FEDERAL AVIATION ADMINISTRATION FUTURE TELECOMMUNICATIONS PLAN "FUCHSIA BOOK"

NAS OPERATIONS DIRECTORATE

Telecommunications Network Planning and Engineering Division (AOP-400)

April 2000

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
800 Independence Avenue, SW
Washington, DC 20591

PB2001-101891

Plan

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INTRODUCTION

I.1 BACKGROUND

The FAA Future Telecommunications Plan is one in a hierarchy of FAA plans defining the National Airspace System (NAS) operational and agency requirements and capabilities. These plans and other documents, such as the Current Telecommunications System and Facility Description Manual, support the acquisition and fielding of telecommunications resources for NAS systems. The key documents used in the planning process are described below. The relationships among the documents are depicted in Figure I-1.

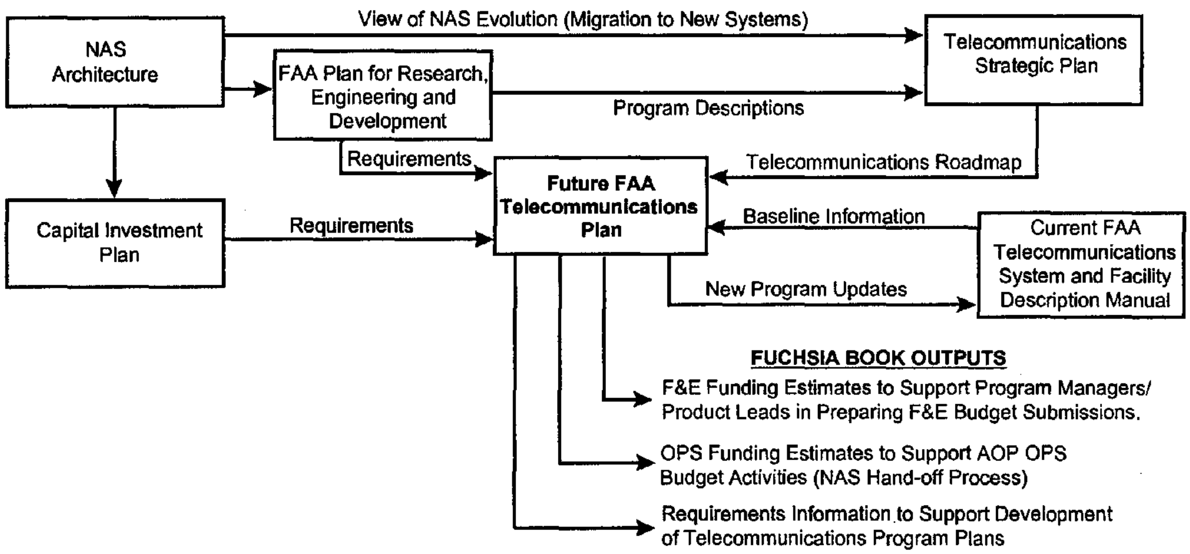

Figure I-1. Relationship of the Future Telecommunications Plan to Other FAA Plans

I.1.1 The FAA Telecommunications Strategic Plan (TSP)

The TSP is FAA's highest level telecommunications planning document. It specifies the vision for FAA telecommunications to which newly planned programs and systems should conform. It defines future agency and Air Traffic Control requirements, security considerations, integrated communications architecture, and a concept for operations, administration, and maintenance of FAA telecommunications. In addition to establishing the strategic planning vision for FAA telecommunications, the TSP recommends transition strategies that should guide future programs.

I.1.2 The Aviation System Capital Investment Plan (CIP)

The CIP is the principal program-planning document, defining the programs that will meet the near-, mid-, and far-term needs of the NAS. Based on mission needs and future concepts, the CIP reflects authorization for program development, design, and implementation. Projects in the CIP systematically improve and expand the current system by capitalizing on new technologies and procedures and making the most effective use of existing resources.

I.1.3 FAA Plan for Research, Engineering and Development ("Red Book")

The Red Book provides advance notice of emerging programs and provides insight into future telecommunications requirements. The Red Book meets the requirement found in the Aviation Research Safety Act of 1988 "to ensure the continued capacity, safety, and efficiency of aviation in the United States, considering emerging technologies and forecasted needs of civil aeronautics, and provide the highest degree of safety in air travel."

I.1.4 Current Telecommunications System and Facility Description Manual (Currant Book)

The Currant Book describes existing NAS operational telecommunications capabilities. The Currant Book and Fuchsia Book together identify and describe all NAS telecommunications capabilities and projects that have been implemented to satisfy NAS telecommunications requirements. It provides a valuable reference to the planning staff.

I.2 FAA FUTURE TELECOMMUNICATIONS PLAN

The Fuchsia Book sets forth the telecommunications requirements, implementation strategies, and costs for leased telecommunications services and systems. It is the primary source for leased communications budget estimates. The Fuchsia Book is published by the Telecommunications Network Planning and Engineering Division (AOP-400) of the Office of the Program Director, NAS Operations, AOP-1, and is updated annually.

I.2.1 Purpose

The Fuchsia Book identifies design considerations and implementation requirements used in planning telecommunications systems. It supports the following activities: analysis of telecommunications requirements; systems implementation planning; FAA owned and FAA managed telecommunications planning and resource allocation; formulation of the leased telecommunications operations budget; and the identification of facilities and equipment (F&E) telecommunications resources associated with the programs.

I.2.2 Scope

The Fuchsia Book identifies specific plans and resources for satisfying each program's stated requirements and the estimated Facilities and Equipment (F&E) and Operations (OPS) telecommunications costs for each program. FAA-owned and FAA-managed telecommunications resources described in the Fuchsia Book include the following:

a. Agency Data Telecommunications Network 2000 (ADTN2000);
b. Alaskan NAS Interfacility Communications System (ANICS);
c. Data Multiplexing Network (DMN);
d. FAA Telecommunications Satellite (FAATSAT) System;
e. Leased Interfacility NAS Communications System (LINCS);
f. The National Airspace Data Interchange Network (NADIN I or Message Switched Network [MSN}, and NADIN II or Packet Switched Network [PPSN});
g. FAA-Owned Microwave Systems (FOMS) including Radio Communications Link (RCL) and Low Density Radio Communications Link (LDRCL);

I.2.3 Cost Estimates

Equally important to the technical data in the Fuchsia Book is the cost estimates that summarize the telecommunications costs. Appendix C provides an overview of how the costs are estimated and presented in the chapters. Each chapter's Cost Summary Table provides a detailed overview of the non-recurring and recurring estimated funding requirements and assigns them to the F&E and OPS accounts. These estimates assist the Program Managers and Project Leads in preparing their F&E budgets and support the formulation and presentation of the OPS budget. Criteria for the use of F&E funds or operations funds for leased telecommunications identified in these tables is found in FAA Order 2500.8A, "Funding Criteria for Operations, Facilities and Equipment (F&E), and Research, Engineering and Development (R, E&D) Accounts," April 9, 1993. An extract of Paragraph 10k, *Leased Telecommunications*, of the Order is provided in Appendix C.

I.3 ORGANIZATION

Each chapter of the Fuchsia Book describes a NAS project. They are written and organized in accordance with the outline and contents definition described in Figure I-2. The chapters (programs) are organized in accordance with their relationship to the functional areas outlined in the FAA *Aviation System Capital Investment Plan* (CIP), January 1997. These functional areas are identified below.

- Automation
- Communications
- Facilities
- Mission Support
- Navigation And Landing
- Surveillance
- Weather

1.1 PROJECT/SYSTEM OVERVIEW
Introduces the project/system, explains its purpose, and identifies applicable references.

1.1.1 Purpose of the Program/System

1.1.2 References

1.2 PROGRAM/SYSTEM DESCRIPTION

1.2.1 Program/System Components
Identifies each system component that has telecommunications or local interfaces, either internal or external to the project, and describes the functionality of the interface.

1.2.1.1 Principal Components

1.2.1.2 Functional Component Interface Requirements
Identifies the functions supported by each interface.

1.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

Identifies the telecommunications required to meet each of the functional requirements identified in the Functional Component Interface Requirements sub-paragraph 1.2.1.2 above. Includes interface specifications, connectivity requirements, and traffic characteristics for each telecommunications interface described in the program/system description.

1.3.1 Telecommunications Interfaces
Each internal interface is described in terms of component-to-component connectivity. Information provided includes interface standards and criteria, connectivity required, and anticipated traffic. If required the information may be provided in subparagraphs as shown.

1.3.1.1 Interface Requirements (as required)

1.3.1.2 Connectivity Requirements (as required)

1.3.1.3 Traffic Characteristics (as required)

1.3.2 Local Interfaces
Local interfaces are those requirements that are satisfied locally by cable or LAN.

1.4 ACQUISITION ISSUES

1.4.1 Program Schedule and Status
Provides site installation schedule, interface implementation schedule, and status of the program.

1.4.2 Planned Telecommunications Strategies
Telecommunications requirements are allocated to their means of satisfaction.

1.4.3 Telecommunications Costs
Provides information on how costs were derived, provides rationale for changes in cost estimates from previous editions, and identifies financial issues. When appropriate, it summarizes the costs associated with satisfying diversity.

Figure I-2. Future Telecommunications Plan Chapter Outline

I.4 CHANGES BETWEEN THE 1999 AND THE 2000 FUTURE TELECOMMUNICATIONS PLANS

I.4.1 Added Program:

Air Traffic Management (ATM) Systems (CAPSTONE) is an urgent safety initiative to reduce the high accident rate of small aircraft operations in western Alaska. It provides for rapid deployment and field demonstration of advanced avionics capabilities leading toward implementation of the Free Flight concept.

I.4.2 Changed Programs:

Air Traffic Management (ATM) is now two programs, Traffic Flow Management (TFM) and Free Flight Phase 1 (FFP1).

User Request Evaluation Tool/Core Capability Limited Deployment (URET/CCLD) was moved to the FFP1 chapter.

Host Interface Device/NAS Local Area Network (HID/NAS LAN), Voice Switching and Control System (VSCS), Weather Message Switching Center Replacement (WMSCR), Departmental Accounting and Financial Information System-Management Information Reporting (DAFIS-MIR), Freedom of Information Act National Tracking System (FOIA-NTS), Microwave Landing System (MLS), Very High Frequency (VHF) Omnidirectional Range/Tactical Air Navigation (VORTAC), Air Route Surveillance Radar Model 4 (ARSR-4), Mode Select Beacon System Sensor (Mode-S), Automated Surface Observing System (ASOS) Controller Equipment (ACE) and Next Generation Weather Radar (NEXRAD) are all implemented systems so were moved to the Currant Book in accordance with FAA Order 1830.6B and with project lead concurrence.

Telecommunications Security (TELESEC) was removed at the request of the program lead because of a policy change requiring TELESEC to be a part of every telecommunications provider program.

Telecommunications Operation Network Support (TONS) was removed at the request of the program lead because of funding issues. It is currently under review for major revision.

Airport Traffic Control Tower (ATCT) was removed at the request of the program lead because it is totally under regional control.

ANI Engineering Center (ANIEC) was removed at the request of the program lead because it has no new requirements and is under going major revision.

I.5 TELECOMMUNICATIONS COST TOTALS

Table I-1 provides a summary of the costs estimates for the "provider programs" described in this edition of the Fuchsia Book. Provider programs are those that provide the services required by the "user programs." For example, LINCS and FAA Owned Microwave Systems (FOMS) are providers of telecommunications services. A summary of the cost estimates for the user programs is found at Table I-2. An example of a telecommunications user is the Standard Terminal Automation Replacement System (STARS).

