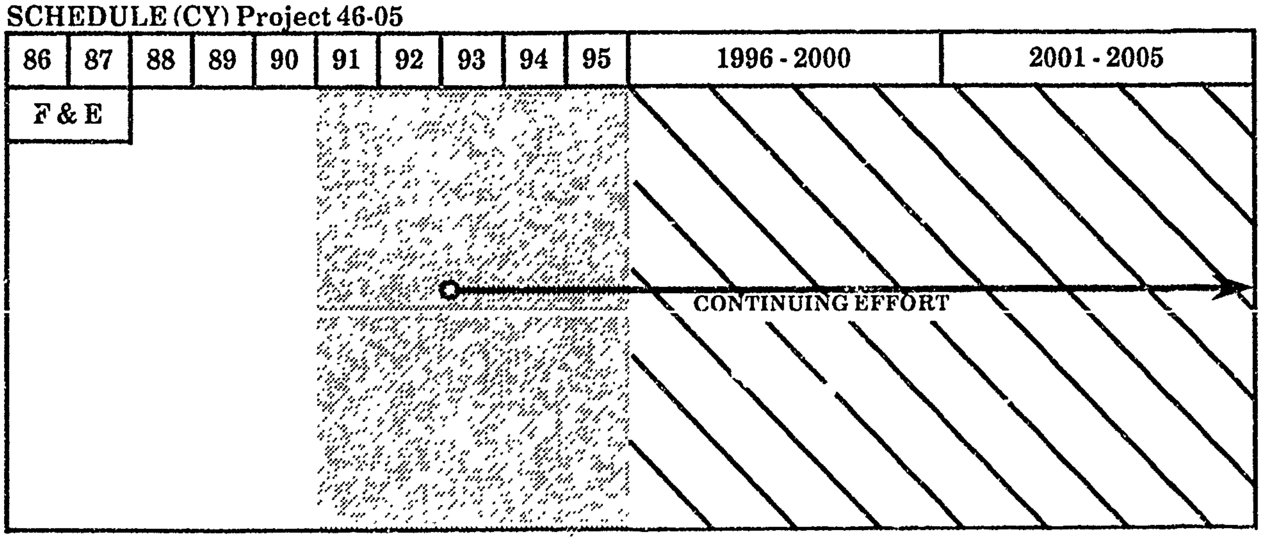
Progress/Activity from October 1989 through November 1990:

- All specifications, orders, and equipment selection criteria issued.
- Projects approved for 24 additional airports.
- Chicago O'Hare installation has begun.
- Atlanta and Memphis airports are in the design stage.
- TSC providing design guidance for the new Denver airport communications loop.
- Video cassettes issued for installation, repair, and maintenance.

Related Projects/Activities: The airport cable loop project is related to all other airport projects such as 26-01 RMMS, 24-07 MLS, 34-06 ILS, etc., which require buried cable for power, signal, control, and communications between sites. It is also related to 26-07 Power Systems in that it can be used for ERMS projects and reduce the need for additional engine generators at airport locations.

List of Contractors: Contractors will be determined by the regions.

SCHEDULE (CY) Project 46-05



PROJECT 46-07: Power Systems Sustained Support

Purpose: This project will provide the optimum type and quality of main and standby electrical power and grounding. This will assure high facility, reliability, and availability and reduce electrical interference, operating cost, and energy consumption at NAS facilities. To achieve these objectives, it is necessary to improve, refurbish, overhaul, and replace aging equipment on a continuing basis.

Engine generators and power conditioning systems become difficult to support with age, and are sometimes overloaded because of the addition of new electronic systems, facility collocations, replacements, or modification. Some existing engine generators, and power and line conditioning systems remaining in the NAS will not be suitable for the newer generations of electronic equipment using switching power supplies. They must be updated, when cost effective, or replaced with systems or equipment which tolerates current harmonics caused by modern electronics. Battery/dc distribution systems must be updated because of age. The grounding and lightning protection systems in some facilities are not adequate for modern electronics, have deteriorated with age, or have damaged components. These must be surveyed and modified or upgraded to assure proper operation of new NAS equipment, Additionally, some facilities have old wiring which must be replaced to meet the requirements of the National Electrical Code. No replacement engine generators were planned for the ALSF 2 or ASR-7/8 leapfrog projects, nor were modified grounding systems anticipated for RCE facilities. These and future unknown requirements must be addressed.

Approach: This project will provide reliable power sources and power and line conditioning devices on a continuing basis. Facility lightning protection, grounding, and electrical distribution systems will be updated on a long-term continuing basis in accordance with a sustained national policy. Power system projects must be accomplished to assure success of all Agency programs, continued safety of field personnel, and assured facility availability during commercial power failures.

Products:

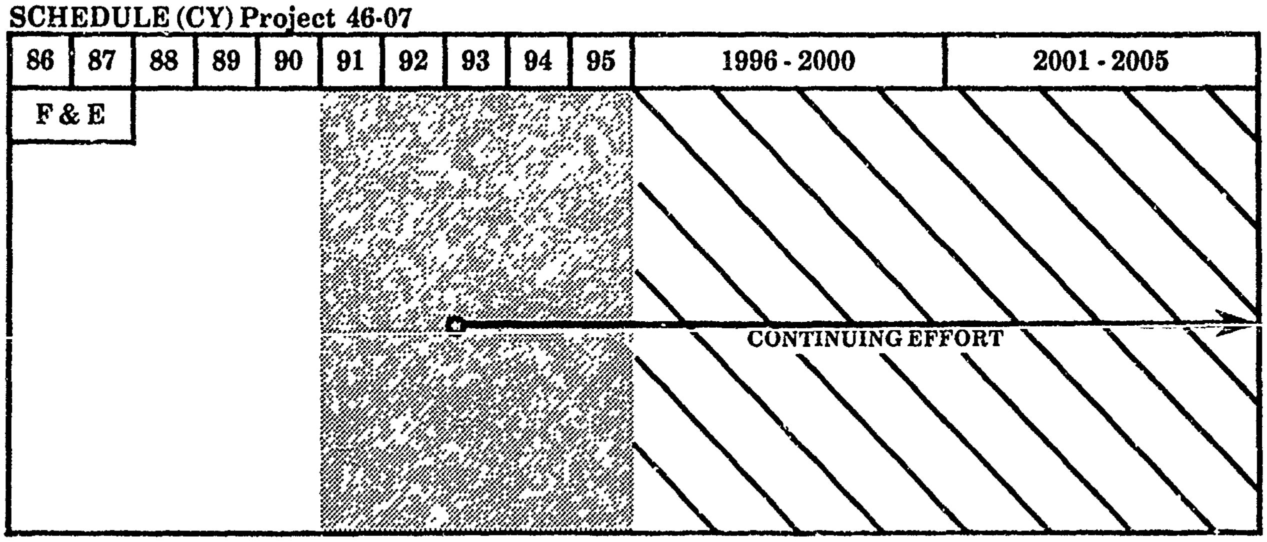
- Engine generator replacements: FY 89 and prior 55; FY 90 and later - 750 (50/year).
- Engine generator modifications and refurbishment: FY 89 and prior - 20; FY 90 and later-95 (13/year).
- Facility lightning protection, grounding, bonding and shielding: FY 89 and prior - 362; FY 90 and later - 7,000 (470/year).
- Facility electrical improvements.
- Battery/dc distribution systems.

Progress/Activity from October 1989 through November 1990:

- Continued support of ARTCC modernization efforts.
- Interagency agreement with the Department of Defense (Air Force) to provide UPS and electrical switchgear for ARTCCs.
- ERMS effort continuing.
- Deliveries of ASR-9 engine generators and loadbanks continuing.
- Problem resolution through the National Power Committee.
- Engine generator and power conditioning system modifications.
- Provided funds to regions for lightning protection, grounding, and facility electrical distribution projects.

Related Projects/Activities: This project is closely related to 26-07 Power Systems, 26-08 Modernize and Improve FAA Buildings and Equipment, and those projects affecting manned Airway Facilities buildings. Also related are those projects affecting agency electronic and communication conditioning devices, lightning and grounding systems, and facility availability and personnel safety throughout the NAS.

SCHEDULE (CY) Project 46-07



PROJECT 46-08: Modernize and Improve FAA Buildings and Equipment Sustained Support

Purpose: This project is a continuation of project 26-08 Modernize and Improve FAA Buildings and Equipment. New standard facility designs were developed under project 26-08 for upgrading or for the replacement of buildings and plant equipment which house and support NAS navigation, communications, surveillance, and visual/electronics landing systems. Although a substantial number of facility improvements have been accomplished using the standard design concept, there is a need to continue this program past the completion date for project 26-08.

Approach: Continue the comprehensive modernization and improvement of buildings and plant equipment which house and support NAS facilities Modifications to repairable facilities will be made to keep the buildings in usable condition. Modifications will also be made to maintain the buildings' integrity, enhance energy conservation through the installation of cost-beneficial insulation, and to meet new equipment environmental support requirements.

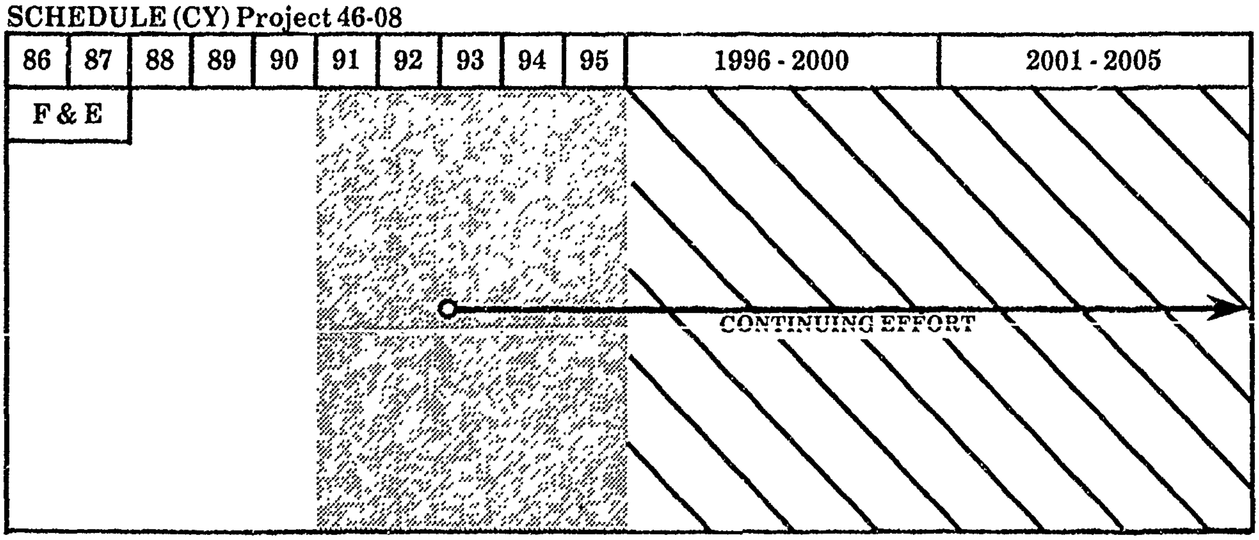
Buildings and structures which cannot be economically upgraded or modified will be replaced with modular structures based on standard national designs. This project will cover all buildings and structures currently used to house, support, and maintain NAS facilities and systems.

Products:

- Define requirements for sustaining building and plant support.
- Multi-year building and plant improvement/ modernization program involving approximately 2400 separate improvements at 1000 facilities each year.

Related Projects/Activities: 26-08 Modernize and Improve FAA Buildings and Equipment, 46-07 Power System Sustained Support, and all facility establishment projects scheduled for deployment at existing structures.

SCHEDULE (CY) Project 46-08



PROJECT 46-09: Sustain ARTCC/ACF Facilities

Purpose: This project will provide for rehabilitation or replacement of various components of the original ARTCC/ACF facilities as they become obsolete or wear out.

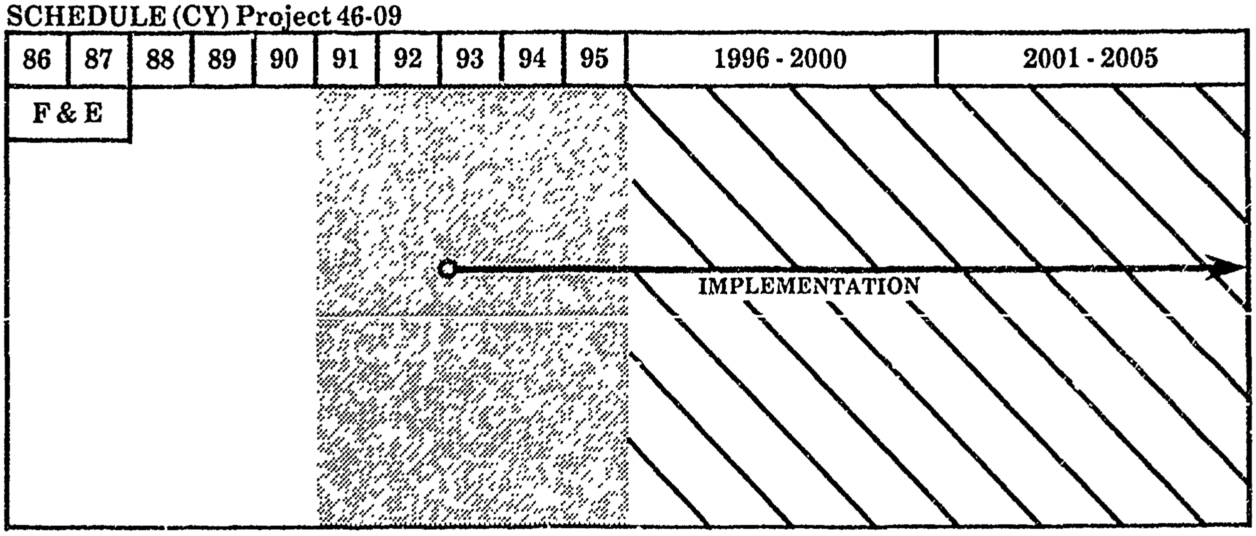
Approach: National programs will be developed for some major systems, such as replacement of older chillers, and regional projects will be developed for site-specific projects.

Products: Upgraded facilities to continue to support ACF operations and TRACON consolidations.

Related Projects/Activities: 21-12 AAS, 21-15 ACF, and 26-09 ARTCC Plant Modernization.

List of Contractors: Multiple construction contracts to be determined by the regions.

SCHEDULE (CY) Project 46-09



PROJECT 46-16: Continued General Support

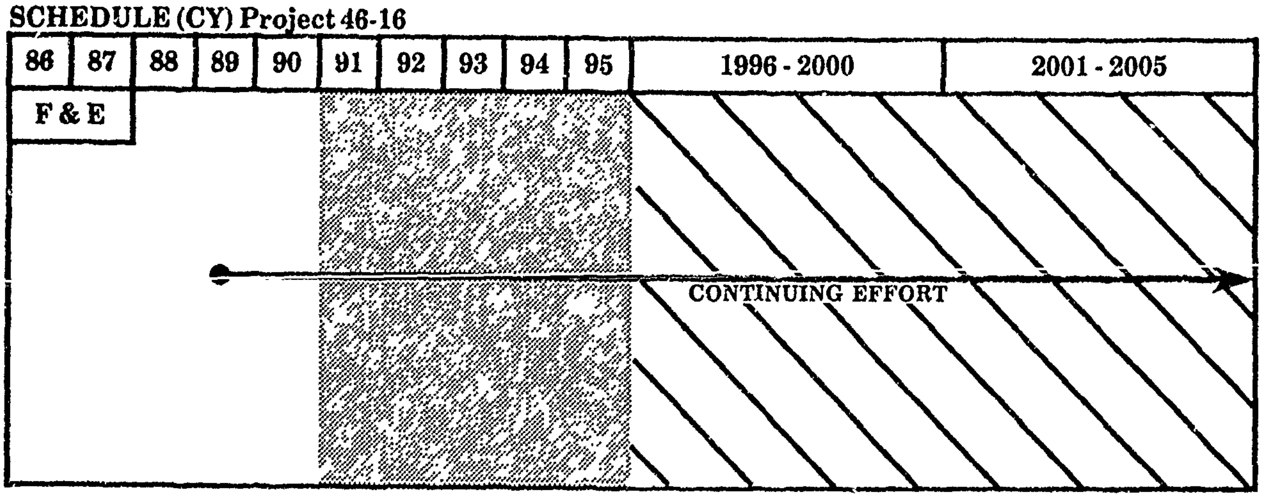
Purpose: This project provides continued general support for NAS initiatives and activities that arise annually. Included are: (a) regional originated projects that respond to changing routes, hubbing, or airspace resectorization; (b) infrastructure replacements necessitated by natural disasters such as hurricanes, tornadoes, earthquakes, etc.; and (c) small nonrecurring national programs not covered in any other Capital Investment Plan (CIP) program.

Approach: Regions are given a dollar funding after they have listed all their local projects in a priority order. Each region submits small improvement projects that develop without notice and require immediate action. National program managers are allocated requested amounts to complete short-term programs or exercise options on existing contracts to meet administration or Congressional mandates.

Products: Engineering feasibility studies, additional ATC operating positions due to increased demand, purchasing land, upgrading of off-road equipment, other national and regional requirements, natural disaster recovery, etc.

Related Projects/Activities: 26-16 General Support.

SCHEDULE (CY) Project 46-16



PROJECT 46-22: Fuel Storage Tanks

Purpose: The Hazardous and Solid Waste Amendments of 1984 to the Clean Water and Solid Waste Disposal Act require that owners (including the Federal Government) of underground petroleum fuel storage tanks shall: notify local (state, county, municipal) governments of such tanks; clean sites that are leaking and replace tanks; and install leak detectors to prevent further environmental pollution.

Fuel tanks in the FAA inventory have a life expectancy of 15 years, and most of them have been in use from 10 to 25 years.

Approach: The revised electrical power policy directive reflects a decreasing need for engine-generator standby power and associated fuel tanks. Engine-generators will be replaced by battery standby power at many locations. Leaking underground fuel tanks will be located and replaced or removed. Sites will be cleaned to acceptable standards. Double-walled fiberglass tanks with internal leak detectors will be installed at sites where continued use of engine-generators is required. Some small gasoline engine-generators will be converted to propane fuel with above-ground tanks. Fuel leak detectors are required to preclude the possibility of future leaks causing either soil or water contamination.

Products: Leaking fuel tanks will be located and replaced. Either new tanks will be installed or small engine-generators will be converted to propane fuel with above-ground tanks. The affected inventory has been estimated to be 425 sites (15 percent of the tanks are over 15 years old). Batteries will also be provided where necessary.

All remaining tanks are over 15 years old will be replaced, if they are not candidates for battery standby power. This should occur at 682 sites.

Leak detectors will be installed at sites that are candidates for battery standby power. The affected inventory has been estimated to be 2,043 sites.

Leaks may develop at 15 percent of the sites where fuel tank replacement is deferred. This may occur at an additional 306 sites. These sites will be converted to propane fuel, with an above-ground tank to reduce the cost of the program.

Removal of tanks, site cleanup, and disposal of tanks, engine-generators, and associated electrical equipment will be required at 2,043 sites after conversion to battery standby power is completed.

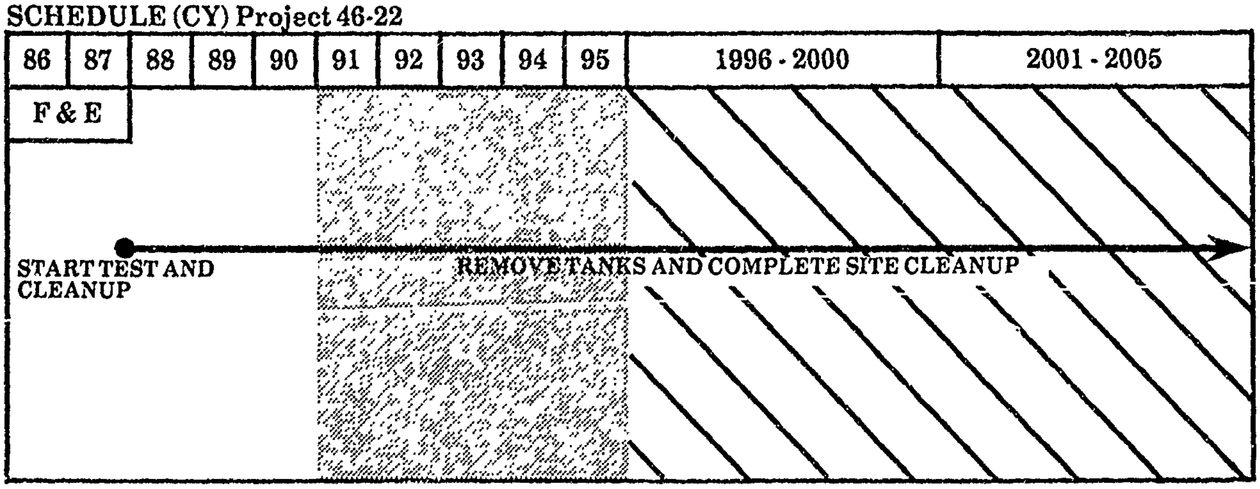
Progress/Activity from October 1989 through November 1990:

- Regions continue to test tanks, remove defective tanks, and clean sites if required. Battery dc distribution systems are being installed.
- All participants will report accomplishments annually as required by the Fuel Tank Implementation Order.

Related Projects/Activities: 26-07 Power Systems.

List of Contractors: Multiple contracts will be determined by the regions.

SCHEDULE (CY) Project 46-22



PROJECT 46-23: Environmental Clean-up

Purpose: This project provides for the cleanup and removal of all hazardous materials/waste found at FAA facilities as required by the Comprehensive, Environmental Response, Compensation, and Liability Act and the Resource Conservation and Recovery Act.

Approach: As required by law, a three-point approach will be employed to assess the severity of each potentially contaminated site. A preliminary assessment will determine whether environmental damage has occurred. If found necessary, a site investigation/feasibility study will be undertaken to determine the extent of contamination and best technology to be used for cleanup. Upon completion of the study, cleanup of all contaminated soil and/or goundwater will take place.

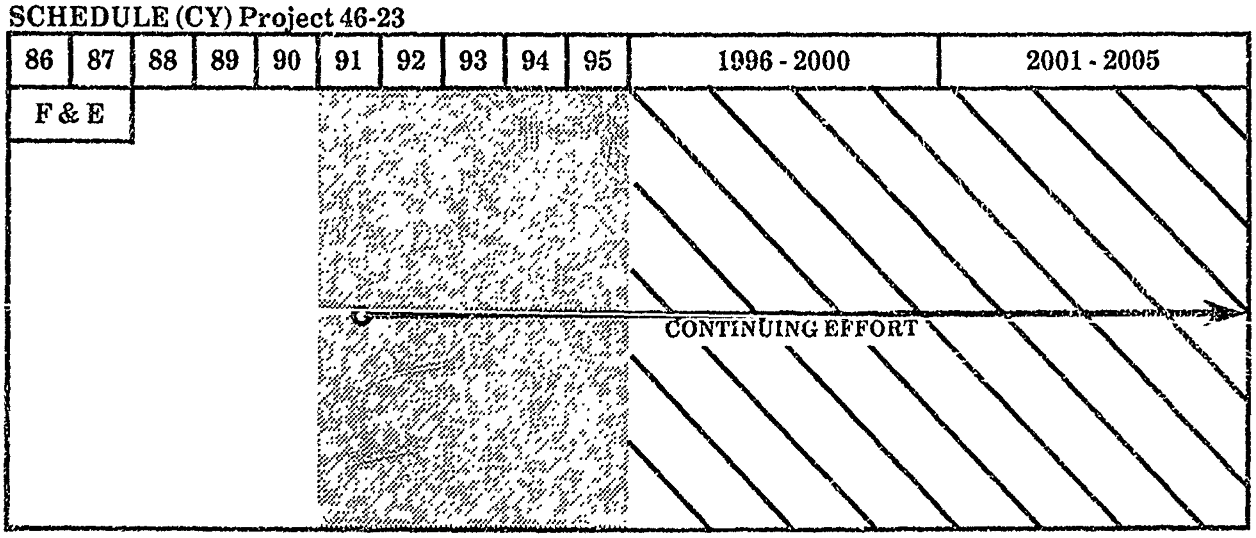
Products: Approximately 80 sites will undergo extensive investigatory work and possible remediation.

Progress/Activity from October 1989 through November 1990:

- A number of sites are either in the preliminary assessment or the site investigation/feasibility/ study stage of remediation. Several sites have begun long-term cleanup measures.

Related Projects/Activities: None.

SCHEDULE (CY) Project 46-23



PROJECT 46-26: Airport Traffic Control Tower (ATCT) Safety Upgrades

Purpose: Upgrade ATC tower facilities to current OSHA life safety standards. Many ATC facilities were designed/constructed before development of current life safety standards. OSHA inspections have resulted in threatened and/or actual facility shutdowns.

Approach: ATC facilities will be surveyed for fire safety deficiencies, asbestos containing materials, and other OSHA safety deficiencies. Qualified, licensed professional services will be used to determine the required corrections to bring the facilities into compliance with safety regulations. Asbestos containing material must be identified and properly treated before the installation of many scheduled ATC tower NAS equipment upgrades. Failure to do so could result in exposing personnel to hazardous conditions.

Products: Approximately 80 percent of the present 438 ATC towers will require some level of effort to correct the fire protection safety deficiencies. Standard ATC towers will be completed by 1991 and nonstandard ATC towers in 1994. A survey for asbestos containing material was initiated in 1990. Survey results will be maintained in a computerized database for inspection requirements and scheduled corrective activities. Where necessary, the asbestos will be removed, encapsulated, or contained.

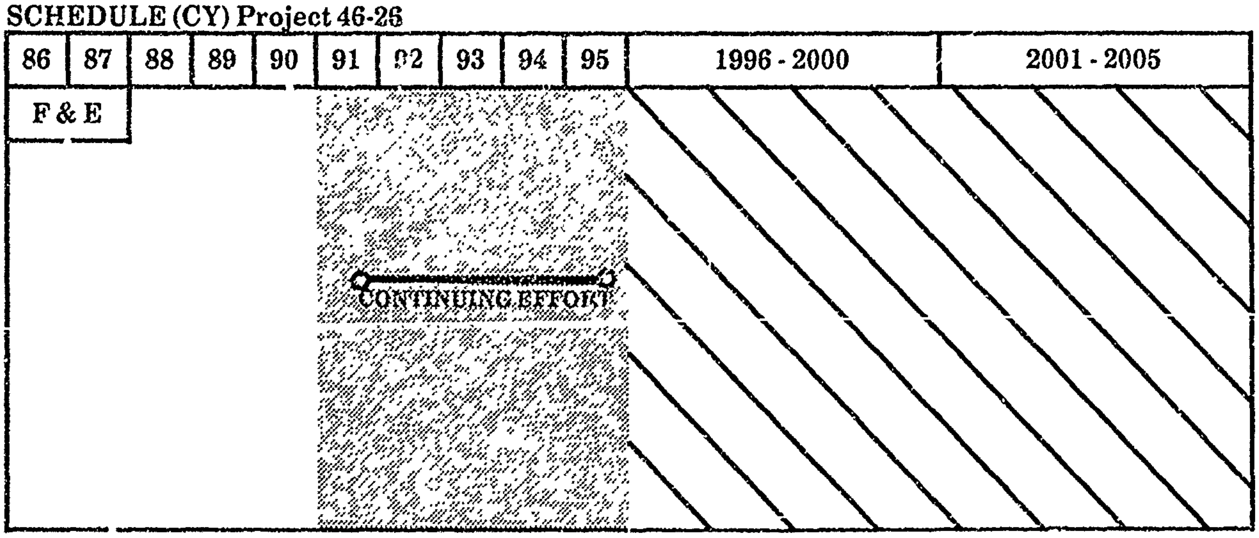
Progress/Activity from October 1989 to November 1990:

- Representative ATC tower surveys for fire safety deficiencies completed.
- Initiation of ATC tower surveys for asbestos containing material.

Related Projects/Activities: 26-16 General Support.

List of Contractors: Multiple construction contracts will be administered by the regions.

SCHEDULE (CY) Project 46-26



PROJECT 46-28: National Airspace System (NAS) Recovery Communications (RCOM)

Purpose: This project supports Executive Orders 12472 and 12656 and National Security Decision Directives 47, 97, 145, 180, 286, and 314. This project ensures that the FAA has the capability to establish minimum essential command and control communication necessary to direct the management, operation, and reconstitution of the National Airspace System (NAS) in support of the FAA/DOT/DOD missions during a national, regional, and/or local emergency in the event the normal common carrier telecommunication/landline connectivity between NAS facilities is interrupted. The project incorporates the necessary combination of redundancy, mobility, connectivity, interoperability, and restorability to obtain survivability of FAA telecommunications during conditions of crisis or national emergency. Interoperability and communications capability with other federal agencies will be increased. The RCOM project will provide essential communications during and after earthquakes, hurricanes, tornadoes, and typhoons. This emergency communication network capability saves flying hours by FAA flight inspection aircraft and other public and private aircraft. The RCOM emergency communication network will also be available for routine purposes on a daily basis for aviation security, accident investigations, and dispatching and redirecting Airway Facilities maintenance technicians and supplies.

Approach: Provide essential FAA communications during any national emergency, including natural disaster, military attack, technological emergency, or other emergency that seriously degrades or threatens the national security of the United States. This will include maintaining the FAA command, control, and communications system, maintaining the electronic tandem network/emergency voice communications system deploying contingency communications support teams and equipment, and maintaining the primary and alternate national and regional Emergency Operating Facilities.

Provide nondevelopmental items to replace existing, unsupportable components of the NARACS, including teletype equipment, system-embedded command and control computers, VHF/FM hand-held transceivers, and selected rotatable log periodic HF antenna.

Provide nondevelopmental items to assure interoperability with other federal agencies, and improve operational efficiency, system reliability, and network service. This will include adding HF spread spectrum communication capability at the National Emergency Operational Facilities (NEOF) and overseas locations, implementing FED-STD-1045 and MIL-STD 188-148 to upgrade network interoperability, and adding uninterruptible power systems (UPS) at existing NARACS HF facilities.

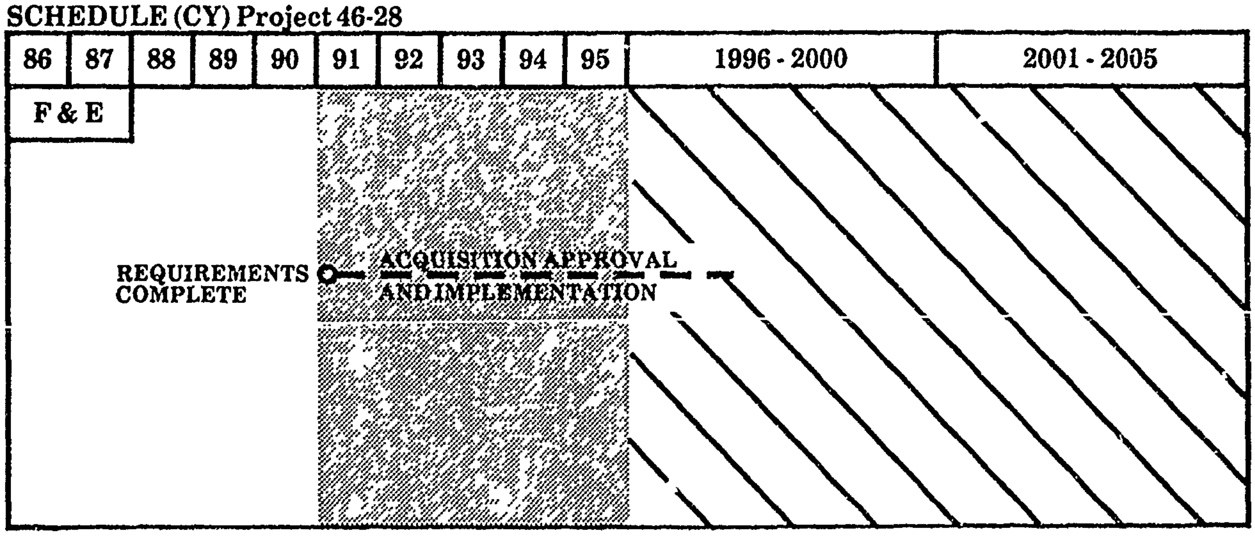
Provide nondevelopment items to extend the HF network and integrate mobile/transportable communications systems. This will include adding HF RCOM facilities, HF/SSB subsystems, acquiring VHF/FM hand-held transceivers, UHF/FM satellite communication subsystems to interface with DOD, and a mobile C3 subsystem at the NEOFs to provide the FAA with a quick reaction capability to disaster sites.

Products: HF spread spectrum communication capability; network interoperability per FED-STD-1045/MIL-STD-188-148; HF RCOM facility; HF/SSB subsystem; VHF/FM hand-held transceiver; UHF/FM satellite subsystem; mobile C3 subsystem; NAILS support items; and the following NARACS components: command and control computer; uninterruptible power supply; teletype; and rotatable log periodic HF antenna.

Related Projects/Activities: 25-02 RML Replacement and Expansion, 26-04 MCC, and 26-15 NAS Spectrum Engineering. Other methods, such as microwave, UHF/VHF, and low power HF will be used where RCL is not available.

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 46-28



PROJECT 46-30: Interim Support Plan (ISP)

Purpose: The ISP will sustain ATC operations until full implementation of the AAS program. The ISP will alleviate system support problems, increase capacity, and provide for near-term expansion of the air traffic system to relieve the increasing demand for aviation services.

Approach: The FAA has defined interim support actions which are consistent with current CIP schedules, require no R&D effort, and can be implemented with maximum use of off-the-shelf devices and existing project contracts. These actions involve hardware replacement (including logistics support), the addition of operating positions at some existing facilities, and software adaptions to expand the capacity of some ARTS systems.

Products:

- 155 128k solid-state replacement memories for ARTS IIIA/EARTS.
- Terminal radar facilities at six qualifying locations.
- Second radars at two facilities.
- Additional ARTS IIA and ARTS IIIA operational and training positions at some facilities.
- Replace/upgrade ARTS IIA/IIIA disk/tape drives.
- 16 uninterruptible power systems for ARTS IIA.
- ICSS emergency bypass for some facilities.
- EARTS provisioning.
- Replacement ceilometers and hygrothermometers.
- 55 capture-effect glide slope antenna conversion kits.
- Solid-state kits for long range radar upgrade.

Progress/Activity from October 1989 through November 1990:

- Accelerated production of solid-state memory; delivery to eight sites completed.
- First disk drive refurbishment test completed.
- Program management plan approved.

Related Projects/Activities: To the extent feasible, products will be procured through related projects and contracts.

List of Contractors:

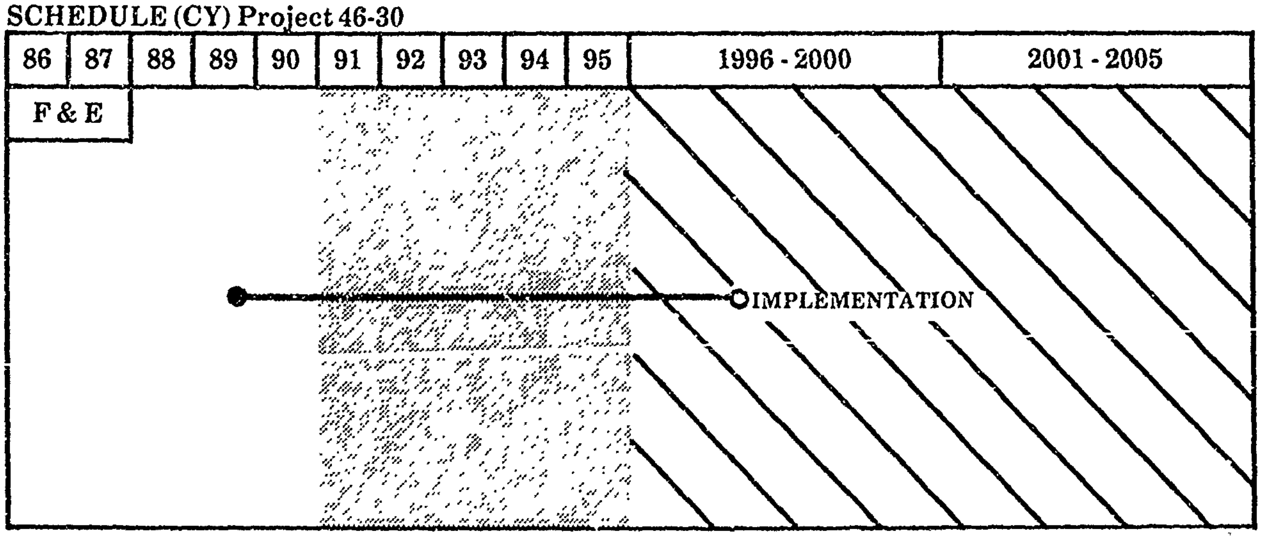
- Exide Electronics
  (16 uninterruptible power systems)
  Raleigh, North Carolina

- Unisys Corporation
  (155 solid-state memories; keyboards; disk drive refurbish)
  St. Paul, Minnesota

  - SSCI
    Tustin, California

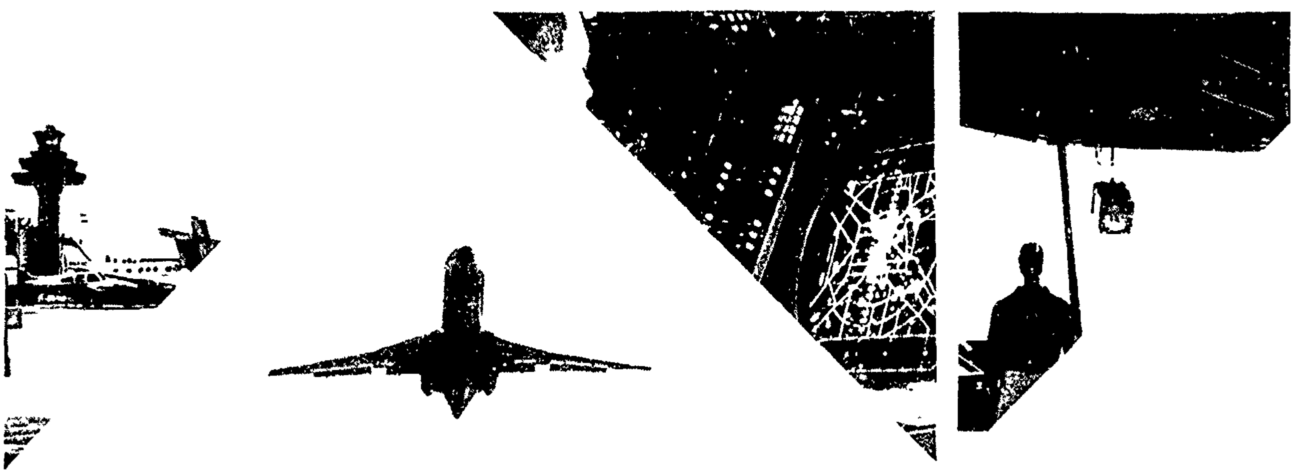
  - Metric, Inc.
    Ft. Walton Beach, Florida

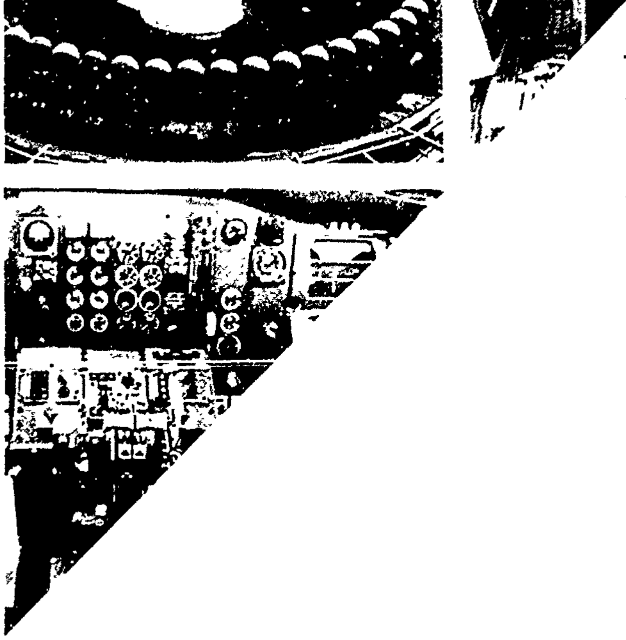
SCHEDULE (CY) Project 46-30



Chapter 5: Supportability

The Supportability chapter describes projects that support logistics, provide for personnel training, and manage the information and human resource aspects of NAS modernization.