Table I-1. Communication Cost Total - Provider Programs

Chapter	System		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
2-02	ADTN	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$0	$0	$0	$0	$0	$0	$0
		Non-recurring	$1,486	$3,625	$321	$336	$353	$371	$389
		Recurring	$12,024	$14,907	$16,721	$18,957	$21,222	$23,521	$25,855
		OPS Total	$13,510	$18,532	$17,042	$19,293	$21,575	$23,892	$26,244
2-04	ANICS	Non-recurring	$3,599	$2,499	$9,001	$8,500	$445	$445	$445
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$3,599	$2,499	$9,001	$8,500	$445	$445	$445
		Non-recurring	$50	$50	$50	$50	$50	$50	$50
		Recurring	$6,054	$8,809	$9,554	$10,600	$11,114	$11,957	$12,832
		OPS Total	$6,104	$8,859	$9,604	$10,650	$11,164	$12,007	$12,882
1-05	BWM	Non-recurring	$50	$50	$50	$50	$50	$50	$50
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$50	$50	$50	$50	$50	$50	$50
		Non-recurring	$50	$50	$50	$50	$50	$50	$50
		Recurring	$1,458	$1,594	$1,743	$1,857	$2,038	$2,237	$2,456
		OPS Total	$1,508	$1,644	$1,793	$1,907	$2,088	$2,287	$2,506
2-07	DMN	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$0	$0	$0	$0	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$1,650	$1,650	$1,650	$1,650	$1,650	$1,650	$1,650
		OPS Total	$1,650	$1,650	$1,650	$1,650	$1,650	$1,650	$1,650
4-08	ENET	Non-recurring	$65	$10	$0	$0	$0	$0	$0
		Recurring	$58	$62	$67	$72	$78	$84	$84
		F&E Total	$123	$72	$67	$72	$78	$84	$84
		Non-recurring	$15	$0	$0	$0	$0	$0	$0
		Recurring	$383	$520	$566	$615	$668	$935	$959
		OPS Total	$398	$520	$566	$615	$668	$935	$959

Table I-1. Communication Cost Total - Provider Programs (continued)

Chapter	System		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
2-03	FAA Skylinks	Non-recurring	TBD	TBD	TBD	TBD	TBD	TBD	TBD
		Recurring	TBD	TBD	TBD	TBD	TBD	TBD	TBD
		F&E Total	TBD	TBD	TBD	TBD	TBD	TBD	TBD
		Non-recurring	TBD	TBD	TBD	TBD	TBD	TBD	TBD
		Recurring	TBD	TBD	TBD	TBD	TBD	TBD	TBD
		OPS Total	TBD	TBD	TBD	TBD	TBD	TBD	TBD
2-08	FAATSAT	Non-recurring	$369	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$369	$0	$0	$0	$0	$0	$0
		Non-recurring	$683	$16	$16	$16	$16	$16	$16
		Recurring	$15,594	$14,407	$13,700	$15,088	$15,236	$15,482	$15,503
		OPS Total	$16,277	$14,423	$13,716	$15,104	$15,252	$15,498	$15,519
2-09	FOMS	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$0	$0	$0	$0	$0	$0	$0
		Non-recurring	$7,800	$4,000	$1,000	$750	$500	$100	$100
		Recurring	$4,896	$5,356	$4,976	$5,416	$5,876	$6,336	$6,436
		OPS Total	$12,696	$9,356	$5,976	$6,166	$6,376	$6,436	$6,536
2-10	FTI	Non-recurring	$6,068	$29,153	$38,691	$51,466	$52,233	$25,097	$1,100
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$6,068	$29,153	$38,691	$51,466	$52,233	$25,097	$1,100
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$8,525	$16,200	$0	$0	$0	$0
		OPS Total	$0	$8,525	$16,200	$0	$0	$0	$0
2-11	FTS2000	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$459	$230	$0	$0	$0	$0	$0
		F&E Total	$459	$230	$0	$0	$0	$0	$0
		Non-recurring	$3,000	$0	$0	$0	$0	$0	$0
		Recurring	$15,287	$16,211	$17,203	$18,062	$18,966	$19,918	$20,911
		OPS Total	$18,287	$16,211	$17,203	$18,062	$18,966	$19,918	$20,911
2-12	GOMEX-CNS	Non-recurring	$2,650	$1,000	$900	$800	$0	$0	$0
		Recurring	$1,638	$1,413	$1,050	$1,000	$0	$0	$0
		F&E Total	$4,288	$2,413	$1,950	$1,800	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$571	$493	$2,054	$2,021	$2,021
		OPS Total	$0	$0	$571	$493	$2,054	$2,021	$2,021

Table 1-1. Communication Cost Total - Provider Programs (continued)

Chapter	System		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
2-13	LINCS	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$0	$0	$0	$0	$0	$0	$0
		Non-recurring	$2,986	$3,070	$2,150	$1,000	$445	$445	$75
		Recurring	$72,860	$74,070	$79,713	$83,530	$73,746	$30,699	$16,349
		OPS Total	$75,846	$77,140	$81,863	$84,530	$74,191	$31,144	$16,424
4-11	MAN	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$0	$0	$0	$0	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		OPS Total	$0	$0	$0	$0	$0	$0	$0
4-12	MCAFS	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$0	$0	$0	$0	$0	$0	$0
		Non-recurring	$700	$1,240	$1,200	$0	$0	$0	$0
		Recurring	$480	$1,248	$1,968	$1,968	$1,968	$1,968	$1,968
		OPS Total	$1,180	$2,488	$3,168	$1,968	$1,968	$1,968	$1,968
2-14	NADIN	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$0	$0	$0	$0	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$3,115	$3,136	$3,248	$3,271	$3,294	$3,319	$3,345
		OPS Total	$3,115	$3,136	$3,248	$3,271	$3,294	$3,319	$3,345
2-19	USITS	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$0	$0	$0	$0	$0	$0	$0
		Non-recurring	$800	$550	$500	$500	$0	$0	$0
		Recurring	$2,561	$3,022	$3,039	$3,039	$2,939	$2,939	$2,939
		OPS Total	$3,361	$3,572	$3,539	$3,539	$2,939	$2,939	$2,939
TOTALS		Non-recurring	$12,801	$32,712	$48,642	$60,816	$52,728	$25,592	$1,595
		Recurring	$2,155	$1,705	$1,117	$1,072	$78	$84	$84
		F&E Total	$14,956	$34,417	$49,759	$61,888	$52,806	$25,676	$1,679
		Non-recurring	$17,570	$12,601	$5,287	$2,702	$1,414	$1,032	$680
		Recurring	$136,362	$153,455	$170,852	$164,546	$160,771	$122,982	$113,224
		OPS Total	$153,932	$166,056	$176,139	$167,248	$162,185	$124,014	$113,904

Table I-2. Communication Cost Total - User Programs

Chapter	System		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
4-01	ACQUIRE	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$0	$0	$0	$0	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$465	$493	$523	$554	$587	$622	$660
		OPS Total	$465	$493	$523	$554	$587	$622	$660
7-01	ADAS	Non-recurring	$0	$607	$677	$0	$0	$0	$0
		Recurring	$0	$428	$492	$4	$0	$0	$0
		F&E Total	$0	$1,034	$1,169	$4	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$350	$3,195	$3,384	$3,619	$3,876	$3,876	$3,876
		OPS Total	$350	$3,195	$3,384	$3,619	$3,876	$3,876	$3,876
2-01	ADL	Non-recurring	$0	$0	$0	TBD	TBD	TBD	TBD
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$0	$0	$0	$0	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		OPS Total	$0	$0	$0	$0	$0	$0	$0
4-02	AFCIMS	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$0	$0	$0	$0	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$23	$26	$26	$28	$28	$31	$34
		OPS Total	$23	$26	$26	$28	$28	$31	$34
5-01	ALSF	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$0	$0	$0	$0	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		OPS Total	$0	$0	$0	$0	$0	$0	$0
6-01	AMASS	Non-recurring	$3	$1	$5	$0	$0	$0	$0
		Recurring	$9	$3	$6	$4	$0	$0	$0
		F&E Total	$12	$4	$11	$4	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$7	$9	$10	$14	$14	$14
		OPS Total	$0	$7	$9	$10	$10	$14	$14

Table I-2. Communication Cost Total - User Programs (continued)

Chapter	System		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
4-03	ARP	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$0	$0	$0	$0	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$159	$159	$159	$159	$159	$159	$159
		OPS Total	$159	$159	$159	$159	$159	$159	$159
6-02	ASR-11	Non-recurring	$37	$331	$368	$221	$294	$294	$294
		Recurring	$22	$214	$412	$347	$304	$347	$347
		F&E Total	$58	$545	$780	$568	$598	$641	$641
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$19	$214	$431	$561	$734
		OPS Total	$0	$0	$19	$214	$431	$561	$734
6-03	ATCBI	Non-recurring	$291	$835	$953	$508	$0	$0	$27
		Recurring	$167	$681	$1,068	$835	$282	$1	$5
		F&E Total	$458	$1,516	$2,021	$1,343	$282	$1	$32
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$166	$680	$1,233	$1,514	$1,514
		OPS Total	$0	$0	$166	$680	$1,233	$1,514	$1,514
3-01	ATCFTM	Non-recurring	$4,806	$0	$0	$0	$0	$0	$0
		Recurring	$260	$4	$0	$0	$0	$0	$0
		F&E Total	$5,066	$4	$0	$0	$0	$0	$0
		Non-recurring	$481	$140	$0	$0	$0	$1	$1
		Recurring	$2,465	$1,595	$1,678	$1,455	$1,482	$1,511	$1,511
		OPS Total	$2,946	$1,735	$1,678	$1,455	$1,482	$1,512	$1,512
3-02	ATCSCC	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$0	$0	$0	$0	$0	$0	$0
		Non-recurring	$773	$830	$15,460	$220	$270	$220	$220
		Recurring	$709	$783	$951	$867	$897	$948	$988
		OPS Total	$1,482	$1,613	$16,411	$1,087	$1,167	$1,168	$1,208
4-04	ATOMS	Non-recurring	$216	$135	$135	$135	$54	$54	$54
		Recurring	$307	$235	$181	$181	$126	$72	$72
		F&E Total	$523	$370	$316	$316	$180	$126	$126
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$295	$458	$602	$692	$783	$873	$909
		OPS Total	$295	$458	$602	$692	$783	$873	$909

Table I-2. Communication Cost Total - User Programs (continued)

Chapter	System		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
1-04	AVR	Non-recurring	$59	$199	$199	$199	$199	$199	$199
		Recurring	$968	$968	$968	$968	$968	$968	$968
		F&E Total	$1,027	$1,167	$1,167	$1,167	$1,167	$1,167	$1,167
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$2,540	$3,049	$3,562	$4,080	$4,602	$5,131	$5,665
		OPS Total	$2,540	$3,049	$3,562	$4,080	$4,602	$5,131	$5,665
7-02	AWOS	Non-recurring	$270	$0	$0	$0	$0	$0	$0
		Recurring	$1,777	$0	$0	$0	$0	$0	$0
		F&E Total	$2,047	$0	$0	$0	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$3,566	$2,682	$2,951	TBD	TBD	TBD	TBD
		OPS Total	$3,566	$2,682	$2,951	TBD	TBD	TBD	TBD
2-05	BUEC	Non-recurring	$810	$756	$842	$864	$864	$1,145	$1,242
		Recurring	$2,511	$630	$657	$747	$765	$999	$1,314
		F&E Total	$3,321	$1,386	$1,499	$1,611	$1,629	$2,144	$2,556
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$2,331	$3,006	$3,681	$4,311	$5,013	$5,733	$6,453
		OPS Total	$2,331	$3,006	$3,681	$4,311	$5,013	$5,733	$6,453
3-03	CAEG	Non-recurring	$296	$0	$0	$0	$0	$0	$0
		Recurring	$310	$310	$0	$0	$0	$0	$0
		F&E Total	$606	$310	$0	$0	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$358	$358	$688	$688	$688	$688	$688
		OPS Total	$358	$358	$688	$688	$688	$688	$688
1-03	CAPSTONE	Non-recurring	$8	$7	$947	$956	$965	$798	$30
		Recurring	$74	$32	$1,834	$3,096	$3,875	$4,163	$1,859
		F&E Total	$83	$39	$2,781	$4,052	$4,840	$4,961	$1,889
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$549	$1,014	$2,174	$3,680	$6,147
		OPS Total	$0	$0	$549	$1,014	$2,174	$3,680	$6,147
2-06	CFE	Non-recurring	$56	$166	$220	$138	$44	$32	$16
		Recurring	$134	$398	$528	$331	$106	$77	$38
		F&E Total	$190	$564	$748	$469	$150	$109	$54
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$1,013	$1,013	$1,147	$1,411	$1,675	$1,742	$1,781
		OPS Total	$1,013	$1,013	$1,147	$1,411	$1,675	$1,742	$1,781