Section	Page Numbers
1 - En Route	(5-1-1 thru 5-1-2)
2 - Terminal	(5-2-1 thru 5-2-2)
3 - Flight Service and Weather	(5-3-1 omitted)
4 - Ground-to-Air	(5-4-1 omitted)
5 - Interfacility Communications	(5-5-1 omitted)
6 - Maintenance and Operations	(5-6-1 thru 5-6-40)

CHAPTER 5
SUPPORTABILITY

INTRODUCTION

Supportability encompasses all personnel, systems, equipment, tools, and other resources required to sustain the NAS at a constant state of operational availability.

The projects described in this chapter represent the FAA's assessment of the various improvements required in the area of NAS supportability. This assessment will be revised annually. Planned improvements for each of the seven supportability activity areas are briefly described below. Project descriptions which follow provide more detail concerning today's assessment of the future evolution of NAS supportability.

MAINTENANCE AND OPERATIONS SUPPORT

Maintenance and operations support in the 1990's will be characterized by the completion of many ongoing NAS equipment modernization programs. Many of these replacement systems will contain built-in diagnostics, automated test equipment, and redundancy for "fail-safe" operations. By the end of the decade, all NAS facilities should have remote maintenance monitoring (RMM), and most will support some level of RMM capability. With full implementation of the RMM system, the maintenance work force will be centralized and consolidated to optimize responsiveness.

Environmental projects which reduce energy consumption and improve physical plant and structures will continue, and the Maintenance Management System (MMS) will be fully deployed, giving field technicians access to facility, logistics, and administrative data via portable computer terminals accessible to the Maintenance Processor Subsystem network. As a result of MMS implementation, many paper-based logging, accounting, and other data recording functions will be automated, and routine administrative paperwork will be reduced to a fraction of that existing today.

AIRCRAFT PROGRAM

Flight inspection, training, and related research and development will be significantly changed by new NAS subsystem deployment and by improvements in aircraft and avionics during the 1990's. The age of the current aircraft fleet, combined with the need for sophisticated high-technology aircraft systems, will necessitate replacement of the entire fleet during the coming decade. The result will be a more standardized fleet with fewer aircraft types, allowing improved service at lower overall cost. Standardization will reduce the chance of pilot or aircraft maintenance personnel error through elimination of requirements for multiple aircraft proficiency. It will also reduce parts and equipment inventory as well as training costs for flight and maintenance personnel. New FAA aircraft will be capable of supporting NAS improvement initiatives, provide greatly improved support and performance, and be suitable for adaptation to accommodate new technology.

TECHNICAL SUPPORT/QUALITY ASSURANCE

As the 1990's proceed, Maintenance Control Centers (MCCs) will play an ever-increasing role in NAS quality assurance. MCCs will be established in every sector, and MCC specialists will assume full-time responsibility for NAS performance monitoring, control, and maintenance coordination. The Remote Maintenance Monitoring System will support remote certification of NAS facilities from Maintenance Control Centers or maintenance work centers by personnel possessing appropriate training credentials and authorization.

Implementation of the Aviation Safety Analysis System (ASAS) will provide a cost-effective, fully integrated capability to provide information for identifying potential safety issues. It will also provide timely and accurate information to enhance safety inspection and productivity. It will improve the FAA's capability to respond to safety information requests, and provide decision support data to Agency management and safety inspectors.

LOGISTICS SUPPORT

Logistics support in the 1990's will be impacted by the implementation of information systems. Automated systems for storage, retrieval, and analysis of National Airspace Integrated Logistics Support (NAILS) data will provide FAA managers with tracking and feedback mechanisms for determining whether NAS materiel is conforming to initial specifications. Automated systems will be established to provide logistics support data to program managers throughout the project life cycle, from initial specification to eventual disposal.

HUMAN RESOURCE MANAGEMENT

The primary objective of the Human Resource Management Program is to ensure that adequate personnel with appropriate knowledge, skills, and abilities are present at the right time and at the right locations to support NAS modernization. Additional objectives include developing an integrated HRM strategy which is coordinated across the various segments of the FAA work force, and the development of information to estimate training resource requirements and develop and evaluate alternative training strategies. Other objectives include the identification of funding requirements to support the human resource aspects of the NAS modernization and the development of planning tools to aid FAA mangers in projecting human resource requirements and examining human resource impacts of alternative transition and system design strategies. Finally, the process includes the effective communication of NAS HRM Program information to the field and the receipt of input from the field.

The FAA Human Resource Management Plan will be updated annually during the 1990's in an ongoing effort to provide adequate levels of trained staff in appropriate locations to meet all FAA supportability requirements. This plan will reflect the changing nature of work as NAS modernization continues.

TRAINING

The 1990's will see considerable development of computer based training hardware and software. The FAA Academy infrastructure and capabilities will be expanded to keep pace with the training requirements associated with new systems being deployed during the 1990's. Advanced simulators, new training centers for radar and automation functions, and classroom improvements will be required. Systems for a multimedia curriculum, instructional material preparation and refinement, and more decentralized training resources will also be implemented.

The FAA Center for Management Development (CMD), located in Palm Coast, Florida, will continue to provide centralized resident management training. It will expand to accommodate the developing training delivery technology, including audio conference, audio graphic, and satellite television broadcast with two-way audio and computer graphics.

SYSTEMS RESEARCH AND DEVELOPMENT

The FAA General Support and System Support Laboratories will continue to play a key role in NAS modernization. Throughout the 1990's, research and development activities will be conducted by these laboratories, examining new technological developments as well as conducting subsystem testing and evaluation.

No En Route projects in this chapter.

PROJECT 52-21: ARTS IIIA Peripheral Adapter Module (PAM) Modernization

Purpose: This project will modernize the ARTS IIIA PAM by emulating its functions with state-of-the-art capability to enhance its efficiency and supportability. The current ARTS IIIA PAM is 20-years old and many replacement components are hard to obtain. The PAM interfaces the Integrated Magnetic Tape (IMT), the Teletype Model 40 Teleprinter (TTY), and the Interfacility Communications Adaptor (ICA) with the ARTS IIIA system. The IMT transport has the same supportability problems as the PAM. The IMT is a nonstandard, seven track, 200 Bits per Inch (BPI) unit with mechanical components that can be obtained from only one manufacturer via special order.

Operationally, the peripherals (IMT, TTY, ICA) that interface with the PAM and the ARTS IIIA computer system cannot be automatically switched, have no on-board diagnostic capability, and insufficient Input/Output Processor B (IOPB) interfaces for the the Mode C Intruder configuration.

Approach: The IMT function will be replaced by interface cards that connect into the IOPB on a Personal Computer (PC). The PC contains software that will emulate the IMT function. The back-to-back switching capability currently performed by the PAM Mode Plug will be a switch contained on the IOPB interface card. The disk subsystem backup capability currently performed by the IMT will be handled by the floppy disk capability of the PC.

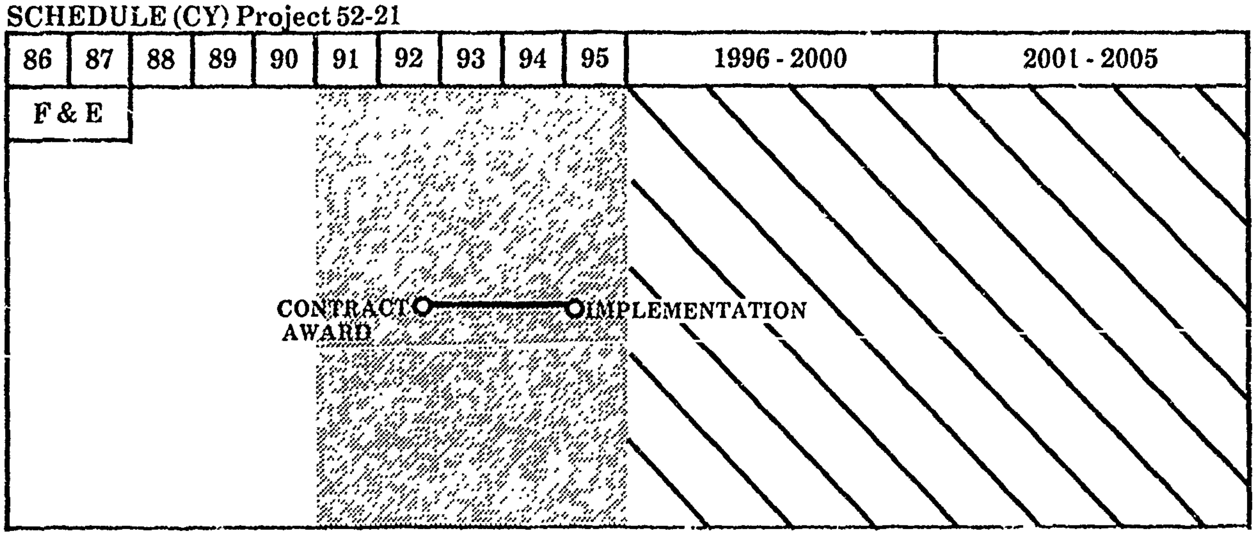
The TTY function will be replaced by interface cards that connect into the IOPB and a PC serial communications port. The PC contains an asynchronous communications software package that emulates the TTY function. The back-to-back switching capability currently performed by the PAM mode plug will be a switch contained on the IOPB interface card. The TTY function PC differs from the IMT function PC.

The ICA function will be replaced by interface cards that will be connected to the IOPB and daisy chained together, then connected into a converter which will be connected to the interfacility modem. The ICA protocol will be emulated in firmware on the card connected into the IOPB. The back-to-back switching capability currently performed by the PAM mode plug will be a switch contained on the IOPB interface card.

Products: One modernized PAM package consisting of the hardware and software required to upgrade the current ARTS IIIA PAM capability. The support software and card reader function will be included with this package.

Related Projects/Activities: 32-20 Expand ARTS IIIA Capacity and Provide MCI Capability.

SCHEDULE (CY) Project 52-21



RESERVED

No Flight Service and Weather projects in this chapter. Page 5 - 3 - 1 omitted

No Ground-to-Air projects in this chapter. Page 5 - 4 - 1 omitted

No Interfacility Communications projects in this chapter. Page 5 - 5 - 1 omitted

Section 3

Section 4

Section 5

Section 6

PROJECT 56-02: Computer Based Instruction (CBI) Expansion

Purpose: This project provides for the expansion and upgrade of the present CBI training capab' for technical employees in the following areas: Traffic (AT), Airway Facilities (AF), Fl Standards (FS), Aircraft Certification, and Security and Aviation Safety. The CBI expansion project allows flexibility in conducting a program of individually prescribed proficiency training in the field.

Approach: Present equipment will be replaced at AF and AT training offices, regions, centers, and the FAA Academy to handle training programs and to conduct technical training for new requirements. Learning centers are being considered for AT and AF field locations which have a substantial requirement for high-volume AAS transition training. The CBI expansion project will provide CBI resources for software compatibility and maximum administrative and operational efficiency.

A centralized system has been established to ensure that equipment procured for CBI will effectively meet increased training needs. CBI capability will be used to support student management, testing, evaluation, content updates, and record keeping. Currently, CBI learning stations interface with a mainframe computer at the FAA Academy in Oklahoma City. This mainframe support is leased on an interagency agreement among the Army, FAA, and the Air Force, and is one of five systems linked nationally to share courseware and technical resources. A move toward the use of networked computer systems will occur in the next decade. Dependency on mainframe computers will decrease. The networked systems will allow transfer of CBI courseware, thereby increasing the available storage of existing mainframes for training management data, records, and reports.

Replacement: The Vikings and IST II computers currently used in the field and at the FAA Academy for CBI training will be phased out in 1990 and 1991. New replacement computers will have advanced technology capabilities, such as expert systems, Compact Disk Read Only Memory (CD ROM), video disc, and digital audio. New hardware will accommodate the present CBI curriculum until the new courses for the AAS equipment have been designed and developed.

It is anticipated that CBI learning stations will be upgraded/replaced on a recurring basis.

Products:

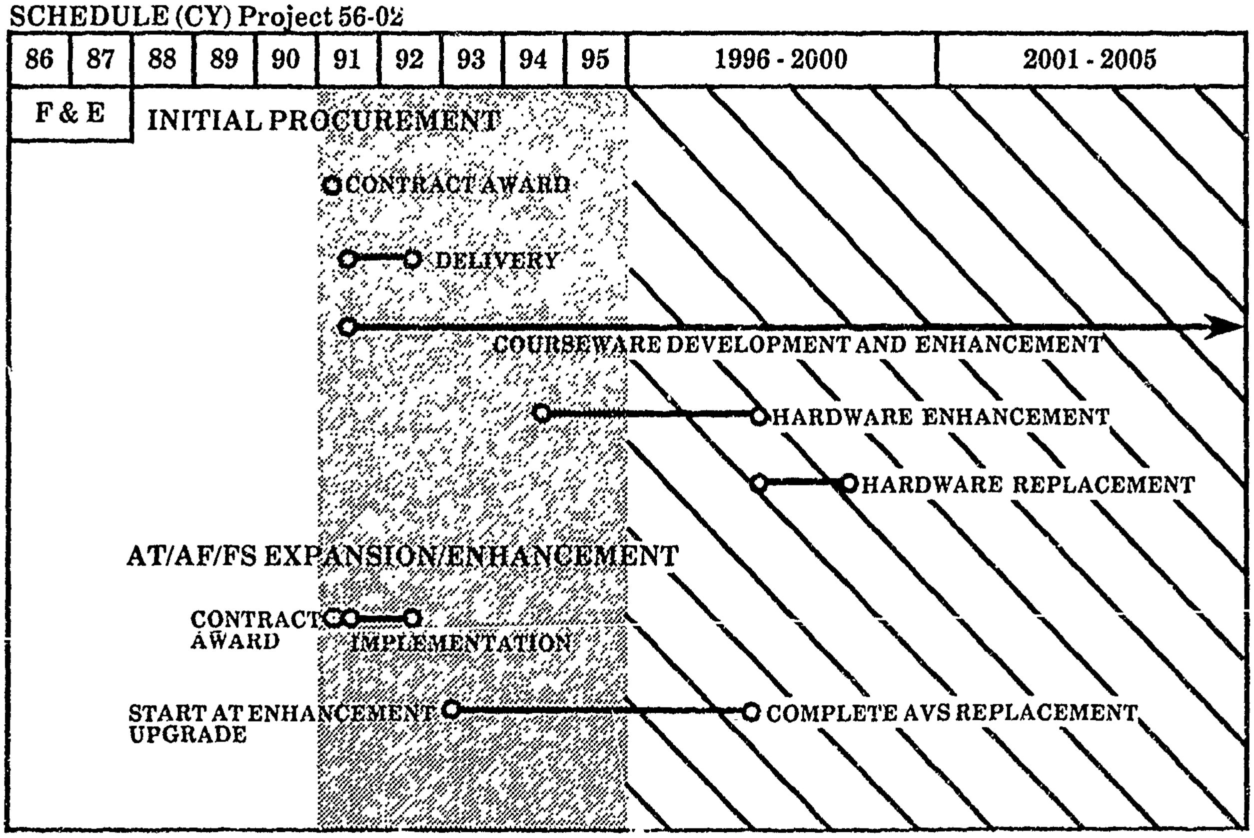
- Under the Office Automation Technology and Services (OATS) contract, CBI equipment contains video disc, CD ROM, digital audio, color monitors, and new interface capabilities.
- One refresher training course for AF has been developed for use on the new equipment. This course, employing the touch screen and video disk, simulates maintenance and trouble-shooting problems for training.
- Design and development of additional courses on the full feature computer equipment are underway.
- New equipment includes software authoring systems that enhance course development and reduce programming time.

Progress/Activity from October 1989 through November 1990:

- Computer hardware was delivered to the field. An implementation plan for distribution of the CBI equipment to field locations is ready for OATS.
- CBI courseware standards are being developed to cover the advanced technological features of the new computer learning stations. These standards will be used to ensure the quality of newly developed CBI courses for AAS.

Related Projects/Activities: 26-02 CBI and 56-56 NASMAP.

SCHEDULE (CY) Project 56-02



PROJECT 56-11: Aircraft Fleet Modernization

Purpose: This project will acquire modern replacement aircraft to overcome the shortcomings associated with the increasing age of the FAA fleet, the inefficiency of operating a fleet of multiple aircraft types, and the limitations of the current fleet to meet mission requirements.

Approach: Initiatives have been developed which will respond to the obsolescent fleet. The priorities are:

- To provide adequate training support for the projected increase in hiring of aviation safety inspectors. This will assure adequate resources to meet the recurrent training and currency/proficiency needs of the Aircraft Safety Inspector work force.
- To replace aircraft with insufficient range and capability to meet the needs of the international flight inspection mission.
- To replace antiquated R&D aircraft that are not comparable with today's state-of-the-art technology.
- To replace domestic flight inspection aircraft that are obsolete and out of production, making it difficult to standardize the fleet and to acquire replacement parts.
- To replace outmoded, aging multipurpose aircraft.

Products:

Flight Inspection Program

- International flight inspection aircraft.
- Multi-purpose aircraft.
- Domestic flight inspection aircraft.

Research and Development Program

- Transport category aircraft.
- Light twin-turboprop aircraft.
- Helicopter.
- Turbojet aircraft.
- Tilt-rotor aircraft.

Training Program

- Turbojet aircraft.
- Turboprop aircraft.
- Transport category jet.

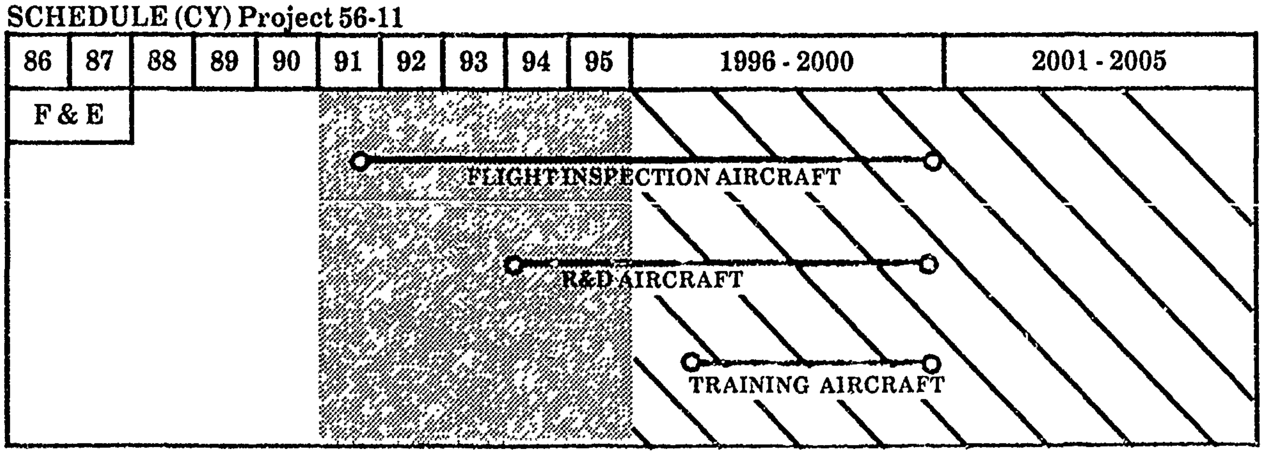
Progress/Activity from October 1989 through November 1990:

- The FAA Aircraft Program Strategic Plan was finalized internally.

Related Projects/Activities: 26-12 Aircraft and Related Equipment, 56-12 Aircraft and Related Equipment Program, Aircraft Flight Simulators.

SCHEDULE UNDER REVIEW

SCHEDULE (CY) Project 56-11



PROJECT 56-12: Aircraft and Related Equipment Program

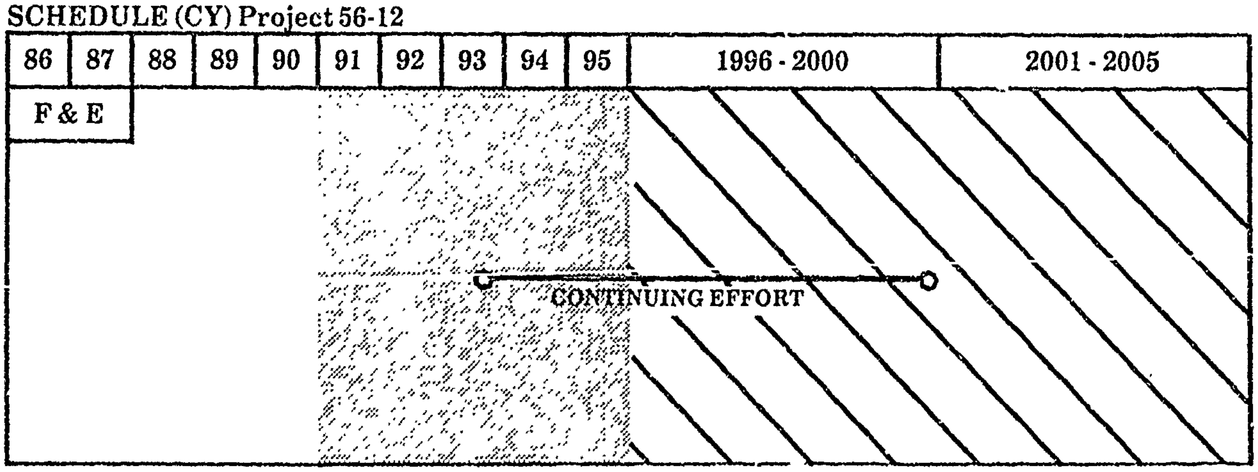
Purpose: Provide technological upgrades to the Agency fleet of aircraft to ensure continued support of the R&D, training, flight inspection, evaluation, currency, and transportation flight programs. These upgrades include equipment requirements to support NAS initiatives in the areas of LORAN-C, MLS, Mode S, TCAS, GPS, etc., as well as replacement of obsolescent equipment and installations required by changing regulations such as Cockpit Voice Recorder (CVR), Flight Data Recorders (FDR), and Ground Proximity Warning System (GPWS).

Approach: Initiatives have been developed which consider all requirements affecting the capability to provide fleet support. The continuation of enhancements and upgrades to the fleet includes procuring and installing LORAN-C, MLS, Mode S, TCAS II, GPS, flight management systems, electronic flight instrumentation systems, precision distance measuring equipment, cockpit voice recorders, flight data recorders, and replacement of obsolescent avionics. The aircraft management information system will be upgraded to effectively monitor the changing fleet configuration and status, and maintain an accurate database of changing facilities (e.g., MLS, LORAN-C).

Products: A technologically updated aircraft fleet that is capable of meeting Agency demands for flight program requirements in the areas of flight inspection, research and development, mission support, and training.

Related Projects/Activities: 56-11 Aircraft Fleet Modernization.

SCHEDULE (CY) Project 56-12



PROJECT 56-13: Aircraft Flight Simulators

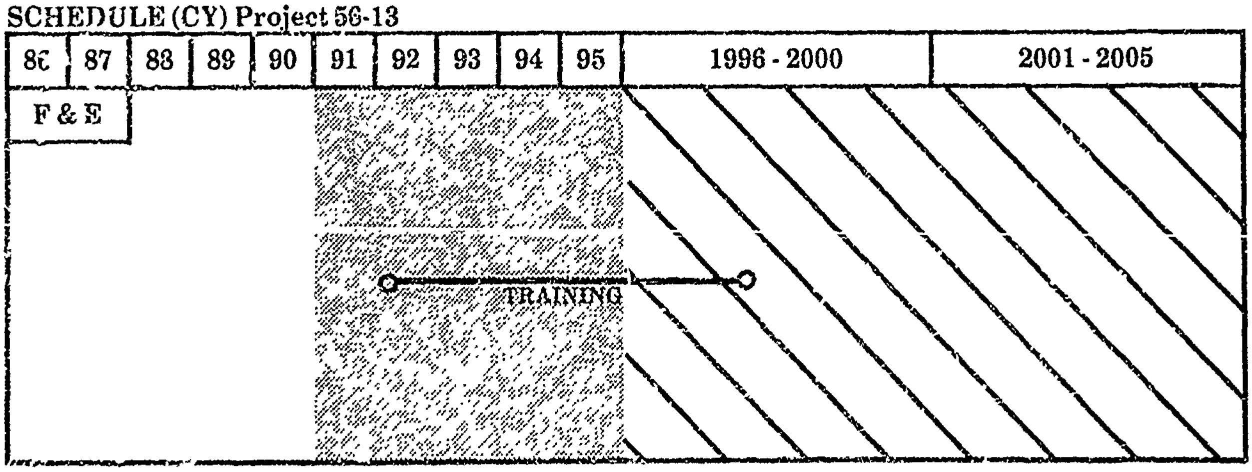
Purpose: To provide cost-effective, high quality training to FAA flight crew personnel in an environment where all operating procedures can be taught safely without regard for aircraft shortages, aircraft operating expenses, the ability to obtain training contracts or the weather. These simulators will allow training of aircraft safety inspectors, aircraft inspector pilots, test pilots in both phase II turboprop and phase II air carrier flight operations and procedures.

Approach: The FAA Academy has a plan to acquire two flight simulators reflecting modern technology for general aviation and air carrier aircraft. This plan includes the acquisition of smaller equipment purchases to complement the simulators. Simulators purchased for the Academy will incorporate the latest in civil aircraft cockpit and systems technology. These simulators support training programs for FAA aviation safety inspection, aircraft certification, airworthiness, and flight inspection personnel.

Products: One general aviation simulator and one air transport simulator.

Related Projects/Activities: 56-11 Aircraft Fleet Modernization.

SCHEDULE (CY) Project 56-13



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PROJECT 56-15: NAS Spectrum Engineering Sustained Support

Purpose: This project will provide spectrum engineering and frequency management support for programs and facilities that are being implemented under the CIP. Effective management of the radio spectrum, including Electromagnetic Compatibility (EMC), is vital to the continued operation of the NAS during facility relocation or replacement.

Approach: Assign frequencies to ensure interference-free operation of the NAS. This effort involves EMC analysis, formal spectrum certification required by the National Telecommunications and Information Administration (NTIA), national and international frequency coordinations, and radio propagation studies.

This support will obtain and protect necessary frequencies for relocated or replaced NAS facilities through automated computer techniques. Radio Frequency Interference (RFI) problems will be investigated and resolved. High-power AM, FM, and TV stations are serious interference sources to both ground and airborne equipment. Resolution and prevention of this type of interference involves close coordination with the broadcasting industry, Federal Communication Commission (FCC), and the International Civil Aviation Organization (ICAO). This project will provide:

- Facility coverage charts necessary for proper engineering of frequencies for relocated or replaced communications, navigation, and surveillance facilities.
- A source of F&E funding for frequency retrofit of existing equipment replaced or relocated under the CIP.
- U.S. telecommunications support to international civil aviation as required in the CIP. This involves extensive international coordination on aeronautical mobile and fixed services High Frequency (HF), Aeronautical Fixed Telecommunication Network (AFTN), world area forecast system, etc.

Products:

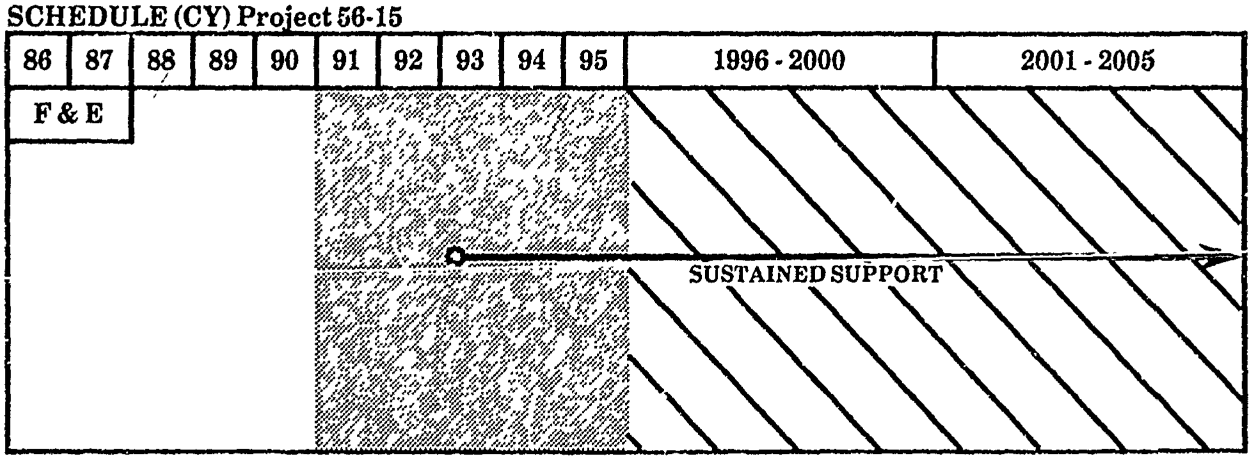
- Frequency plans in support of the CIP include MLS, high-altitude EFAS, 25-kHz air-ground communications, Radio Communications Link (RCL), National Radio Communications System (NARACS), and Next Generation Weather Radar (NEXRAD).
- EMC guidelines for facility consolidation.
- Frequency authorization and formal spectrum approval from the NTIA.
- Facility coverage charts.
- Spectrum engineering studies in support of the CIP. These studies include frequency engineering models, RFI suppression devices, investigation of state-of-the-art technology and procedures for RFI elimination, AM/FM/TV interference evaluation, etc.

Progress/Activity from October 1 through November 1990:

- Completion of frequency engineering and assignments for RCL backbone.
- Continuing frequency model conversion/development.
- Continuing to provide facility coverage charts.
- Spectrum engineering studies.
- Continuing frequency plans development.
- Continuing frequency authorization and formal spectrum approval.
- Continuing EMC guidelines research and development.

Related Projects/Activities: Spectrum engineering facilities and activities at the FAA Technical Center provide the test bed and EMC analysis necessary to accomplish the spectrum management function. 26-15 NAS Spectrum Engineering.

SCHEDULE (CY) Project 56-15



PROJECT 56-17: System Support Laboratory Sustained Support

Purpose: This project provides facilities and equipment at the FAA Technical Center (FAATC) for test, evaluation, and integration of new systems. To support the FAA test and evaluation policy, the System Support Laboratory will duplicate future systems, equipment, and interfaces necessary to establish realistic environments for all types of developmental, operational, and production acceptance testing. The testing will ensure that total system requirements are met prior to installation at field facilities. Upon completion of testing, systems will be integrated into the laboratory for direct field support, development and testing of hardware, software, and firmware modifications, and development of system enhancements.

Approach: Upgrade the System Support Laboratory which is partitioned into six support complexes:

- En route systems.
- Terminal systems.
- Flight service and weather systems.
- Ground-to-air systems.
- Interfacility communications systems.
- Maintenance and operations support systems.

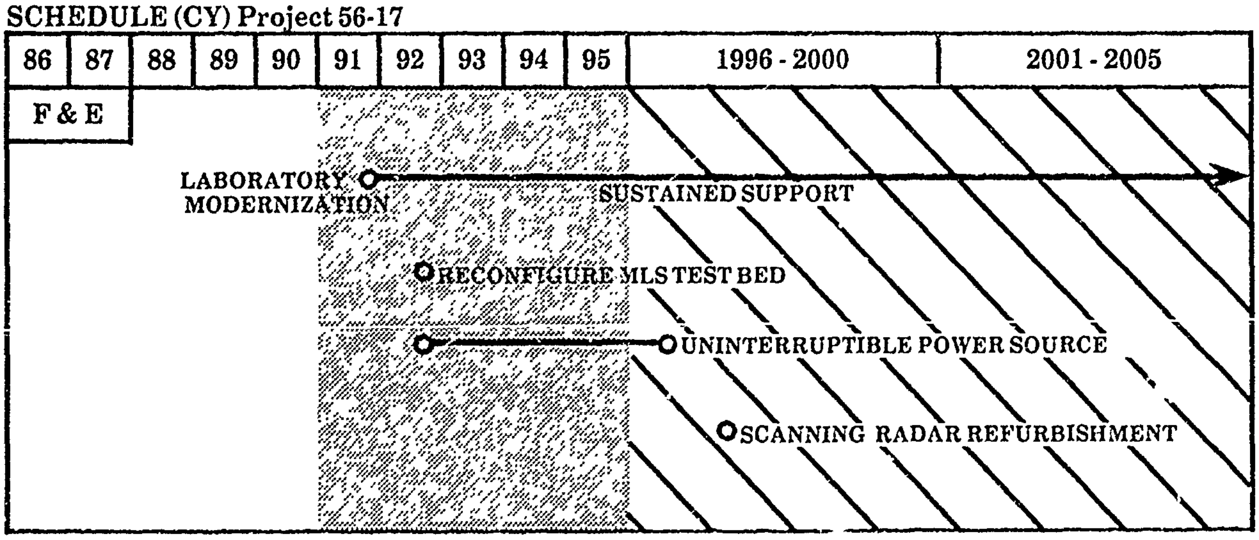
An FAATC transition plan is updated periodically. The plan is consistent with the master transition plan and the master schedule. It identifies space requirements, installation plans, and evolutionary changes that ensure the integrity of the configurations in the System Support Laboratory. System interdependency and the switching capabilities of system configurations are also defined in the transition plan.

Products: System Support Laboratory improvements to the following:

- NAS laboratory modernization.
- MLS test bed reconfiguration.
- Uninterruptible power source installation.
- Scanning radar refurbishment.

Related Projects/Activities: 26-17 System Support Laboratory.

SCHEDULE (CY) Project 56-17



PROJECT 56-18: General Support Laboratory Sustained Support

Purpose: To provide facilities, equipment, aircraft, general computer systems, and necessary enhancements, modifications, or replacements to support the engineering, development, and testing programs assigned to the Technical Center.

Approach: The General Support Laboratory is partitioned into distinct complexes where resources are shared by systems and projects. The support systems and projects for the complexes are involved with design, research, development, and test and evaluation of advanced concepts, procedures, and systems that are being considered for introduction into the NAS. The complexes provide:

- Airborne support.
- Simulation support.
- Test and evaluation support.
- General purpose data processing support.

Airborne support includes both fixed-wing aircraft and helicopters which are instrumented to provide flight data for projects.

Simulation support is provided for system tests that require both real-time and fast-time simulation of present and future air space environments. The target generation facility replaces the existing NAS simulation support facility to continue providing this function.

Test and evaluation support is provi[illegible] to both F&E and R,E,&D projects requiring facilities of the General Support Laboratory.

The General Purpose Data Center supports computational models as well as reduction and analysis of data obtained in tests and research.