Table I-2. Communication Cost Total - User Programs (continue)

Chapter	System		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
1-06	DBRITE	Non-recurring	$187	$75	$0	$0	$0	$0	$0
		Recurring	$374	$374	$112	$0	$0	$0	$0
		F&E Total	$561	$449	$112	$0	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$521	$628	$939	$1,051	$1,051	$1,051	$1,051
		OPS Total	$521	$628	$939	$1,051	$1,051	$1,051	$1,051
4-05	DELPHI	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$0	$0	$0	$0	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$3	$10	$10	$10	$10	$10
		OPS Total	$0	$3	$10	$10	$10	$10	$10
4-06	DL	Non-recurring	$0	$0	$0	$500	$401	$437	$0
		Recurring	$0	$0	$0	$0	$31	$10	$0
		F&E Total	$0	$0	$0	$500	$432	$447	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$279	$323	$381	$457	$555	$713	$887
		OPS Total	$279	$323	$381	$457	$555	$713	$887
4-07	DVTS	Non-recurring	$0	$70	$70	$70	$70	$70	$70
		Recurring	$0	$40	$80	$80	$80	$80	$80
		F&E Total	$0	$110	$150	$150	$150	$150	$150
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$408	$408	$408	$448	$488	$528	$568
		OPS Total	$408	$408	$408	$448	$488	$528	$568
1-07	ERAP	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$71	$0	$0	$0	$0	$0	$0
		F&E Total	$71	$0	$0	$0	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$151	$222	$222	$222	$222	$222	$222
		OPS Total	$151	$222	$222	$222	$222	$222	$222
1-02	FFP1	Non-recurring	$83	$65	$31	$0	$0	$0	$0
		Recurring	$255	$282	$159	$64	$0	$0	$0
		F&E Total	$338	$347	$190	$64	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$17	$38	$171	$219	$204	$236	$236
		OPS Total	$17	$38	$171	$219	$204	$236	$236

Table I-2. Communication Cost Total - User Programs (continued)

Chapter	System		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
1-08	FSAS	Non-recurring	$17	$96	$416	$559	$497	$0	$0
		Recurring	$70	$243	$1,179	$2,080	$1,791	$835	$0
		F&E Total	$87	$339	$1,595	$2,639	$2,288	$835	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$1,195	$1,232	$1,276	$1,414	$2,487	$3,346	$4,139
		OPS Total	$1,195	$1,232	$1,276	$1,414	$2,487	$3,346	$4,139
4-09	FSP	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$0	$0	$0	$0	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$4	$4	$5	$5	$5	$5	$5
		OPS Total	$4	$4	$5	$5	$5	$5	$5
5-02	ILS	Non-recurring	$43	$4	$0	TBD	TBD	TBD	TBD
		Recurring	$187	$16	$0	$0	$0	$0	$0
		F&E Total	$230	$20	TBD	TBD	TBD	TBD	TBD
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$538	$709	$725	$725	$725	$725	$725
		OPS Total	$538	$709	$725	$725	$725	$725	$725
4-10	IPPS	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$0	$0	$0	$0	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$125	$125	$125	$125	$125	$125	$125
		OPS Total	$125	$125	$125	$125	$125	$125	$125
7-03	ITWS	Non-recurring	$28	$45	$992	$236	$16	$0	$0
		Recurring	$43	$275	$1,929	$1,884	$233	$0	$0
		F&E Total	$70	$321	$2,920	$2,119	$250	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$27	$311	$1,961	$2,196	$2,196
		OPS Total	$0	$0	$27	$311	$1,961	$2,196	$2,196
5-03	MALSR	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$0	$0	$0	$0	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		OPS Total	$0	$0	$0	$0	$0	$0	$0

Table I-2. Communication Cost Total - User Programs (continued)

Chapter	System		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
7-04	MDCRS	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$0	$0	$0	$0	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$175	$200	$200	$200	$200	$200	$200
		OPS Total	$175	$200	$200	$200	$200	$200	$200
1-09	MEARTS	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$360	$0	$0	$0	$0	$0	$0
		F&E Total	$360	$0	$0	$0	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$360	$360	$360	$360	$360	$360
		OPS Total	$0	$360	$360	$360	$360	$360	$360
1-11	NASR	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$0	$0	$0	$0	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$1	$1	$1	$1	$1	$1	$1
		OPS Total	$1	$1	$1	$1	$1	$1	$1
2-15	NEXCOM	Non-recurring	$6	$0	$0	$0	$0	$300	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$6	$0	$0	$0	$0	$300	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		OPS Total	$0	$0	$0	$0	$0	$0	$0
4-13	NIMS	Non-recurring	TBD	TBD	TBD	TBD	TBD	TBD	TBD
		Recurring	TBD	TBD	TBD	TBD	TBD	TBD	TBD
		F&E Total	TBD	TBD	TBD	TBD	TBD	TBD	TBD
		Non-recurring	$238	TBD	TBD	TBD	TBD	TBD	TBD
		Recurring	$733	TBD	TBD	TBD	TBD	TBD	TBD
		OPS Total	$971	TBD	TBD	TBD	TBD	TBD	TBD
4.14	NPPS	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$73	$147	$147	$0	$0	$0
		F&E Total	$0	$73	$147	$147	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$147	$147	$147
		OPS Total	$0	$0	$0	$0	$147	$147	$147

Table I-2. Communication Cost Total - User Programs (continued)

Chapter	System		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
1-10	OAP	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$0	$0	$0	$0	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$17,445	$15,417	$18,286	$15,465	$12,104	$9,599	$10,170
		OPS Total	$17,445	$15,417	$18,286	$15,465	$12,104	$9,599	$10,170
1-12	OATMS	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$0	$0	$0	$0	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$121	$121	$121	$121	$121	$121	$121
		OPS Total	$121	$121	$121	$121	$121	$121	$121
5-04	PAPI	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$0	$0	$0	$0	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		OPS Total	$0	$0	$0	$0	$0	$0	$0
2-16	RCOM	Non-recurring	$4,400	$4,650	$4,300	$4,000	$3,000	$5,100	$5,200
		Recurring	$45	$10	$10	$10	$10	$10	$10
		F&E Total	$4,445	$4,660	$4,310	$4,010	$3,010	$10	$10
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$1,664	$1,771	$1,771	$1,796	$1,796	$1,796	$1,796
		OPS Total	$1,664	$1,771	$1,771	$1,796	$1,796	$1,796	$1,796
5-05	REIL	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$0	$0	$0	$0	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		OPS Total	$0	$0	$0	$0	$0	$0	$0
5-06	RVR	Non-recurring	$88	$105	$122	$184	$105	$105	$122
		Recurring	$29	$41	$47	$55	$53	$45	$47
		F&E Total	$117	$146	$169	$239	$158	$150	$169
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$127	$137	$164	$186	$211	$242	$264
		OPS Total	$127	$137	$164	$186	$211	$242	$264

Table I-2. Communication Cost Total - User Programs (continued)

Chapter	System		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
4-15	SAMS	Non-recurring	$96	$0	$0	$0	$0	$0	$0
		Recurring	$77	$77	$0	$0	$0	$0	$0
		F&E Total	$174	$77	$0	$0	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$77	$77	$77	$77	$77
		OPS Total	$289	$273	$352	$368	$368	$368	$368
1-13	STARS	Non-recurring	$408	$1,299	$2,385	$1,381	$1,321	$66	$1,294
		Recurring	$407	$1,809	$4,416	$4,488	$3,112	$1,731	$5,620
		F&E Total	$816	$3,108	$6,801	$5,870	$4,433	$1,797	$6,914
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$48	$424	$1,940	$4,840	$6,428	$7,952
		OPS Total	$0	$48	$424	$1,940	$4,840	$6,428	$7,952
2-17	TDLS	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$0	$0	$0	$0	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$19	$19	$14	$10	$0	$0	$0
		OPS Total	$19	$19	$14	$10	$0	$0	$0
7-05	TDWR	Non-recurring	$36	$0	$0	$0	$0	$0	$0
		Recurring	$17	$5	$0	$0	$0	$0	$0
		F&E Total	$53	$5	$0	$0	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$109	$120	$126	$126	$126	$126	$126
		OPS Total	$109	$120	$126	$126	$126	$126	$126
1-01	TFM	Non-recurring	$84	$38	$0	$0	$0	$0	$0
		Recurring	$96	$96	$0	$0	$0	$0	$0
		F&E Total	$180	$134	$0	$0	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$1,435	$1,436	$1,554	$1,420	$1,421	$1,424	$1,424
		OPS Total	$1,435	$1,436	$1,554	$1,420	$1,421	$1,424	$1,424
3-04	TR-ATL	Non-recurring	$4,509	$0	$0	$0	$0	$0	$0
		Recurring	$992	$1,161	$0	$0	$0	$0	$0
		F&E Total	$5,501	$1,161	$0	$0	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$1	$1	$666	$666	$666	$666	$666
		OPS Total	$1	$1	$666	$666	$666	$666	$666

Table I-2. Communication Cost Total - User Programs (continued)

Chapter	System		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
4-16	TRMM	Non-recurring	$0	$125	$15	$15	$15	$15	$15
		Recurring	$100	$150	$225	$394	$591	$886	$975
		F&E Total	$100	$275	$240	$409	$606	$901	$990
		Non-recurring	$945	$220	$242	$266	$293	$322	$354
		Recurring	$151	$89	$104	$104	$104	$104	$104
		OPS Total	$1,096	$309	$346	$370	$397	$426	$458
3-05	TR-NOCAL	Non-recurring	$4,015	$407	$0	$0	$0	$0	$0
		Recurring	$346	$3,161	$1,207	$0	$0	$0	$0
		F&E Total	$4,361	$3,568	$1,207	$0	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$1,166	$2,373	$2,373	$2,373	$2,373
		OPS Total	$0	$0	$1,166	$2,373	$2,373	$2,373	$2,373
3-06	TR-PTC	Non-recurring	$0	$6,197	$0	$0	$0	$0	$0
		Recurring	$0	$0	$1,174	$1,761	$0	$0	$0
		F&E Total	$0	$6,197	$1,174	$1,761	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$1,264	$1,264	$1,264
		OPS Total	$0	$0	$0	$0	$1,264	$1,264	$1,264
2-18	TVSR	Non-recurring	$10	$11	$5	$5	$8	$8	$7
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$10	$11	$5	$5	$8	$8	$7
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$6	$7	$7	$9	$7	$7
		OPS Total	$0	$6	$7	$7	$9	$7	$7
2-20	VTS	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$0	$0	$0	$0	$0	$0	$0
		Non-recurring	$0	$4,152	$580	$0	$355	$0	$375
		Recurring	$0	$931	$834	$853	$872	$892	$913
		OPS Total	$0	$5,084	$1,414	$853	$1,227	$892	$1,288
5-07	WAAS	Non-recurring	$11	$12,000	$0	$0	$0	$0	$0
		Recurring	$14,504	$19,629	$29,261	$29,261	$49,661	$49,661	$68,061
		F&E Total	$14,515	$31,628	$29,261	$29,261	$49,661	$49,661	$68,061
		Non-recurring	$0	$0	$433	$1,659	$223	$1,613	$37
		Recurring	$0	$487	$8,554	$10,415	$11,142	$11,170	$11,248
		OPS Total	$0	$487	$8,987	$12,073	$11,365	$12,783	$11,285