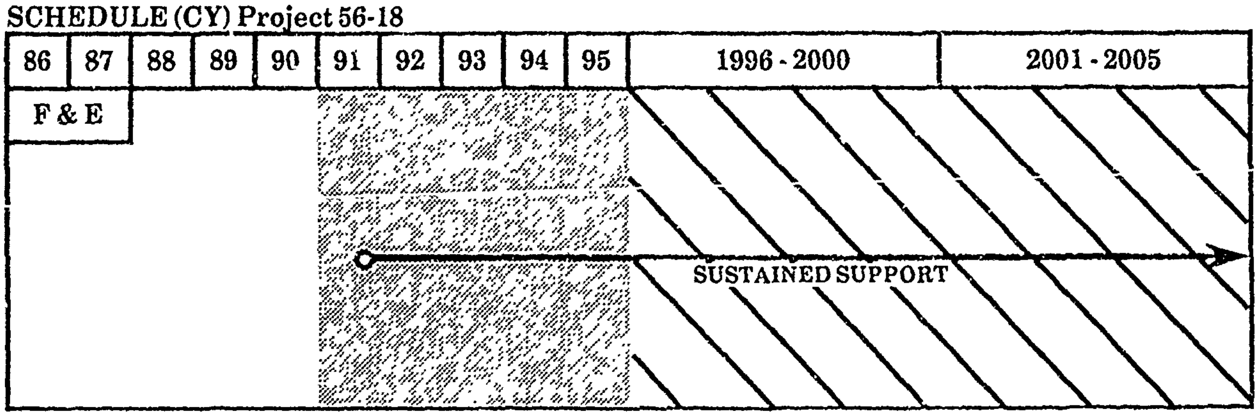
Plans are being developed to upgrade specific complexes within the General Support Laboratory. The plans will be responsive to the requirements of the CIP and the R,E,&D Plan.

Products: Items under consideration include:

- Turbine rotor burst test facility.
- Establishment of R&D laboratory.
- Special component evaluation facility.
- Communication system modernization.
- Precision automatic tracking system.
- Nondestructive evaluation laboratory.
- Fuel release characteristic test unit.
- Fuel research facility.
- Structures research facility.
- General Purpose Data Center (Honeywell 66/60) replacement.
- Propulsion research facility.
- Flight safety research facility.
- Multiple-object tracking radar (MOTR).
- Aircraft simulator facility.
- Flight test monitor facility.
- Central test range facility.
- Flight simulation visual enhancement.
- Advanced aircraft system evaluation facility.
- Tilt rotor power plant test unit.
- National target simulation facility.
- Provision of an antenna test range.
- General purpose display/collection system for aircraft.
- Replacement of fixed track radar/MOTR.
- Add six degrees of freedom to the visual flight simulator.
- Scanning radar/range target location.

Related Projects/Activities: Many of the major CIP projects.

SCHEDULE (CY) Project 56-18



PROJECT 56-19: FAA Technical Center Building and Plant Support

Purpose: To provide funds for the FAA Technical Center building lease and for the improvement, rehabilitation, or replacement of plant equipment supporting assigned programs but not funded by individual programs.

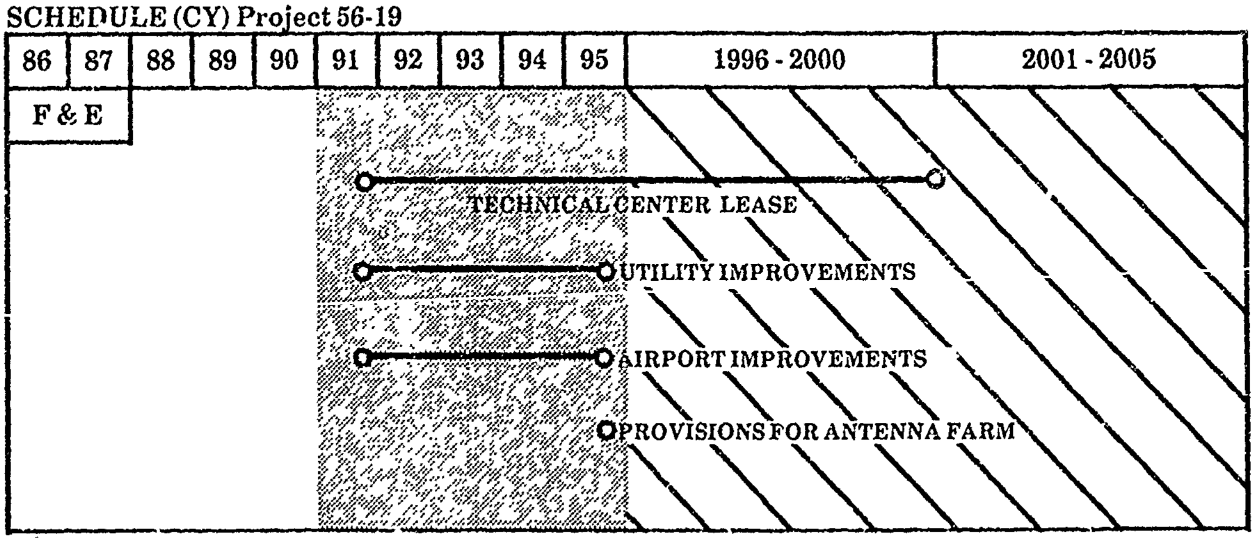
Approach: The FAATC erected a new building in 1980 to accommodate the technical and administrative complex. Most of the utilities (power, heating, and cooling) supporting the new building and airfield facilities were installed prior to 1970. These utilities require rehabilitation and in some cases, complete replacement.

Products: Items under consideration include:

- The utility improvement activity includes numerous items including replacement of chiller and boiler units. These units are 20-years old and fail frequently, most often during maximum need, such as extremely hot and humid conditions. The downtime is costly as important testing must frequently be delayed.
- Airport improvements are scheduled to refurbish the runway and taxiway. Taxiway "F" had to be closed due to deterioration of its surface. Refurbishment will eliminate the need to completely replace the deteriorating asphalt and concrete.
- A more detailed description of the activities associated with this project are available in the Development Test and Evaluation (DT&E) master planning document available at the FAATC.

Related Projects/Activities: This project supports all CIP projects assigned to the FAA Technical Center.

SCHEDULE (CY) Project 56-19



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PROJECT 56-22: Human Resource Management

Purpose: This project develops and implements a long-range FAA plan for managing the human resource aspects of the NAS modernization.

The major objective of the Human Resource Management (HRM) Plan is to establish an orderly process for effectively managing such issues as staffing, training, and relocating people so that CIP technology can be used effectively as it is delivered. The plan will be based on the principle that the FAA's goals for operational effectiveness, high levels of productivity, quality service, and a positive organizational culture can best be achieved by carefully considering and managing the transition of its people.

Approach: The plan will be updated annually to integrate new or modified requirements. The update process will ensure the full support and accountability of all affected organizations in the implementation of the NAS transition.

The first iteration of the HRM Plan will affect the Airway Facilities, Air Traffic, FAA Academy, FAA Logistics Center, and FAA Technical Center work forces. As the planning process matures, the HRM Plan will expand to include all affected employees and more precise projections over longer time frames.

The plan is being developed through a coordinated process between the Air Traffic, Airway Facilities, CIP development, FAA Technical Centers, FAA Aeronautical Center, and HRM organizations. Each organization will be responsible for production of the portion of the plan that addresses their operations, policies, and human resources. The HRM organization will establish and assure standardization to achieve a cohesive approach. An oversight committee will guide the process. This annual HRM Plan will present a current consensus on the transition strategy for addressing HRM issues. This project uses a three-phase approach:

In Phase 1, an action plan was developed to complete the first iteration of the HRM Plan. The action plan:

- Established the administrative processes and systems for management of the human resource planning efforts.
- Defined planning criteria and guidelines.
- Specified types of analyses that will form the basis of the plan.
- Defined specific methodologies and tools to be used for development of plans to ensure consistency of planning objectives and outcomes.
- Established schedules and assigned responsibilities for accomplishment of required actions.
- Detailed funding and other resource requirements and sources to support the planning process.

Phase 2 will develop the HRM Plan. Phase 3 will implement the plan developed in Phase 2.

The HRM Plan will address:

- Projected changes to operational procedures and policies resulting from new technology.
- Projections of work and the structure of jobs at significant points.
- Staffing plans based on projections of the number of people and the skill requirements necessary to operate, staff, and maintain the NAS during transition. These projections will take into account forecasted attrition, developmental pipelines, training time required for full performance-level employees, periods of switch-over from one system to another, and facility consolidation procedures.
- Training requirements (including types of courses and numbers of participants) based on projections of training needed to assure that adequate skills are acquired and maintained for a smooth transition. These projections will take into account full life-cycle training for maintenance and operation of the modernized system. They will include training in the technical, program management, supervisory, and managerial areas.

- Planning for other key work force issues including impacts of facility consolidations and the relocation of people. Strategies for taking into account the employees' personal needs and goals in the relocation process will be outlined. Standards for dealing with these employee concerns will be developed to guide regional planning.

- A communications strategy which will inform involved employees, employee groups, and labor organizations of transition actions.

The HRM Plan is being developed with the support of, and in coordination with, all operating elements of FAA Headquarters, regions, centers, employee participation groups, and labor organizations representing affected employees.

A contractor is developing and will update the plan for the FAA.

Products: Human Resource Management Plan.

Progress/Activity from October 1989 through November 1990:

- Alternative future scenarios approved for planning targets.

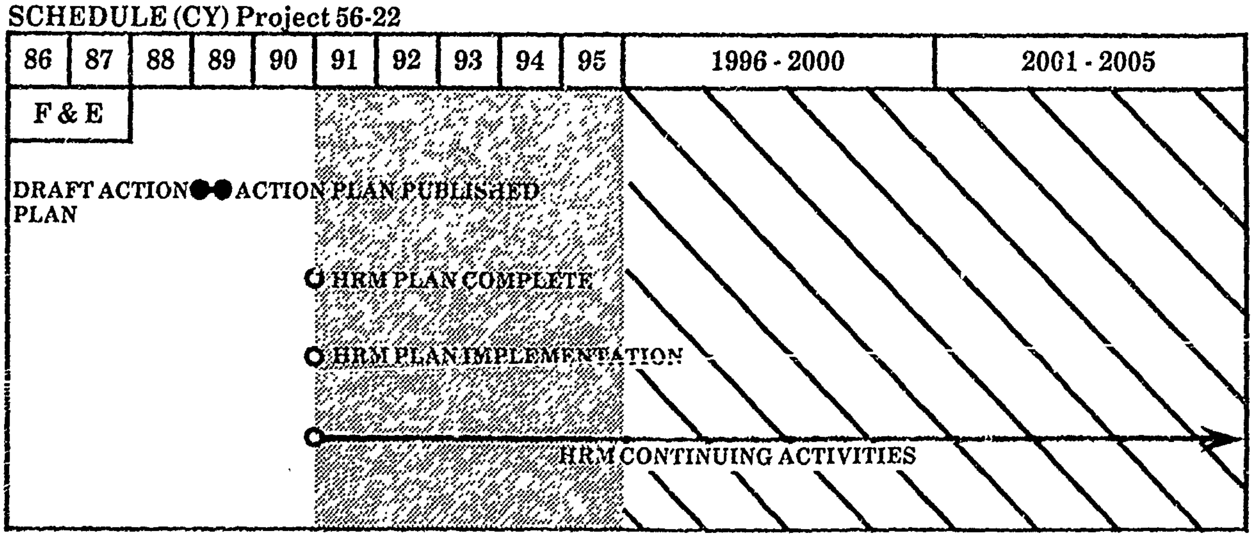
- Completed initial prototype models for estimating training resource requirements and pipeline analysis.

Related Projects/Activities: This project supports ongoing F&E and operations activities.

List of Contractors:

- Fu Associates, Ltd.
  (HRM plan support)
  Arlington, Virginia

SCHEDULE (CY) Project 56-22



PROJECT 56-23: Instrument Approach Procedures Automation (IAPA)

Purpose: Provide procedures specialists with an automated tool to develop, store, and transmit Standard Instrument Approach Procedures (SIAPs). This results in faster SIAP development (25 to 50% reduction in time to develop a SIAP) with less errors, greater accuracy, and increased standardization.

Approach: This project will replace the obsolete system of SIAP development. The new system will meet the requirements for procedures development using standardized databases which incorporate Terminal Instrument Procedures (TERPS), geodetic calculations, math functions, and graphic display generators. This technology will ensure standardized procedures development and decreased response time during a period of increasing requirements. The automated workstations developed for this project will consist of graphic workstations, map modeling software, terrain modeling software, specialized printers, and local area networks.

Products: The improved procedures development process will provide:

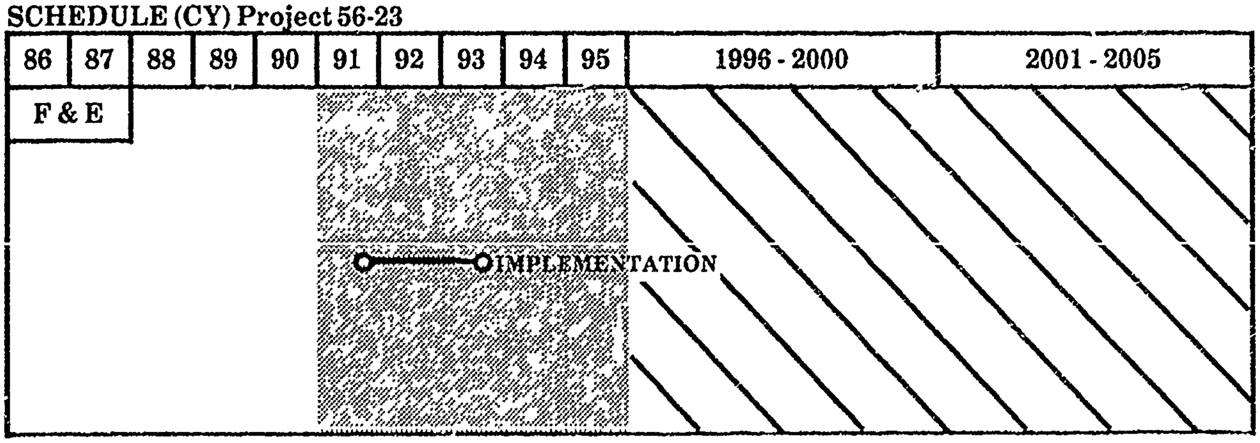
- Standardized development of instrument flight procedures including takeoff minimums/ instrument departure procedures, en route (airways) procedures, fixes and holding development and documentation, and instrument approach procedures.
- A capability for electronically transmitting instrument procedures data.
- A mechanism for storing completed instrument procedures with a capability for automatic data retrieval and display.
- Regional flight procedures branches with full hardware and software capabilities of the IAPA system, thereby maximizing regional resources.
- Intra/interservice interface capabilities in support of regional organization projects, ensuring availability of a common database for instrument flight procedures activities.

Progress/Activity from October 1989 through November 1990:

- Evaluation of prototype system in progress.

Related Projects/Activities: The transition of the components which require procedures development processes (e.g., ILS, MLS, GPS, LORAN-C, etc.) are directly dependent on the successful implementation of the automated procedures developmental process.

SCHEDULE (CY) Project 56-23



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PROJECT 56-24: Airmen and Aircraft Registry Modernization

Purpose: To modernize the airmen certification and aircraft registration systems to support changes mandated by the Anti-Drug Abuse Act of 1988, support the operational needs of the Airmen and Aircraft Registry Division, and provide better service to law enforcement agencies and the aviation community.

Approach: The 1988 FAA Drug Enforcement Assistance Act mandated a number of basic record keeping, procedural, and communications changes in the registry. Upgrades of basic document recording, storing, and retrieval are to be accomplished along with faster and better interagency communication of data on airmen and aircraft. The modernization of the registry will provide the capability to address the following:

- Registration of aircraft to fictitious people.
- The use of a post office box or mail drop as a return address by people registering an aircraft or applying for an airmen certificate for the purpose of evading identification.
- The registration of aircraft to corporations and other entities to facilitate unlawful activities.
- The illegal use of "reserved" registration marking on aircraft.
- The lack of a system to assure timely and adequate notice of the transfer of ownership of aircraft.
- The practice of allowing temporary operation and navigation of aircraft without issuance of a certificate of registration.
- Use of false or nonexistent addresses by people registering aircraft.
- Submission of names of individuals which are not identifiable on applications for registration of aircraft.
- The use of fictitious names and addresses or fraudulent or stolen identification by applicants for airmen certificates.
- The use of counterfeit and stolen airmen certificates by pilots.
- The absence of information concerning physical characteristics of holders of airmen certificates.
- Ability to make frequent legal changes in the registration markings which are assigned to aircraft.
- Use of false registration markings on aircraft.
- The large number of aircraft which are classified as being in "sale-reported" status.

The implementation of these precepts will require the purchase and installation of new equipment. The Airmen and Aircraft Registry is using a mix of old and new technologies. Although many records can be accessed by computer, the accuracy of the information, its completeness, and the ability to retrieve historical supporting data will require new automation equipment and document storage facilities.

To accomplish this task, the FAA will procure optical disk systems and document production equipment which will support the following functions:

- Periodic renewal of aircraft registrations and airmen certificates.
- A photograph will be included on a new airmen certificate with features making it less prone to forgery and photographic documentation to validate applicants for aircraft registration.
- Aircraft registration and airmen certificates will be machine readable by the U.S. Customs Service.
- Verification of original registration applications by an FAA office authorized to perform this function when immediate flight authority is required.

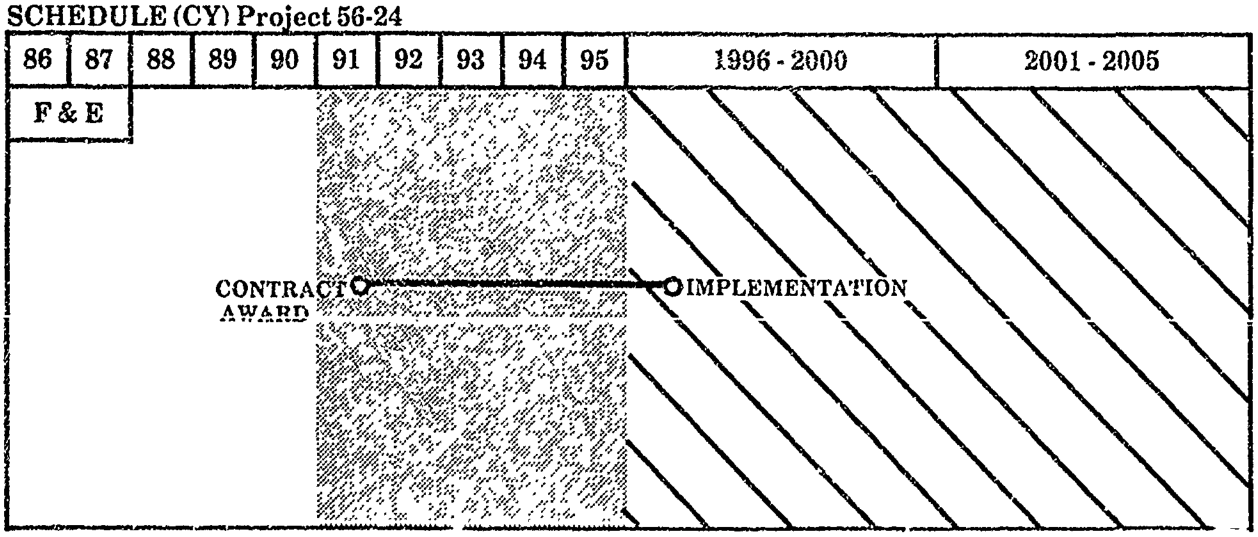
Products: The enhanced registry system will function in accordance with the congressional mandates included in the 1988 FAA Drug Enforcement Assistance Act. The improved systems for registering aircraft, certificating pilots, processing major aircraft repair and alteration forms, and the increased enforcement of requirements will benefit all users (including law enforcement officials) and the general public.

Progress/Activity from October 1989 through November 1990:

- Requirements defined.
- Delegation of Procurement Authority from GSA requested.
- Program plan developed.

Related Projects/Activities: None.

SCHEDULE (CY) Project 56-24



PROJECT 56-25: Computer Aided Engineering Graphics (CAEG) Enhancement

Purpose: To provide additional automated graphic workstations to regions, ARTCCs, FAATC, and FAAAC. These workstations will facilitate installation planning, air traffic sector design, and transition planning.

Approach: A considerable portion of CIP implementation is being done at all ARTCCs, FAA Headquarters, FAAAC, and FAATC. Efforts at the ARTCCs include developing the equipment installation plan, converting maps into digital format so data can be accepted by the new system, and air traffic sector design and modifications. Efforts at FAA Headquarters include developing the facility master plan to track projects added to each facility and the analysis of each facility's capacity for future growth. Efforts at FAAAC included developing an information model for the FAA Academy to meet future training requirements of CIP projects and streamline procedures in the FAA Logistic Support Center. Efforts also include developing three-dimensional computer models of new and modified FAA facilities to facilitate transition planning and simulate test scenarios.

Providing CAEG equipment to the above sites will enhance the FAA rapid prototyping capabilities. Linking these facilities with standard communication links already in place will shorten the time needed for approval of any plan modifications and aid in accelerating the implementation of the CIP.

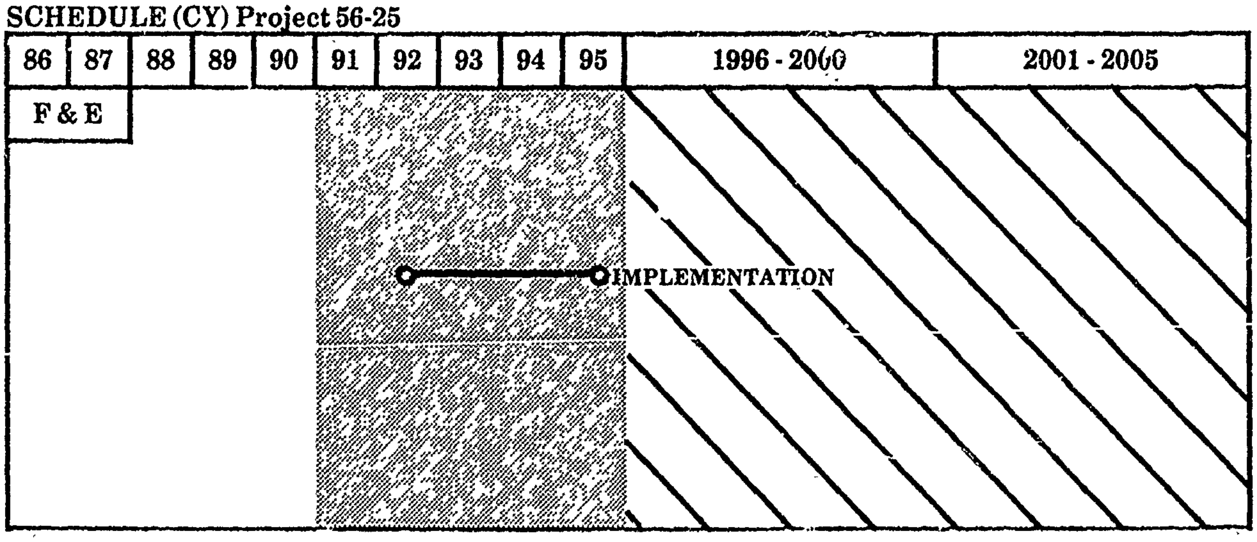
Products: Each of the aforementioned sites will receive one or more CAEG workstations with software and training.

Progress/Activity from October 1989 through November 1990:

- Completed four contract modifications.
- Initiated work on contract modification 9. Completion of modification 9 combined with funding approval will permit implementation of this enhancement.

Related Projects/Activities: 56-56 NASMAP.

SCHEDULE (CY) Project 56-25



PROJECT 56-26: Frequency Interference Support/Resolution

Purpose: This project will provide the sectors with the resources required to independently identify the source of interference problems in a timely manner. With this increased sector-level capability in place, interference problems will be avoided or eliminated in a more efficient manner, reducing the potential for air traffic delays.

Frequency congestion is a growing problem, particularly in areas surrounding major airports. This situation has developed as a result of increased frequency assignments necessitated by the increase in communication and navigational aids required to ensure safe and efficient flow of aircraft.

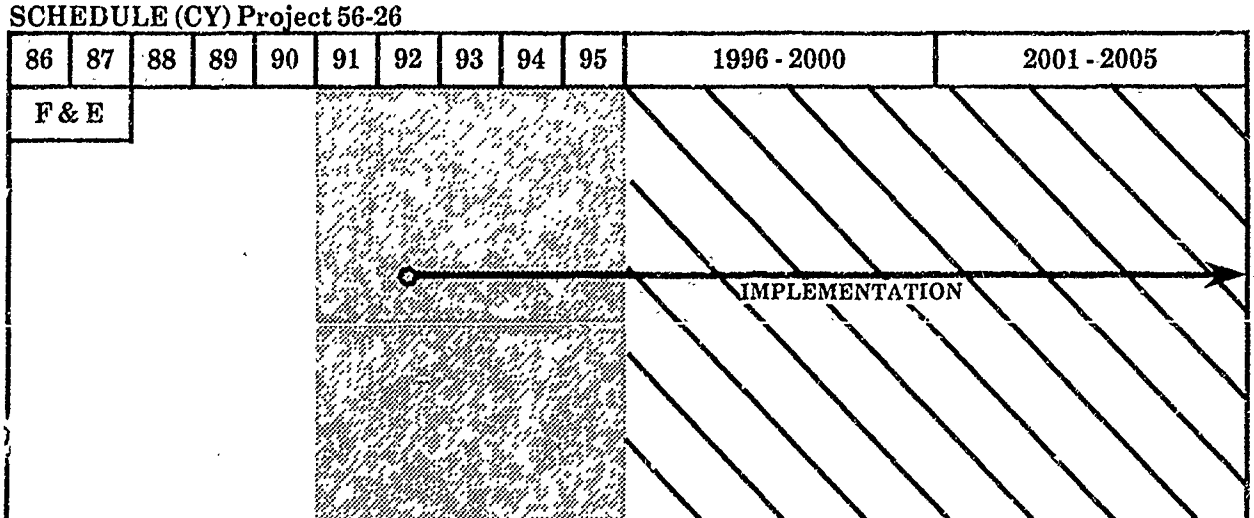
This increase in frequency congestion requires improved efficiency in the identification and resolution of frequency interference problems. Continued reliance on the regional office to support this critical function is no longer efficient or effective in terms of ensuring maximum availability of equipment and services. Timely identification of the source of interference now requires development of sector-level expertise.

Approach: This project will require two additional resources at the sector level. First, the test equipment necessary to identify and eliminate frequency interference problems will be provided to every sector office. Second, the sector's technical support staff personnel will be provided training in this area. Together, these two new sector-level resources will significantly enhance the sectors' ability to independently resolve interference problems.

Products: Modern test equipment will be procured and deployed to all sector offices. Sector office personnel will be provided the required training.

Related Projects/Activities: None.

SCHEDULE (CY) Project 56-26



PROJECT 56-27: Test Equipment Replacement

Purpose: This project provides for the acquisition of new test equipment to replace sector test equipment that is no longer repairable, obsolete, and no longer supportable by the manufacturer or the FAA Logistics Center.

Approach: Review the current inventory and provide upgrades by replacing equipment which is difficult to maintain or no longer functional in today's environment. This project will also:

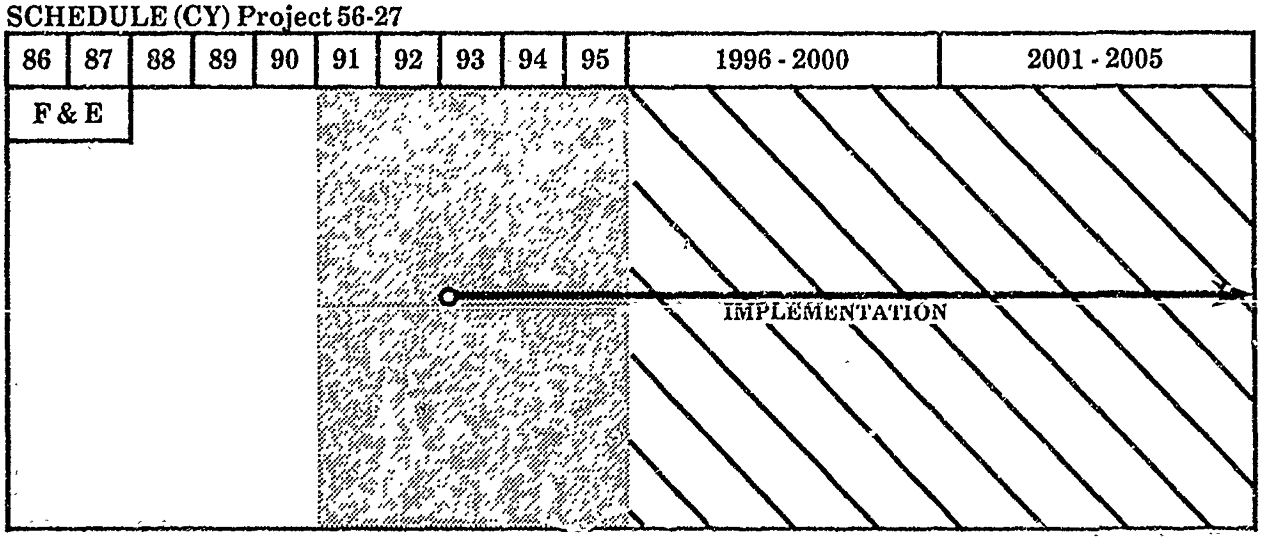
- Provide for test equipment repair and calibration.
- Provide test equipment needed to maintain systems.
- Establish test equipment complements which support the work center concept.

Products: State-of-the-art test equipment will be procured and deployed to replace obsolete test equipment as it becomes inefficient to maintain from a cost standpoint or ineffective from a technical utilization standpoint.

State-of-the-art telecommunications test equipment will also be procured and deployed to meet the demands of a growing dependence on critical data circuits.

Related Projects/Activities: None.

SCHEDULE (CY) Project 56-27



PROJECT 56-28: Computer Resources Nucleus (CORN)

Purpose: This project supports the Automated Data Processing (ADP) needs of the FAA by creating a uniform, Agency-wide computing resource for operational and administrative programs. Through such a resource, the inconsistencies and capacity shortfalls of the current ADP system will be alleviated. To accomplish this, the project will secure ADP services which will provide for total facilities management and turnkey operations through contractor-provided facilities, software, and staff. The objectives of this effort are to:

- Provide timely, responsive, and economical general purpose ADP resources to satisfy programmatic needs.
- Increase productivity of FAA programs and personnel.
- Provide uniformity of FAA data processing, facilitating systems integration and ADP standardization.
- Provide backup processing capabilities.
- Reduce frequency of procurement for ADP upgrades, reducing related expenditures.
- Foster utility-like budgeting and usage of computer resources (uniform chargeback mechanisms).
- Devote the FAA's limited ADP staff resources to better satisfying its programmatic requirements.

Approach: The approach is to view the general purpose ADP configurations in FAA Headquarters, the regions, the FAA Aeronautical Center, and the FAA Technical Center as a common resource for all FAA elements, and to quantify the current and future demand for such ADP support. Once defined and quantified, the next step is to transfer the operational and technical functions of this ADP support to the commercial arena.

Products: The contract will:

- Furnish the FAA with contractor-provided computer resources and subsequent upgrades.
- Provide for the conversion of existing ADP workload to the contractor-provided ADP environment.
- Provide all staffing, hardware, systems software, and off-the-shelf package software to meet the requirements for general purpose data processing for all elements (regions, centers, and headquarters) in a timely and economical manner.

Progress/Activity from October 1989 through November 1990:

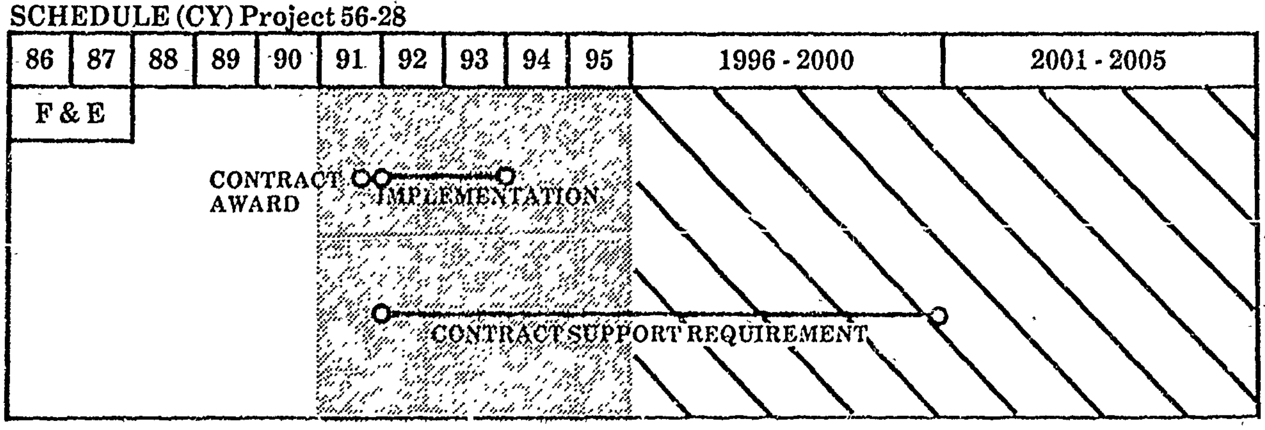
- RFP being revised.

Related Projects/Activities: This project supports the activities of the CORN program. It also supports the interface and data interchange requirements of the Office Automation Technology and Services (OATS) contract, and interfaces with the Administrative Data Transmission Network (ADTN).

List of Contractors:

- Erekson Associates
  (technical support)
  Arlington, Virginia

SCHEDULE (CY) Project 56-28



PROJECT 56-29: On-Site Simulation-Based Training Systems

Purpose: This project provides for the development of a number of stand-alone simulation-based training systems for the training of technical employees. Simulation-based training devices provide for a safe, efficient, and flexible training environment. The training systems to be developed will provide initial training for Air Traffic and Airway Facilities personnel in a realistic environment without taking operating equipment out of service, risking injury to personnel, or damaging the system.

Simulators will:

- Be less costly than operational equipment.
- Allow for the practice of emergency or hazardous situations.
- Allow for flexible training schedules.
- Provide for consistent training.

Approach: The FAA is improving its training programs through the use of simulation technology. Over the next decade, future training needs for complex automated systems are being identified to have simulation training available before the delivery of the operational equipment. High-fidelity simulations are planned for selected FAA sites which have large Air Traffic and Airway Facilities student populations. Simulations technology will be used to prepare students to meet the challenges of the job environment without risk to personnel or systems. Coordination among the FAA training organizations will be emphasized to optimize the use of simulation hardware. As upgrades to operational equipment and systems occur, the simulation training will be upgraded to keep pace with changes in job requirements.

The approach for AT personnel is:

- In the short-term, enhanced stand-alone simulation with freeze and playback features is needed to increase developmental throughput in the en route dynamic simulator. This can be accomplished by using personal computers instead of Planned View Displays (PVDs) for the pilot and ghost positions. This will enable several facilities, which could otherwise not do so, to have their controller work force ready to transition to the Initial Sector Suite System (ISSS). Additionally, it will free-up PVDs for use in the operational environment or to train additional employees.
- In the longer-term, the use of simulation technology for training ATC personnel will involve three phases: (1) evaluation and implementation of an interim, enhanced simulation system in selected ARTCCs and TRACON facilities prior to installation of ISSS and TCCC, (2) evaluation and implementation of an advanced simulator system in conjunction with ISSS and continued use in Area Control Facilities (ACFs), and (3) development of a plan to integrate and sequence the use of low and medium fidelity simulation using part-task trainers and other computer based training with high fidelity simulators, and identify needed simulation in the AERA timeframe.
- The requirements and approach for AF simulation systems are being evaluated.

Products:

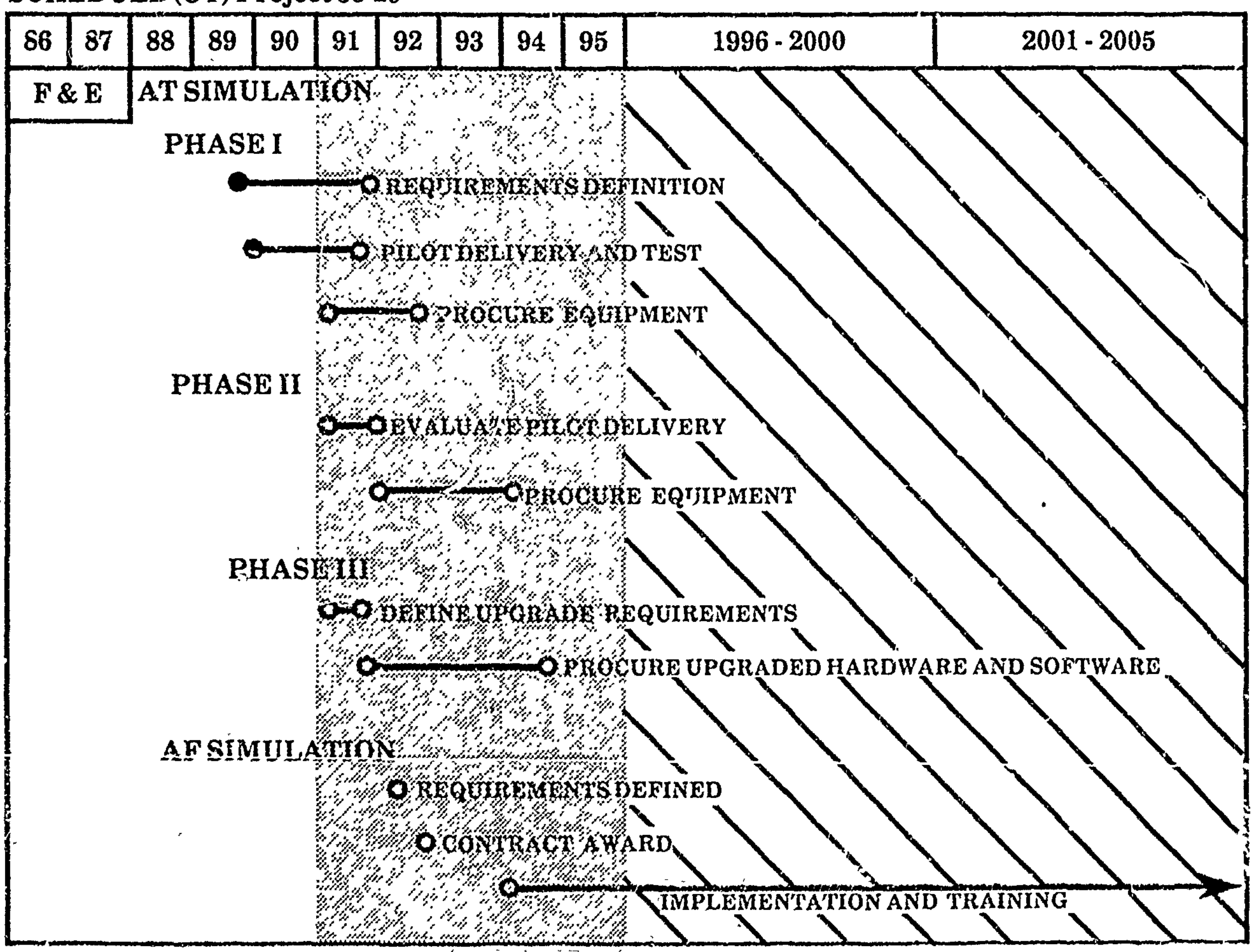
- Air Traffic en route simulator suites in each center.
- Air Traffic approach simulator suites in each TRACON.
- Airway facility equipment simulators in each ARTCC.