Table I-2. Communication Cost Total - User Programs (continued)

Chapter	System		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
7-06	WAFS	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$0	$0	$0	$0	$0	$0	$0
		Non-recurring	$2	$139	$0	$0	$0	$0	$0
		Recurring	$1,400	$1,400	$1,847	$1,847	$1,847	$1,847	$1,847
		OPS Total	$1,402	$1,539	$1,847	$1,847	$1,847	$1,847	$1,847
7-07	WARP	Non-recurring	$647	$869	$0	$0	$0	$0	$0
		Recurring	$455	$3,368	$2,987	$0	$0	$0	$0
		F&E Total	$1,102	$4,237	$2,987	$0	$0	$0	$0
		Non-recurring	$185	$0	$0	$0	$0	$0	$0
		Recurring	$83	$766	$1,493	$4,486	$4,522	$4,559	$4,599
		OPS Total	$268	$766	$1,493	$4,486	$4,522	$4,559	$4,599
7-08	WSP	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	$0	$0	$0	$0	$0	$0	$0
		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		OPS Total	$0	$0	$0	$0	$0	$0	$0
TOTALS		Non-recurring	$21,520	$29,093	$12,682	$9,971	$7,853	$8,623	$8,570
		Recurring	$24,621	$31,552	$49,079	$46,737	$61,988	$59,885	$79,396
		F&E Total	$46,141	$60,645	$61,761	$56,708	$69,841	$68,508	$87,966
		Non-recurring	$2,624	$5,481	$16,715	$2,145	$1,141	$2,156	$987
		Recurring	$40,976	$43,826	$62,153	$67,222	$75,678	$79,643	$86,956
		OPS Total	$43,600	$49,307	$78,868	$69,367	$76,819	$81,799	$87,943

Table I-3. Communication Cost Total - Provider Programs and User Programs

PROVIDER PROGRAMS		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
TOTALS	Non-recurring	$12,801	$32,712	$48,642	$60,816	$52,728	$25,592	$1,595
	Recurring	$2,155	$1,705	$1,117	$1,072	$78	$84	$84
	F&E Total	$14,956	$34,417	$49,759	$61,888	$52,806	$25,676	$1,679
	Non-recurring	$17,570	$12,601	$5,287	$2,702	$1,414	$1,032	$680
	Recurring	$136,362	$153,455	$170,852	$164,546	$160,771	$122,982	$113,224
	OPS Total	$153,932	$166,056	$176,139	$167,248	$162,185	$124,014	$113,904

USER PROGRAMS		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
TOTALS	Non-recurring	$21,520	$29,093	$12,682	$9,971	$7,853	$8,623	$8,570
	Recurring	$24,621	$31,552	$49,079	$46,737	$61,988	$59,885	$79,396
	F&E Total	$46,141	$60,645	$61,761	$56,708	$69,841	$68,508	$87,966
	Non-recurring	$2,624	$5,481	$16,715	$2,145	$1,141	$2,156	$987
	Recurring	$40,976	$43,826	$62,153	$67,222	$75,678	$79,643	$86,956
	OPS Total	$43,600	$49,307	$78,868	$69,367	$76,819	$81,799	$87,943

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CHAPTER 1-01 - SUMMARY SHEET

TRAFFIC FLOW MANAGEMENT (TFM) SYSTEMS

Program/Project Identifiers:

Project Number(s):	CIPs A-05
Related Program(s):	CIPs A-01, A-03, A-04, A-06, A-11, A-12, C-14, C-15, C-20, W-07, R,E&D 021-110, 021-190, 021-220, 021-230, 031-110
New/Replacement/Upgrade?	New
Responsible Organization:	AUA-700
Program Mgr./Project Lead:	Dan Gutwein AUA-700 (202) 366-1753 (Traffic Flow Mgmt. ETMS, CDM, DSP)
Fuchsia Book POC:	Dan Gutwein (202) 366-1753

Assigned Codes:

PDC(s):	IA, RB, RC, RD, MV
PDC Description:	Administrative Services for ATC Facilities, Business Line (Exchange Service) Circuits; Circuits for the Center-TRACON Automation System (CTAS); Circuits for Enhanced Traffic Management System (ETMS); Circuits for Surface Movement Advisor (SMA); Circuits for the Computerized Voice Reservation System (CVRS)(800).
Service Code:	ADVO, IDAT

Cost Estimates*:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$83	$38	$0	$0	$0	$0	$0
F&E Recurring	$96	$96	$0	$0	$0	$0	$0
Total F&E	$180	$134	$0	$0	$0	$0	$0
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$1,436	$1,436	$1,554	$1,420	$1,421	$1,424	$1,424
Total OPS	$1,436	$1,436	$1,554	$1,420	$1,421	$1,424	$1,424

*Cost for ETMS & CDM, DSP, and CVRS are shown on the reverse side by system.

Cost Estimates: CIP #A-05 **ETMS and CDM**

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$38	$38	$0	$0	$0	$0	$0
F&E Recurring	$45	$45	$0	$0	$0	$0	$0
Total F&E	$83	$83	$0	$0	$0	$0	$0
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$1,352	$1,352	$1,412	$1,412	$1,412	$1,415	$1,415
Total OPS	$1,352	$1,352	$1,412	$1,412	$1,412	$1,415	$1,415

Cost Estimates: **CIP #A-05 DSP**

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$47	$0.0	$0	TBD	TBD	TBD	TBD
F&E Recurring	$51	$51	$0	TBD	TBD	TBD	TBD
Total F&E	$98	$51	$0	TBD	TBD	TBD	TBD
OPS Non-recurring	$0	$0	$0	TBD	TBD	TBD	TBD
OPS Recurring	$77	$77	$134	TBD	TBD	TBD	TBD
Total OPS	$77	$77	$134	TBD	TBD	TBD	TBD

Cost Estimates: **CIP #A-05 CVRS**

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	$0	$0	$0	$0	$0	$0	$0
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$7	$7	$7	$8	$8	$9	$9
Total OPS	$7	$7	$7	$8	$8	$9	$9

CIP Category:
Automation

1-01.0 TRAFFIC FLOW MANAGEMENT SYSTEMS

1-01.1 PROGRAM OVERVIEW

1-01.1.1 Purpose of Air Traffic Management Systems

The Traffic Flow Management System (TMS) and many of its subsystems, networks, infrastructure and staff have transitioned to the AUA-700 organization during FY-99. The Enhanced Traffic Management System (ETMS)/Traffic Flow Management-Infrastructure (TFM-I); Collaborative Decision-Making (CDM); Departure Spacing Program (DSP), and networks are under reorganization and restructuring within AUA-700.

The Traffic Flow Management mission is to provide tools that balance air traffic demand with system capacity to ensure maximum efficiency in the utilization of the National Airspace System (NAS), providing a safe, orderly and expeditious flow of air traffic. This is coupled with the task of minimizing delays, both on the ground and while en route. TFM systems consist of a set of integrated tools that reside in Air Route Traffic Control Centers (ARTCCs), Terminal Radar Approach Controls (TRACONs), Airport Traffic Control Towers (ATCTs) and the Air Traffic Control System Command Center (ATCSCC). TFM goals are as follows:

- Reduce flight delays by balancing capacity with demand;
- Promote increased user/service provider situational awareness;
- Improve controllers' ability to optimize aircraft scheduling and sequencing;
- Increase aircraft fuel efficiency.

En route air traffic management capabilities currently under development will assist traffic management personnel in assessing and updating demand predictions, comparing demand and capacity, developing flow strategies, and monitoring the performance of implemented strategies. As the tools are developed and refined over time, selected en route and terminal applications will be merged and maintained as a single application.

The Enhanced Traffic Management System (ETMS) operates at the national level through the ATCSCC located at Herndon, VA, and at the local level through Traffic Management Units (TMU) in each ARTCC and designated terminals. It also provides a subset of its capabilities to participating airlines. ETMS supports analysis of projected flight activity aided by near-real-time weather, weather forecasts, development of plans for anticipated traffic flows and monitoring of traffic flows. The Central Altitude Reservation Function (CARF) processes moving and stationary altitude reservation requests and approvals. CARF coordinates these requests for the use of airspace within the NAS and interfaces with military and civilian project officers.

The Advanced Traffic Management System (ATMS) is the R, E&D project for the Traffic Management System. The Collaborative Decision Making (CDM) concept is currently being prototyped/evaluated for future inclusion into the NAS traffic management system.

1-01.1.2 References

1-01.1.2.1 NAS System Specification, Functional and Performance Requirements for the National Airspace System General, NAS-SS-1000, Volume I, December 1986 (with changes through May 1993, SCN-21), DOT/FAA.

1-01.1.2.2 FAA Capital Investment Plan (CIP), Project A-05, Traffic Management System (TMS), January 1999.

1-01.2 SYSTEM DESCRIPTION

1-01.2.1 System Component Descriptions

Currently TFM consists of the following systems: ETMS, CDM, DSP, CARF, and Computerized Voice Research System (CVRS). There are also a few prototype systems or tools being developed. Each operational system is described in detail in the following paragraphs. The prototypes are briefly described as they have not yet advanced far enough into the design/testing phase to stabilize either hardware or software design.

1-01.2.1.1 Enhanced Traffic Management System

ETMS provides national-level traffic management support. It provides traffic management services to the user/specialist as follows:

- Flow sequencing of aircraft in controlled airspace;
- Monitoring of current traffic flow within the NAS;
- Estimating the future use of NAS airspace;
- Allocation of NAS airspace; and
- Traffic management restrictions and delay advisories.

In a major hardware and software upgrade during FY-99, ETMS successfully transitioned from proprietary to a standards compliant traffic management infrastructure.

1-01.2.1.2 Collaborative Decision Making

A Collaborative Decision-Making (CDM) capability is currently in operation. CDM will allow improved interaction between the FAA's traffic management function and the airline's operations centers. In turn, this will reduce impacts on the traveling public from traffic flow restrictions during periods of reduced airport and airspace capacity. As part of this effort, NAS status information will be disseminated across the NAS, and a collaborative routing capability will be deployed. CDM is expected to increase bandwidth requirements as a result of increased data exchange between TMUs, the ATCSCC and NAS operators.

1-01.2.1.3 Departure Spacing Program

The Departure Spacing Program (DSP) is another tool being prototyped. DSP will provide departure times to tower controllers for all flights. It will schedule departures so as to maintain a desired rate of traffic flow over TRACON and en route merge fixes. Departure schedules will be adjustable to accommodate ARTCC or TRACON imposed flow rates.

1-01.2.1.4 Central Altitude Reservation Facility

CARF processes moving and stationary reservation requests and approvals. Additionally, CARF coordinates the operational movement of the Open Skies Treaty Verification flights within the NAS. The CARF system is located at the ATCSCC.

1-01.2.1.5 Computerized Voice Reservation System

The CVRS provides an automated means to obtain arrival and departure reservations at designated high traffic density airports and for other special traffic management "events" such as the annual Oshkosh fly-in. Reservations are obtained on a "first-come-first-served" basis from the CVRS system located in the ATCSCC facility. Reservations can be made via computerized voice response, touch-tone, or direct data entry via a modem connection.

1-01.2.2 Principal Components

1-01.2.2.1 ETMS Principal Components

Traffic management functions are performed in the ATCSCC, ETMS Traffic Management Computer Complex (ETMCC), TMUs, and, when activated, the Emergency Operations Facility (EOF). The ATCSCC, located in Herndon, VA, is the operations area for the Central Flow Control Function (CFCF), CARF, and CVRS. The ETMCC, located at the Volpe Center in Boston, is the central, automated data processing (ADP) facility. TMUs are located in all 21 ARTCCs, the Honolulu and San Juan Combined Center Radar Approach Controls (CERAPs), and about fifty selected TRACONs and towers. CDM functions will be implemented in TMUs, the ATCSCC, some Tower/TRACON facilities, Aeronautical Operations Control (AOC), and other flight planning facilities. These components are described in their functional groupings in the following paragraphs.

1-01.2.2.1.1 Enhanced Traffic Management Computer Complex

The ETMCC has external interfaces with each TMU-equipped FAA ARTCC, TRACON, and ATCT, and with the William J. Hughes Technical Center (WJHTC), Aeronautical Radio, Incorporated (ARINC), participating airlines, the Canadian air traffic system, selected European locations, and the United States Air Force.

1-01.2.2.1.2 ETMS Workstations

ETMS workstations consist of HP microcomputers, mass storage devices, printers, and interface devices. These include HP/K570 processors in the ETMCC and HP/C300 Series processors in TMU sites. A local area network connects the workstations in each facility. Local area networks located at the ETMCC, ATCSCC, ARTCCs, EOF, TRACONs selected towers, and regional offices have a direct interface with the ETMCC. Workstations at ARTCCs also interface with the local NAS En Route Stage A processor (Host).

1-01.2.2.2 CARF Principal Components

The CARF computer system is a network of 4 computers, which consist of a Sun Ultra server and three workstations, 2 Sun Sparc 20's and 1 Sun Sparc 5 workstation. In addition there is a Pentium II 400 PC connected to the network used for transferring files to the National Airspace Data Interchange Network (NADIN) and DOD Automatic Digital Interface Network (AUTODIN) systems. All are located at the ATCSCC. There are no remote workstations. Airspace reservations processed by CARF are coordinated via manual transfer of information to the AUTODIN circuit and automated transfer to the NADIN circuit. CARF also has an AUTODIN connection that is not on the CARF network.

1-01.2.2.3 CVRS Principal Components

The CVRS operates on two Pentium-class personal computers with additional terminals located within the ATCSCC. The CVRS is accessed by NAS users via eight toll-free telephone numbers with rollover capability. The system also accepts reservations via dial-up modem connections using two additional toll-free numbers. Twenty-one telephone company circuits are currently used to provide this service.

1-01.3 INTERFACE REQUIREMENTS

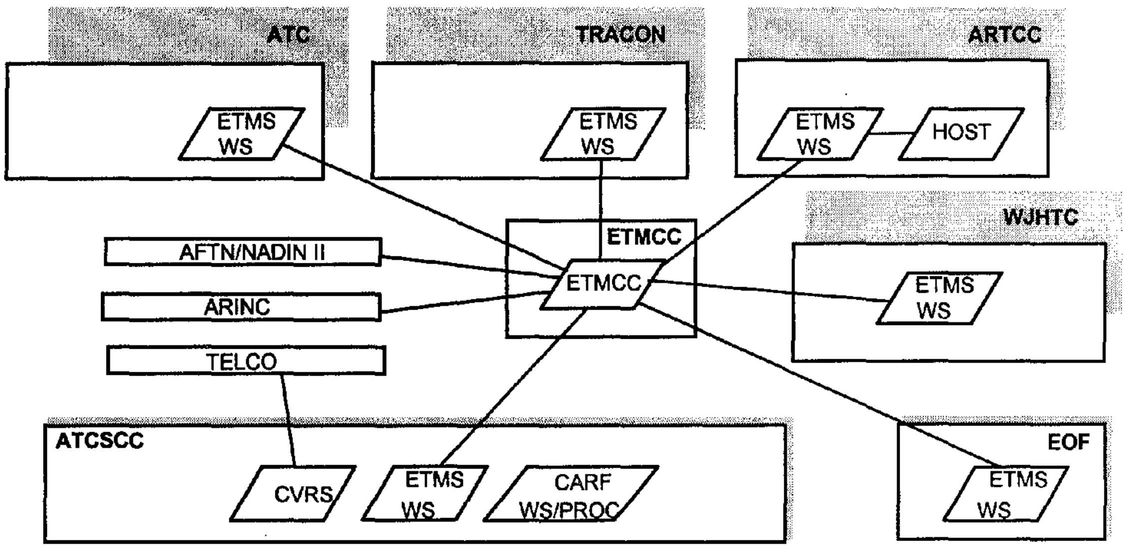
1-01.3.1 Telecommunications Interfaces

1-01.3.1.1 ETMS Telecommunications Interface Requirements

ETMS obtains flight data from the host computers at each ARTCC, processes this data at the ETMCC, and then distributes Traffic Situation Display (TSD) data to ETMS workstations located at ARTCCs, TRACONs, ATCTs, and other facilities. ETMS also acquires NWS meteorological data as well as weather radar data. It processes the data at the ETMCC and distributes it in the same data channel as the TSD data. ETMS telecommunications employ a star communications topology among TFM processors at the ATCSCC, ARTCCs, TRACONs, ETMCC, WJHTC, Regional offices and the EOF, as well as with external sites. ETMS is an essential service (.999 availability). The WJHTC is the system support test facility. The ETMS telecommunication interfaces are illustrated in Figure 1-01-1. The interfaces at ARTCCs send NAS messages from the HCS to the ETMCC via the ETMS communications circuit from each ARTCC. Similarly, the interfaces at the Alaskan En Route Automated Radar Tracking System (EARTS) route NAS messages from these sites to the ETMCC via the ETMS communications circuits. These communications are provided by a combination of terrestrial services. With the exception of the ETMCC to ATCSCC and ETMCC to WJHTC links, all sites currently employ 56 KBPS full-duplex trunks to the ETMCC.

Besides FAA facilities, other direct external interfaces with the ETMCC include ARINC, Weather Service International (WSI), Inc., and the Official Airline Guide (OAG). ARINC connects to the ETMCC via NADIN for input of Oceanic Position Updates from Dynamic Oceanic Tracking System (DOTS) and Flight Substitutions from airlines. WSI, Inc. is the current commercial source of weather data to ETMS. This data is provided via vendor-supplied satellite data feed to the ETMCC. ETMS weather data may eventually be obtained from Weather and Radar processor (WARP) with the communications approach to be determined. The Airline Schedule updates are acquired from the OAG by dial-up telephone circuit.

Traffic Management Point-to Point Communications Network



Legend			
AFTN	- Aeronautical Fixed Telecommunications	ETMS	- Enhanced Traffic Management System
ARINC	- Aeronautical Radio, Inc	NADIN	- NAS Data Interchange Network
ARTC	- Air Route Traffic Control Center	PROC	- Processor
ATCSCC	- Air Traffic Control System Command Center	TELCO	- Telephone Company
ATCT	- Airport Traffic Control Tower	TRACON	- Terminal Radar Approach Control
CARF	- Central Altitude Reservation Facility	ETMCC	- Enhanced Traffic Management Computer Complex
CVRS	- Computerized Voice Reservation System		
EOF	- Emergency Operations Facility	WS	- Work Station
ETMCC	- Enhanced Traffic Management Computer Complex	WJHTC	- William J. Hughes Technical Center

Figure 1-01.1 – ETMS and CARF Telecommunications Interfaces

1-01.3.1.2 <u>Future ETMS Traffic Characteristics</u>

The ETMCC currently sends air traffic information updates to the sites every five minutes, but one minute updates are required for more timely traffic flow management. The feasibility of migrating to once every minute has been confirmed. The conversion to the TCP/IP protocols (completed in 1999) allows many choices of distribution, all of which are under evaluation. Bandwidth requirements, taking into account one-minute air traffic updates, future CDM requirements, and required data encryption, call for at least 256 KBPS bandwidth. Table 1-01-1 provides an indication of the current traffic characteristics. The system is being evaluated for a major communications upgrade.

The existing interfacility communications circuits may be upgraded to support greater ETMS bandwidth during FY-2000. Alternatives are currently being considered for moving from point-to-point, Leased Interfacility NAS Communications System (LINCS) circuits to a frame relay network. Recent studies show a need to upgrade these circuits to at least 256 KBPS. The same studies support a need for T-1 circuits between the ETMCC and the ATCSCC and WJHTC.

Table 1-01-1. ETMS Traffic Characteristics

Service	Response Time Requirements
Flow sequence all participating aircraft in controlled airspace	• Minimum 2 hours in advance for local traffic management • Minimum 8 hours in advance for national traffic management
Monitor and disseminate current traffic flow within the NAS using fix, sector, route, other information	• Respond to request within 10 seconds
Estimate future use of NAS airspace	• Minimum 2 hours in advance for local traffic management • Minimum 8 hours in advance for national traffic management
Allocate use of NAS airspace	• Minimum 2 hours in advance for local traffic management • Minimum 8 hours in advance for national traffic management
Disseminate traffic management restrictions, weather/aeronautical information and current/future delay advisories	• Respond to request within 10 seconds; • Periodic update of weather products at various periods of 5-min. to 1-hour.
Process a central altitude reservation that supports flow planning and conflict-free scheduling and display	• Respond to request within 10 seconds
Provide an airport reservation that supports flow planning and conflict-free scheduling	• Respond to request within 6 seconds
Analyze and evaluate the effectiveness of the traffic management system and notify specialists	• Respond to request within 10 seconds

1-01.3.2 CARF Telecommunications Interfaces

The CARF computer system, located in the ATCSCC, is a stand-alone unit. There are no other components. There are no physical interconnections or telecommunications interfaces at this time, but the Free Flight Program may require an interface in the future.

1-01.3.3 CVRS Telecommunications Interfaces

All interfaces are via the Federal Telecommunications System (FTS2000) switched (dial) voice network. The CVRS is a dialup system utilizing FTS2000 1-800 voice grade lines for voice or asynchronous modem interconnection. Modems must meet commercial dialup standards (Bell or ITU). Users provide standard touch-tone input or use commercial off-the-shelf modems and terminals/PCs. The CVRS automatically configures to handle a voice, touch-tone, or modem user. Presently, CVRS requires no additional telecommunications interfaces.

1-01.3.4 Local Interfaces

1-01.3.4.1 ETMS Local Interface Requirements

At the site level, the system operates on its own local area network (10/100 baseT), using HP-C300 Series/HP-UX workstations. ETMS completed a major modernization program from proprietary to non-proprietary platforms with extensive software changes during FY-99. The upgrade included transition to TCP/IP router-based communications. Table 1-01-2 summarizes ETMS Telecommunications Interface Requirements, and Table 1-01-1 explains ETMS Traffic Characteristics. Upgrades described later under *ETMS Telecommunications Interface Requirements* are not expected to alter these intrafacility communications.

Table 1-01-2. ETMS Telecommunications Interface Requirements Summary

TELECOMMUNICATIONS INTERFACES		ETMCC to ATC Facilities
INTERFACE CONTROL DOCUMENTATION		TBD
	Network Layer	IP (≈FY98+)
PROTOCOL	Data Link Layer	Ethernet/IEEE 802.3
REQUIREMENT	Physical Layer	Synchronous
	Special Formats/Codes	TBD
TRANSMIS-SION	No. of Channels	1 per ARTCC, TRACON, ATCT; 5 to ATCSCC
REQUIREMENT	Speed (KBPS)	56/128 KBPS
	Simplex Half/Full Duplex	FD, Fractional T-1
	Service	Pt-to-Pt Frame Relay
HARDWARE	MODEM	CSU/DSU Routers
REQUIREMENT	Cable/Misc	Av=0.999

1-01.3.4.2 CARF Local Interfaces

There are no local interfaces.