Progress/Activity from October 1989 through November 1990:

- A management plan for a comprehensive job-task analysis for the Airway Facilities work force for AAS is underway.
- Planning for simulation training is being coordinated with the FAA Academy, AAT, AAF, ASM, AHT, and the Alaskan Region.
- Job task agreements for tower and TRACONs have been completed. An update of the en route agreement was completed.
- A comprehensive approach was initiated on the use of simulation technology in training ATC personnel before, during, and after the transition to the ISSS.

Related Projects/Activities: All CIP projects requiring simulation training.

SCHEDULE (CY) Project 56-29



PROJECT 56-30: Aeronautical Center Training and Support Facilities

Purpose: This project provides training complexes and support buildings to house facilities and equipment required to accomplish FAA training and provide logistics and engineering support.

Approach: Training complexes and other support facilities will be constructed by using the FAA Aeronautical Center comprehensive land use and space plans. OMB Circular A-104 requires that all leases of capital assets must be justified as preferable to direct government purchase and ownership. It is anticipated that direct federal construction will clearly be the least costly alternative based on this OMB criteria. Therefore the funding allocated is for direct federal construction of the proposed facilities. Buildings, enclosures, and related structures will be geographically located and configured to provide for efficient use of training, logistic, and engineering support functions.

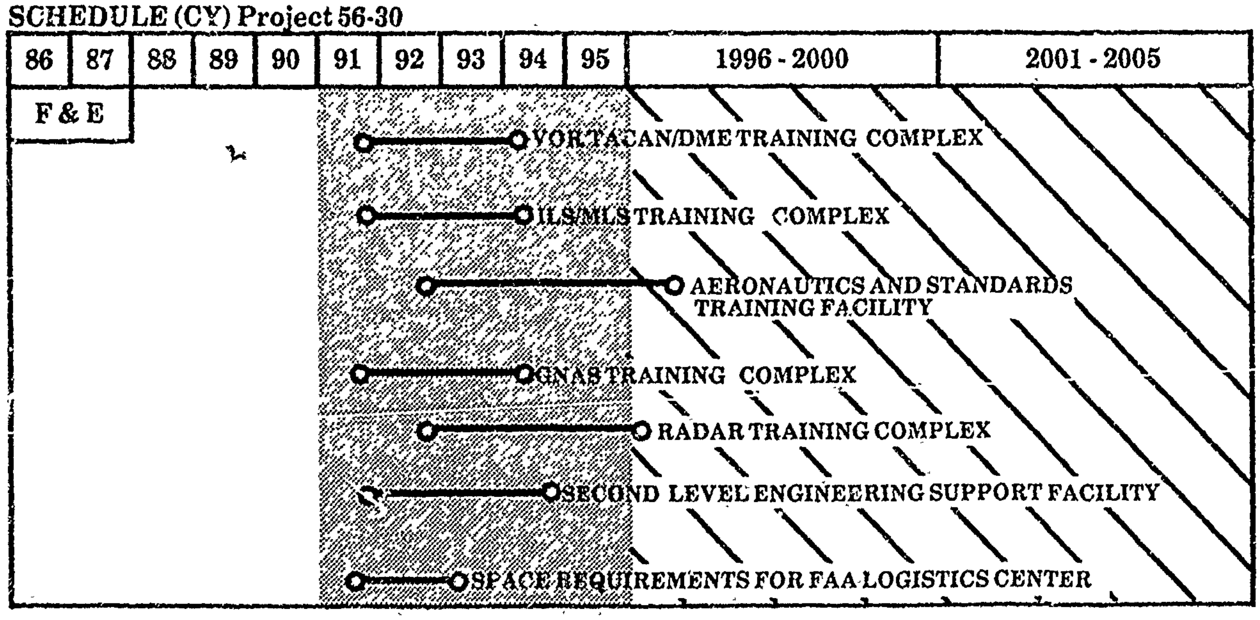
These complexes will meet specific and designated requirements with features such as classrooms, training laboratories, equipment, instructor/administrative support offices, and work areas. Hangar space, training/support material space, and courseware/support equipment will be configured for maximum flexibility to meet future requirements. The different training complexes will consolidate present training systems and accommodate new systems.

Products:

- General National Airspace System (GNAS) training complex.
- An Aeronautics and Standards Training Facility for Aviation Standards consisting of a main structure to house classrooms, laboratories, equipment, and support offices for instructor, administrative, and work areas. An attached hangar to house laboratories, flight training support functions, flight training rental aircraft maintenance offices and shops, and aircraft hangar space will also be constructed.
- A navigation systems training complex.
- A landing systems training complex.
- A surveillance systems training complex.
- A second-level engineering support facility.
- A comprehensive space study to determine the future configuration of the warehouse facility and any additional space requirements.

Related Projects/Activities: All CIP projects requiring Agency training, logistics, and engineering services support.

SCHEDULE (CY) Project 56-30



PROJECT 56-33: Aeronautical Center Lease

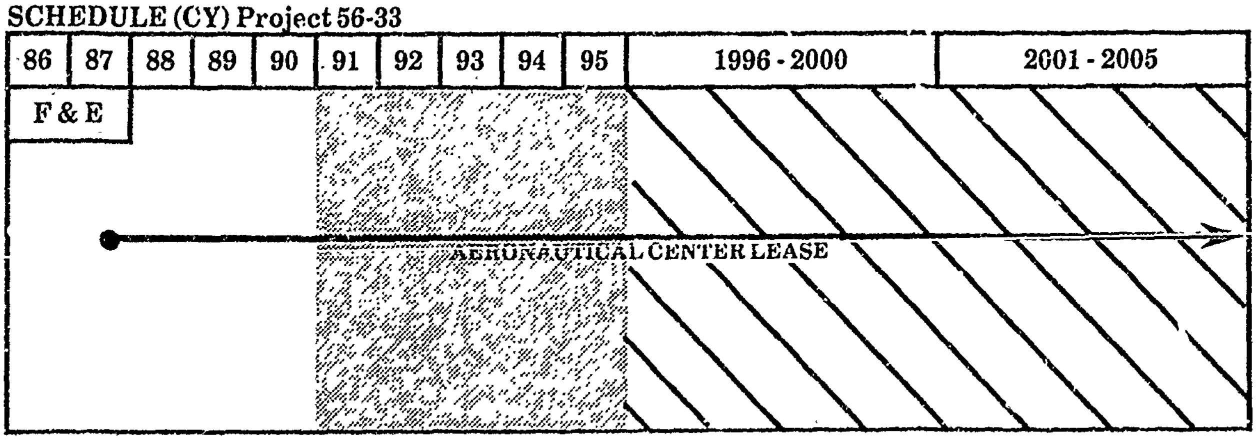
Purpose: This project provides for the lease payments for the land and buildings which house the Mike Monroney Aeronautical Center and tenant FAA organizational elements.

Approach: The FAA Aeronautical Center is a major organizational complex in Oklahoma City, Oklahoma. It conducts centralized training, aircraft fleet maintenance and modification, central warehousing and supply, and aeromedical research. It also maintains and administers aircraft and airman (including medical) records. The FAA Aeronautical Center provides centralized administrative automatic data processing for national programs and also provides engineering support and technical modification and maintenance field guidance for the operation and maintenance of assigned facilities in the National Airspace System. The leased land and buildings which house the Aeronautical Center, as well as tenant FAA organizational elements, provide a cost-effective, mid-continent location for the vital functions described above.

Products: Mike Monroney Aeronautical Center lease.

Related Projets/Activities: This program supports numerous ongoing F&E efforts and operations.

SCHEDULE (CY) Project 56-33



PROJECT 56-35: National Airspace System Training

Purpose: To procure and install modern training media, automated training development systems, and communications equipment at the FAA Academy. Also, to retrofit or improve FAA Academy classrooms, laboratories, and staff work areas.

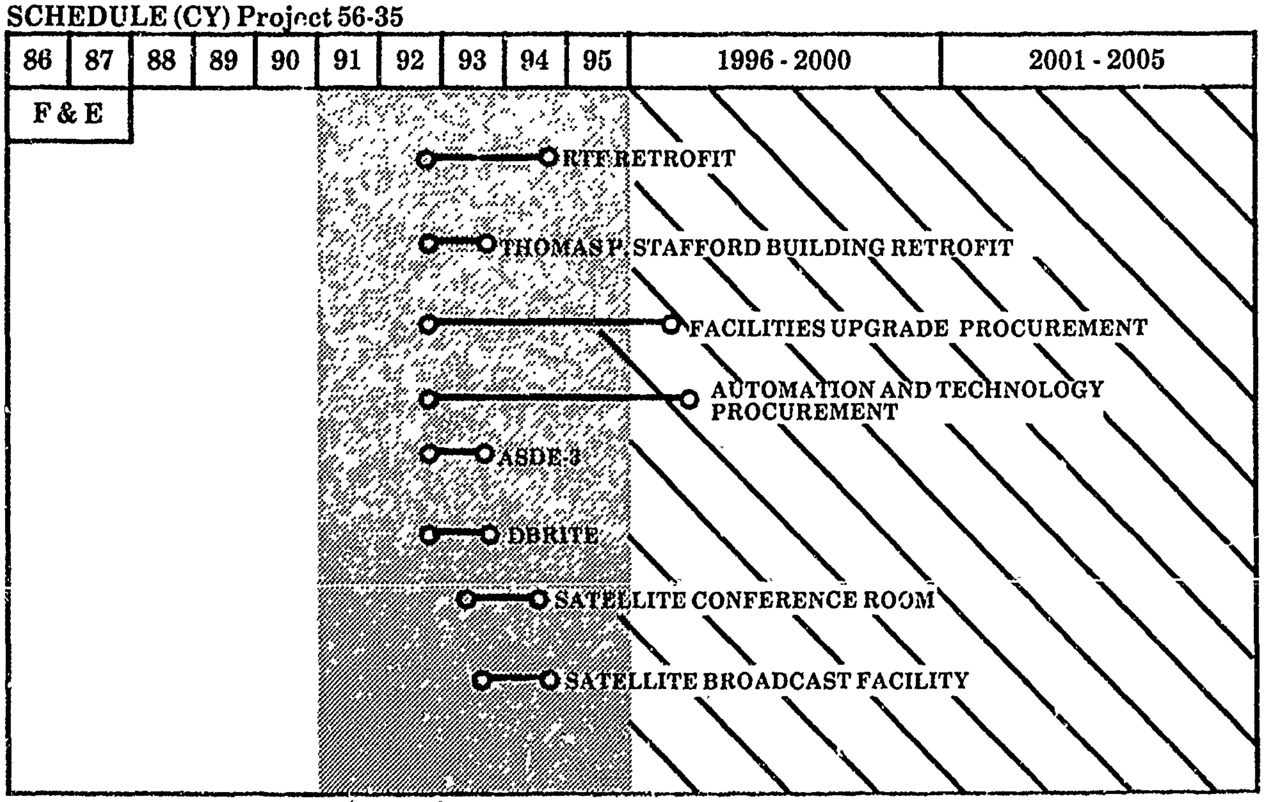
Approach: This project includes activities designed to procure modern training media, simulators, automated training development systems, and communications equipment. Also included are activities to retrofit or improve FAA Academy classrooms, laboratories, and staff work areas to meet the needs of the NAS.

Products: Items under consideration include:

- Radar Training Facility (RTF) retrofit.
- Thomas P. Stafford Building retrofit.
- Facility upgrade projects.
- Airport Surface Detection Equipment (ASDE-3) simulator procurement.
- Digital Bright Radar Indicator Tower Equipment (DBRITE) simulator procurement.
- Establish satellite conference room and broadcast facility (located at the Center for Management Development).

Related Projects/Activities: All CIP projects that require training support.

SCHEDULE (CY) Project 56-35



PROJECT 56-37: Logistics Support Systems and Facilities

Purpose: The implementation of the CIP impacts the FAA logistics support functions, particularly in the area of supply support. This project will identify and provide support equipment, facilities, and systems that are directly required for CIP project deployment life-cycle support.

The FAA Logistics Center supports equipment, facilities, and systems that have become obsolete or have significant deterioration leading to sparing/support problems. In addition, the number of spare parts, as a direct result of the CIP project deployment, has increased and the technology for testing and quality checking has changed.

Approach: To provide responsive life-cycle support, the FAA Logistics Center will identify obsolete/deteriorated parts/equipment and replenish quantities, provide additional materiel handling capability, and construct facilities for current technology testing.

Specific items to be addressed are as follows:

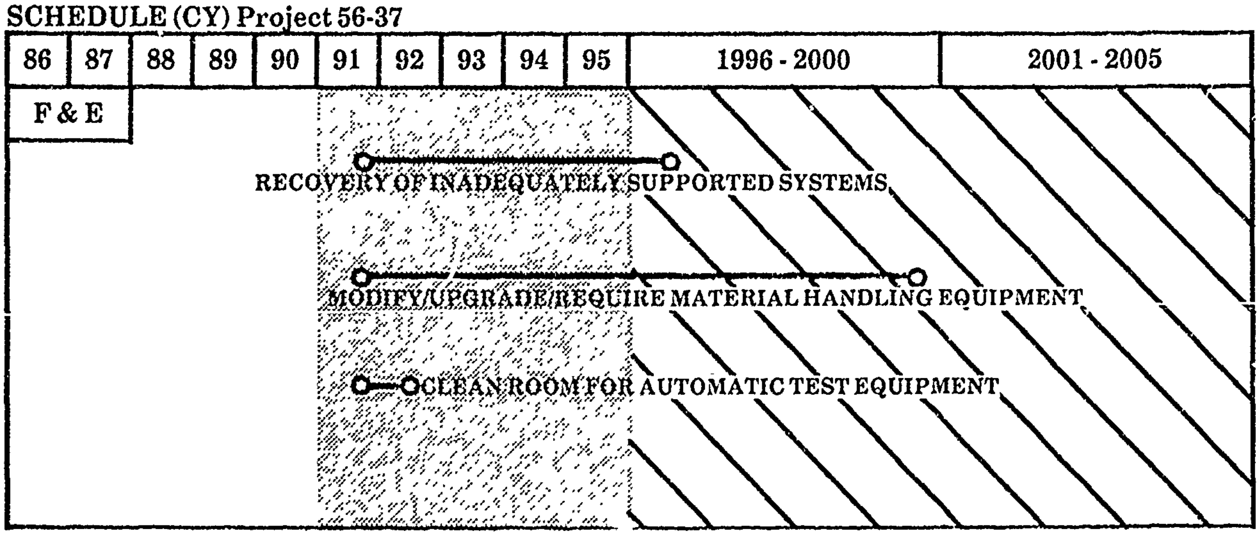
- Determination and replenishment of stocks of deteriorated or obsolescent parts/equipment and facilities.
- Determine needs and procure materiel handling equipment.
- Determine needs and construct "clean room" facilities for automated test equipment.

Products:

- Adequate spare parts and upgraded unique equipment. In addition, a continuing review will take place for future program actions.
- Material handling equipment to make efficient use of storage space and equipment to expand the use of automated storage.
- A "clean room" for ATE, based on requirements.

Related Projects/Activities: All CIP projects that depend upon life-cycle support on FAA Logistics Center capabilities.

SCHEDULE (CY) Project 56-37



PROJECT 56-41: Development of an Enhanced Radar Analysis Tool

Purpose: This project optimizes radar operational performance by providing a tool for automated analysis. While some capability exists today, integration/evaluation/current capabilities are dispersed throughout many incompatible packages, and with the advent of such systems as the ARSR-4 and ASR-9, new requirements exist for capabilities not contained in any existing package.

The Generic Tool for the Analysis of Radars and the Evaluation of System (GENTARES) will provide a single, integrated tool for analyses of all FAA radar systems.

Approach: GENTARES development will be conducted in phases, with the completion of each phase adding new tools and capabilities to the overall package. GENTARES will be developed cooperatively with the U.S. Air Force and the European community's EUROCONTROL.

Initially a single, integrated software package consisting of a consolidation of all functions currently available in the dispersed radar analysis packages/systems will be developed. Also included will be support capabilities for the ARSR-4 and ASR-9 radar systems.

- This will permit interfacing the radar analysis tool with any radar digitizer system as well as interfacing with most personal computer systems (IBM AT, AT compatibles, or better), workstations, and the Host system. It is also projected to interface with the AAS.
- The applications software will be developed to be relatively machine/system independent thus assuring the FAA has a common radar analysis tool.

This initial GENTARES package will permit sophisticated radar analysis support of all existing radar systems, i.e., primary, secondary, terminal, long range, and/or height systems, including ASR-9, Mode S, ARSR-4, and FPS-117.

Future steps in the evolution of GENTARES will include a radar simulation capability, playback, weather analysis, radar site modeling, long-term performance analysis, database management for trend analysis, data archiving, multisensor system performance analysis, tracker evaluation, and clutter analysis.

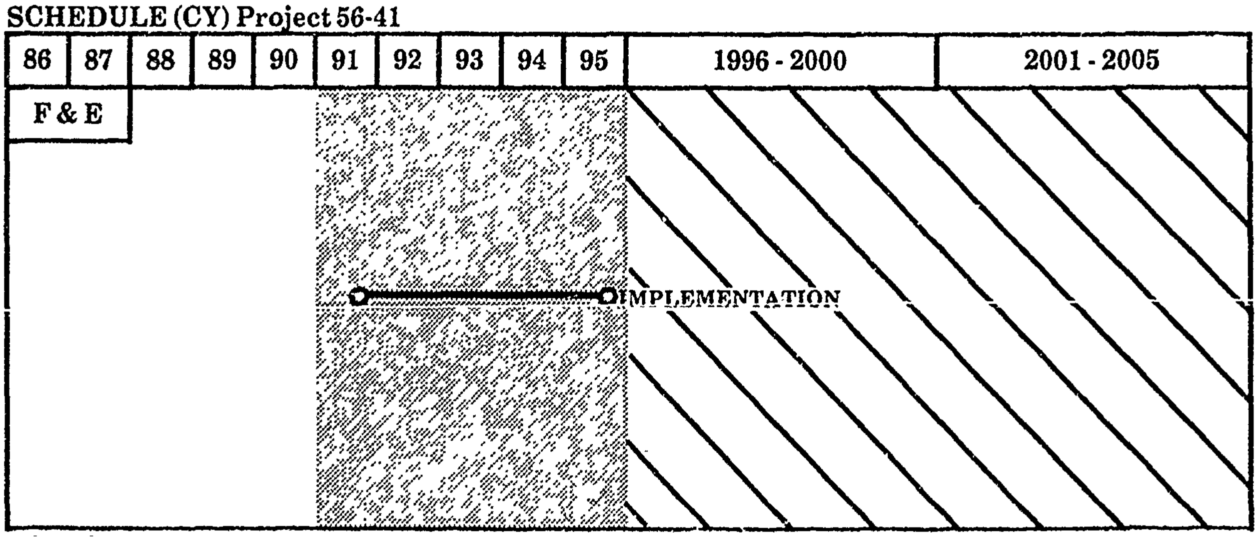
Products:

- A portable system consisting of a printed circuit card inserted into a portable computer system. This product will be distributed to all FAA regions as well as all field facilities requiring a long-term radar support capability.
- A multisensor system which will be stationed at ARTCCs, ACFs, or other facilities where three or more sensors are in use.
- A software package comprising all of the radar analysis requirements of the FAA. This product will be developed under DOD-STD-2167A using a single, higher-order language, and a single operating system.
- A complete GENTARES software support system, all required documentation, and supporting hardware and software necessary to permit long-term systems maintenance and in-service engineering support of the GENTARES.

Related Projects/Activities:

- Long-range radar provides system optimization, analysis, and performance evaluation tools as well as equipment, including the ARSR-4.
- Terminal radar provides system optimization, analysis, and performance evaluation tools for the ASR-9 and ASR-10 systems as well as all other ASR systems equipped with digitizing equipment.
- Secondary radar provides system optimization, analysis, and performance evaluation tools for all radar beacon interrogation systems, including Mode S.
- The EUROCONTROL Radar Analysis Support System (RASS) portions of the software developed cooperatively between the FAA and EUROCONTROL.
- AAS provides off-line, nonintrusive radar performance and evaluation capabilities for the radar sensors feeding the AAS. The current design philosophy for the AAS does not permit integration of GENTARES directly into the AAS system.

SCHEDULE (CY) Project 56-41



PROJECT 56-47: Transition Engineering Support

Purpose: This project assures efficient transition of the systems being acquired into the FAA operational environment, by providing FAA Headquarters and regions with contractor support to complete transition planning and implementation tasks.

Approach: The NAS Transition and Implementation Service will retain a contractor to assist Headquarters and the regions as follows.

- Strategic planning for forecasting regional requirements for infrastructure replenishment/modernization, communication and surveillance network plans, consolidations, and interagency agreements.
- Provide authoritative studies on both human and system resource requirements for the air traffic control modernization process.
- Document and provide solutions to transition and implementation issues.
- Transition planning support at the headquarters, regional, and facility level in the development and updating of transitional policy, guidelines, and facility plans.
- Configuration management at the facility level to establish and maintain facility (ARTCC/ATCT/ACF/AFSS) physical and functional baselines, and support of regional configuration control boards.
- Program management support to augment headquarters and regional staffs for the planning, budgeting, and monitoring of the ATC modernization activities, to ensure timely and cost-effective integration of the new ATC systems.
- Planning support for the establishment of Airway Facilities work centers and the transition planning for changing from a manual maintenance system to an automated maintenance management system.
- Establishment of facility and equipment configuration databases which will be used in conjunction with computer-aided engineering graphics systems and automated project management tools to facilitate the ATC modernization process.

Products: Support at the FAA Headquarters, regional, and facility level to:

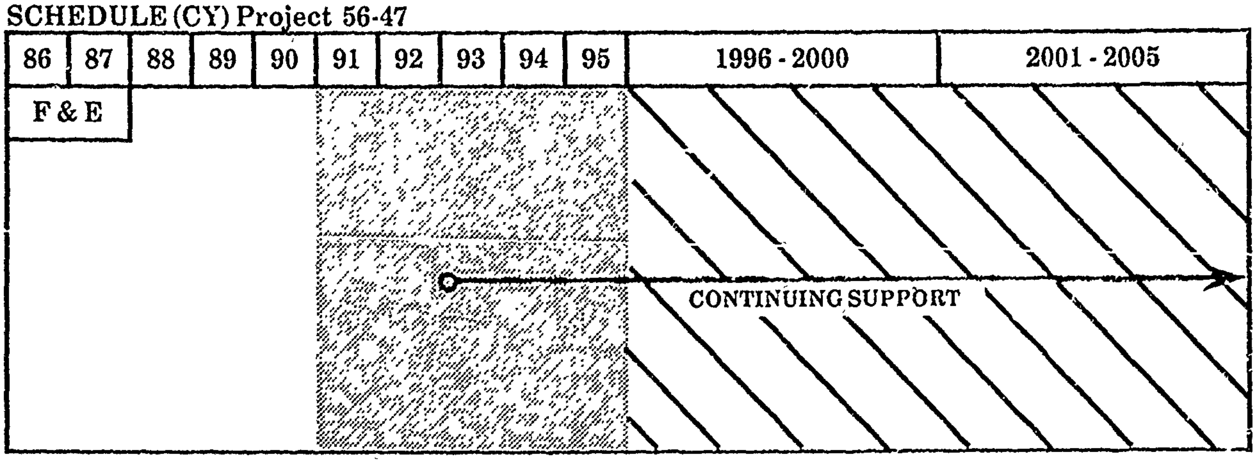
- Develop, coordinate, review, and maintain facility transition plans.
- Review specifications, designs, and NAS change proposals.
- Provide assistance in program management to provide system engineering support at the regional level.
- Complete special studies as required.

Progress/Activity from October 1989 through November 1990:

- A survey to establish regional support requirements was completed.
- A draft statement of work has been completed.

Related Projects/Activities: All projects which are to be implemented at the regional or facility level.

SCHEDULE (CY) Project 56-47



PROJECT 56-51: Aviation Safety Analysis System (ASAS)

Purpose: This project facilitates effective management of FAA's safety data resources by providing FAA's safety work force with essential automation tools, i.e., OATS micro-computers and software.

The primary functions to be supported by the ASAS include the certification of air personnel, aircraft products, operators, and air agencies, as well as automated support to accident investigation, enforcement activities, security, inspections, surveillance, accident prevention, safety analyses, aviation medicine, staffing use, research and development projects, and rulemaking activities.

Approach: The basic design philosophy is to integrate safety related information into a single data structure, provide source-level information capture and dissemination through user-friendly computer terminals, and provide management with the tools and information necessary to improve both aviation safety and management functions. Extensive help functions and local data editing will be provided to improve the accuracy and completeness of the entered information. The Administrative Data Telecommunications Network (ADTN) links field offices with regional and national FAA information processing facilities. This approach is intended to provide field personnel and other Agency organizational elements with improved access to more reliable and timely certification and safety information data, and the capability to retrieve and conduct more effective analysis of potential safety issues.

- Short term (to 1992) - During this period the design, development, and implementation of currently identified ASAS subsystems will be completed. The integrated ASAS prototype will be expanded to include all subsystem information and a corporate database structure will be defined. All required internal and external interfaces will be operational. Access to data systems from within the Agency at all appropriate levels will be completed, and external access will be available. Evaluations of subsystems usage, effectiveness, and impacts will be conducted. In addition, data processing equipment currently in the field will gradually be replaced with micro-computer workstations that will afford extensive office automation capabilities as well as access to ASAS data systems.

- Long term (to 2000) - System enhancements necessary to satisfy new data requirements will be designed, developed, and implemented. The single database structure will be implemented to provide the necessary standardization for all new and changing requirements. An assessment of the functional efficiency and effectiveness of the system in meeting user needs from both within and outside the Agency will be completed, and the appropriate revisions or modifications, if needed, will be implemented. New hardware and software enhancements, including new statistical and mathematical techniques and data management systems, will be continuously reviewed for Agency application. The capability of the system to meet the increase in aviation activity projected by the NAS forecast will be analyzed, and if necessary, appropriate modifications will be designed and implemented.

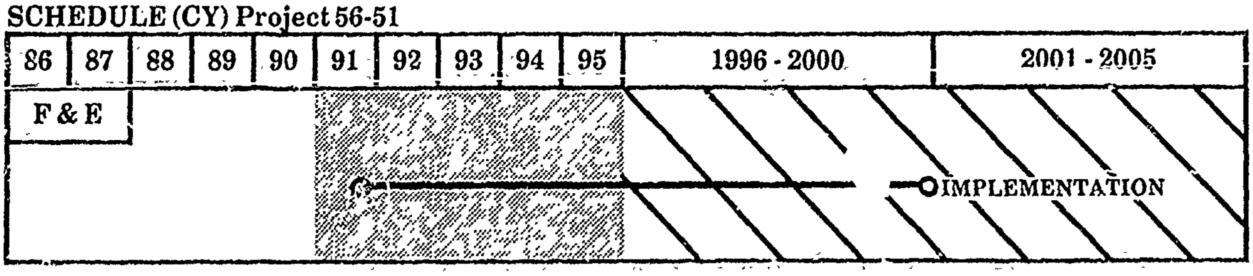
Products: The ASAS development process is evolutionary in that the system is comprised of numerous databases, or subsystems, in various stages of development. Many of these subsystems are operational, providing the benefits intended by the ASAS program to users at all organization levels. Commercial hardware and software is also available under the OATS program.

Progress/Activity from October 1989 through November 1990:

- ASAS development has begun.

Related Projects/Activities: None.

SCHEDULE (CY) Project 56-51



PROJECT 56-53: Refurbish AN/FPS-20 Radars

Purpose: This project will provide for the removal and refurbishment of surplus military AN/FPS-20 series long-range surveillance radars for subsequent use by the FAA.

Approach: Decommissioned AN/FPS-20 radars which have been declared surplus by the U.S. Air Force and made available to the FAA will be removed and sent to the FAA Logistics Center for refurbishment.

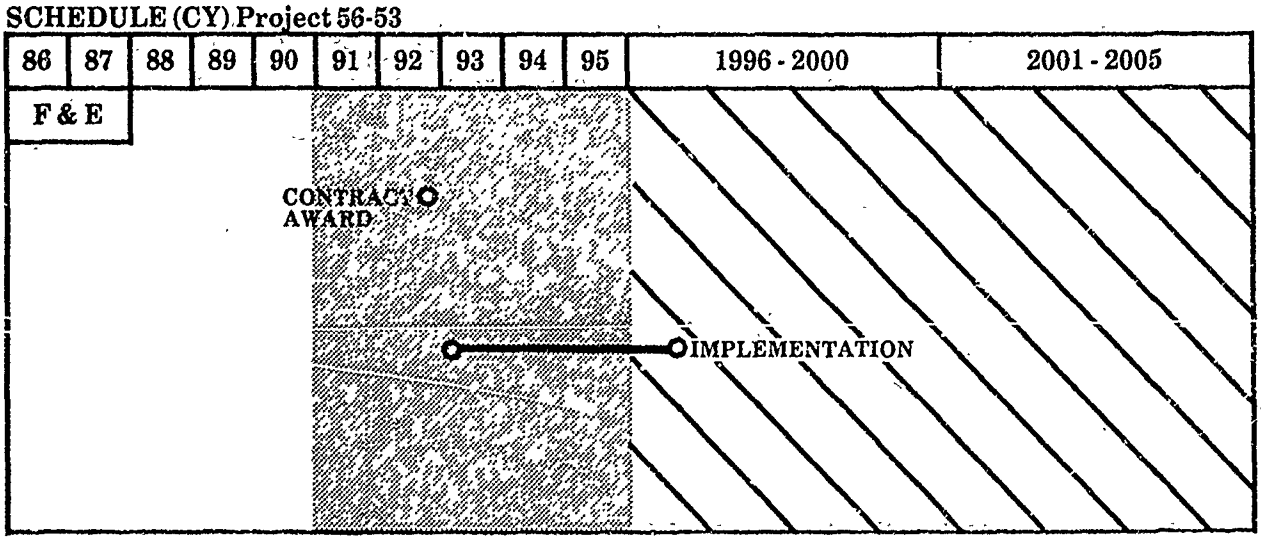
Products: Refurbishment of up to six AN/FPS-20 radars.

Progress/Activity from October 1989 through November 1990:

- Refurbishment activity continued on two AN/FPS-20 radars.
- Plans were made to accept a third radar from the U.S. Air Force.

Related Projects/Activities: Some AN/FPS-20 radars will be made surplus as the result of the joint FAA/Air Force radar replacement program (FAAR). Solid-State Receiver/Digital Moving Target Indicator (SSR/DMTI) transmitter modifications and other long-range radar improvements will be used in some of the refurbished radars.

SCHEDULE (CY) Project 56-53



PROJECT 56-54: Provide FAA Housing

Purpose: This project provides for the establishment, replacement, and refurbishment of FAA housing units. The FAA currently provides housing for FAA operations and maintenance personnel, and their families, at remote locations where commercial housing is unavailable or inadequate.

The FAA housing program is an integral part of the FAA's Human Resource Management (HRM) Plan. The HRM Plan is based on the principle that high levels of productivity, operational effectiveness, quality of service, and positive attitudes can best be achieved when employee needs are carefully considered and addressed in the HRM planning process. The FAA housing project supports this principle by ensuring that adequate housing is available to employees and their families at remote locations.

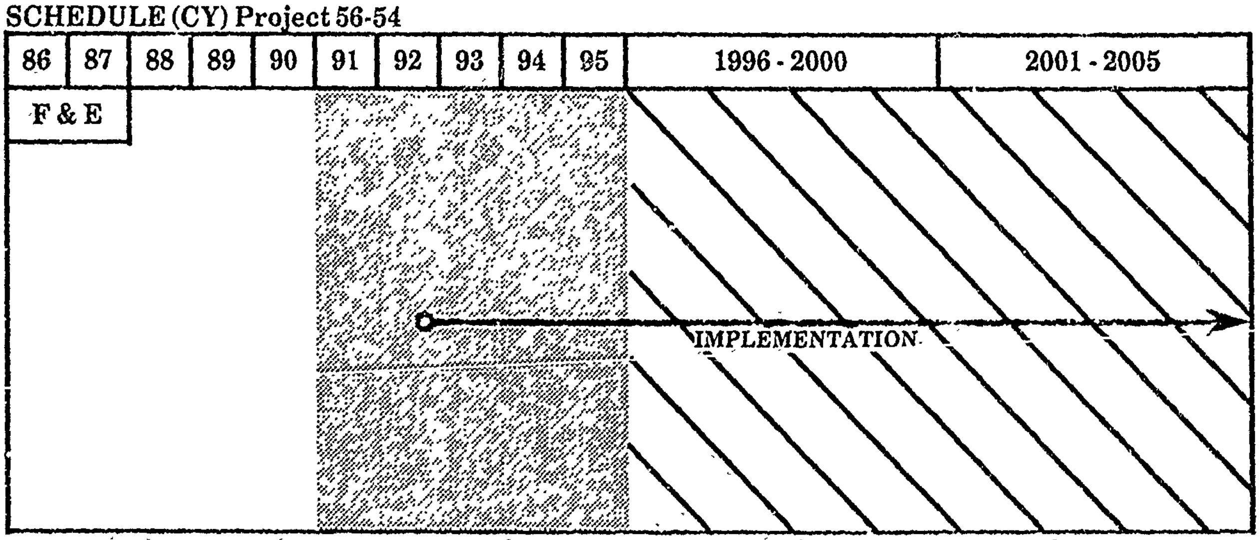
Approach: Establish a multiyear project for the establishment of new FAA housing units, replacement of obsolete housing units, and modernization and refurbishment of existing housing units. This project will provide and support permanent housing for FAA employees and their families at remote locations; provide and support transient quarters for FAA employees at remote locations where commercial housing is unavailable; and provide and support emergency quarters at remote FAA sites where commercial housing is unavailable or the establishment of transient housing is not practical.

Products:

- 12 new housing units at Nantucket, Massachusetts, for FY 92.
- Repairs and renovations to existing housing in the U.S. Virgin Islands, various remote locations in Alaska, various locations in the U.S. Pacific Territories, and at Grand Canyon, Arizona, and Tonopah, Nevada.

Related Projects/Activities: 46-08 Modernize and Improve FAA Buildings and Equipment Sustained Support and 56-22 Human Resource Management.

SCHEDULE (CY) Project 56-54



PROJECT 56-55: Independent Operational Test and Evaluation Oversight

Purpose: This project provides f·: independent operational test and evaluation oversight of major new system acquisitions to ensure operational readiness and reduce deployment risk to the FAA.

Approach: The IOT&E oversight function will ensure that requirements are met, and that systems are ready for implementation. The IOT&E Office independently assesses the technical and operational performances of major systems in a realistic test environment prior to key decision point 4 - the full-production commitment. For programs where OT&E was not conducted before the full-production commitment, the Administrator extended the IOT&E oversight to the commissioning of the first site. The Administrator may require IOT&E oversight for programs using an abbreviated acquisition process. Recently, the IOT&E Office was given the oversight responsibility for other selected FAA programs of significant operational impact.

Products: For major system acquisition programs and other selected FAA programs, the Office of IOT&E Oversight staff will assess compliance with the system requirements statement and an operational readiness criteria checklist developed for each program. Each program is examined carefully, and when IOT&E oversight identifies a system operational problem, it is immediately reported to the appropriate program office for resolution. Operational areas addressed in IOT&E may be categorized as software, hardware, procedures, system, or human/machine/resource relationship. The extent to which a system increases safety and effectiveness depends on how well all of these considerations are integrated. From the results of both the Integration Test and Evaluation (IT&E) and Operational Test and Evaluation (OT&E), the operational readiness of the system will be independently assessed and reported to the Administrator.