1-01.3.4.3 CVRS Local Interfaces

There are no CVRS local interfaces.

1-01.4 ACQUISITION ISSUES

1-01.4.1 DSP Interim Communications for Test Support

The DSP tool prototype is currently installed at seven locations. The New York ARTCC (ZNY) is the location of the primary processors. Workstations and X-Terminals are located at the New York TRACON, the three NY area towers (EWR, JFK, and LGA), the Philadelphia ATCT/TRACON, and the DSP laboratory in Atlantic City, NJ. Current planning requires T-1 links between all seven sites. Congress has authorized funding for expansion of DSP in FY2000 to the ATCSCC and three additional towers, Teterboro (TEB), White Plains (HPN), and Islip (ISP).

DSP Facilities

ATCSCC	Herndon (future)
ARTCC	New York
TRACON	New York
TRACON	Philadelphia
ATCT	Newark
ATCT	La Guardia
ATCT	JFK
ATCT	Islip (future)
ATCT	Teterboro (future)
ATCT	White Plains (future)
	CSC-NJ

1-01.4.2 ETMS Project Schedule and Status

The ETMS project consists of several phases. A large part of the remaining efforts will focus on improvements and additions to the ETMS equipment and software. See Table 1-01-3 for the site installation schedule. Another significant change currently being studied could increase the update rate of the Traffic Situation Displays at all ETMS facilities. This would require substantially increasing the telecommunications requirements at all sites. Means to maintain the current data rate requirements are being evaluated.

1-01.4.2.1 Communications Circuit Upgrades

ETMS upgraded the capacity of the LINCS circuits connecting the ETMCC to 25 existing TMU sites in FY-99. The following sites were upgraded:

Cleveland ARTCC
Kansas City ARTCC
Ft. Worth ARTCC
Chicago TRACON
Oakland ARTCC
Jacksonville ARTCC
Memphis ARTCC
Atlanta TRACON
Salt Lake ARTCC
Chicago ARTCC
Minneapolis ARTCC
Indianapolis ARTCC
New York TRACON
Los Angeles ARTCC
Atlanta ARTCC
Denver TRACON
Seattle ARTCC
New York ARTCC
Boston ARTCC
Southern California TRACON
DFW TRACON
Miami ARTCC
Houston ARTCC
Washington ARTCC
Albuquerque ARTCC

ETMS may upgrade inter-facility communications via the Bandwidth Manager Network or leased Frame Relay Service.

1-01.4.2.2 ETMS Interim Communications for Test Support

CDM uses a T1 circuit between Volpe and an ARINC site in Annapolis to interconnect with the airlines' network. Bandwidth is currently under evaluation but will not exceed T1 capacity. Additional test circuits using Agency Data Telecommunications Network 2000 (ADTN2000) is required between the ATCSCC and 5 tentative test sites (A90, ABQ, EWR, ORD, and SFO) for further prototyping. The ETMCC to NADIN will remain unchanged.

Table 1-01-3. ETMS New Site Installation & Implementation Schedule

Site Installation	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
ARTCC	23	23	0	0	0	0	0	0
ATCSCC	1	1	0	0	0	0	0	0
ATCT	5	5	0	0	0	0	0	0
EOF*	1	1	0	1[1]	0	0	0	0
ETMCC	1	1	0	0	0	0	0	0
FAA Academy	2	2	0	0	0	0	0	0
WJHTC	1	1	0	0	0	0	0	0
Large TRACON	3	3	0	1	1	0	0	0

Other Locations	3	3	0	0	0	0	0	0
Regional Office	9	9	0	0	0	0	0	0
TRACON	34	36	5	4	0	0	0	0

*EOF capability upgrade- supports 20 ARTCCs, 5 TRACONS

1-01.4.3 CVRS Program Schedule and Status

There are no system changes currently planned for the CVRS.

1-01.4.4 DSP Program Schedule and Status

Installation and testing began in May 1998. Evaluation continued throughout 1999. Test and evaluation will continue in the coming year, and the test sites may be expanded to include the ATCSCC and 2-3 additional towers in the New York area. Future anticipated expansion of the prototype may include additional ARTCCs and associated TRACONs and ATCTs.

1-01.4.5 Planned Telecommunications Strategies

Office of Air Traffic Systems Development (AUA) is currently evaluating alternatives to its communications infrastructure to accommodate evolving user needs. Hardware changes required to existing equipment or equipment currently being procured, changes to the software and protocols currently in use by existing systems, and the identified requirements of future systems are under study. If it is determined that a particular communications approach is cost-effective, a significant change to future telecommunications requirements will occur.

1-01.4.6 Telecommunications Costs

The estimated leased telecommunications costs for fiscal years 2000-2006 are identified in the following tables for TFM systems: Table 1-01-4 (ETMS and CDM), Table 1-01-5 (DSP), and Table 1-01-6 (CVRS). The costs are based upon the requirements identified in Tables 1-01-1 through 1-01-3 as well as in Section 1-01.3.1.

Table 1-01-4. Cost Summary - ETMS and CDM

CIP # A-05 — All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
1. ETMCC <---> ATC Facilities / Regional Offices								
Channel Costs								
Cost Profile: FTS2000/2001 DTS-56 Circuits								
Channels Added		0	0	0	0	0	0	0
Total Channels	9	9	9	9	9	9	9	9
F&E Non-recurring Channel Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$53**	**$53**	**$53**	**$53**	**$53**	**$56**	**$56**
Cost Profile: LINCS 56/64 DDC Circuits								
Channels Added		0	0	0	0	0	0	0
Totals Channels	74	74	74	74	74	74	74	74
Channels Upgraded to 256 kbps		TBD	TBD	TBD	TBD	TBD	TBD	TBD
Channels Migrated to Frame Relay		TBD	TBD	TBD	TBD	TBD	TBD	TBD
Non-recurring Channel Costs								
F&E Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$1,204**	**$1,204**	**$1,264**	**$1,264**	**$1,264**	**$1,264**	**$1,264**
Hardware Costs				*N/A - Program Provided*				
2. ETMCC <---> ARINC								
Channel Costs								
Cost Profile: ARINC Leased T-1 Telco Circuit								
Channels Added		0	0	0	0	0	0	0
Total Channels	1	1	1	1	1	1	1	1
F&E Funded Channels		0	0	0	0	0	0	0
OPS Funded Channels		1	1	1	1	1	1	1
F&E Non-recurring Channel Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$90**	**$90**	**$90**	**$90**	**$90**	**$90**	**$90**
Cost Profile: ADTN2000 128 kbps Circuits								
Channels Added		**5**	**0**	**0**	**0**	**0**	**0**	**0**
Total Channels	0	5	5	5	5	5	5	5
F&E Funded Channels		5	5	0	0	0	0	0
OPS Funded Channels		0	0	5	5	5	5	5
Non-recurring Channel Costs								
F&E Non-recurring Costs		**$38**	**$38**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$45**	**$45**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$0**	**$45**	**$45**	**$45**	**$45**	**$45**

Table 1-01-4. Cost Summary - ETMS and CDM (concluded)

CIP # A-05 All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
3. ETMCC <---> NADIN								
Cost Profile: A-A/DMN LINCS/2.4kbps (VG-8) Circuits								
Channel Costs								
Channels Added		0	0	0	0	0	0	0
Total Channels	1	1	1	1	1	1	1	1
F&E Funded Channels		0	0	0	0	0	0	0
OPS Funded Channels		1	1	1	1	1	1	1
F&E Non-recurring Channel Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$4**	**$4**	**$5**	**$5**	**$5**	**$5**	**$5**

SUMMARY

		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
F&E Totals	Non-recurring	$38	$38	$0	$0	$0	$0	$0
	Recurring	$45	$45	$0	$0	$0	$0	$0
	F&E Totals	**$83**	**$83**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$1,352	$1,352	$1,412	$1,412	$1,412	$1,415	$1,415
	OPS Totals	**$1,352**	**$1,352**	**$1,412**	**$1,412**	**$1,412**	**$1,415**	**$1,415**

Notes:
1. A one month period of parallel operations is required for each circuit that is transitioned.

Table 1-01-5. Cost Summary - DSP

CIP # A-05	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
1. ARTCC <---> DSP Test Sites									
	Cost Profile: LINCS T-1 Circuits from ZNY ARTCC to DSP Test Sites								
Channel Costs									
	Channels Added		4	0	0	TBD	TBD	TBD	TBD
	Total Channels	6	10	10	10	TBD	TBD	TBD	TBD
	F&E Funded Channels		4	4	0	TBD	TBD	TBD	TBD
	OPS Funded Channels		6	6	10	TBD	TBD	TBD	TBD
	F&E Non-recurring Channel Costs		**$26.9**	**$0.0**	**$0.0**	**TBD**	**TBD**	**TBD**	**TBD**
	Recurring Channel Costs								
	F&E Recurring Costs		**$50.8**	**$50.8**	**$0.0**	**TBD**	**TBD**	**TBD**	**TBD**
	OPS Recurring Costs		**$76.2**	**$76.2**	**$133.3**	**TBD**	**TBD**	**TBD**	**TBD**
Hardware Costs									
	CSU/DSUs Required		8	0	0	TBD	TBD	TBD	TBD
	Total CSU/DSUs	12	20	20	20	TBD	TBD	TBD	TBD
	F&E Funded HW Units		8	8	0	TBD	TBD	TBD	TBD
	OPS Funded HW Units		12	12	20	TBD	TBD	TBD	TBD
	F&E Non-recurring Hardware Costs		**$20.0**	**$0.0**	**$0.0**	**TBD**	**TBD**	**TBD**	**TBD**
	Recurring Hardware Costs								
	F&E Recurring Costs		**$0.3**	**$0.3**	**$0.0**	**TBD**	**TBD**	**TBD**	**TBD**
	OPS Recurring Costs		**$0.4**	**$0.4**	**$0.7**	**TBD**	**TBD**	**TBD**	**TBD**

SUMMARY

		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
F&E Totals	Non-recurring	$46.9	$0.0	$0.0	TBD	TBD	TBD	TBD
	Recurring	$51.1	$51.1	$0.0	TBD	TBD	TBD	TBD
	F&E Totals	**$98.0**	**$51.1**	**$0.0**	**TBD**	**TBD**	**TBD**	**TBD**
OPS Totals	Non-recurring	$0.0	$0.0	$0.0	TBD	TBD	TBD	TBD
	Recurring	$76.6	$76.6	$134.0	TBD	TBD	TBD	TBD
	OPS Totals	**$76.6**	**$76.6**	**$134.0**	**TBD**	**TBD**	**TBD**	**TBD**

Table 1-01-6. Cost Summary - CVRS

All costs in 000's		Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
1. CVRS 800 Service									
Cost FTS2000/2001 800 Service Profile: (8 toll-free numbers with roll-over plus 2 additional toll-free numbers for modem connections)									
800 Service Costs									
Recurring Costs									
F&E Recurring Costs			**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.0**
OPS Recurring Costs			**$6.6**	**$6.9**	**$7.3**	**$7.7**	**$8.0**	**$8.8**	**$9.3**
		SUMMARY							
F&E Totals	Non-recurring		$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
	Recurring		$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
	F&E Totals		**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.0**
OPS Totals	Non-recurring		$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
	Recurring		$6.6	$6.9	$7.3	$7.7	$8.0	$8.8	$9.3
	OPS Totals		**$6.6**	**$6.9**	**$7.3**	**$7.7**	**$8.0**	**$8.8**	**$9.3**

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CHAPTER 1-02 - SUMMARY SHEET

FREE FLIGHT PHASE I

Program/Project Identifiers:

Project Number(s):	CIPs A-05, A-22
Related Program(s):	CIPs A-01, A-03, A-04, A-06, A-11, A-12, C-14, C-15, C-20, S-02, W-07, R,E&D 021-110, 021-190, 021-220, 021-230, 031-110
New/Replacement/Upgrade?	New
Responsible Organization:	AOZ
Program Mgr./Project Lead:	Robert Voss, AOZ-2, 202.220.3300 (CTAS, CDM, SMA, URET)
Fuchsia Book POC:	Andy J. Taylor, AOZ-40, 202.220.3358

Assigned Codes:

PDC(s):	BR, BV, BY, IA
PDC Description:	ATC computer circuits, ARTCC to ATCT/TRACO; Non-critical TMS (Central flow) data circuits; Critical TMS (central flow) data circuits; Administrative services for ATC facilities, business line (exchange service) circuits
Service Code:	IDAT, CFCS, ADVO

Cost Estimates *:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$83	$65	$31	$0	$0	$0	$0
F&E Recurring	$255	$282	$159	$64	$0	$0	$0
Total F&E	**$338**	**$347**	**$190**	**$64**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$17	$38	$171	$219	$204	$236	$236
Total OPS	**$17**	**$38**	**$171**	**$219**	**$204**	**$236**	**$236**

*Cost for CTAS, SMA, and URET are shown on the reverse side by system.