Progress/Activity from October 1989 through November 1990:

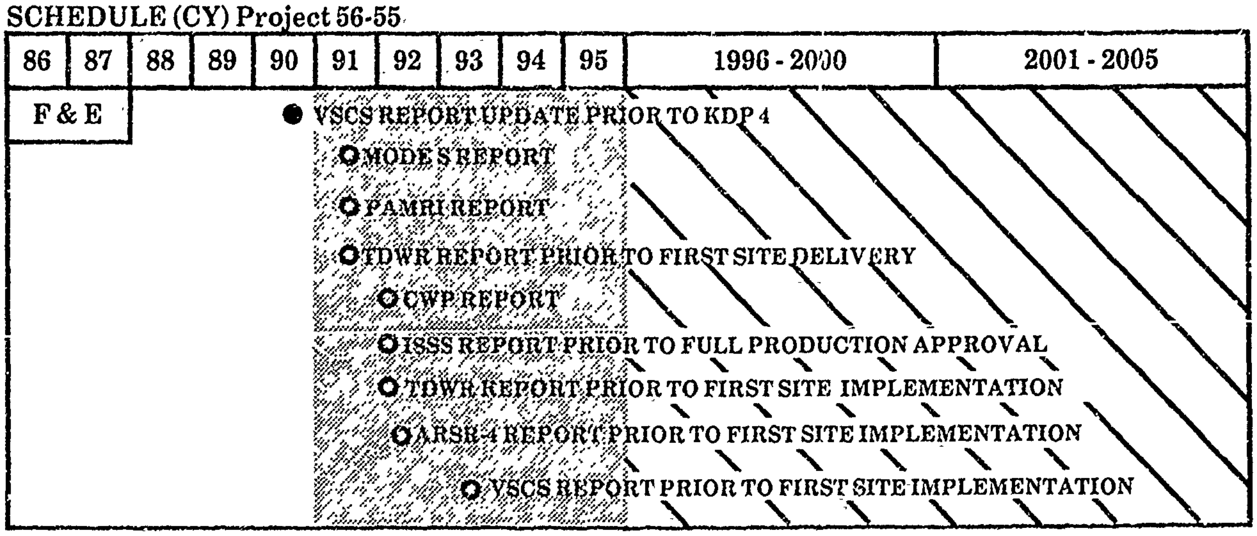
- VSCS independent operational readiness assessment reported prior to KDP 4.
- Draft operational readiness criteria developed for the following systems: PAMRI, Mode S, ISSS, TDWR, CWP, and ARSR-4.

Related Projects/Activities: Current/future major system acquisitions and other selected systems.

List of Contractors:

- CRM/Edgewood
  (telecommunications and technical/monitoring)
  Herndon, Virginia
- CRM/Amalex
  (radar technical/ monitoring)
  Herndon, Virginia
- Synetics
  (technical expertise for radars)
  Vienna, Virginia

SCHEDULE (CY) Project 56-55



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PROJECT 56-56: NAS Management Automation Program (NASMAP)

Purpose: This program provides an integrated office automation system for administrative tasks to support NAS facilities in the AAF organization. It provides nationwide automation capabilities giving planning and implementation organizations on-line access to technical, operational, and administrative application systems and databases necessary for the management of the NAS down to the AF sector level.

NASMAP automation platform will serve as the backbone Local Area Network (LAN) and communications environment which will support common access requirements of a variety of related programmatic efforts within the AAF community. Projects such as Automated Documentation Development and Maintenance (ADDM) will also provide on-line multi-user search, retrieval, and editing of NAS technical documentation through the use of the ADDM program. ADDM will provide the foundation and engineering specifications required to implement the CIP.

Approach: Implementation of NASMAP calls for the establishment of a national network providing connectivity and standard applications capability for AAF personnel at the headquarters, regional, center, and sector levels engaged in the management and administration of the NAS. To ensure this standard level of connectivity, NASMAP is being implemented in an incremental process beginning with site analyses, site integration, upgrade plans, and implementation strategy plans. Full NAS organization connectivity is targeted for FY 95.

- Short term (to 1994) - The design, development, and implementation of the existing AF LAN automation environment will be completed. The integrated AF environment will be migrated to address all AF information requirements and the appropriate corporate database structure will be defined and established. Internal and external interfaces will be established and brought on line. Access to data systems from within the Agency will be completed. External access will also be available. Evaluations of user requirements, accessibility, usage, effectiveness, and impacts will be conducted. Data processing equipment currently in the field will gradually be replaced with micro-computer workstations which will provide the field access to ADP applications and office automation capabilities.

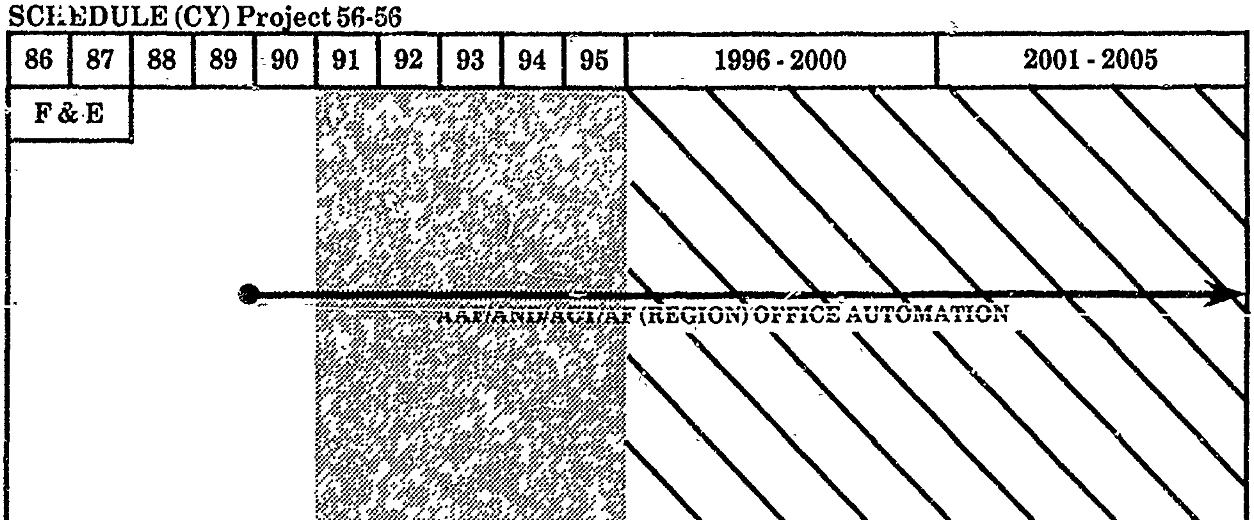
- Long term (to 2000) - System enhancements necessary to satisfy new data requirements will be designed, developed, standardized, and implemented. New hardware and software enhancements, including new statistical and mathematical techniques and data management systems, will be continuously reviewed for Agency application.

Products: Implementation of NASMAP will provide an automation strategy that recognizes the existing ADP equipment base, takes advantage of the remaining life cycle of this equipment, and plans for the integration and migration to a uniform user interface, hardware platform, and LAN environment. NASMAP will provide eighty-one local area net-works comprised of approximately 5,700 micro-based workstations distributed throughout headquarters and field organizations Inter-organization connectivity will be accomplished via link to the Administrative Data Transmission Network (ADTN), or similar telecommunications network.

ADDM will provide an automated system to produce and update documents at the FAA Technical Center, FAA Headquarters, and the FAA Aeronautical Center in digital format for direct transfer to an automatic storage retrieval subsystem and publishing system. ADDM will provide storage of technical material in digital format, a central storage location for technical documents, and immediate network distribution. Creating a total system will provide standard, compatible exchange formats with minimal translations to other systems

Related Projects/Activities: 26-01 RMMS, 26-04 MCC, 46-01 Sustain RMMS, 46-04 MCC Enhancement, and 56-25 CAEG Enhancement.

SCHEDULE (CY) Project 56-56



PROJECT 56-58: National Airspace Integrated Logistics Support (NAILS)

Purpose: This project ensures that pre-deployment supportability planning is included in all program acquisitions and that this supportability is maintained over the life cycle of the subsystem/equipment. NAILS management support will be provided to minimize total life-cycle costs of major NAS acquisitions.

Approach: A key aspect of pre-deployment supportability planning is the estimation of life-cycle cost components. Support to the NAILS process will be provided through the development of tools, using computer models for estimating these cost components, given various input assumptions. To aid program officials in life-cycle logistics management, two separate information systems will be established to provide precommissioning logistics event scheduling and actual field operations.

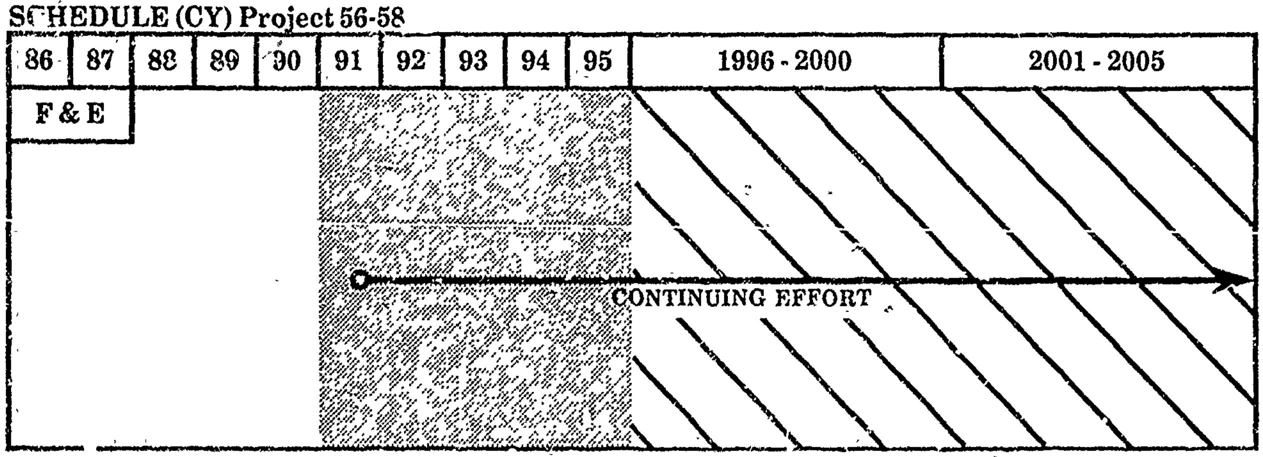
Initial production and subsequent updating of NAILS planning documents and data throughout the subsystem life cycle will be provided by automation of the production and updating process

Products:

- NAILS cost estimation model.
- NAILS life-cycle cost model.
- Site spares criticality model.
- Level-of-repair analysis models.
- Logistics management project tracking system.
- Logistics management decision auditing and feedback system.
- NAILS planning and procurement document automation.
- Logistics data storage, access, and use.
- Technical data maintenance.
- Market analysis for commercial-off-the shelf/nondevelopmental items.
- NAILS information data system.
- Contractor support.

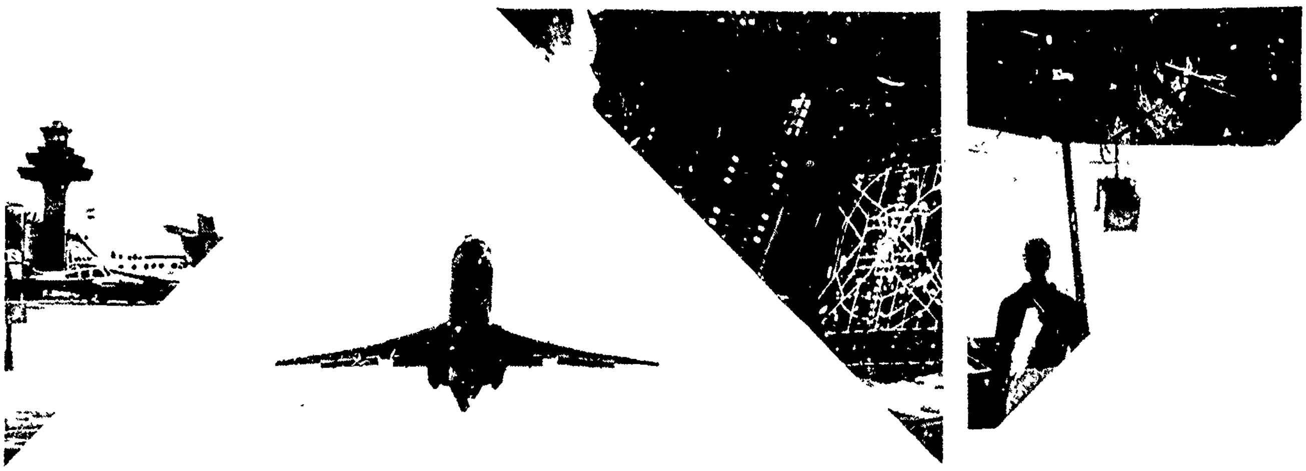
Related Projects/Activities: Most CIP projects.

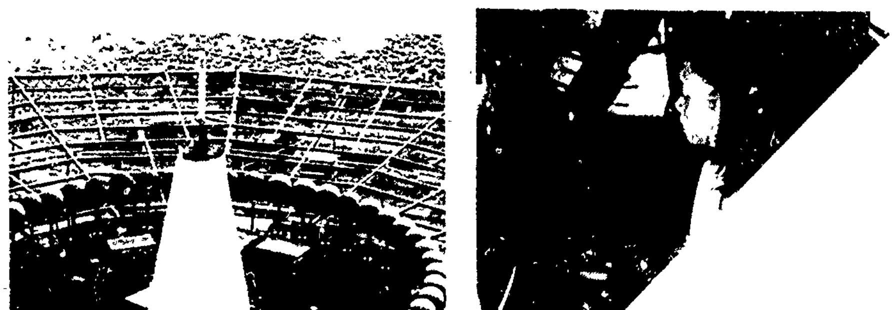
SCHEDULE (CY) Project 56-58

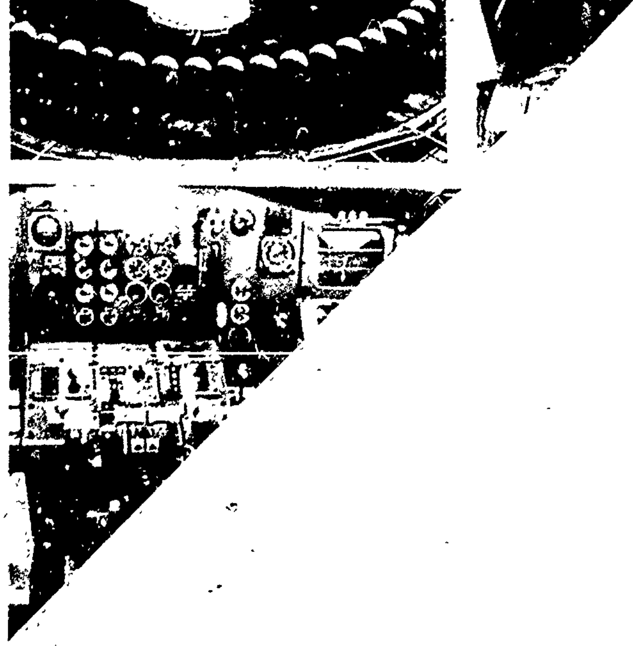


Chapter 6: New Capabilities

The last chapter, New Capabilities, addresses new projects which, if implemented, are expected to add significant new capabilities to the NAS.







Section	Page Numbers
1 - En Route	(6-1-1 thru 6-1-2)
2 - Terminal	(6-2-1 thru 6-2-8)
3 - Flight Service and Weather	(6-3-1 thru 6-3-8)
4 - Ground-to-Air	(6-4-1 thru 6-4-10)
5 - Interfacility Communications	(6-5-1 thru 6-5-4)
6 - Maintenance and Operations	(6-6-1 thru 6-6-2)

CHAPTER 6

NEW CAPABILITIES

The national system of airports and airways is expected to accommodate more traffic at increasing levels of safety and efficiency. To accomplish this, it will be necessary to research, develop, procure, install, and operate new hardware and software systems on a continuing basis.

New capabilities will arise from enhancements to current and planned investments and from new systems being developed through the FAA's Research, Engineering, and Development (R,E,&D) program. New capabilities are developed in response to user requirements or arise from technological breakthroughs which are adapted to civil aviation use.

While most of the new capabilities are in response to system growth, the projects discussed in this chapter differ from those in Chapter 3 (Growth) in two important aspects. First, the projects in Chapter 3 are for more of the same kinds of Facilities and Equipment (F&E) that the FAA has been buying in the past. Some product improvement can be expected in Chapter 3 projects along with some new capabilities as the technology improves. Projects in this chapter represent totally new capabilities or those that are so significantly different that they can be treated as new.

The second difference is the degree of certainty associated with the proposed capabilities. Other chapters deal with known products, cost, and production schedules. Projects in this chapter tend to be less certain. Some of the projects have been in the R,E,&D pipeline for some time and are well defined with respect to both schedule and cost. Others are not as well defined and both the timing of implementation and the cost represent best estimates or goals. In some cases, there has not yet been a decision to implement the functionalities or acquire the facilities being developed through the R,E,&D program. Decisions about funding and scheduling will be made when these projects become better defined.

All projects in the R,E,&D pipeline are not represented in this plan. A detailed description of the R,E,&D program is contained in FAA's Plan for Research, Engineering, and Development. As F&E requirements evolve from R,E,&D efforts, projects will be established in future editions of the CIP.

PROJECT 61-06: Local Flow Management Enhancements (LFME)

Purpose: This project will provide enhancements for the tower, terminal, and en route levels of traffic management beyond those planned for the Traffic Management System (TMS). Since the en route metering (ERM) functional requirements were approved, additional enhancements have been identified that would make flow management automation more effective.

Approach: This project will evaluate potential en route, terminal, and tower traffic management improvements using prototypes for demonstrations. The focus of the project will be on Host enhancements and providing needed data to Terminal Radar Approach Control Facilities (TRACONs) and towers. However, the results of the analyses and evaluations will be useful for other projects. To facilitate transition of the tools from concept to implementation, rapid prototyping and simulation techniques will be used.

Potential enhancements to balance the flow of traffic through air-route intersections, metering functions, interfacility transmission of traffic management data, merging departures into en route streams, and "imaging" aid applications in en route airspace will be included. In addition, this project will evaluate changes necessary to improve the human-computer interface for the plan view displays to reduce the complexity of flow management functions.

Since Visual Flight Rules (VFR) traffic arrives at the TRACON without any prior warning, it is a continual source of last minute adjustments. Advance warning of incoming VFR traffic into the TRACON airspace is desirable. This project will generate technical analyses to support policy initiatives to enable TRACONs to receive advance information of incoming VFR traffic.

Products: An enhancement to ERM software that would be a tool for the TRACON in estimating and communicating more accurate, dynamic values of airport acceptance rates with increased discrimination over aircraft types, period of concern, destination fixes, and destination runways.

An enhancement to provide towers with better advance information of incoming traffic to plan runway configurations.

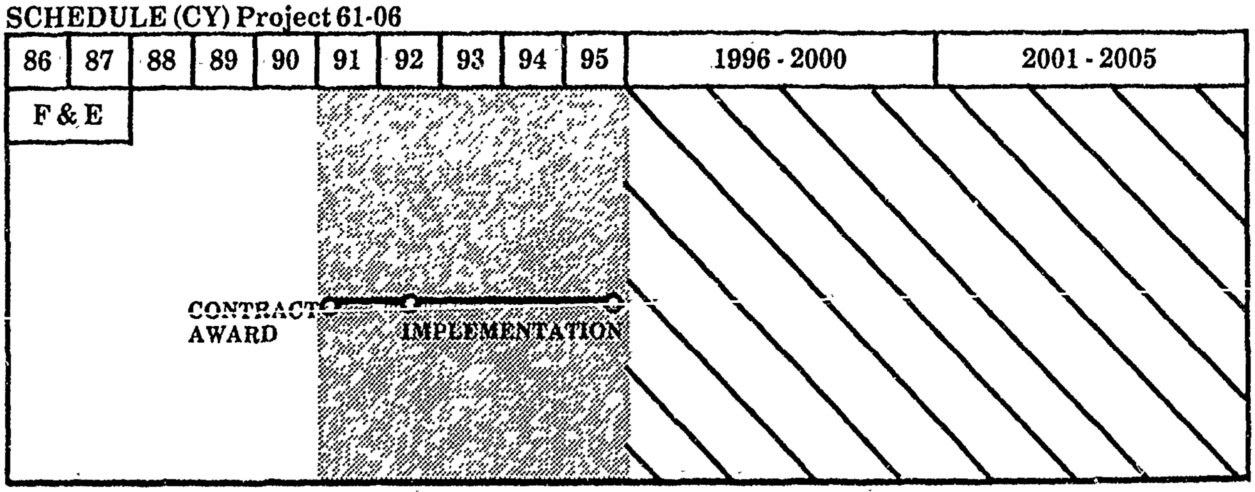
A tool to plan the arrival of aircraft based on a well-defined route structure for TRACON airspace, actual aircraft performance, and estimations of time-based separations.

Applications of the "imaging" aid in en route airspace. The aid consists of displaying a reference image or "ghosting" of an aircraft target on one approach onto another approach. Several applications for en route ATC have been identified including use of the aid to reduce the complex task of merging aircraft streams; the provision of relevant traffic being metered to common merge points across sector, area, or center boundaries; and providing enhancements to the quality assurance procedures in effect with regard to aircraft separation.

Software deliverables will be in the form of national Host or ARTS releases.

Related Project/Activities: 21-06 TMS, 21-12 AAS, 21-13 AERA, 46-30 ISP, 62-20 TATCA, and 62-22 NAMFAC.

SCHEDULE (CY) Project 61-06



PROJECT 61-20: Dynamic Ocean Track System (DOTS)

Purpose: Minimize fuel consumption, facilitate aircraft operations for users and the ATC system, and improve ATC designs and procedures by developing a tool to optimize flight track design and track utilization in oceanic airspace.

Approach: Develop computer algorithms which determine an aircraft's projected time and fuel consumption over the ocean given the operating conditions. Optimization techniques use these algorithms together with an automatic, dynamic weather database and varying ATC separation criteria to design flexible, fuel efficient tracks for oceanic traffic. A similar process is used to advise individual scheduled flights of the optimal track based on oceanic entry time and other aircraft traffic.

Products: Track generation and advisory algorithms, traffic planning display, and dynamic simulation model.

Progress/Activity from October 1989 through November 1990:

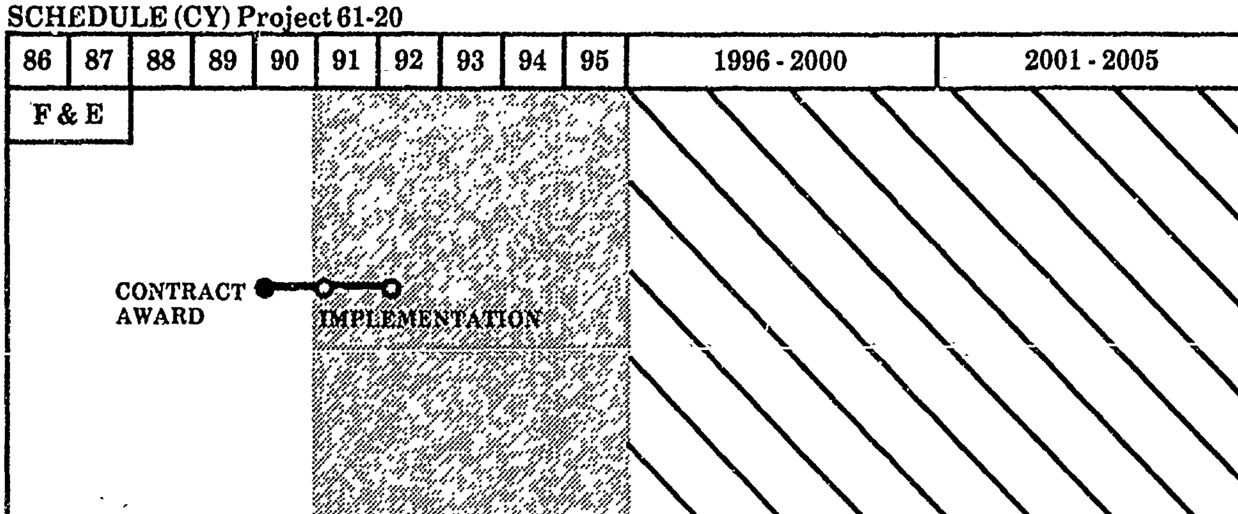
- Contract awarded to produce an operational system.
- Traffic display systems operational in the New York and Anchorage oceanic facilities.
- Tested the track generation capability in the Oakland oceanic facility.

Related Projects/Activities: 21-05 ODAPS and 21-06 TMS.

List of Contractors:

- TAMSCO
  (hardware/software development)
  Calverton, Maryland
  - Av Tec Systems
    Manassas, Virginia

SCHEDULE (CY) Project 61-20



PROJECT 62-01: Terminal Intrusion Function (TIF)

Purpose: This project enhances safety in all Terminal Control Areas (TCAs) and Airport Radar Service Areas (ARSAs) by providing an automated alert of uncontrolled aircraft. Aircraft operations within TCA airspace and ARSA airspace are controlled by strict rules to maintain safety in an environment of dense air traffic. As an additional safety measure, airspace volumes at nearby TCAs and ARSAs require that controlled and uncontrolled aircraft be equipped with altitude reporting equipment (Mode C). Unauthorized penetration of these airspace volumes by uncontrolled aircraft or aircraft without the proper equipment can cause extremely hazardous situations.

TIF will provide the radar controller with a display that warns of the unauthorized intrusion of an uncontrolled aircraft into TCA or ARSA airspace. It also will warn a terminal controller when an uncontrolled aircraft without Mode C enters airspace that requires such equipment. TIF will also provide the radar controller with the ability to notify other controllers of an intruding primary radar target (non-beacon-equipped) by using a specifically dedicated start-track manual entry.

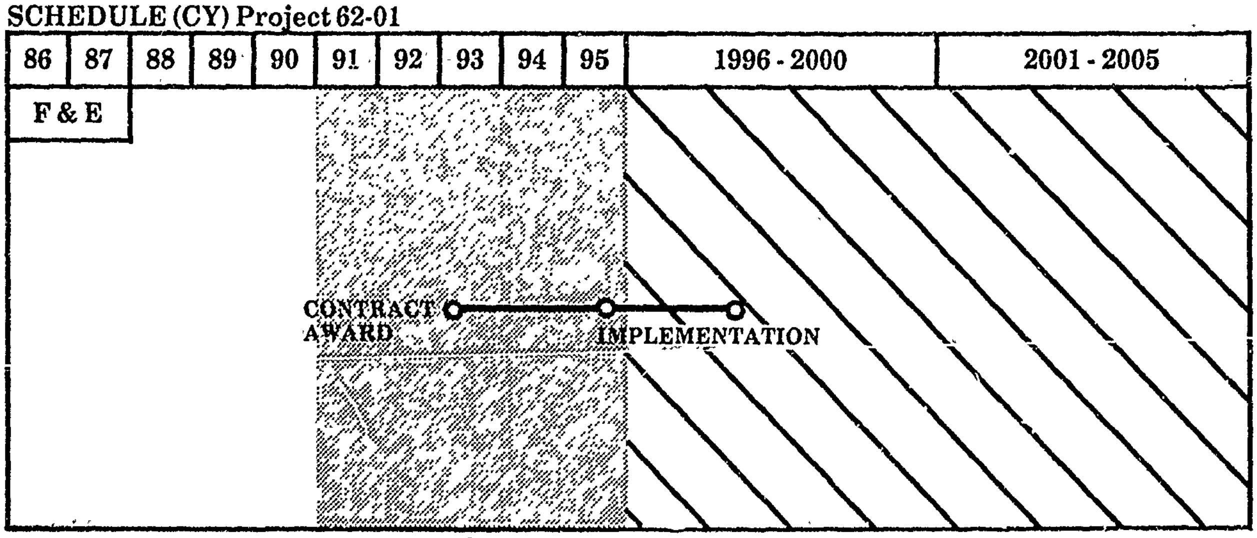
In providing these warnings to controllers, TIF complements the terminal Mode C Intruder (MCI) function. MCI extends the terminal conflict alert function by warning controllers of conflicts between controlled versus uncontrolled Mode C equipped aircraft. Currently, conflict alert warns controllers only about conflicts between controlled pairs of Mode C equipped aircraft. TIF will add another level of safety to MCI by warning controllers of uncontrolled aircraft. Additionally, TIF will warn controllers about uncontrolled aircraft that are not included in MCI calculations because they are not Mode C equipped.

Approach: Using a functional specification, a support contractor will design and program a prototype of the TIF function into the terminal computer program. Using this prototype program, testing will be conducted to demonstrate the feasibility of TIF. Once the feasibility of TIF is shown, an operational version of the function will be implemented into terminal system programs.

Products: One computer program adaptable for use at 61 Automated Radar Terminal System (ARTS) IIA locations and the New York TRACON, and one program adaptable at 128 ARTS IIA locations.

Related Projects/Activities: 24-12 Mode S, 32-06 Expand ARTS IIA Capacity and Provide MCI Capability, 32-20 Expand ARTS IIIA Capacity and Provide MCI Capability, 46-30 ISP, and 62-23 AMASS.

SCHEDULE (CY) Project 62-01



PROJECT 62-20: Terminal ATC Automation (TATCA)

Purpose: Develop ATC automation aids to assist controllers and supervisors to fully use available terminal airspace capacity, and to increase the safety and efficiency of aircraft operations into and out of terminal areas.

Approach: TATCA will help controller teams at major airports handle larger volumes of aircraft arrivals at major airports, particularly under Instrument Meteorological Conditions (IMC). The principal automation functions being investigated are traffic management advisory/planning tool, descent advisor, and final approach spacing tool.

The traffic management advisory tool will display aircraft arrival times and landing sequence to the en route and terminal control team. This will assure a steady flow of traffic to match the available capacity.

Arrival plans will be updated automatically based on surveillance data-derived changes in aircraft locations and speeds, demand information flight plans, and manual input data (e.g., runway configuration, visibility, and hazardous weather). A plan conformance indicator will display the amount of time each aircraft has deviated from the schedule.

When demand is heavy under IMC, the traffic planner will suggest aircraft landing sequences that will reduce the average in-trail spacing by using the predictable differences in landing intervals caused by factors such as wake-vortex separation and landing speed.

TATCA will help controllers by providing speed-control and holding advisories, descent advisories, and final-spacing aids.

Descent advisories will provide fuel efficient descents from cruise altitude using aircraft type-dependent fuel utilization models.

Final spacing aids will suggest specific speed changes or turn-to-final commands for bringing aircraft into compliance with the plan and for precisely spacing aircraft on final approach. The converging approach delivery aid, an early version of the final-spacing advisor for the ARTS environment, will assist controllers in feeding staggered approach streams to converging runways. This will allow beneficial use of converging approaches under IMC and continued use of multiple runways under lower ceilings.

The TATCA planning and advisory system will complement the FAA's current ERM system, the planned En Route Spacing Program (ESP), and the Arrival Sequencing Program (ASP). These programs deliver en route aircraft to the TRACON boundary at a manually specified average hourly rate. TATCA, in contrast, will assist controllers and supervisors planning individual trajectories and a specific, efficient landing sequence for aircraft.

The TATCA functions will be developed in parallel and integrated according to a phased development plan.

Operational procedures and guidelines will be established based on test results.

Development steps will include extensive demonstration, evaluation, and validation at the FAATC and key field sites prior to national implementation.

Products:

- Traffic management advisor including controller advisory software and controller interfaces.
- Specifications and technical support for national implementation.

Progress/Activity from October 1989 through November 1990:

- Developed TATCA Program Master Plan.
- Conducted initial concept review of Center-Terminal Automation System.
- Evaluated ghosting system for converging approaches at St. Louis TRACON.
- Initiated real-time simulation of TATCA planning with controllers.

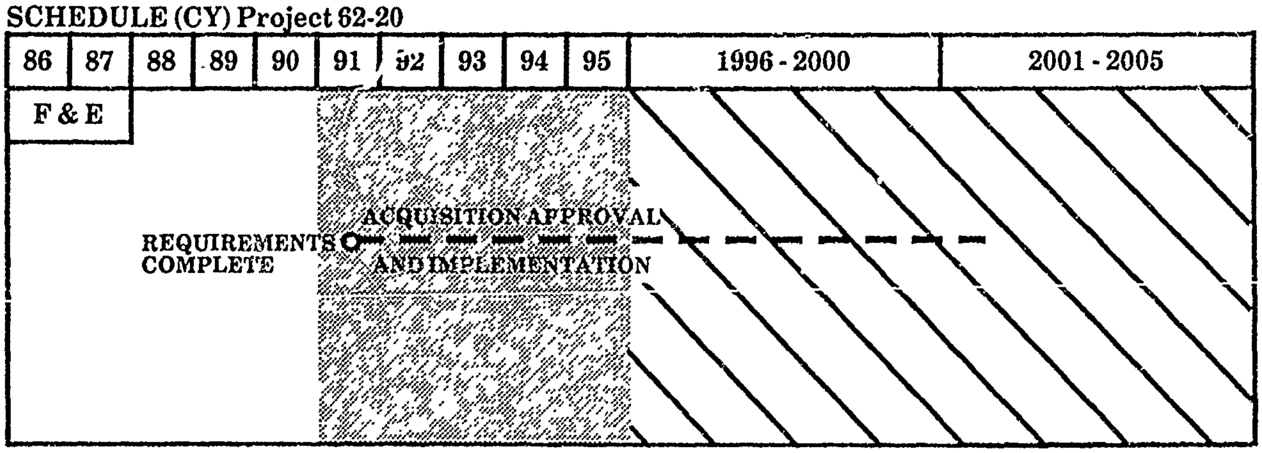
Related Projects/Activities: 21-06 TMS, 21-12 AAS, 21-13 AERA, 24-12 Mode S, 61-06 LFME, 62-21 ASTA, 62-22 NAMFAC, 63-21 ITWS, and R,E,&D Plan Project 3.5 TATCA. Weather projects will provide weather data along the terminal flight path.

List of Contractors:

- Lincoln Laboratory
  Lexington, Massachusetts
- MITRE Corporation
  McLean, Virginia
- NASA Ames Research Center
  Moffett Field, California

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 62-20



PROJECT 62-21: Airport Surface Traffic Automation (ASTA)

Purpose: Develop airport surface surveillance, communication, and automation techniques to provide an effective runway incursion alert and prevention capability, and to enhance airport capacity.

Approach: The safety and traffic automation functions of ASTA are based on the development of new primary and secondary surveillance techniques, which provide continuous coverage of the movement area and the short final approach airspace. The development and implementation of these techniques will occur in three overlapping phases.

Phase 1 will focus on the prevention of runway incursions based on radar surveillance, runway status lighting, and an interface for tower controllers providing advisories and warnings regarding aircraft movements. The Phase 1 safety system will build on enhancements to the ASDE 3 radar with AMASS installed. These enhancements include the digital processing of radar data to develop target reports within the movement area, an interface to obtain surveillance coverage of the short final airspace, and an audible alerting capability for tower controllers. ASTA 1 will provide a runway incursion prevention capability through the addition of software and a system of automatically-controlled runway status lights.

Work will begin during ASTA 1 on a Mode S surface surveillance system to complement the ASDE radar and automatically provide tags. Studies and experiments will be conducted leading to a Technical Development Plan (TDP) for the Mode S Airport Surface Surveillance and Communication System. The TDP will address system design, interface specifications to other surveillance and automation systems, and siting requirements. Engineering model units will be built to support data acquisition and real time tests. Candidate airports will be surveyed and site selection algorithms tested.

In Phase 2. the initial departure traffic management capability, including interfaces to other traffic automation elements, will be implemented. In addition, traffic management will have access to assigned taxi routing and provide initial conformance monitoring of aircraft movement. The experimental Mode S surface surveillance system, described in Phase 1, will be completed and integrated with the enhanced ASDE and the standard Mode S/ASR-9 sensors. Engineering tests of the Mode S surface surveillance system will be conducted at one or more large airports to validate surveillance accuracy, coverage, and interfaces with the other surveillance sensors. The tests will provide data to support system modeling and ASTA simulations. The development and introduction of ASDE processing enhancements will continue.

Phase 3 will extend the Mode S surface surveillance system to provide a two-way data link between the tower and the cockpit. The link will provide cockpit alerts for time-critical safety messages, cockpit display of surface traffic data, active taxi-route guidance, and final elements of the conformance monitoring capability. The integration of functions with TATCA and other traffic automation systems will be completed in Phase 3.

Products: Operational procedures, system descriptions, a rapid prototyping laboratory, data collection and analysis, system evaluations, and system specifications will be needed to produce 30 Phase 1, 2, and 3 ASTA systems.

Progress/Activity from October 1989 through November 1990:

- Completed ASTA system concepts and project planning.
- Completed preliminary documentation.
- Established initial Phase 1 ASTA real-time simulation capability (tower positions).
- Identified ASTA 1 integrated system design and subsystem requirements.

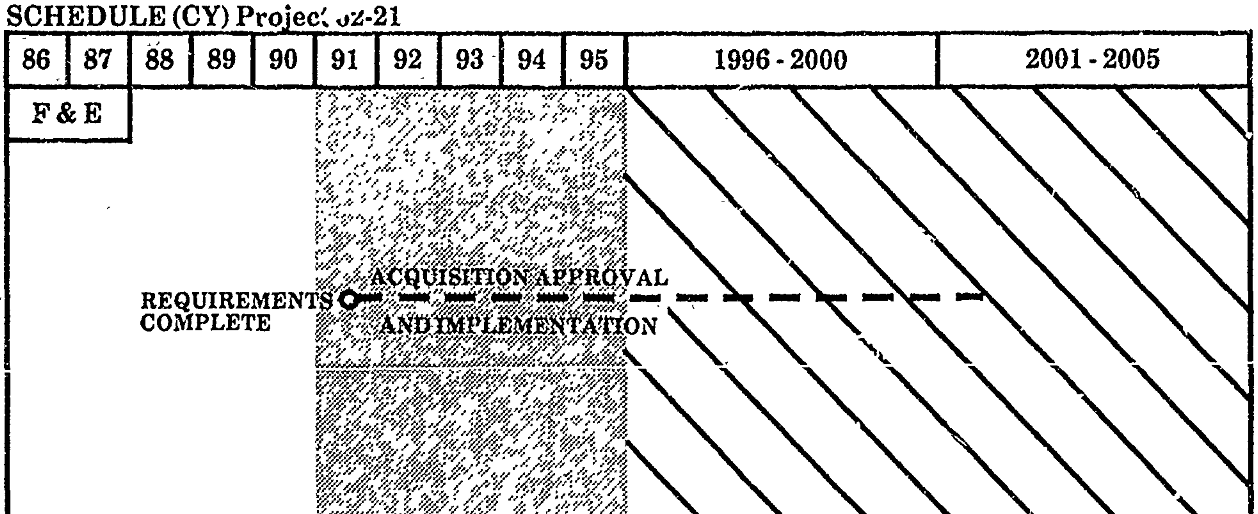
Related Projects/Activities: 21-06 TMS, 21-13 AERA, 24-12 Mode S, 24-14 ASDE 3, 44-33 ALSIP Continuation, 61-06 LFME, 62-22 NAMFAC, 62-23 AMASS, and R,E,&D Plan Project 3.6 ASTA.