Cost Estimates: **CIP #A-05 CTAS**

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$71	$18	$31	$0	$0	$0	$0
F&E Recurring	$203	$219	$127	$64	$0	$0	$0
Total F&E	**$274**	**$237**	**$158**	**$64**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$17	$17	$119	$135	$152	$152	$152
Total OPS	**$17**	**$17**	**$119**	**$135**	**$152**	**$152**	**$152**

Cost Estimates: **CIP #A-05 SMA**

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$12	$0	$0	$0	$0	$0	$0
F&E Recurring	$52	$31	$0	$0	$0	$0	$0
Total F&E	**$64**	**$31**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$0	$21	$52	$52	$52	$52	$52
Total OPS	**$0**	**$21**	**$52**	**$52**	**$52**	**$52**	**$52**

Cost Estimates *****: **CIP #A-05 URET**

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$47	$0	$0	$0	$0	$0
F&E Recurring	$0	$32	$32	$0	$0	$0	$0
Total F&E	**$0**	**$79**	**$32**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$0	$0	$0	$32	$32	$32	$32
Total OPS	**$0**	**$0**	**$0**	**$32**	**$32**	**$32**	**$32**

CIP Category:
Free Flight

1-02.0 FREE FLIGHT PHASE I

1-02.1 PROGRAM OVERVIEW

1-02.1.1 Purpose of Free Flight Systems

Since 1995, beginning with Requirements and Technical Concepts for Aviation (RTCA) Task Force 3, RTCA and the FAA, working with a broad cross section of NAS user groups, have collaborated on the development of the "Government/Industry Operational Concept for the Evolution of Free Flight" document. The products providing Free Flight Phase 1 (FFP1) capabilities have been selected for limited deployment to start the evolutionary spiral process of implementation of Free Flight capabilities across the NAS. The overall philosophy is to take the RTCA recommendations from ideas to reality in a short time frame (build a little), ensure the proper operation within the NAS (test a little), and evaluate the results/benefits to build a case for NAS-wide implementation.

Free flight is the reduction of restrictions on Instrument Flight Rules (IFR) traffic to the point that system users can choose their own flight path and altitude to maximize efficiency with only minimum constraints to maintain the highest level of flight safety. To meet this FFP1 goal and provide early benefits to users, each FFP1 Capability will provide functions, which will support near term operational enhancements in each domain of the NAS. These functions will be used by controllers, pilots and traffic management specialists to move toward the Free Flight concept.

FFP1 is composed of the limited deployment of the following core capabilities:

- Conflict Probe as represented by the User Request Evaluation Tool (URET)
- Traffic Management Advisor (TMA) Single Center Operations (SC)
- Passive Final Approach Spacing Tool (pFAST)
- Collaborative Decision Making (CDM) with Airline Operations Centers
- Surface Movement Advisor (SMA)

To accomplish the goals of FFP1, these capabilities must be deployed on schedule with acceptance and use by FAA air traffic controllers and management specialists to satisfy the needs of the end users. Wherever possible, incentives for acceleration of schedules and early delivery of capabilities will be used to make the reality of FFP1 happen by 2002. The emphasis throughout the implementation of FFP1 is on acceleration of product deployment and early realization of user benefits. Decisions for further deployment or development will be based upon results of the Free Flight Phase 1 evaluation of program's benefits.

1-02.1.2 References

1-02.1.2.1 Government/Industry Operational Concept for the Evolution of Free Flight, August 1998.

1-02.1.2.2 FAA Capital Investment Plan (CIP), Project A-22, Free Flight Phase 1, January 1999.

1-02.2 SYSTEM DESCRIPTION

1-02.2.1 System Component Descriptions

Currently, Free Flight consists of the following systems: Center TRACON Automation System (CTAS), SMA, URET, and CDM. SMA operational system is described in detail in the following paragraphs. For clarity CDM is described in the TFM chapter in section 1-01.2.1.2.

1-02.2.1.1 Center-TRACON Automation System (CTAS)

Existing CTAS tools and those being prototyped determine aircraft schedules and sequences based upon aircraft Flight Plans, Radar Track Data, Aircraft Characteristics, Meteorological conditions along the air route, and standards-based spacing between air traffic. The system generates advisories to the controller intended to optimize traffic flow to achieve the above objectives.

Aircraft flight schedules and sequences computed by CTAS in an ARTCC or TRACON will be communicated to CTAS elements and other NAS subsystems in adjacent facilities to prepare for hand-off of flights to adjacent jurisdictions. These messages will require added communications resources. In addition, delivery of meteorological data from the National Weather Service to CTAS development and Build 1 sites will require continued use of the existing unique communications resources.

Traffic Management Advisory (TMA) schedules the arrival of air traffic by automatically determining the route, runway assignment, and landing time.

Final Approach Spacing Tool (FAST) provides advisories to the TRACON controller to assist in establishing optimum sequence and minimum spacing on final approach and in rapidly assessing and resolving emergency situations. Timeline and situation displays describe the traffic and required reaction times.

The Descent Adviser (DA) and Expedite Departure Path (EDP) are potential future enhancements to CTAS. They are research and development projects beyond the scope of this document.

1-02.2.1.2 Surface Movement Advisor (SMA)

The SMA Atlanta prototype is an airport automation system. that aids in the coordination of surface activities by providing air traffic, airline, and airport operations personnel with arrival times and runway information. It provides tower local and ground controllers with airline-provided gate information, as well as proposed push back times. Airport operations personnel are able to provide proposed runway and taxiway plowing information to all SMA users.

The SMA FFP1 provides Aircraft Arrival Information to airlines. An SMA FFP1 server provides a one-way filtered Automated Radar Terminal System (ARTS) III data set to airlines via the Airline Operational Control Intra-net (AOCNet) via the Volpe National Transportation System Center (VNTSC).

1-02.2.1.3 User Request Evaluation Tool (URET)

The URET Core Capability Limited Deployment (CCLD) system architecture is shown in Figure 1-02-1. URET CCLD will leverage existing En Route automation infrastructure, such as the Display System (DS) introduced in the Display System Replacement program.

URET CCLD will interact with air traffic controllers at the DS D-position.

URET CCLD system elements will be attached to a new Local Area Network (LAN) called the Enhanced Display System Infrastructure LAN (EDI LAN). The EDI LAN will have a Host Gateway interface that enables two-way communication between URET CCLD and the legacy Host Computer System (HCS). URET CCLD system elements will communicate with DS system elements by means of a gateway between the EDI LAN and the primary DS LAN. URET CCLD will obtain wind, temperature and pressure data from the local Weather and Radar Processor (WARP) system by means of a new WARP interface that is in addition to the legacy interface that carries Next Generation Radar (NEXRAD) data.

Each URET CCLD system will share data with interconnected URET CCLD systems by means of Wide Area Network (WAN) facilities provided by the FAA. The router interface shown in Figure 1-02-1 may be furnished by the WAN provider. The FAA WAN service is to be provided by the Bandwidth Manager (BWM) network. The internal routing capability of the BWM will be used to provide the required URET CCLD virtual circuit connectivity.

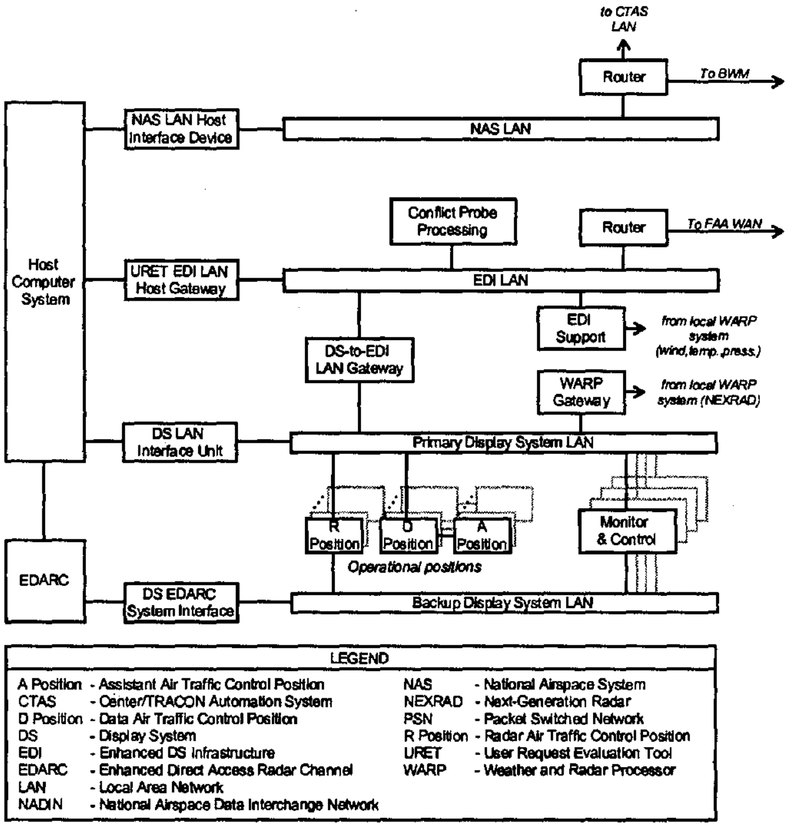

Figure 1-02-1. URET CCLD System Architecture

1-02.2.2 Principal Components

1-02.2.2.1 CTAS Principal Components

CTAS includes Traffic Management Advisor (TMA), located primarily in ARTCCs, and Final Approach Spacing Tool (FAST), located in TRACONs. Potential future enhancements are now in research and development, including Descent Advisor (DA), Multicenter TMA, active FAST, and Expedite departure Path Tool (EDP). Active FAST is distinguished from the current version, "passive FAST."

As currently implemented, the fielded Build 1 CTAS runs on Sun Sparc workstations interconnected via an Ethernet local area network (LAN). Build 2 CTAS will also run on Sun Sparc workstations interconnected via an Ethernet (100BaseT) LAN.

1-02.2.2.2 SMA Principal Components

The SMA Atlanta prototype consists of a client server that networks workstations in the tower, the airlines' airport operations centers, the airports' operations center, and Atlanta Center and TRACON.