List of Contractors:

- Lincoln Laboratory
  Lexington, Massachusetts
- MITRE Corporation
  McLean, Virginia
- Norden Systems
  Melville, New York

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 62-21



PROJECT 62-22: National Airspace Management Facility (NAMFAC)

Purpose: The NAMFAC provides three major functions to support the goals of the FAA. Each function is supported by an entity within NAMFAC.

1) The national traffic management function will ensure the viability of and provide the national direction and airspace management of the air traffic control system.

2) The modeling and analysis function will include the databases, personnel, and systems required to provide Air Traffic and selected organizations with tactical and strategic recommendations and forecasts based on computer simulation and optimization models, and studies and analyses of the air traffic system.

3) The management development function will provide a structure to familiarize users with the capabilities of the ATC system. Specific areas to be addressed in the curriculum include orientation to national airspace management, recurring training in system management techniques for FAA airspace managers, operational review and critique, and demonstration to the airspace system users of potential system problems identified through our modeling efforts.

Approach: This facility will house the airspace management organization, the National Weather Service (NWS) Central Flow Weather Service Unit (CFWSU), the National Flight Data Center, and the National Maintenance Coordination Complex. The existing and future systems required to support these organizations will also be housed here.

The airspace management function will include the personnel and systems needed to manage the national air traffic syster A proactive management role is envisioned using a combination of the data currently available, improved processing, better communications, and additional data.

The modeling and analysis facility will provide the capabilities required to perform in-depth statistical and analytical studies of the airspace system. These studies will enable the examination of solutions to airspace problems, and the determination of the maximum utilization of the airspace system on a real-time basis as well as during a long-term planning effort. It will also provide simulations and reconstructions to support the training and refresher activities of the management development facility. The functions required to support this effort include database management, airspace and rules simulations, and system analyses.

Field training, product indoctrination, and event critique capabilities will be provided by the management development facility. This facility will provide an off-line support capability and have an interface to the TMS. These capabilities will provide the forum for training the system managers in the function of national airspace management and will educate the aviation community on the operational effect of schedule changes, the implementation of new hubs, and changes of equipment.

This project will determine requirements for the incremental development of the NAMFAC and procure the necessary hardware and software. Initially, NAMFAC will operate using current TMS capabilities for the traffic management facility. NAMFAC will be enhanced to take advantage of advancements in hardware, improvements that are identified for the NAMFAC algorithms, and improved capabilities offered by other projects. This project will develop the requirements and will provide the processing capabilities necessary to support NAMFAC functions designed specifically to operate with the Advanced Automation System (AAS) for the next-generation TMS. Prototyping and simulation techniques will be used for development and evaluation.

Programmatic developments will be engineered sequentially into respective physical facilities as follows: the Air Traffic Control System Command Center building, followed by the Modeling and Simulation Facility and the Management Development Facility.

Products: NAMFAC will contain functions for national traffic management, operational analysis and modeling, and management development capabilities.

Progress/Activity from October 1989 through November 1990:

- Established concepts and definitions.
- Identified system and site requirements.
- Initiated site selection activity.
- Developed project plan and program plan.
- Identified and initiated systems engineering activities.

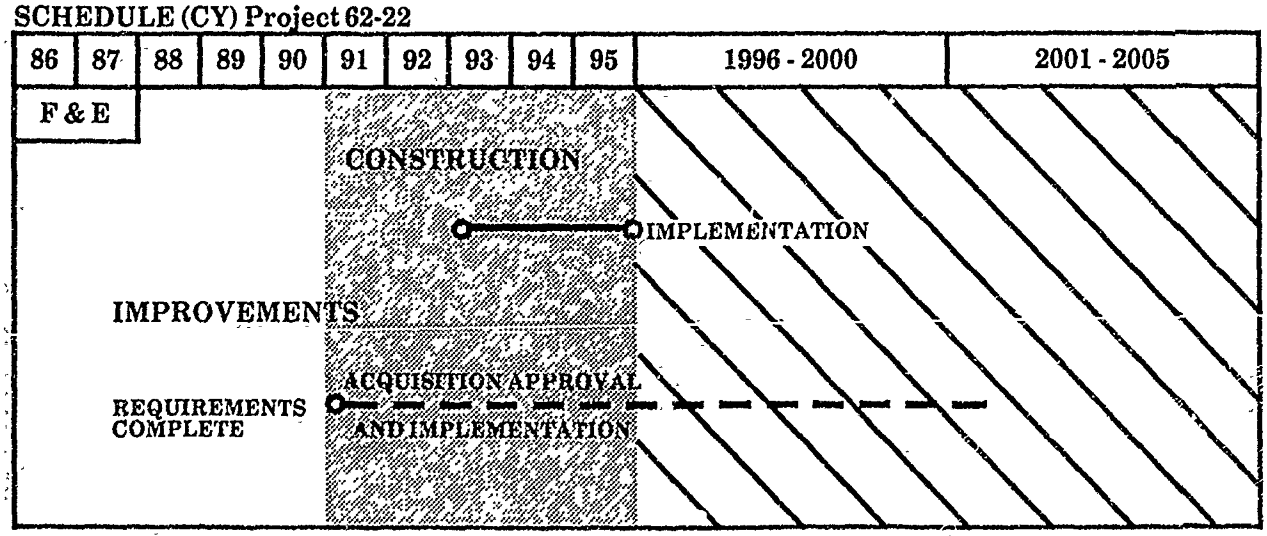
Related Projects/Activities: 21-06 TMS, 41-22 Relocate ATSCC, 61-06 LFME, 62-20 TATCA, 62-21 ASTA, 62-23 AMASS, and 63-22 AWPG.

List of Contractors:

- MITRE Corporation
 (engineering support services)
 McLean, Virginia

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 62-22



PROJECT 62-23: Airport Movement Area Safety System (AMASS)

Purpose: Develop a near-term solution to provide an interim runway incursion prevention system at airports with ASDE-3 radars.

Approach: AMASS will add an automation enhancement to the ASDE-3 to provide conflict alert algorithms for tower controllers to detect and prevent runway incursions and accidents. The AMASS will be used by local and ground controllers at the 31 operational ASDE-3 sites. The technical approach includes converting ASDE-3 digitally processed target data into target image data as inputs to the runway incursion algorithms. The system also includes a track data interface with the ARTS IIIA to include airborne aircraft on final approach in the conflict alert algorithms. The system uses the ASDE-3 equipment as the display/entry device, requiring no additional displays or entry devices in the tower. Controller entries are not required during normal operations. Entries are required to set the logic at the beginning of each change in runway configuration or operating condition. This will require significant work with controllers to define the man-machine interfaces and air traffic procedures.

Products: 31 operational runway incursion prevention systems.

Progress/Activity from October 1989 through November 1990:

- R&D contract awarded.

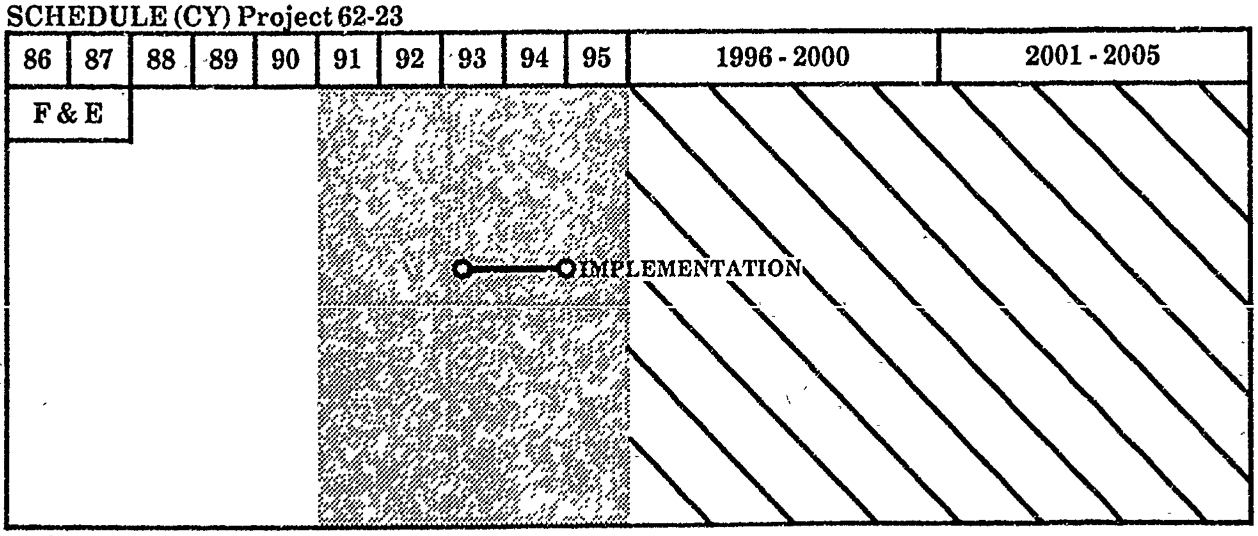
Related Projects/Activities: 24-14 ASDE-3, 62-01 TIF, 42-20 ATCT System Intra-Connectivity, 62-21 ASTA, and 62-22 NAMFAC.

List of Contractors:

- Norden Systems
  (AMASS algorithms)
  Melville, New York

- MITRE Corporation
  (engineering support services)
  McLean, Virginia

SCHEDULE (CY) Project 62-23



PROJECT 63-02: Central Weather Processor (CWP) Interfaces

Purpose: Develop, test, and evaluate required CWP interfaces to other elements of the NAS to realize the full potential of CWP to disseminate real-time weather information to pilots, air traffic controllers, and traffic management specialists.

Approach: The CWP, composed of the Real-Time Weather Processor (RWP) and the Meteorologist Weather Processor (MWP), will provide time-critical information on hazardous and operationally significant nonhazardous weather. Through interfaces to the Data Link Processor (DLP), RWP will supply a subset of these products for uplink to pilots via Mode S. The RWP will receive aircraft-based winds and temperatures aloft observations from the DLP. These observations will be used to provide enhanced wind products for use by automation systems such as Automated En Route ATC (AERA) 2, AERA 3, TMS, and TATCA. The RWP will also produce other products needed by those systems, such as hazardous weather contours with sufficient spatial and temporal resolutions. In addition, the RWP will supply products to the MWP which will allow meteorologists at Center Weather Service Units to display and manipulate weather products available in the MWP. Also, the RWP will forward products developed by meteorologists from the MWP to the AAS.

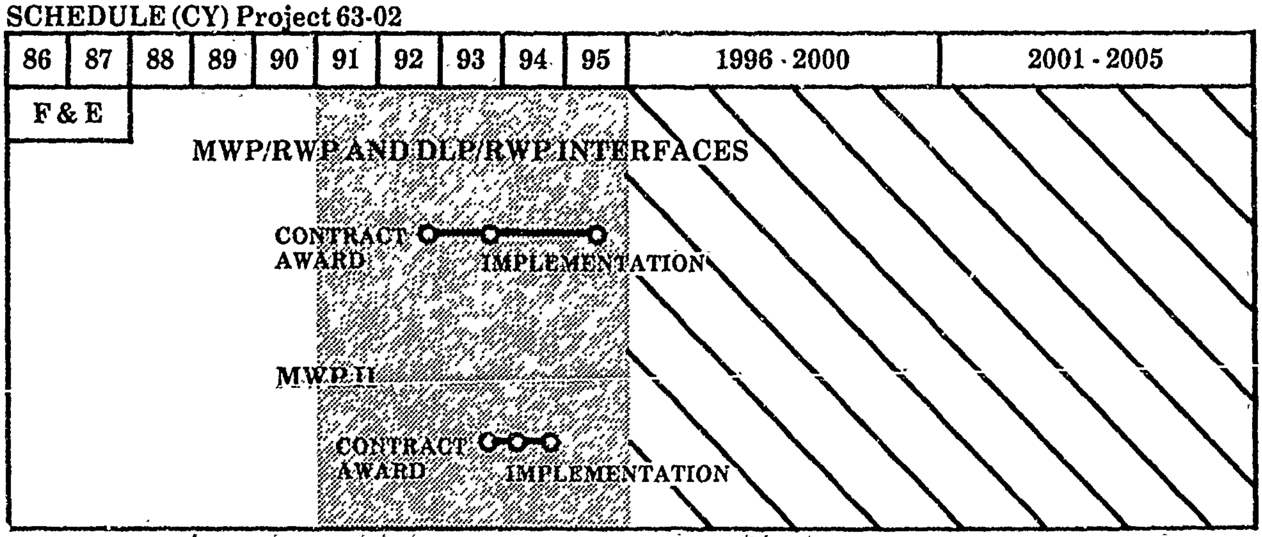
Enhancement packages will be developed to accommodate the RWP/MWP and RWP/DLP interfaces. These interfaces will enhance the benefits of the CWP, providing better and more timely weather information to pilots, controllers, and traffic management specialists. Specifications will be updated to support these interfaces and additional software developed for the RWP to implement the requirements. Second-generation MWP requirements will be defined and will include an interface with the RWP.

Products:

- RWP-MWP interface implementation.
- RWP-DLP interface implementation.
- Second-generation MWP implementation.

Related Projects/Activities: 23-02 CWP, 23-05 Aeronautical Data Link, 24-12 Mode S, 64-16 Weather Enhancements, and R,E,&D Plan Project 7.5 CWP.

SCHEDULE (CY) Project 63-02



PROJECT 63-05: Aeronautical Data Link Communications and Applications

Purpose: Develop data link applications for improving air-to-ground data communications services to achieve goals of higher productivity, increased efficiency, enhanced safety, and increased capacity through error-free communications and reduced voice frequency congestion. This effort will support the creation of the future ATC environment and provide the technical development needed to implement the enhanced DLP, Aeronautical Telecommunications Network (ATN), and Mode S data link system as an air-to-ground data communications element within the NAS.

Approach: Implement air-to-ground data link communication enhancements and weather-related data link applications to establish a flexible air-to-ground data communications system. This project provides communications between NAS elements and properly equipped aircraft, and develops useful applications for the communications system.

Develop the architecture of the air-to-ground communications system to conform to the separation of functions specified by the Open Systems Interconnection (OSI) reference model. This will allow applications development independent of the air-to-ground links used for communications. Protocols will allow the use of multiple air-to-ground data links. Establish several test beds to help verify the correctness of communications protocols and to permit pilot and controller evaluations of new services. Protocols to be tested will include both Mode S data link and end-to-end communication functions not specific to Mode S. Test beds will also test the operability of multiple air-to-ground data links. Developing and evaluating these communications protocols will further the establishment of guidelines and standards for related avionics. This, in turn, will lead to a wider use of Mode S data link.

Activities include developing, testing, and validating operational concepts for several data link applications, as well as defining message flows, content, and format for each application. The project also addresses message-processing algorithms and detail-specific human interfaces.

Cost studies of the safety improvements for proposed air-to-ground data communication applications will be conducted to determine the priority of services and the order of their implementation. Interfaces between Mode S and other CIP projects using the air-to-ground data link will be defined. Technical guidance will be provided as appropriate.

Products:

- ATC services to be implemented include predeparture clearance delivery, initial contact, transfer of communications, altitude assignment, and voice communication backup, predeter mined ATC instructions such as restricted altitude assignments, speed instructions, and crossing restrictions; and Automatic Terminal Information Service (ATIS).

- Additional weather applications.

- Mode S data link engineering test bed, Mode S data link avionics test bed (processors and input/output devices), and demonstration, testing, and user evaluation of applications.

- Application-independent communications protocols, message-coding algorithms, and applications and interface software needed to implement services.

- Technical guidance data for data link national aviation system standard, data for the Radio Technical Commission for Aeronautics process that is developing Minimum Operational Performance Standards, data for the development of International Civil Aviation Organization (ICAO) standards, and recommended practices and data link interoperability guidelines.

- Requirements and analyses for architectural and operational requirements for Mode S data link interface with the AAS and DLP, correlation of graphic data link weather presentation with actual weather, as observed by the pilot, to permit product improvement, user and FAA cost-benefit studies to determine service priority and implementation order, and operational concepts for each application.

- Implementation of tower workstation and enhanced DLP hardware and software to support the NAS air to-ground data link needs.

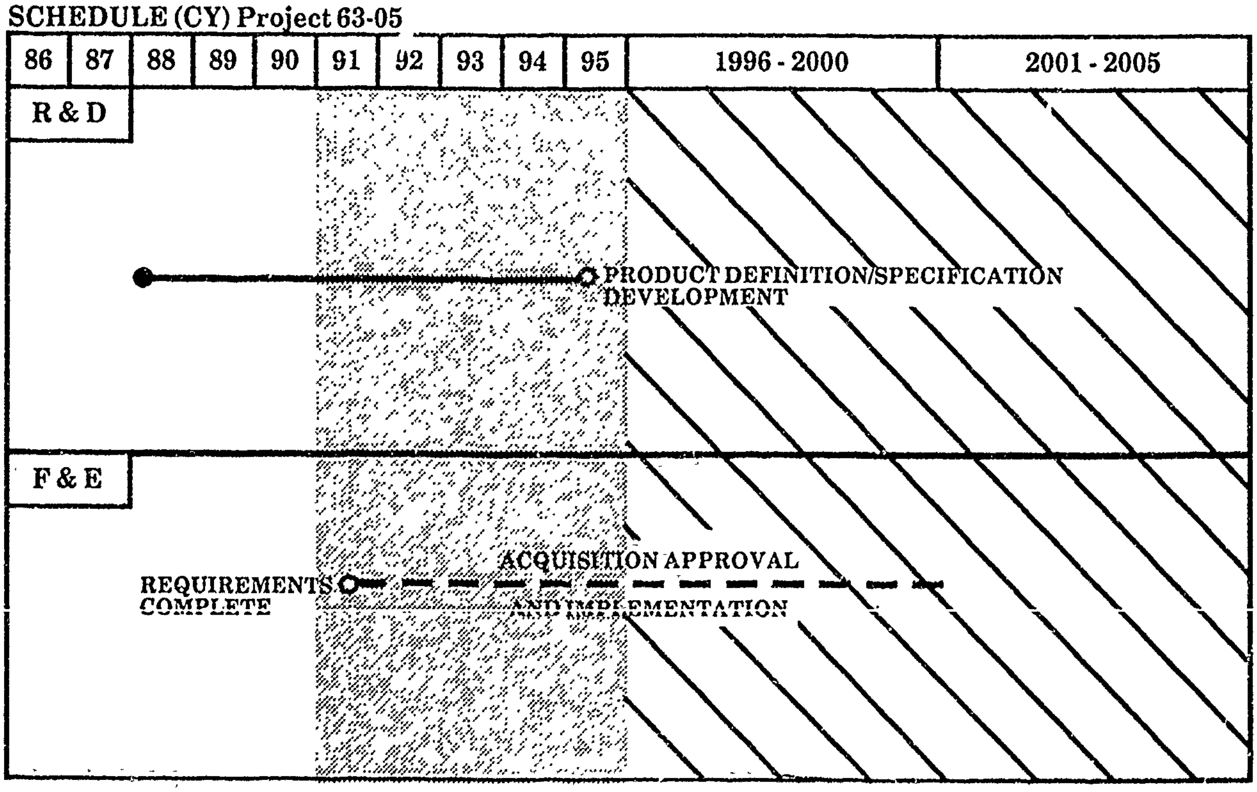
Progress/Activity from October 1989 through November 1990:

- Initial design of en route and terminal ATC services by Air Traffic Data Link Validation Team (ATDLVT), Aeronautical Data Link Validation Committee (ADLVC), and engineering support (data link program office).
- Preparation for operational field evaluation of the controller tower workstation for ATIS.
- Operational field evaluations of predeparture clearance data link service at the Dallas/Ft. Worth, San Francisco, and the Chicago O'Hare airports.
- Guidelines for OSI internetworking aprroved by RTCA.
- Second annual Data Link Symposium conducted.
- Requirements analysis completed for initial en route data link services as part of the En Route Software Development Support contract.
- Initial terminal data link services using the data link testbed at FAATC are being evaluated by the ATDLVT and ADLVC.

Related Projects/Activities: 21-12 AAS, 21-13 AERA, 23-05 Aeronautical Data Link, 24-12 Mode S, 41-21 En Route Software Development Support, 65-22 ATN, and R,E,&D Plan Project 4.5 Aeronautical Data Link Communications Applications.

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 63-05



PROJECT 63-12: Low-Level Wind Shear Alert System (LLWAS) Enhancements

Purpose: This project enhances LLWAS performance by improving the LLWAS algorithm by integrating LLWAS with Terminal Doppler Weather Radar (TDWR) when both sensors are collocated, and by evaluating ice-free LLWAS sensors.

Approach: Improve the performance of the LLWAS by completing scientific algorithm refinements that specifically address the mitigation of false alarms caused by "chinook" wind conditions. Complete LLWAS interfaces to the TDWR. Test and evaluate candidate LLWAS wind sensors for compliance with the ice-free wind sensor requirements. Continue an interagency agreement with the National Science Foundation to have the National Center for Atmospheric Research (NCAR) complete the LLWAS/TDWR integration algorithm. Complete the remaining algorithms through an interagency agreement with the U.S. Air Force. Continue support of the Transportation Systems Center to complete a specification for a wind sensor replacement.

Products: LLWAS enhancements will provide algorithms for wind shear detection and identification, integrated LLWAS/TDWR, and improved LLWAS wind sensors.

Progress/Activity from October 1989 through November 1990:

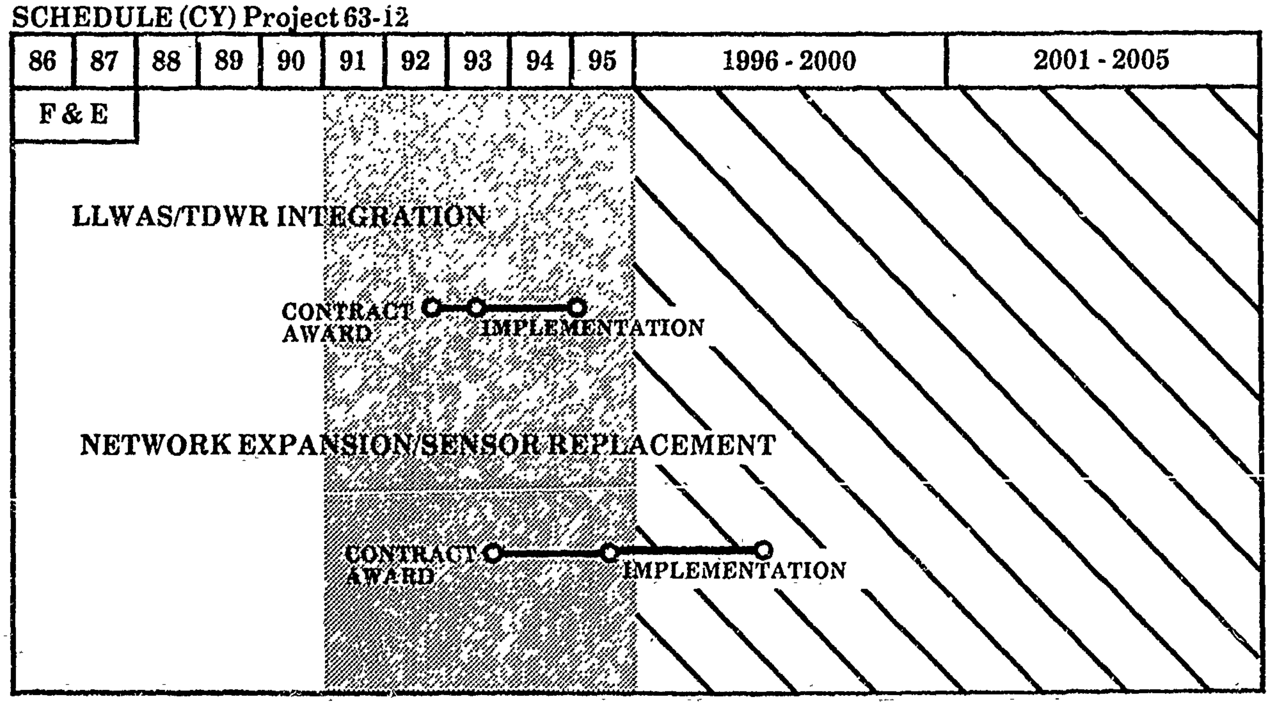
- Completed algorithm modifications to suppress thermal alarms.
- Completed large airport algorithm redesign.
- Completed Runway Extension Evaluation Report.
- Completed Algorithm Specification for Network Expansion LLWAS.

Related Projects/Activities: 23-12 LLWAS, 24-18 TDWR System, 43-12 Upgrade LLWAS to Expanded Network Configuration, 64-16 Weather Enhancements, and R,E,&D Plan Project 7.3 LLWAS Enhancements.

List of Contractors:

- National Center for Atmospheric Research (algorithms)
  Boulder, Colorado
- Cooperative Institute for Mesoscale Meteorological Studies (meteorological research)
  Norman, Oklahoma
- Lincoln Laboratory
  Lexington, Massachusetts

SCHEDULE (CY) Project 63-12



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PROJECT 63-21: Integrated Terminal Weather System (ITWS)

Purpose: This project enhances terminal area weather products for controllers/traffic managers by integrating all existing weather data sources and synthesizing the information into a user-friendly environment.

It will integrate the FAA's automated terminal area weather products with NWS terminal forecast products and generate new weather products for display to controllers and traffic management specialists at airport traffic control towers. This integration will increase the number of aviation weather products while eliminating duplication and potential contradictory messages. The goal of this activity is to correlate hazardous weather coverage to aircraft surveillance radar coverage.

Approach: This project is focused on the largest airports that have numerous sources of weather data (e.g., TDWR, LLWAS, ASR-9). Automated products from existing terminal area detection and display systems will be integrated sequentially to generate new weather products. ASR-9 weather data will be added to the LLWAS/TDWR data sets. Automated Weather Observing System (AWOS)/Automated Surface Observing System (ASOS) and lightning detection will be added to the new system thereafter.

Demonstration and evaluation of a rapid prototype display and workstation will be accomplished in an operations center test bed. A variety of new strategic aviation weather products for use in management of terminal, air traffic sector, and national airspace will also be developed and introduced for testing. Procurement requirements and specifications will be further refined in subsequent operational field testing of the prototype system. In addition, the project will explore the viability of providing hazardous wind shear products directly to pilots via data link and to outlying airports, including those primarily serving general aviation. Principal technologies to be addressed will encompass current NAS sensors [TDWR, LLWAS, Next Generation Weather Radar (NEXRAD)], winds and temperatures aloft via data link, and lower cost technologies that may be shown to provide benefits. New product refinements will continue during the contract and implementation phase of the project to facilitate contractor follow-through.

Products: 100 ITWS consoles, 2 weather product operational test beds, 2 prototype display and workstation consoles, and integrated hazardous weather detection and display algorithms.

Progress/Activity from October 1989 through November 1990:

- Work on the LLWAS-TDWR integrated display continued.
- Contractor study completed showing cost-benefits of increasing LLWAS locations and integrating wind shear related systems with ASR-9 precipitation data.
- Research to expand weather functionality of ASR-9 for wind shear related detection proven feasible for airports not covered by TDWR.

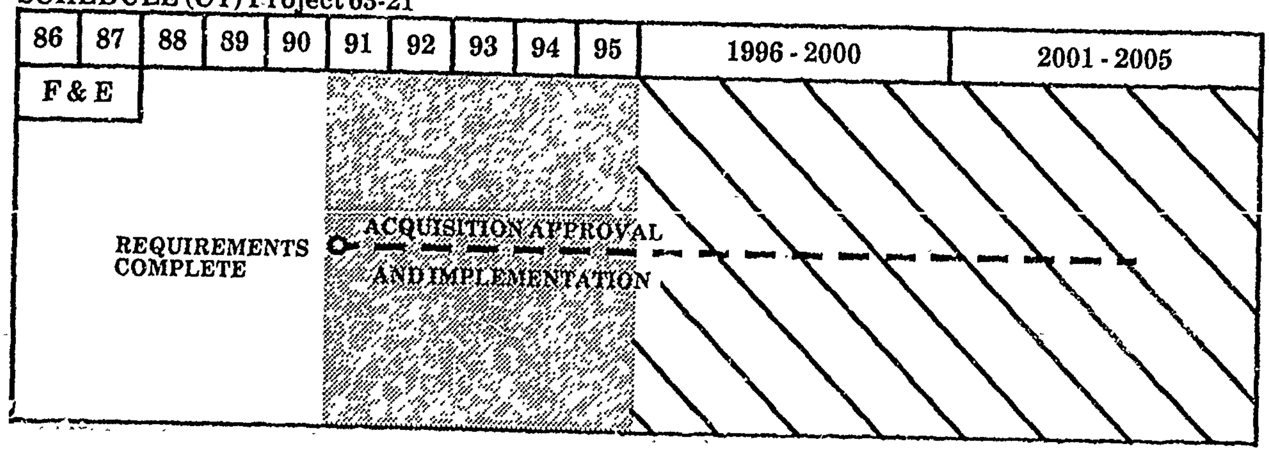
Related Projects/Activities: This project will provide centralized functions which will consolidate and use existing and planned FAA weather capabilities. It will also provide an integrated weather data set to meet the weather data requirements of 62-20 TATCA.

List of Contractors:

- Lincoln Laboratory
  (ITWS prototype)
  Lexington, Massachusetts

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 63-21



PROJECT 63-22: Aviation Weather Products Generator (AWPG)

Purpose: This project will integrate all NWS/FAA weather sensor data into real-time weather products for use by the aviation community.

Approach: As a result of the efforts of the NWS and the FAA, weather system detection and data processing capabilities are being dramatically improved. The acquisition of sensor systems like NEXRAD, wind profiler, and next generation geostationary operational environmental satellite by the NWS, and terminal area weather sensors like TDWR will allow the acquisition of high-density, state-of-the-atmosphere data. The NWS and the FAA will jointly develop the aviation weather forecasting techniques necessary to convert these data sets into high-resolution aviation weather forecasts. These forecasts will be generated by NWS Aviation Weather Interactive Processing Systems (AWIPS) at their Warning and Forecast Offices (WFOs). The AWPG will store these forecasts into a gridded database, merge and smooth the data sets into regional and national data sets, generate aviation user-specific graphic and alphanumeric weather forecast products, and generate voice aviation messages.

The resolution of these problems will be accomplished by providing facilities to receive and process AWIPS-derived products into the NAS. AWPG is divided into two components: a National Aviation Weather Products Generator (NAWPG), and a Regional Aviation Weather Products Generator (RAWPG). Development of the AWPG will be supported by an Aviation Weather Development Laboratory (AWDL). The AWPG will ensure the appropriate integration of NWS AWIPS products into the NAS and provide the means for generating additional specialized aviation weather products, including products derived from FAA systems as well as from the NWS.

As aviation weather products are developed by the AWDL, processing functions will be allocated to the appropriate level. It is envisioned that most local product generation responsibility will be allocated to the AWPG. AWPG products will be interfaced regionally with the upgraded RWP/MWP for ACF utilization. Because there are many WFOs in each ACF area, products will require an ACF area merge. WFO and ACF products of interest to the national level will be forwarded to the NAWPG. In this case, a merge of ACF products to form a national-level product will be carried out by the NAWPG. As a national-level facility, the NAWPG will provide a great deal of direct support to the national traffic management function. As a result, the NAMFAC has been selected as a candidate location for NAWPG.

Products: 23 RAWPG and one NAWPG.

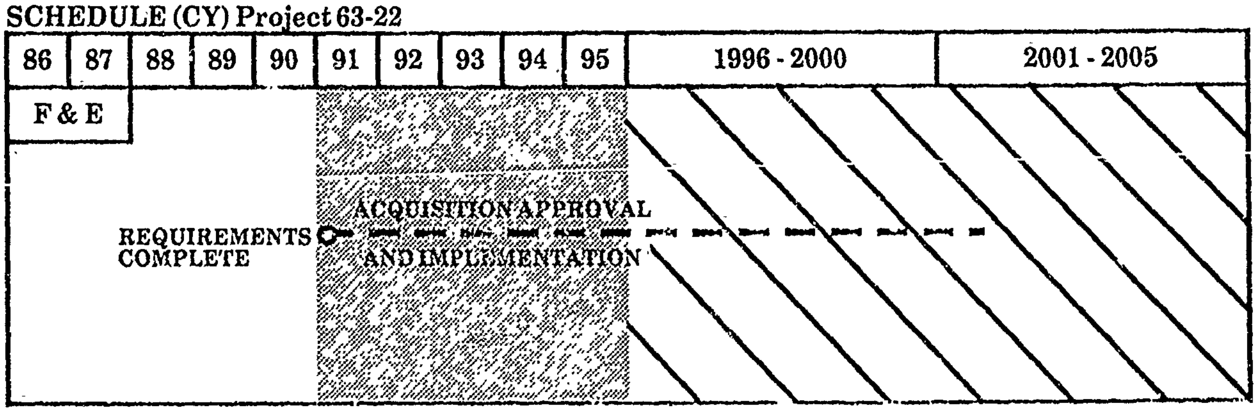
Related Projects/Activities: 62-22 NAMFAC and all FAA and NWS weather projects.

List of Contractors:

- National Center for Atmospheric Research
  (AWDL and AWPG prototype)
  Boulder, Colorado
- National Oceanic and Atmospheric
  Administration (NOAA)
  Environmental Research Laboratory
  (AWIPS forecast products)
  Boulder, Colorado

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 63-22



PROJECT 64-05: Global Positioning System (GPS) Monitors

Purpose: This project provides a monitor system to enable use of GPS by civil aviation for supplemental en route navigation and nonprecision approaches.

Approach: VOR/DME is the international standard for civil air navigation. Navigation systems that provide service in the NAS in conjunction with VOR/DME are termed supplemental systems. To better prepare the FAA for the future of air navigation, GPS will serve as a supplemental system for civil aviation in addition to its primary role as a U.S. military positioning system.

The FAA will monitor GPS satellite signals to be immediately aware of the operational status of the total GPS navigation system. Monitor data will be used to inform pilots and air traffic personnel of the status of GPS.

Studies and experiments will be conducted to finalize requirements and verify performance of alternative monitoring techniques.

In response to industry concerns, FAA will focus on a "wide-band" technique which can support future enhancements. The potential of non-ground-based (receiver autonomous) techniques are also being investigated.

Products: GPS monitor systems.

Progress/Activity from October 1989 through November 1990:

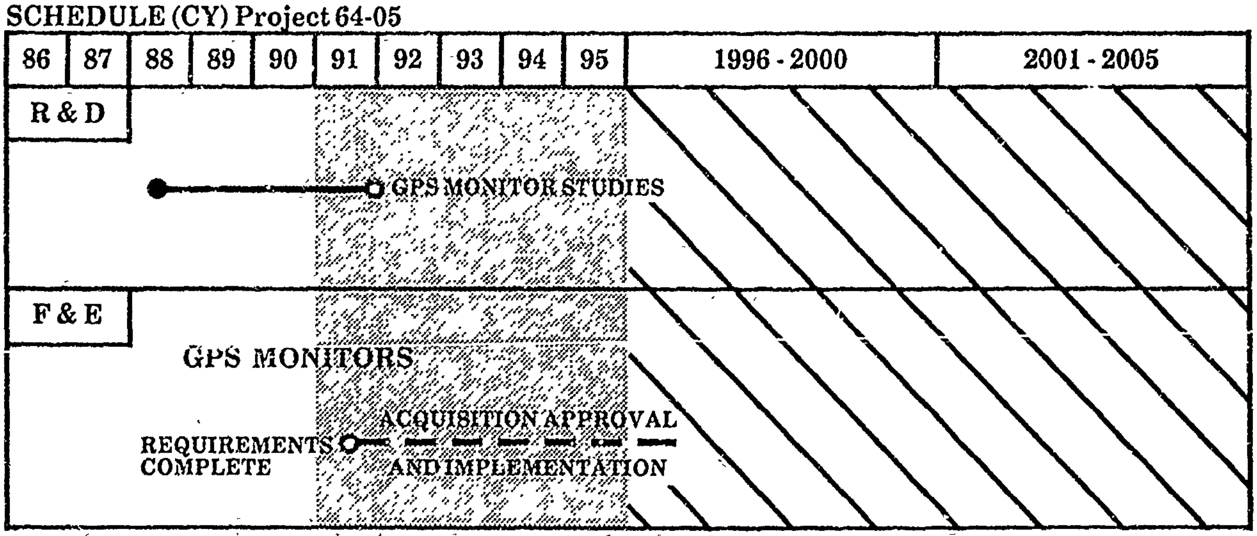
- Test and studies of GPS performance completed.

Related Projects/Activities: 26-01 RMMS, 26-04 MCC, 46-01 Sustain RMMS, and 46-04 MCC Enhancement.

Section 4

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 64-05



PROJECT 64-13: Airport Surveillance Radar (ASR-9) Modification for Low-Altitude Wind Shear Detection

Purpose: Enhance the hazardous weather detection capability of ASR-9 by developing and testing a modular data processing channel for automatic detection of thunderstorm microbursts and gust fronts. This enhancement provides wind shear warnings at airports not planned to receive TDWR.

Approach: Continue an interagency agreement with the Air Force to have Lincoln Laboratory develop and demonstrate radar modifications, data processing computers, and processing algorithms that enable an ASR-9 to detect low-altitude wind shear. Techniques will be implemented on a production ASR-9 and demonstrated during tests at the Orlando, Florida, airport.

Products:

- Signal processing algorithms for estimation of low-altitude radial winds using ASR-9.
- Microburst and gust front detection algorithms.
- Demonstration of wind shear detection on a production ASR-9.
- Specification for radar modifications and wind shear processor.
- Production of radar modifications and wind shear detection processor on approximately 65 ASR-9s.

Progress/Activity from October 1989 through November 1990:

- Collected analysis of severe storms data in Kansas City.
- Developed/implemented real-time microburst detection on ASR-9 emulation radar.
- Examined gust front detection using ASR-9.
- Began outfitting of production ASR-9 as transportable testbed for wind shear detection and airplane surveillance testing.

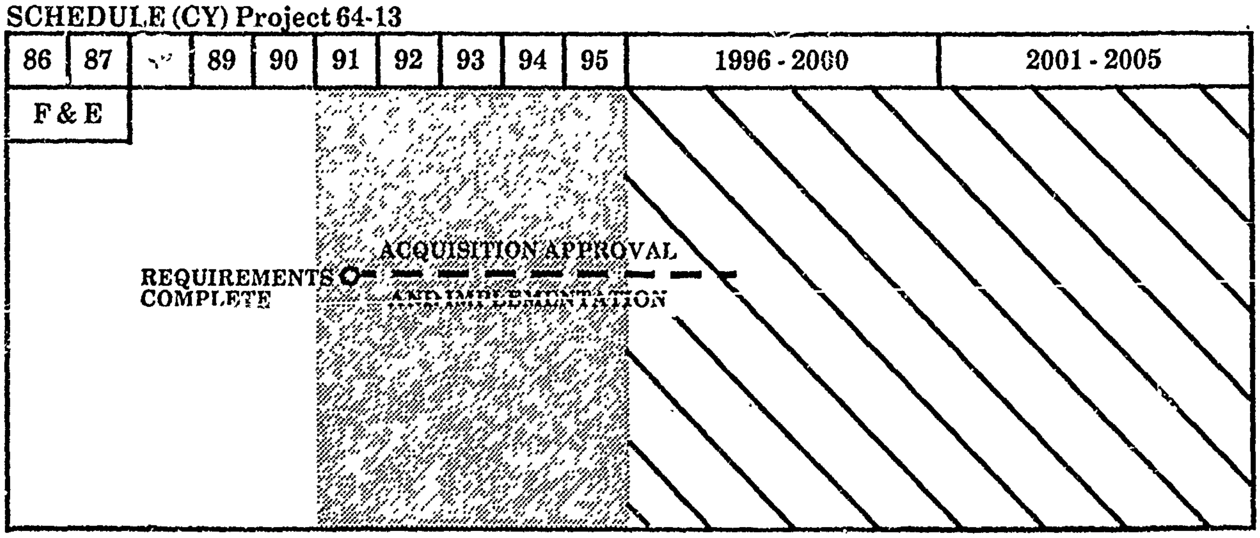
Related Projects/Activities: 23-12 LLWAS, 24-13 ASR Program, 24-18 TDWR System, 43-12 Upgrade LLWAS to Expanded Network Configuration, 63-12 LLWAS Enhancements, and 64-16 Weather Enhancements.

List of Contractors:

- Lincoln Laboratory
  (ASR-9 modifications)
  Lexington, Massachusetts

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 64-13



PROJECT 64-16: Weather Enhancements

Purpose: Improve the weather short range forecasting and nowcasting for aviation. This program will improve hazardous weather warnings and short range forecasts affecting the safety, efficiency, and capacity of the NAS.

Approach: New techniques will be developed for the use of single sensors, such as NEXRAD and TDWR, and multiple sensors to detect and predict changing weather conditions.

Activities in this project consist of new algorithms including turbulence, gust fronts, and convective initiation; algorithms, numerical weather prediction models and/or expert systems to predict changes in ceiling and visibility; and methods of detecting and predicting clear air turbulence, icing, and upper winds.

Products:

- NEXRAD algorithms:
  - Convective initiation
  - Gust Fronts
  - Downbursts
  - Turbulence detection
- TDWR algorithms:
  - Microburst prediction
  - Gust front detection enhancements
  - Tornado detection
  - Storm movement prediction
- Nowcasting:
  - Weather hazards
- Short range forecasting:
  - Winds, turbulence, ceiling and visibility changes, etc.

Progress/Activity from October 1989 through November 1990:

- Icing algorithm concept tested.
- Convective initiation data collected.
- Gust front algorithm concept developed.
- Downburst algorithm concept developed.

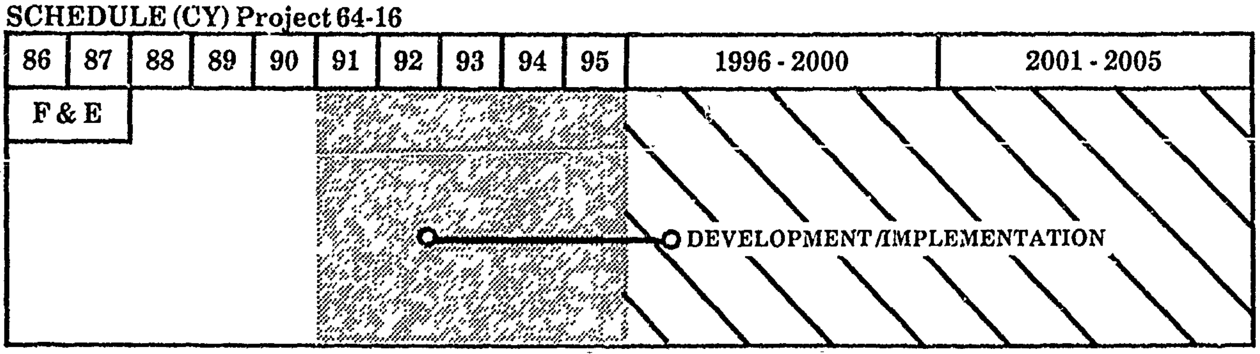
Related Projects/Activities: 23-02 CWP, 23-12 LLWAS, 24-16 Weather Radar Program, 24-18 TDWR System, 43-12 Upgrade LLWAS to Expanded Network Configuration, 63-02 CWP Interfaces, 63-12 LLWAS Enhancements, 63-21 ITWS, 63-22 AWPG, 64-13 ASR-9 Modification for Low-Altitude Wind Shear Detection, R,E,&D Plan Project 7.1 NEXRAD, and R,E,&D Plan Project 7.2 TDWR.

List of Contractors:

- Lincoln Laboratory
  (test bed, microburst algorithm)
  Lexington, Massachusetts
- National Center for Atmospheric Research
  (test bed)
  Boulder, Colorado
- National Severe Storms Laboratory
  (gust front algorithm)
  Norman, Oklahoma

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 64-16



PROJECT 64-17: LORAN Offshore Flight Following (LOFF)

Purpose: This project provides LORAN-C dependent surveillance data on aircraft operating in the Gulf of Mexico area.

Approach: The project will be accomplished by documenting requirements, initiating budgetary actions, coordinating specifications, coordinating procurement package, initiating production contract, and implementing delivered products.

Houston Center has been involved in the testing of LOFF. LOFF is an automatic independent surveillance system which uses LORAN-C to compute aircraft position in latitude and longitude. This information is then sent to a transceiver and transmitted via a data burst on a standard Very-High Frequency (VHF) to the ATC computer. The data are converted into standard common digitizer format, providing pseudo beacon reply messages to the computer. The final result is a display of track and target data on the controller display. Based on the results of this testing, a recommendation was made that the FAA pursue LOFF as an alternative to non-radar separation in the Gulf of Mexico.

Products:

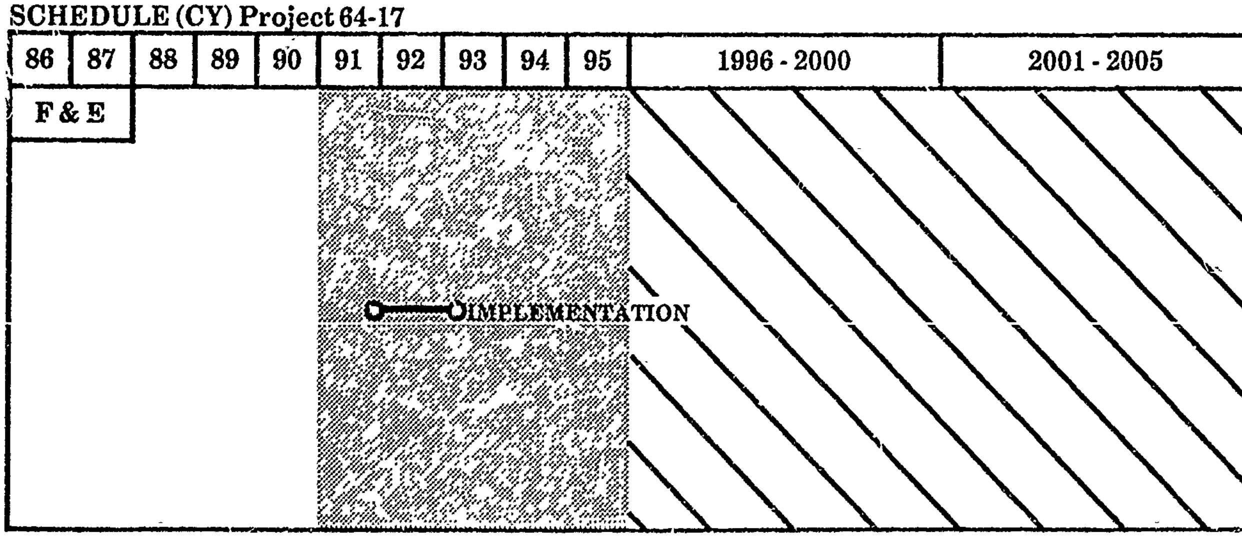
- LOFF processor.
- LOFF specifications, reports, and contract documents.

Progress/Activity from October 1989 through November 1990:

- Development of program plan for LOFF.

Related Projects/Activities: 24-17 LORAN-C Systems and 44-35 LORAN-C Monitors.

SCHEDULE (CY) Project 64-17



PROJECT 64-20: National Implementation of the "Imaging" Aid for Dependent Converging Runway Approaches

Purpose: This project implements the "ghosting" automation aid for dependent converging approaches in Category I Instrument Flight Rules (IFR) conditions at all eligible TRACONs/airports. The effect of this implementation will increase the capacity of airports with converging runways in IFR conditions and marginal VFR conditions by allowing continued use of the converging runway. The safety of this operation will be maintained by using the "ghosting" automation aid to assist the controllers in setting up an appropriate dependent operation.

Approach: An automation aid, called the "imaging" or "ghosting" aid, has been prototyped and demonstrated in laboratory conditions through controller simulations for facilitating precision approaches to converging runways in Category I IFR conditions. The aid consists of displaying to controllers a reference image or a "ghosting" of an aircraft target approaching a runway which is used for facilitating staggered converging operations. The aid has the potential of use at up to 30 of the top 101 airports in the United States. Modifications to the ARTS code specifications for national implementation and any changes required in air traffic procedures for a general application at all airports are being developed. The project will implement this aid nationally and will include developing and deploying software modifications to the ARTS IIIA and ARTS IIIE systems. The project will provide site-specific guidance for the implementation of the aid and new procedures for dependent, converging, IFR approaches.

Products:

- An operational "ghosting" aid at all eligible terminals. This includes an operational ARTS IIIA or ARTS IIIE code at all eligible sites.
- Guidance and training materials for implementing the aid and conducting dependent converging approaches.

Progress/Activity from October 1989 through November 1990:

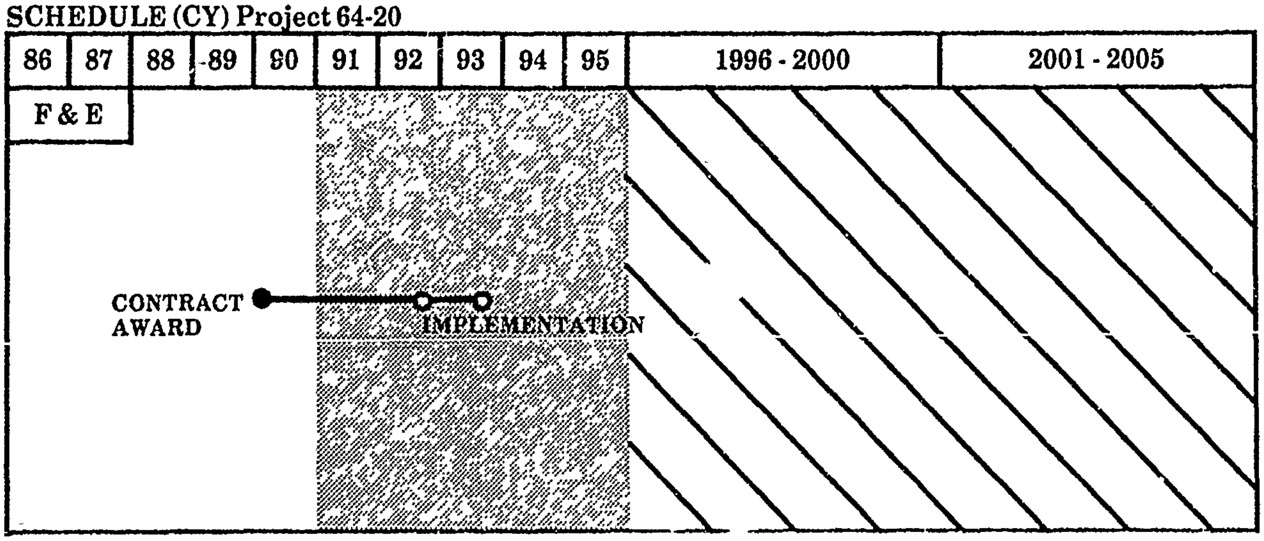
- Demonstrated "ghosting" aid at St. Louis Lambert International Airport.

Related Project/Activities: 46-30 ISP, 62-20 TATCA, 64-27 Landing Monitor for Closely Spaced Parallel Runways, and 64-28 Improve Capacity of Closely Spaced Parallel Runways.

List of Contractors:

- MITRE Corporation
  (engineering support services)
  McLean, Virginia

SCHEDULE (CY) Project 64-20



PROJECT 64-27: Landing Monitor for Closely Spaced Parallel Runways

Purpose: Deploy improved surveillance systems for aircraft approach, landing, and missed-approach flight paths to allow more closely spaced parallel runways and to achieve increased airport capacities during IMC.

Approach: A better surveillance system will reduce the spacing between parallel runways without reducing the safety and number of independent operations at those runways. For example, parallel runways separated by 3400 feet require a 1-milliradian (mrad) azimuth accuracy and a 2.4-second update rate while a 1-mrad/1-second update capability is required for 3000-foot parallel runway separations.

Alternative surveillance concepts are being examined, including back-to-back and electronically scanned antennas, a production Mode S sensor, and a production Mode S sensor modified for back-to-back antenna operations. Engineering models of an electronically scanned antenna sensor and a sensor having Mode S surveillance performance, called the Air Traffic Control Radar Beacon System monopulse processing system, have been developed. The Mode S processing system will be equipped with back-to-back, 5-foot open-array beacon antennas to obtain 2.4-second update interval data.

An engineering test bed with variable azimuth precision (1-5 mrad) and update rates (0.5 to 5 seconds) has been installed and is being tested. The tests will determine required technical characteristics for a landing monitor to reduce runway separations below the current 4300-foot standard. An evaluation of alternative system designs will also be conducted. This system will be upgraded for IFR conditions.

Measurements of Instrument Landing System (ILS) aircraft trajectories in both visual conditions and IMC are being made to characterize parallel approach flight path deviations.

This information is being used to support safety model validation and to test automatic blunder detection algorithms. Data are being gathered on targets of opportunity and on test aircraft flying blunder profiles. Both sensors provide displays and automatic blunder detection alerts for evaluation by air traffic control personnel. Cost studies are being performed to determine the best system solution for selected airports. Operational procedures and guidelines are being established based on test results. Production specification development will begin in 1990 for the Electronically Scanned (E-Scan) and the back-to-back antenna.

Products: 10 operational systems.

Progress/Activity from October 1989 through November 1990:

- The ability of both the E-Scan and Mode S back-to-back antenna sensors to provide surveillance data compatible with independent ILS procedures was evaluated and demonstrated during FY 89 and FY 90. Standards and procedures to support parallel approaches for runways separated by 3400 feet or more were also developed.
- An upgraded E-Scan system was developed in 1990. Production specification development was completed in 1990 for the E-Scan system.
- The demo E-Scan system was integrated and tested at Raleigh, North Carolina.

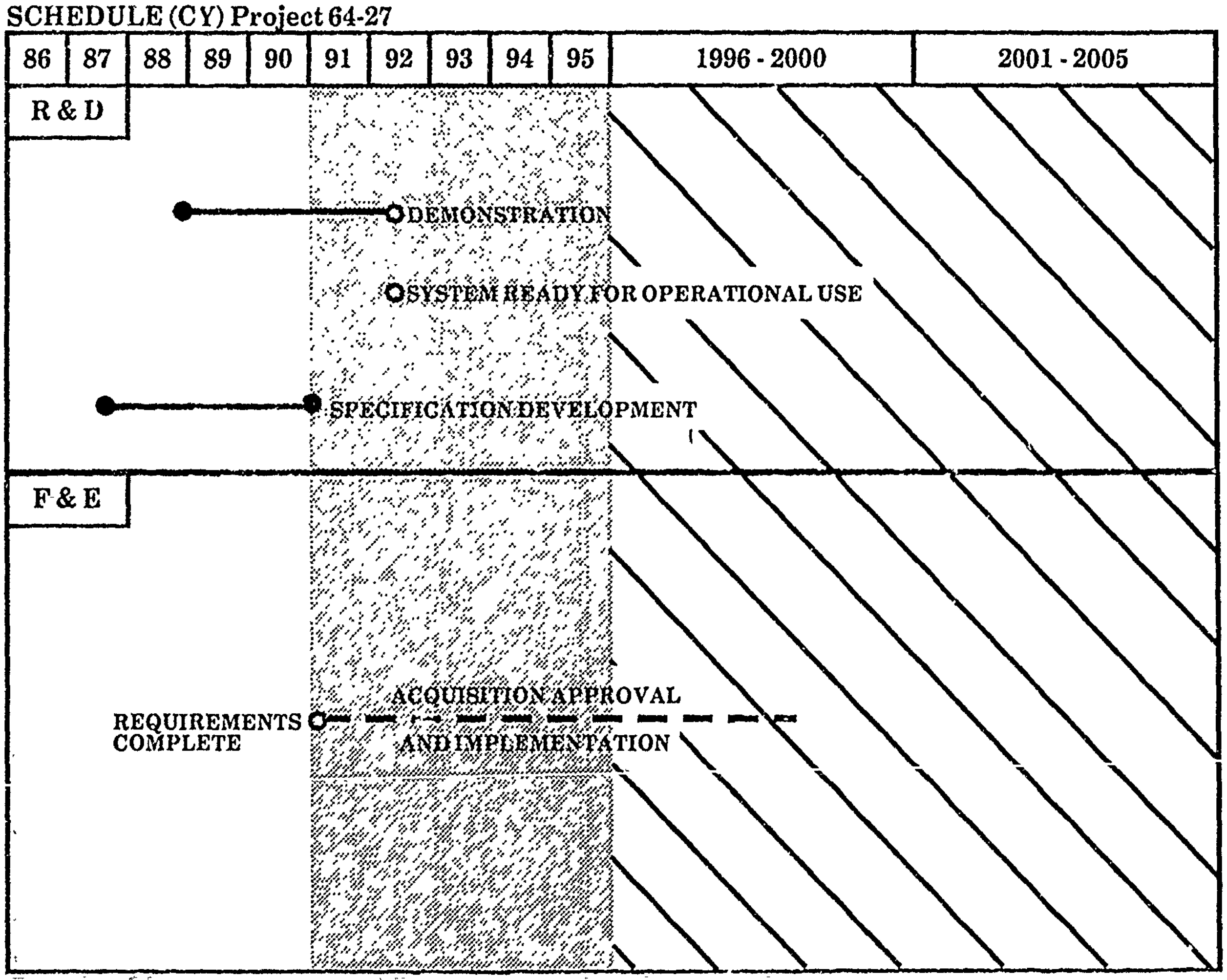
Related Projects/Activities: 24-12 Mode S, 34-12 ATCBI Establishment, 64-20 National Implementation of the "Imaging" Aid for Dependent Converging Runway Approaches, 64-28 Improve Capacity of Closely Spaced Parallel Runways, and R,E,&D Plan Project 6.3 Landing Monitor for Closely Spaced and Converging Runways.

List of Contractors:

- Lincoln Laboratory
  (back-to-back antenna)
  Lexington, Massachusetts
- MSI Services, Inc.
  (E-Scan antenna)
  Washington, District of Columbia
  - Allied-Signal Aerospace Company
    (E-Scan radar antenna)
    Towson, Maryland

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 64-27



PROJECT 64-28: Improve Capacity of Closely Spaced Parallel Runways

Purpose: Improve capacity of closely spaced parallel runways (i.e., runways spaced from 700 feet to 3500 feet).

Approach: Currently, airports which have runways spaced at least 700 feet apart can be used for simultaneous operations as long as visual meteorological conditions (VMC) or visual separation can be provided. The precision approach monitor radars now under development will enable airports to conduct simultaneous ILS approaches for runways spaced 3500 feet or possibly even 3000 feet. Below those runway separations, staggered ILS approaches must be conducted, reducing the airport throughput. For runways separated by less than 2500 feet, staggered ILS operations cannot be conducted. Thus, use of one runway is lost while weather conditions are well above IFR conditions. Airports cannot use their closely spaced parallel runways in low VMC and in IMC.

Possible solutions to solving this capacity problem have recently been identified. A partial solution of changing approach procedures which uses aircraft staggering techniques will allow operations on parallel runways during lower weather ceilings than are currently acceptable. Use of Traffic Alert and Collision Avoidance System (TCAS) for monitoring separations up to 1.5 miles may, however, provide near 100 percent capacity for these configurations in VMC. Use of Microwave Landing System (MLS) may extend IMC use.

This project will develop ATC procedures and technology necessary to use closely spaced parallel runways in marginal VMC and IMC. It will explore the use of TCAS and MLS, will develop appropriate prototype simulations of the ground system and avionics, and will conduct closed loop simulations to demonstrate the viability of the concepts.

Cost studies will be performed to determine the best solution for maximizing the use of closely spaced parallel runways. Operational procedures and guidelines will be established based on test results. A production specification will be developed from the cost studies and the analysis of the test results.

Products: Procedures for conducting concurrent operations and evaluation of closely spaced parallel runways in VMC and IMC, requirements for TCAS and MLS, and development of prototypes and simulations.

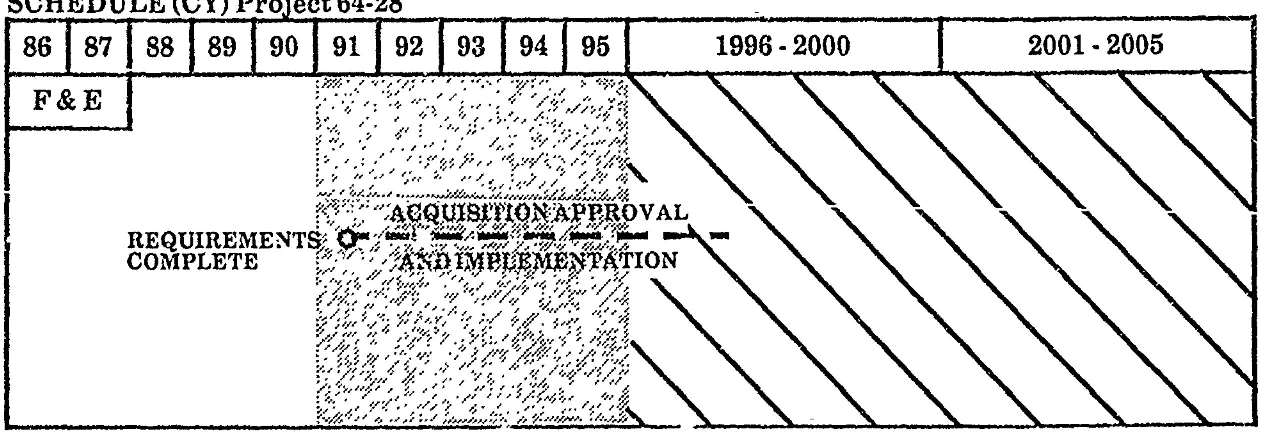
Related Project/Activities: 24-12 Modes S, 34-12 ATCBI Establishment, 64-20 National Implementation of the "Imaging" Aid for Dependent Converging Runway Approaches, and 64-27 Landing Monitor for Closely Spaced Parallel Runways.

List of Contractors:

- MITRE Corporation
  McLean, Virginia
- Lincoln Laboratory
  Lexington, Massachusetts

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 64-28



PROJECT 64-29: ATC Applications of Automatic Dependent Surveillance (ADS)

Purpose: Implement a satellite-based ATC surveillance and communications service to aircraft in oceanic environments in coordination with international ATC authorities. Benefits include an increase in safety and efficiency of flight operations.

Approach: Oceanic ATC operations are conducted manually, with controllers monitoring aircraft flight progress based on HF voice position reports from flight crews. Aircraft must adhere to rigid route structures, and relatively large separations must be maintained to accommodate untimely position reports and the lack of a two-way pilot/controller data link. The resulting airspace capacity limitations and the inability of controllers to approve flight plan changes force aircraft to operate on less efficient routes. Similar problems exist for offshore, low-altitude domestic airspace, and other non-radar environments.

The satellite-based ADS system will permit tactical and strategic control of aircraft. Automated position report processing and analysis will result in a precise monitoring of aircraft movement. Automatic flight plan deviation alerts and conflict probes will support increased safety, reductions in separation minima, and increased accommodation of user-preferred routes and trajectories. Graphic display of aircraft movement and automated processing of data messages, flight plans, and weather data will significantly improve the ability of the controller to manage oceanic air traffic.

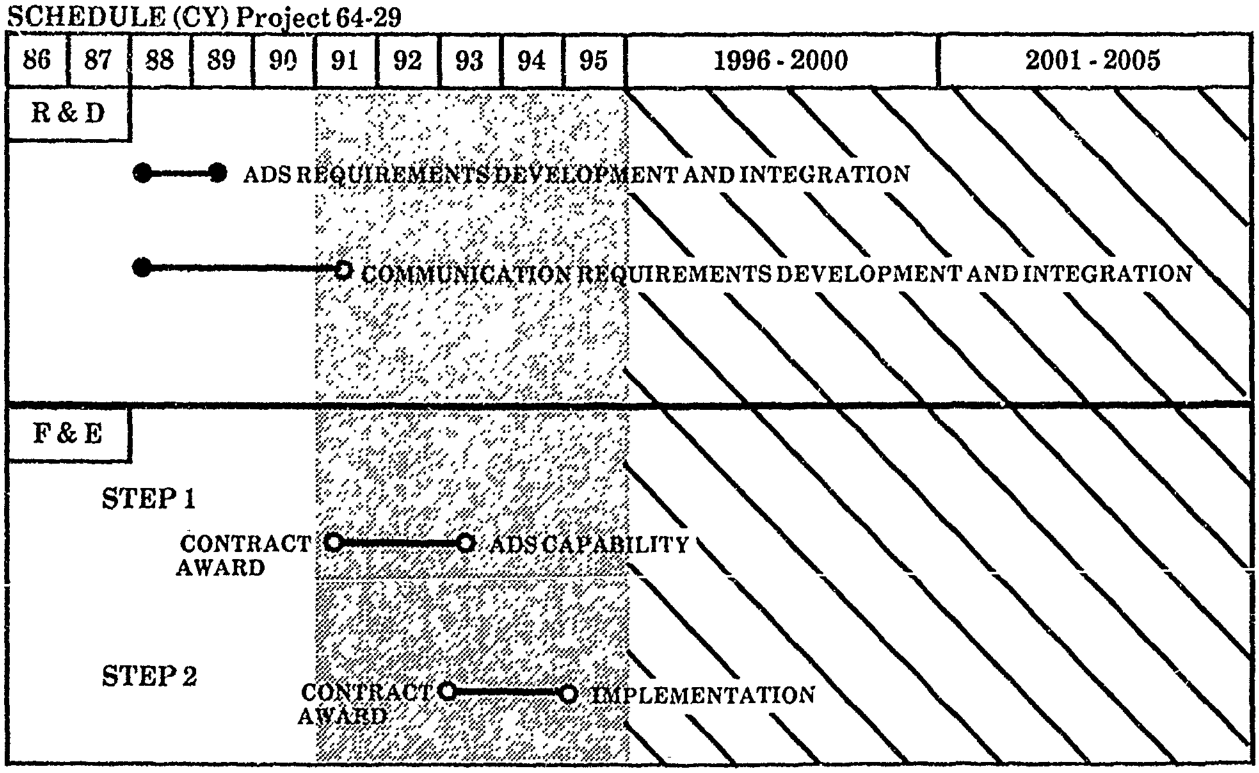
This program will be developed in incremental steps, beginning with automated position reports via satellite and digital data link for air traffic command and control. Follow-on steps will include the development of a new man-machine interface environment, the application of digital voice, support for the reduction of separation standards, and enhanced automation functions.

Products:

- Engineering prototypes.
- U.S. oceanic satellite-based ATC system.

Related Projects/Activities: 21-05 ODAPS, 21-12 AAS, 23-05 Aeronautical Data Link, 34-22 Oceanic Satellite Communications, 65-22 ATN, and R,E,&D Plan Project 3.4 ATC Applications of ADS.

SCHEDULE (CY) Project 64-29



PROJECT 65-03: Network Management and Control Equipment (NMCE)

Purpose: To provide a centralized network management and control capability for FAA telecommunications.

Approach: The approach to NMCE is currently under study. Potentially, the NMCE will be implemented in two phases.

Phase I will establish network management and control facilities in each ACF and the two national telecommunication facilities (Atlanta and Salt Lake City). Monitoring and/or control stations including Radio Communications Link (RCL), RCL Circuit Restoral, National Airspace Data Interchange Network (NADIN) IA, NADIN II, and Data Multiplexing Network will be collocated in these facilities. The collocating of these systems in control centers will provide improved coordination with greater staffing efficiency and effectiveness.

Phase II will provide the hardware and software to consolidate the control functions now provided by the separate control systems associated with each of the above telecommunication systems. The NMCE will use the Government open systems interconnect protocol and emerging network management protocols. The NMCE will give the network manager at each facility total status of the applicable FAA telecommunication domains without having to view each of the individual control subsystems. Telecommunication problems will be identified quicker and resolved more efficiently. This will increase network availability and reliability.

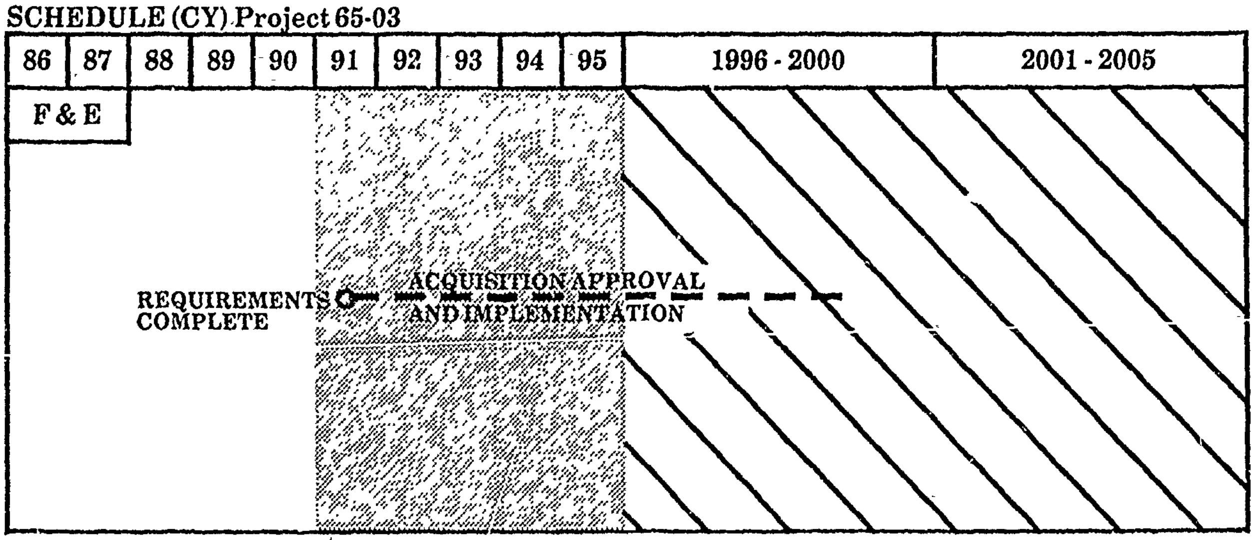
Products:

- Network management and control facilities.
- Network management and control equipment.

Related Projects/Activities: The majority of the CIP projects require transmission of data or voice from point-to-point. This project will provide centralized facilities and functions which will consolidate and use existing FAA monitoring and control capabilities to manage the FAA telecommunications system. R,E,&D Plan Project 4.2 NMCE.

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 65-03



PROJECT 65-07: Conversion of NADIN IA Message Network Users to the NADIN II Packet Switched Network

Purpose: This project will eliminate all remaining NADIN IA equipment, thereby reducing staff and logistic costs. The NADIN IA message switching network is based on 1960's technology. Maintenance, operations, and modifications are costly. By the late 1990's, almost all interfacility data communications will be handled by NADIN II. NADIN IA will be maintained only to interface to the remaining Aeronautical Fixed Telecommunications Network (AFTN) international circuits which cannot directly interface with NADIN II (Europe and Canada will have X.25 networks similar to NADIN II). This network consolidation will reduce operating costs and increase the flexibility and efficiency of the FAA's interfacility communications service.

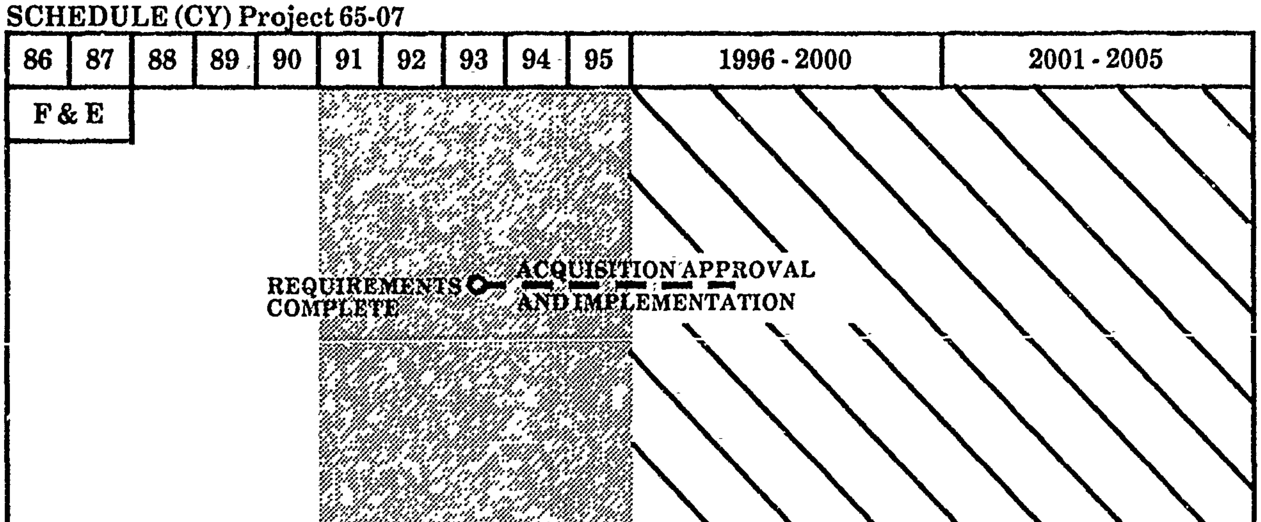
Approach: Analyses will be performed to identify and categorize candidate users for conversion and their requirements for modification. The analyses will focus on data needs, interface protocol development, circuit connectivity equipment compatibility, cost estimates, and methods for integrating the ICAO user community into a packet switched communications environment. An action plan for implementation and cutover will be developed and final coordination of these actions will begin.

Products: Analyses and an implementation plan for NADIN network consolidation.

Related Projects/Activities: 25-07 NADIN II and 35-07 NADIN II Continuation.

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 65-07



PROJECT 65-22: Aeronautical Telecommunications Network (ATN)

Purpose: This project provides interoperable digital telecommunications between aircraft and ground systems using any combination of Mode S, satellite, and VHF data links.

Approach: The Aeronautical Data Link project has designed the communications architecture to provide interoperable digital telecommunications between OSI-compatible air-to-ground networks. Ground data link processors and router equipment are being designed to interface with satellite and VHF data networks to enable data communications between individual links. The ATN project will develop compatible interfaces and communications protocols with non-FAA networks to provide the desired multi-link capability for ATC data communications.

In addition, airborne equipment will be developed to perform the comparable routing function aboard the aircraft.

Products:

- Hardware/software to provide internetwork data transmission on the ground.
- Hardware/software for the airborne routing function.

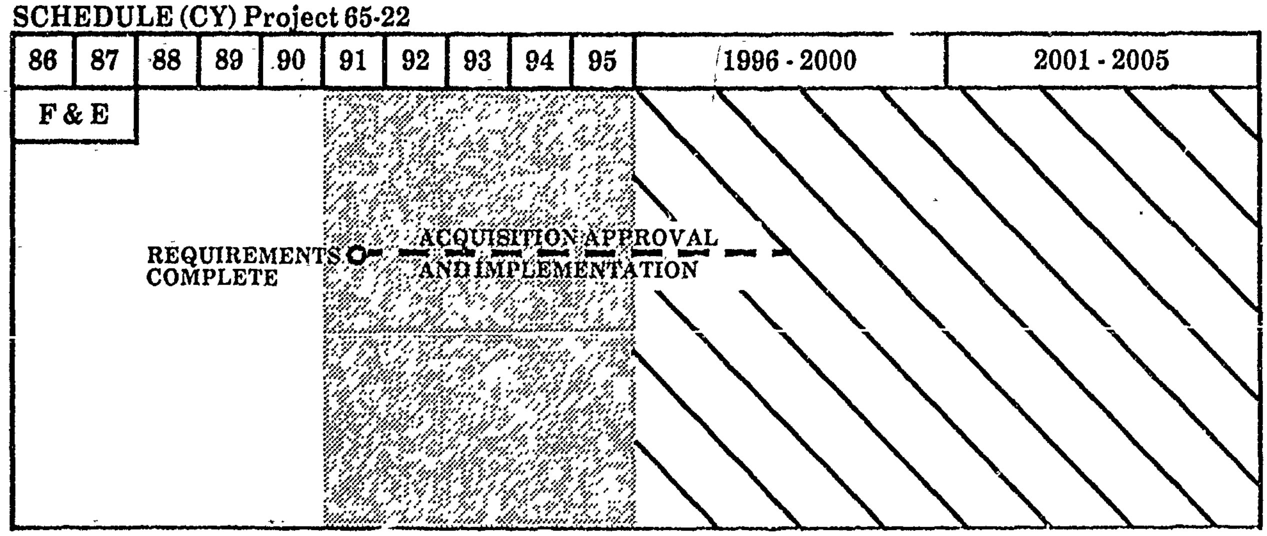
Progress/Activity from October 1989 through November 1990:

- Met with data link users and operators to disucss demonstrating ATN in a live environment.

Related Projects/Activities: 23-05 Aeronautical Data Link, 34-22 Oceanic Satellite Communications, 45-20 Critical Telecommunications Support, 45-21 Satellite Communications Circuit Backup, 63-05 Aeronautical Data Link Communications and Applications, and 64-29 ATC Applications of ADS.

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY) Project 65-22



PROJECT 66-20: FAA National Simulation Laboratory (NSL)

Purpose: The FAA will establish a laboratory to evaluate the interaction between proposed future subsystems (e.g., MLS, TCAS, and high return-rate radar), flight procedures, airspace organization, and human factors in an integrated environment. The NSL will have the capability to evaluate and shape future concepts in manned ATC simulation facilities. The NSL will also compare system performance against requirements. The NSL will be capable of assessing the system-wide implications of concepts and national policy alternatives. It will tie together human factors engineering and NAS equipment and procedures in a disciplined manner, allowing rapid prototyping of advanced concepts and the evaluation of new technologies.

Approach: The initial goal of this project is to establish a preliminary systems integration capability to evaluate the integration of NAS subsystems in an AERA 2 environment. Because of the limited time for development, this facility will be assembled from several existing laboratory products. The initial demonstration laboratory will integrate existing hardware and software systems that were not designed for interoperability. The simulations include the following applications: terminal operations using MLS and ARTS, tower functions using the Departure Sequencing Program (DSP) and predeparture clearance, ground control using the Airport Traffic Surface Management System, metering using DSP, and AERA 2 for en route functions. The demonstration will simulate the New York air traffic environment.

The NSL will evolve as a complete, high-fidelity simulation of future-generation ATC systems. It will be built using modern software engineering so that simulated NAS operational system components (such as traffic management and en route ATC) can be disconnected and easily replaced by components integrating new concepts, policies, or procedures. The NSL architectures will be open to the aviation community. With the interfaces between simulated NAS operational components well documented, ATC researchers will be able to propose and evaluate concepts in an integrated environment, leading to the definition of the future NAS.

Products: Future NAS definition, optimized NAS equipment integration, and improved ATC procedures.

Progress/Activity from October 1989 through November 1990:

- First phase of interim Integration Laboratory begun.
- Basic requirements defined.

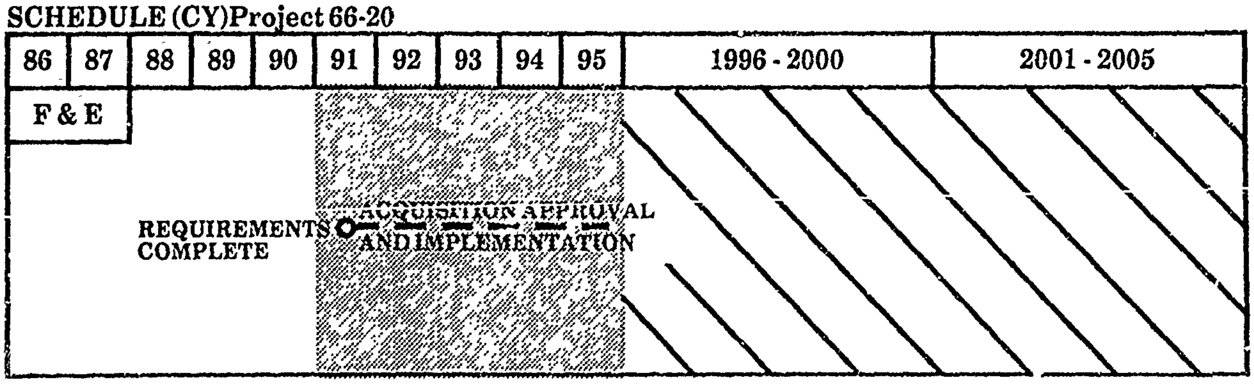
Related Projects/Activities: The NSL will simulate future NAS operational systems and procedures, and will emulate human factors processes.

List of Contractors:

- MITRE Corporation
  (initial systems integration simulation)
  McLean, Virginia

Project Status: This project is currently in the advance planning and engineering phase where alternatives are being considered and requirements are being established, reviewed, and validated.

SCHEDULE (CY)Project 66-20



GLOSSARY OF ACRONYMS

AAS	Advanced Automation System
AATS	Advanced Automation Training System
AC	Advisory Circular or Alternating Current
ACCC	Area Control Computer Complex
ACCILS	Aeronautical Center Centralized Integrated Logistics Support
ACF	Area Control Facility
ADAS	AWOS Data Acquisition System
ADDM	Automated Documentation Development and Maintenance
ADP	Automated Data Processing
ADS	Automatic Dependent Surveillance
ADTN	Administrative Data Transmission Network
A&E	Architectural and Engineering
AERA	Automated En Route Air Traffic Control
AF	Airway Facilities
AFB	Air Force Base
AFSS	Automated Flight Service Station
AFTN	Aeronautical Fixed Telecommunications Network
A/G	Air-to-Ground
agl	above ground level
AIFSS	Automated International FSS
AIP	Airport Improvement Program
AIRMET	Airmen's Meteorological Information
ALSF	Approach Lighting System with Sequenced Flashing Lights
ALSIP	Approach Lighting System Improvement Program
AM	Amplitude Modulation
AMASS	Airport Movement Area Safety System
AMCC	ACF Maintenance Control Center
ANICS	Alaskan NICS
AOCI	Airport Operators Council International
APS	Airway Planning Standard
ARF	Airport Reservation Function
ARINC	Aeronautical Radio, Incorporated
ARSR	Air Route Surveillance Radar
ARTCC	Air Route Traffic Control Center
ARTS	Automated Radar Terminal System
ASAS	Aviation Safety Analysis System
ASD	Aircraft Situation Display
ASDE	Airport Surface Detection Equipment
ASOS	Automated Surface Observing System
ASP	Arrival Sequencing Program
ASR	Airport Surveillance Radar
ASTA	Airport Surface Traffic Automation
AT	Air Traffic
ATC	Air Traffic Control
ATCBI	Air Traffic Control Beacon Interrogator
ATCCC	Air Traffic Control Command Center
ATCRBS	Air Traffic Control Radar Beacon System
ATCT	Airport Traffic Control Tower
ATIS	Automatic Terminal Information Service
ATN	Aeronautical Telecommunications Network

ATSCC	Air Traffic System Command Center
AUTODIN	Automated Digital Network
AUTOVON	Automatic Voice Network
AVS	Aviation Standards
AWANS	Aviation Weather and NOTAM System
AWOS	Automated Weather Observing System
AWP	Aviation Weather Processor
AWPG	Aviation Weather Products Generator
BDIS	Automatic Data Interchange System, Service B
bps	bits per second
BRITE	Bright Radar Indicator Tower Equipment
BUEC	Backup Emergency Communications
CA	Conflict Alert
CAEG	Computer Aided Engineering Graphics
CA/MSAW	Conflict Alert/Minimum Safe Altitude Warning
CARF	Central Altitude Reservation Function
CAT	Category
CBI	Computer Based Instruction
CCC	Central Computer Complex
CCD	Consolidated Cab Display
CCP	Contingency Command Post
CD	Common Digitizer
CDC	Computer Display Channel
CDR	Critical Design Review
CDT	Controlled Departure time
CERAP	Combined Center Radar Approach Control
CFC	Central Flow Control
CFCC	Central Flow Control Computer
CFCF	Central Flow Control Function/ Facility
CFDPS	Compact Flight Data Processing System
CFMWP	Central Flow Meteorologist Weather Processor
CFWP	Central Flow Weather Processor
CFWSU	Central Flow Weather Service Unit
CIP	Capital Investment Plan
CMD	Center for Management Development
COMLO	Compass Locator
COMSEC	Communications Security
CONUS	Continental, Contiguous, or Conterminous United States
CORN	Computer Resources Nucleus
COTS	Commercial-Off-The-Shelf
CRA	Conflict Resolution Advisory
crt	cathode ray tube
CWP	Central Weather Processor
CWSU	Center Weather Service Unit
CY	Calendar Year
DARC	Direct Access Radar Channel
DASI	Digital Altimeter Setting Indicator
DBRITE	Digital BRITE
dc	direct current
DCC	Display Channel Complex
DES	Data Encryption Standard
DF	Direction Finder
DFW	Dallas/Fort Worth
DLP	Data Link Processor
DME	Distance Measuring Equipment
DME/P	Precision Distance Measuring Equipment
DMN	Data Multiplexing Network
DOD	Department of Defense

DOT	Department of Transportation
DOTS	Dynamic Ocean Track System
DPS	Data Processing Subsystem
DRR	Deployment Readiness Review
DSB	Double Sideband
DSP	Departure Sequencing Program
DTDM	Deterministic Time Division Multiplexing
DUAT	Direct User Access Terminal
DVOR	Doppler Very High Frequency Omnidirectional Range
DYSIM	Dynamic Simulation (laboratory)
EARTS	En Route Automated Radar Tracking System
EDARC	Enhanced DARC
EFAS	En Route Flight Advisory Service
ELOD	En Route Sector Load
EMC	Electromagnetic Compatibility
EOF	Emergency Operations Facility
EPA	Environmental Protection Agency
ERL	Environmental Research Laboratories
ERM	En Route Metering
ESMMC	Enhanced SMMC
ESP	En Route Spacing Program
ETG	Enhanced Target Generator
ETMS	Enhanced Traffic Management System
FAA	Federal Aviation Administration
FAAAC	FAA Aeronautical Center
FAATC	FAA Technical Center
FAT	Factory Acceptance Test
FAR	Federal Aquisition Regulations
FDAD	Full Digital ARTS Displays
FDEP	Flight Data Entry and Printout
FDIO	Flight Data Input/Output
FDPS	Flight Data Processing System
F&E	Facilities and Equipment
FE&D	Facilities, Engineering & Development
FIFO	Flight Inspection Field Office
FIR	Flight Information Region
FM	Frequency Modulation
FPCL	Flight Plan Communications Link
FPS	Military Primary Radar
FSAS	Flight Service Automation System
FSDPS	Flight Service Data Processing System
FSP	Flight Strip Printer
FSS	Flight Service Station
FSTN	Federal Secure Telephone Network
FWCS	Flight Watch Control Station
FY	Fiscal Year
GAO	Government Accounting Office
GCA	Ground Control Approach
GENTARES	Generic Tool for the Analysis of Radars and the Evaluation of Systems
GFE	Government Furnished Equipment
GLONASS	Global Orbiting Navigational Satellite System
GMCC	General NAS Sector Maintenance Control Center
GNAS	General NAS Sector
GNSS	Global Navigation Satellite System
GOES	Geostationary Operational Environmental Satellite
GPO/GPI	General Purpose Output/General Purpose Input
GPS	Global Positioning System
GSA	General Services Administration
GSL	General Support Laboratory

GWDS	Graphic Weather Display System
H	Homing Radio Beacon
HEMP	High-Altitude Electromagnetic Pulse
HF	High Frequency
HIWAS	Hazardous in-Flight Weather Advisory Service
HRM	Human Resource Management
HUD	Head-Up Display
HVAC	Heating, Ventilating, and Air Conditioning
IAPA	Instrument Approach Procedures Automation
ICAO	International Civil Aviation Organization
ICSS	Integrated Communications Switching System
IFCN	Interfacility Flow Control Network
IFM	Integrated Flow Management
IFR	Instrument Flight Rules
IFSS	International Flight Service Station
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
IMCS	Interim MCS
IOP	Input/Output Processor
IOS	Input/Output System
IOT&E	Integrated Operational Test & Evaluation
IPCSS	In-Plant Contract Support Services
IRBT	Integrated Radar Beacon Tracker
ISP	Interim Support Plan
ISSS	Initial Sector Suite System
ITU	International Telecommunications Union
ITWS	Integrated Terminal Weather System
IVRS	Interim Voice Response System
JAWS	Joint Airport Weather Studies
JSS	Joint Surveillance System
KDP	Key Decision Point
kHz	Kilohertz
kW	Kilowatt
kWh	Kilowatt Hour
LAN	Local Area Network
LCN	Local Communications Network
LDRCL	Low Density RCL
LFME	Local Flow Management Enhancements
LIS	Logistics Inventory System
LLWAS	Low-Level Wind Shear Alert System
LOE	Level-of-Effort
LOFF	LORAN Offshore Flight Following
LOM	Locator Outer Marker
LORAN	Long Range Navigation
LRR	Long Range Radar
LRU	Lowest/Line Replaceable Unit
M1FC	Model 1 Full Capacity
MAD	MDARC Architecture Software - rev D
MAE	MDARC Architecture Software - rev E
MALSR	Medium-Intensity Approach Lighting System with Runway Alignment Indicator Lights
MAR	Minimally Attended Radar
MCC	Maintenance Control Center
MCCP/MMC	Maintenance Control Center Processor/Maintenance Monitor Console
MCI	Mode C Intruder
MCS	Monitoring/Control Software
MDARC	Mosaic Tracking Direct Access Radar Channel
MDT	Maintenance Data Terminal
MED	Manual Entry Device

MHz	Megahertz
MLS	Microwave Landing System
MMS	Maintenance Management System
MOA	Memorandum of Agreement
Mode C	Altitude Reporting Mode of Secondary Radar
Mode S	Mode Select; Discrete Addressable Secondary Radar System with Data Link
modem	modulator-demodulator
MOPS	Minimum Operational Performance Standards
MOS	Metal-Oxide Semiconductor
MPS	Maintenance Processor Subsystem
MSAW	Minimum Safe Altitude Warning
msl	mean sea level
MSN	Message Switched Network
MTBF	Mean-Time-Between-Failure
MWP	Meteorologist Weather Processor
NADIN	National Airspace Data Interchange Network
NAILS	National Airspace Integrated Logistics Support
NAMFAC	National Airspace Management Facility
NAR	National Airspace Review
NARACS	National Radio Communications System
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
NASMAP	NAS Management Automation Program
NASNET	NAS Network
NASPAC	NAS Performance Analysis Capability
NATCOM	National Communications Center
navaid	navigational aid
NAWP	National Aviation Weather Processor
NAWPF	National Aviation Weather Processor Facility
NCC	Network Control Center
NCIU	NEXRAD Communications Interface Unit
NCP	NAS Change Proposal
NCU	Navigational Computer Unit
NDB	Nondirectional Beacon
NEOF	National Emergency Operations Facilities
NEXRAD	Next Generation Weather Radar
NICS	NAS Interfacility Communications System
NMCC	National Maintenance Coordination Complex
NMCE	Network Management and Control Equipment
NOAA	National Oceanic and Atmospheric Administration
NOTAM	Notice to Airmen
NPIAS	National Plan of Integrated Airport Systems
NSL	National Simulation Laboratory
NSSF	NAS Simulation Support Facility
NTIA	National Telecommunications Information Agency
NTP	National Transportation Policy
NTSB	National Transportation Safety Board
NWS	National Weather Service
NWSTG	NWS Telecommunications Gateway
OATS	Office Automation Technology and Services
OCAT	Oklahoma City Airport Trust
ODALS	Omnidirectional Approach Lighting System
ODAPS	Oceanic Display and Planning System

OFDPS	Offshore Flight Data Processing System
OMB	Office of Management and Budget
ORD	Operational Readiness Demonstration
OSHA	Occupational Safety and Health Administration
OSI	Open Systems Interconnection
OST	Office of the Secretary of Transportation
OTA	Office of Technology Assessment
OT&E	Operational Test and Evaluation
PAM	Peripheral Adapter Module
PAMRI	Peripheral Adapter Module Replacement Item
PAPI	Precision Approach Path Indicator
PAR	Precision Approach Radar
PATWAS	Pilots Automatic Telephone Weather Answering Service
PCRM	Parallel and Converging Runway Monitor
PCS	Power Conditioning System
PIREP	Pilot Weather Report
PM	Preventive Maintenance
PMP	Program Management Plan
ppi	plan position indicator
prf	pulse repetition frequency
PROFS	Program for Regional Observing and Forecasting Services
PSN	Packet Switched Network
PUP	Principal User Processor
PVD	Plan View Display
RADS	Radar Alphanumeric Display System
RAPCON	Radar Approach Control
RBPM	Radar Beacon Performance Monitor
RCAG	Remote Center Air/Ground Communications Facility
RCE	Radio Control Equipment
RCF	Remote Communication Facility
RCIU	Remote Control Interface Unit
RCL	Radio Communications Link
RCO	Remote Communications Outlet
RCOM	Recovery Communication
RCR	Routing and Circuit Restoral
R&D	Research and Development
RE&D	Research, Engineering, and Development
REIL	Runway-End Identification Lights
RF	Radio Frequency
RFI	Radio Frequency Interference
RFP	Request for Proposal
RLSS	Regional/Center Logistics Support Services
RML	Radar Microwave Link
RMM	Remote Maintenance Monitoring
RMMS	Remote Maintenance Monitoring System
RMS	Remote Monitoring Subsystem
RMSC	RMS Concentrator
RNAV	Area Navigation
RPG	Radar Products Generator
RRCS	Remote Radio Control System
RRWDS	Radar Remote Weather Display System
RTCA	Radio Technical Commission for Aeronautics
RTF	Radar Training Facility
RTR	Remote Transmitter/Receiver
RVR	Runway Visual Range
RVV	Runway Visibility Value

RWP	Real-time Weather Processor
SAFE	Safety Activity Functional Evaluation
SAR	System Analysis Recorder
SCT	Southern California TRACON
SEI	System Engineering and Integration
SEIC	System Engineering and Integration Contractor/Contract
SET	System Embedded Training
SIAP	Standard Instrument Approach Procedure
SIGMET	Significant Meteorological Information
SIMMOD	Airspace and Airport Simulation Model
SMMC	System Maintenance Monitor Console
SSALF	Simplified Short Approach Lighting System with Sequenced Flashing Lights
SSALR	Simplified Short Approach Lighting System with Runway Alignment Indicator Lights
SSB	Single Sideband
SSF	System Support Facility
SSL	System Support Laboratory
SSM	Solid-State Memory
SSR	Secondary Surveillance Radar
STAR	Southern California Terminal Airspace Realignment
STDM	Statistical Time-Division Multiplexing
STEP	Service Test and Evaluation Program
STOL	Short Take-Off and Landing
TAAS	Terminal Advanced Automation System
TACAN	Tactical Air Navigation
TACS	Technical Activities Committee
TATCA	Terminal Air Traffic Control Automation
TCA	Terminal Control Area
TCAS	Traffic Alert and Collision Avoidance System
TCCC	Tower Control Computer Complex
TCS	Tower Communications System
TDWR	Terminal Doppler Weather Radar
T&E	Test and Evaluation
TERPS	Terminal Instrument Procedures
TIF	Terminal Intrusion Function
TML	Television Microwave Link
TMP	Traffic Management Processor
TMS	Traffic Management System
TMU	Traffic Management Unit
TRACAB	Terminal Radar Approach Control in the Tower Cab
TRACON	Terminal Radar Approach Control
TSC	Transportation System Center
TSSC	Technical Support Services Contract
TSSF	Terminal System Support Facility
TV	Television
TWA	Traveling Wave Antenna
TWEB	Transcribed Weather Broadcast
UHF	Ultra High Frequency
UPS	Uninterruptible Power System
USAF	United States Air Force
USNS	United States NOTAM System
VASI	Visual Approach Slope Indicator
VFR	Visual Flight Rules
VFSS	Voice Frequency Signaling System
VHF	Very High Frequency
VLF	Very Low Frequency
VMC	Visual Meteorological Conditions

VOR	VHF Omnidirectional Range
VORTAC	VOR Collocated with TACAN
VOT	VHF Omnidirectional Range Test
VRS	Voice Response System
VSCS	Voice Switching and Control System
VTOL	Vertical Take-Off and Landing
WMSC	Weather Message Switching Center
WSR	Weather Service Radar
Wx	Weather
9020	computer system model number

INACTIVE PROJECTS

Projects that have been completed, moved, combined, or deleted are listed below by functional area.

PROJECT NUMBER	PROJECT TITLE	LAST ACTIVITY
	En Route	
21-01	En Route Automation Hardware Improvements and Enhancements	1986
21-07	Modern ATC Host Computer	1988
21-08	En Route Metering (ERM)	Combined With TMS
21-10	Conflict Alert IFR/VFR Mode C Intruder	1988
21-14	Integration of Nonradar Approach Control into Radar Facilities	1987
51-20	Data System Specialist Support	1987
	Terminal	
22-01	Enhanced Terminal Conflict Alert	1989
22-02	ARTS IIIA Assembler	1983
22-03	Enhanced Target Generator (ETG) Displays (ARTS III)	1988
22-04	Additional ARTS IIIA Memory	1986
22-05	Additional ARTS IIIA Support at the FAA Technical Center	1986
22-07	ARTS II Displays	1984
22-08	ARTS II Interfacility Interface	1986
22-10	Automatic Terminal Information Service (ATIS) Recorders	1989
22-14	VFR ATCT Closures	1987

PROJECT NUMBER	PROJECT TITLE	LAST ACTIVITY
22-15	Combine Radar Approach Control into ARTCC	Deleted
22-17	TPX 42 Replacement	1990
32-23	Chicago Area Improvements	Deleted
	Flight Service and Weather	
23-03	Consolidated NOTAM System (CNS)	1986
23-06	Interim Voice Response System (IVRS)	1985
23-07	High-Altitude En Route Flight Advisory Service (EFAS) Frequencies	1989
23-08	Hazardous In-Flight Weather Advisory Service (HIWAS)	1989
23-10	Radar Remote Weather Display System (RRWDS)	1984
23-11	Geostationary Operational Environmental Satellite (GOES) Recorders	1985
33-07	High-Altitude En Route Flight Advisory Service (EFAS) Expansion	Deleted
	Ground-to-Air	
24-01	Air/Ground (A/G) Communications Equipment Modernization	1987
24-04	Nondirectional Beacon (NDB)	1988
24-05	Global Positioning System (GPS) Monitors	Moved to Chapter 6
24-06	Instrument Landing System (ILS)	1989
34-21	Advanced Format for Radar/Beacon Target Reports	Combined with 34-20
44-38	Long Range Radar (LRR) Replacement and Networking	Deleted

PROJECT NUMBER	PROJECT TITLE	LAST ACTIVITY
	Interfacility Communications	
25-01	RML Trunking	1986
25-04	Television Microwave Link (TML)	Combined With BRITE
25-05	Airport Telecommunications	1987
25-06	National Airspace Data Interchange Network (NADIN) IA	1988
25-09	Teletypewriter Replacement	1986
	Maintenance and Operations	
26-03	Central Repair Facility (CRF)	Deleted
26-06	Power Conditioning Systems for Automated Radar Terminal Systems III (ARTS III)	1989
26-11	Aircraft Fleet Conversion/Flight Inspection Modernization	1988
56-20	Automated Documentation Development and Maintenance (ADDM)	Combined with 56-56
56-21	Aeronautical Center Centralized Integrated Logistics Support (ACCILS) Plan	Deleted

ALPHABETICAL INDEX
OF PROJECT TITLES

Project	Page
Acquisition of Flight Service Facilities	2-6-14
Additional Airport Surface Detection Equipment (ASDE) Establishment	3-4-9
Advanced Automation System (AAS)	2-1-14
Aeronautical Center Lease	5-6-27
Aeronautical Center Training and Support Facilities	5-6-26
Aeronautical Data Link	2-3-6
Aeronautical Data Link Communications and Applications	6-3-2
Aeronautical Telecommunications Network (ATN)	6-5-3
Air/Ground Communications Radio Frequency Interference (RFI) Elimination	4-4-1
Air/Ground Radio Replacement	4-4-2
Air Traffic Control Beacon Interrogator (ATCBI) Establishment	3-4-7
Air Traffic Control Beacon Interrogator (ATCBI) Replacement	4-4-23
Air Traffic Control Radar Beacon System (ATCRBS) Relocation	4-4-22
Aircraft and Related Equipment	2-6-16
Aircraft and Related Equipment Program	5-6-5
Aircraft Fleet Modernization	5-6-4
Aircraft Flight Simulators	5-6-6
Airmen and Aircraft Registry Modernization	5-6-18
Airport Movement Area Safety System (AMASS)	6-2-8
Airport Surface Detection Equipment (ASDE-3) Radar	2-4-14
Airport Surface Traffic Automation (ASTA)	6-2-4
Airport Surveillance Radar (ASR-9) Modification for Low-Altitude Wind Shear Detection	6-4-2
Airport Traffic Control Tower (ATCT) Establishment	3-2-2
Airport Traffic Control Tower (ATCT) Safety Upgrades	4-6-11
Airport Traffic Control Tower (ATCT) System Intra-Connectivity	4-2-4
Airport Traffic Control Tower (ATCT)/Terminal Radar Approach Control (TRACON) Modernization	4-2-1
Airport Traffic Control Tower (ATCT)/Terminal Radar Approach Control (TRACON) Replacement	4-2-2
AN/FPS-117 Beacon Improvement	4-4-24
AN/GRN-27 Instrument Landing System (ILS) Replacement	4-4-8
Approach Lighting System Improvement Program (ALSIP)	2-4-8
Approach Lighting System Improvement Program (ALSIP) Continuation	4-4-16
Area Control Facilities (ACF)	2-1-18
ARTCC Plant Modernization	2-6-12
ARTCC/ACF Support Space	3-6-2

Page

ARTS IIA Enhancements 2-2-1
ARTS IIA Interface with Mode S/ASR-9 2-2-2
ARTS IIIA Peripheral Adapter Module (PAM) Modernization 5-2-1
ATC Applications of Automatic Dependent Surveillance (ADS) 6-4-9
ATCT/TRACON Establishment, Replacement, and Modernization 2-2-5
Automated En Route Air Traffic Control (AERA) 2-1-16
Automated Flight Service Station (AFSS) Support Space 4-3-8
Automated Weather Observing System (AWOS) 2-3-8
Aviation Safety Analysis System (ASAS) 5-6-33
Aviation Weather Products Generator (AWPG) 6-3-8

Base Buildings for Airport Traffic Control Towers (ATCT) 3-2-14
Bright Radar Indicator Tower Equipment (BRITE) 2-2-6

Capital Investment Plan (CIP) System Engineering and Program Management Support 3-6-1
Central Weather Processor (CWP) 2-3-2
Central Weather Processor (CWP) Interfaces 6-3-1
Communications Facilities Consolidation /Network 2-4-1
Communications Facilities Expansion 3-4-12
Computer Aided Engineering Graphics (CAEG) Enhancement 5-6-20
Computer Based Instruction (CBI) 2-6-2
Computer Based Instruction (CBI) Expansion 5-6-2
Computer Resources Nucleus (CORN) 5-6-23
Conflict Resolution Advisory (CRA) Function 2-1-10
Continued General Support 4-6-8
Conversion of NADIN IA Message Network Users to the NADIN II
Packet Switched Network 6-5-2
Critical Telecommunications Support 4-5-4

Dallas/Fort Worth Metroplex 3-2-8
Data Multiplexing Network (DMN) 2-5-1a
Data Multiplexing Network (DMN) Continuation 4-5-1
Development of an Enhanced Radar Analysis Tool 5-6-30
Digital Altimeter Setting Indicator (DASI) Replacement 4-3-6
Direct Access Radar Channel (DARC) System 2-1-2
Direct User Access Terminal (DUAT) Service Geographic Expansion 3-3-1
Direction Finder (DF) 2-4-9
DOD/FAA Air Traffic Control Facility Transfer/Modernization 3-2-12
Dynamic Ocean Track System (DOTS) 6-1-2

	Page
EARTS Enhancements	2-1-4
Emergency Transceiver Replacement	4-4-4
En Route Software Development Support	4-1-1
Environmental Cleanup	4-6-10
Establish Additional Radar Positions	3-2-13
Establish Alaskan NAS Interfacility Communications System (ANICS) Satellite Network	4-5-8
Establish/Expand Digital Bright Radar Indicator Tower Equipment (DBRITE)	3-2-3
Establish Locator Outer Markers (LOM)	3-4-1
Establish New Chicago Terminal Radar Approach Control (TRACON) Facility	3-2-9
Establish Visual Navaids for New Qualifiers	3-4-6
Expand Automated Radar Terminal System (ARTS) IIA Capacity and Provide Mode C Intruder (MCI) Capability	3-2-1
Expand Automated Radar Terminal System (ARTS) IIIA Capacity and Provide Mode C Intruder (MCI) Capability	3-2-4
Expansion/Reconfiguration of Low Density Radio Communications Link (LDRCL)	4-5-2
Expansion/Reconfiguration of Routing and Circuit Restoral (RCR)	4-5-.
FAA National Simulation Laboratory (NSL)	6-6-1
FAA Technical Center Building and Plant Support	5-6-12
Flight Data Entry and Printout Devices	2-1-1
Flight Service Automation System (FSAS)	2-3-1a
Flight Service Automation System (FSAS) Computer Replacement	4-3-3
Frequency Interference Support/Resolution	5-6-21
Fuel Storage Tanks	4-6-9
General Support	2-6-24
General Support Laboratory	2-6-28
General Support Laboratory Sustained Support	5-6-11
Global Positioning System (GPS) Monitors	6-4-1
Hazardous In-Flight Weather Advisory Service (HIWAS) Expansion	3-3-2
Human Resource Management	5-6-14
ILS and Visual Navaids Engineering and Sparing	4-4-11
Improve Capacity of Closely Spaced Parallel Runways	6-4-8
Independent Operational Test and Evaluation Oversight	5-6-36
Instrument Approach Procedures Automation (IAPA)	5-6-16
Instrument Landing System (ILS)	3-4-2
Integrated Communications Switching System (ICSS)	2-3-12
Integrated Communications Switching System (ICSS) Logistics Support	4-3-7
Integrated Terminal Weather System (ITWS)	6-3-6

	Page
Interfacility Data Transfer System for Edwards AFB RAPCON	3-5-2
Interim Backup Emergency Communications (BUEC) Improvement	4-4-3
Interim Support Plan (ISP)	4-6-14
Landing Monitor for Closely Spaced Parallel Runways	6-4-6
Large Airport Cable Loop Systems	2-6-6
Large Airport Cable Loop Systems Sustained Support	4-6-3
Local Flow Management Enhancements (LFME)	6-1-1
Logistics Support Systems and Facilities	5-6-29
Long Range Radar Improvements	4-4-19
Long Range Radar Program	2-4-15
Long Range Radar Radome Replacement	4-4-20
LORAN Offshore Flight Following (LOFF)	6-4-4
LORAN-C Monitors	4-4-17
LORAN-C Systems	2-4-18
Low-Level Wind Shear Alert System (LLWAS)	2-3-10
Low-Level Wind Shear Alert System (LLWAS) Enhancements	6-3-4
Low-Power TACAN Antennas	4-4-6
Maintenance Control Center (MCC)	2-6-4
Maintenance Control Center (MCC) Enhancement	4-6-2
Microwave Landing System (MLS) - First Procurement, Design Phase, and Production Phase I	2-4-4
Microwave Landing System (MLS) - Production Phase II	3-4-4
Mode S	2-4-10
Modernize and Improve FAA Buildings and Equipment	2-6-10
Modernize and Improve FAA Buildings and Equipment Sustained Support	4-6-6
Multichannel Voice Recorders	2-2-3
NAS In-Plant Contract Support Services (NAS/IPCSS)	3-6-3
NAS Management Automation Program (NASMAP)	5-6-38
NAS Regional/Center Logistics Support Services	3-6-4
NAS Spectrum Engineering	2-6-22
NAS Spectrum Engineering Sustained Support	5-6-8
National Airspace Data Interchange Network (NADIN) II	2-5-4
National Airspace Data Interchange Network (NADIN) II Continuation	3-5-1
National Airspace Integrated Logistics Support (NAILS)	5-6-40
National Airspace Management Facility (NAMFAC)	6-2-6
National Airspace System (NAS) Recovery Communications (RCOM)	4-6-12
National Airspace System Training	5-6-28
National Implementation of the "Imaging" Aid for Dependent Converging Runway Approaches	6-4-5

	Page
National Radio Communications System (NARACS)	2-6-20
Network Management and Control Equipment (NMCE)	6-5-1
New Airport and Other Facility Planning	3-2-15
New Airport Facilities, Denver, Colorado	3-2-6
New Austin Airport	3-2-10
Oceanic Display and Planning System (ODAPS)	2-1-6
Oceanic Satellite Communications	3-4-11
Offshore Flight Data Processing System (OFDPS)	2-1-20
On-Site Simulation-Based Training Systems	5-6-24
Power Systems	2-6-8
Power Systems Sustained Support	4-6-4
Provide FAA Housing	5-6-35
Provide Flight Service Automation System (FSAS) Power Conditioning Systems	4-3-2
Radar Pedestal Vibration Analysis	4-4-21
Radio Control Equipment (RCE)	2-5-6
Radio Control Equipment (RCE) Enhancements	4-4-5
Refurbish AN/FPS-20 Radars	5-6-34
Relocate Air Route Surveillance Radar (ARSR)	4-4-18
Relocate Air Traffic System Command Center (ATSCC)	4-1-2
Remote Maintenance Monitoring System (RMMS)	2-6-1a
Replace Mark 1A, 1B, and 1C Instrument Landing System (ILS)	4-4-10
Replace Regional Interim Weather Graphics with National Graphic Weather Display System (GWDS)	4-3-1
Replace Type FA9964 Direction Finder	4-4-14
Replacement of Controller Chairs	4-2-8
RML Replacement and Expansion	2-5-2
Runway Visual Range (RVR)	2-4-6
Runway Visual Range (RVR) Establishment	3-4-5
Runway Visual Range (RVR) Replacement	4-4-12
Satellite Communication Circuits System	4-5-6
Southern California Terminal Airspace Realignment (STAR)/Southern California TRACON (SCT)	3-2-11
Surveillance System Enhancements	3-4-10
Sustain ARTCC/ACF Facilities	4-6-7
Sustain/Consolidate San Juan Facilities	4-2-7
Sustain Distance Measuring Equipment (DME)	4-4-13
Sustain Nondirectional Beacon (NDB)	4-4-15

	Page
Sustain/Relocate Airport Surveillance Radar (ASR)	4-4-25
Sustain Remote Maintenance Monitoring System (RMMS)	4-6-1
Sustain the New York TRACON	2-2-7
Sustain VOR/VORTAC	4-4-7
System Engineering and Integration Contract (SEIC)	2-6-18
System Support Laboratory	2-6-26
System Support Laboratory Sustained Support	5-6-10
Technical Support Services	2-6-30
Terminal ATC Automation (TATCA)	6-2-2
Terminal Doppler Weather Radar (TDWR) System	2-4-20
Terminal Intrusion Function (TIF)	6-2-1
Terminal Radar (ASR) Program	2-4-12
Terminal Radar Digitizing, Replacement, and Establishment	3-4-8
Terminal Software Development	4-2-6
Test Equipment Replacement	5-6-22
Tower Communications System (TCS)	2-2-4
Traffic Management System (TMS)	2-1-8
Transition Engineering Support	5-6-32
Upgrade Commercial Automated Weather Observing System (AWOS)	4-3-4
Upgrade Low-Level Wind Shear Alert System (LLWAS) to Expanded Network Configuration	4-3-5
Visual Navaids	2-4-7
Voice Switching and Control System (VSCS)	2-1-12
VORTAC	2-4-2
Weather Enhancements	6-4-3
Weather Message Switching Center (WMSC) Replacement	2-3-4
Weather Radar Program	2-4-16
Wilcox CAT II/III Instrument Landing System (ILS) Replacement	4-4-9

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