The SMA FFP1 consists of a front-end processor connected to an ARTS III interface. The processor is located within the TRACON equipment room near the ARTS III computers. Data from the front-end processor is automatically transferred via a Fractional T-1 (FT-1) communication circuit to the VNTSC. Five commercial circuits are currently used to provide this service to Philadelphia, Detroit, Dallas/Fort-Worth, Chicago O'Hare, and New York TRACONs.

1-02.2.3 Functional Component Interface Requirements

1-02.2.3.1 CTAS Component Interfaces

CTAS communicates with subsystems in the local facility. It also communicates with CTAS TRACONs and may in the future communicate with adjacent ARTCCs to access air traffic data and provide computed schedules and sequences. The communications resources for this purpose will support full-duplex operation. CTAS also acquires meteorological data from the National Weather Service (NWS) for use at the ARTCCs and TRACONs. This data is acquired for development support directly from NWS via a CTAS weather data server located at the WJHTC. Eventually, the plan is for CTAS to receive this data from WARP.

The CTAS telecommunications interfaces are illustrated in the figure below which describes the interface characteristics at the NAS LAN router for the local ARTCC and at the CTAS router for TRACON connections. The Host/ATM Data Distribution System (HADDS) will acquire data from the Host for distribution to CTAS.

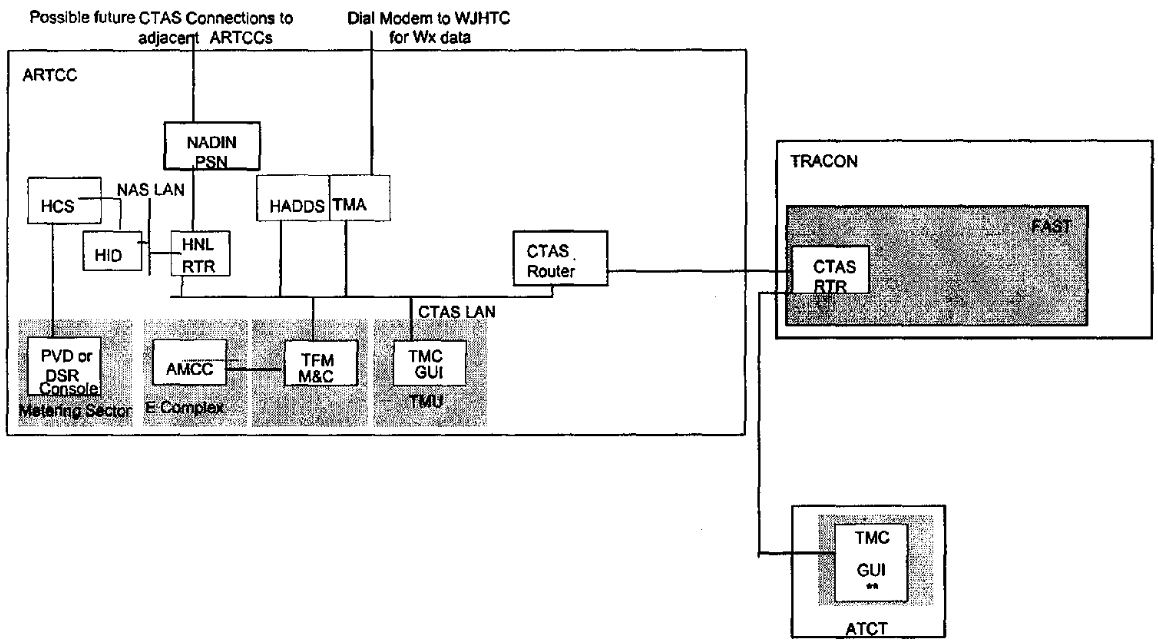

Figure 1-02-2. CTAS/ARTCC Intrafacility Communications Architecture

Figure 1-02-2 shows both TMA and FAST elements of CTAS. The planned implementation will provide TMA in at least one TRACON for each ARTCC at which CTAS is operating. Initially, weather data will be provided via a dial-modem connection to a dedicated weather server located at WJHTC.

1-02.2.3.2 SMA Component Interface Requirements

The SMA Atlanta prototype interfaces with the Airport Surveillance Radar (ASR), the local ARTS or Standard Terminal Automation Replacement System (STARS) processors, the ARTCC Host Computer System (HCS), and the local airline flight information display system.

The SMA FFP1 interfaces have been developed for the ARTS IIIA and the ARTS IIIE. Five systems have been implemented. A STARS interface is under development.

1-02.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

1-02.3.1 Telecommunications Interfaces

1-02.3.1.1 CTAS Interfaces

CTAS is currently being developed in a Core-Capability Limited Deployment mode. Requirements will be supplied in future updates to this document.

1-02.3.1.1.1 CTAS Telecommunications Interface Requirements

CTAS system interfaces exist on both an inter- and intra-facility level. CTAS is an essential service (.999 availability) and consists of ARTCC element, TMA, and TRACON element, FAST. Within each applicable ARTCC and each applicable TRACON, CTAS processors perform all remote communications via a shared LAN and router. In this way, incoming and outgoing CTAS application messages are routed to the appropriate destination.

Intra-facility circuits are provided via an Ethernet based local area network. Inter-facility links between the existing Build 1 ARTCC-based CTAS processor and the TRACON-hosted processor are via full-duplex 256 kbps digital links. The Build 2 system inter-facility links between Build 2 ARTCC-based and TRACON-hosted processors will be achieved initially via full T-1 links. Bandwidth analyses will be conducted to determine a realistic production goal.

1-02.3.1.1.2 CTAS Connectivity Requirements

CTAS message delivery time within the local facility should not exceed 5 milliseconds and, typically, should be on the order of 1.0 millisecond. Message deliveries between facilities (ARTCC to TRACON) shall be a maximum of 0.5_second. Communications bandwidth requirements and top-level connectivity are summarized in Table 1-02-1. Table 1-02-2 contains the currently defined telecommunications interface requirements.

Table 1-02-1. CTAS Communications Bandwidth Requirements

Messages between:	Maximum Mbps
ARTCC/TMA and TRACON/FAST, TMA Display	Initially 1.544[1]
TRACON/TMA, FAST and ATCT/TMA, FAST Display	Initially 1.544[1]

[1] Contractor to measure data flow for actual bandwidth requirements.

Table 1-01-2. CTAS Interface Requirements Summary

CTAS INTERFACES		ARTCC to TRACON
INTERFACE CONTROL DOCUMENTATION		TBD
PROTOCOL REQUIREMENT	Network Layer	IP
	Data Link Layer	HDLC
	Physical Layer	V.35, RJ48
	Special Formats/Codes	N/A
TRANSMISSION REQUIREMENT	No. of Channels	1
	Speed (kbps)	T-1
	Simplex Half/Full Duplex	FD
	Service	TBD
HARDWARE REQUIREMENT		CSU

1-02.3.1.1.3 <u>CTAS Meteorological Data Messages</u>

ARTCC-based Build 1 CTAS systems currently access binary, gridded weather (Wx) data from a CTAS weather server at the WJHTC via FTS2000 dial-up circuits. They obtain an updated forecast once each hour. The forecast size will initially be about 150-200 kilobytes, growing to 1 Mbyte as the weather service modifies its models.

1-02.3.1.2 <u>SMA Telecommunications Interface Requirements</u>

The SMA Atlanta prototype requires an airport network for the SMA users and a Data Multiplexing Network (DMN) to interconnect to TRACON and ARTCC SMA displays.

The SMA FFP1 system front-end processor connects directly to a router, which connects to a standard Channel Service Unit/Data Service Unit (CSU/DSU). The router is the TRACON demarcation point. There is no user display.

The SMA Atlanta prototype data displayed at the ARTCC is provided via a commercial connection. Each SMA FFP1 system has one telecommunications interface to VNTSC.

1-02.3.1.3 URET CCLD Telecommunications Interfaces

1-02.3.1.3.1 URET CCLD-to-URET CCLD Interface Requirements

Exchange of data between interconnected URET CCLD systems will be bi-directional. The initial network protocols will be X.25/Link Access Protocol B (LAPB) and Internet Protocol (IP) at the Network Layer along with Transmission Control Protocol (TCP) at the Transport Layer.

1-02.3.1.3.2 URET CCLD-to-URET CCLD Connectivity Requirements

Planned URET CCLD-to-URET CCLD logical connectivity is shown in Table 1-02-3. Virtual circuits are also needed between the WJHTC DSF laboratory and the WJHTC IIF.

Table 1-02-3. ARTCC-to-ARTCC Virtual Circuits

CP-to-CP Virtual Circuits	Albuquerque	**Atlanta**	Boston	**Chicago**	**Cleveland**	Denver	Fort Worth	Houston	**Indianapolis**	Jacksonville	**Kansas City**	Los Angeles	**Memphis**	Miami	Minneapolis	New York	Oakland	Salt Lake	Seattle	**Washington**	**WJHTC DSF-2**	**WJHTC IIF**
Albuquerque																						
Atlanta									*				*							*	*	
Boston																						
Chicago					*				*		*										*	
Cleveland									*											*	*	
Denver																						
Fort Worth																						
Houston																						
Indianapolis											*		*							*	*	
Jacksonville																						
Kansas City													*								*	
Los Angeles																						
Memphis																					*	
Miami																						
Minneapolis																						
New York																						
Oakland																						
Salt Lake																						
Seattle																						
Washington																					*	
WJHTC DSF-2																						*
WJHTC IIF																						

Operational availability of any URET CCLD-to-URET CCLD inter-ARTCC communication path shall be greater than 0.99995. There should be no single point of failure in the WAN for any URET CCLD-to-URET CCLD communication path.

1-02.3.1.3.3 URET CCLD-to-URET CCLD Traffic Characteristics

The expected URET CCLD-to-URET CCLD output traffic load on the FAA WAN through year-end 2002 is shown in Table 1-02-4.

Table 1-02-4. URET CCLD-to-URET CCLD Message and Data Rates

URET CCLD Operating Condition	Message Rate (per sec)	Total One-way Data Rate (kilobits per sec)
Normal	14	64
Recovery	18	128*

*Requirement applies to ZID only. All other sites require 64Kbps maximum one-way

URET CCLD-to-URET CCLD inter-ARTCC requirements for message response times through year-end 2002 are shown in Table 1-02-5.

Table 1-02-5. URET CCLD-to-URET CCLD Inter-ARTCC Message Response Times

URET CCLD Operating Condition	Total One-way Data Rate (kilobits per sec)	One-way End-to-End Message Delay (seconds)	
		Mean	95th Percentile
Normal, Peaking	64	0.250	0.8
Recovery, Peaking	128	0.250	0.8

1-02.3.1.4 CTAS Interface

The communications interface between CTAS and other Air Traffic Subsystems in the ARTCC or TRACON will be via a bridge between the CTAS integral LAN and the ATM LAN.

The communications interface between CTAS/FAST and the ARTS is via ARTS Gateway to the CTAS LAN.

CTAS at the TRACON will require external communication circuits to the local ARTCC and to remote ATCTs that display TMA and FAST products. These connections are tentatively planned to be 1.544Mbps dedicated, point-to-point LINCS circuits.

Final details of these interconnections are not currently available. The currently fielded prototype systems use a Host Interface Device (HID)-to-router-to-CTAS LAN connection. Weather data characteristics are as defined in the Interface paragraph (CTAS Meteorological Data Messages) above.

Table 1-02-6. CTAS Interface Requirements Summary

CTAS INTERFACES		With Internal ARTCC Systems	WX to ARTCC	ARTCC to ARTCC [1]	Feeder ARTCC to CTAS ARTCC
INTERFACE CONTROL DOCUMENTATION		HCS via HADDS	NAS-IRD-24038219/dft	TBD	TBD
	Network Layer	IP	IP	IP; X.25	IP; X.25
PROTOCOL	Data Link Layer	IEEE-802.3	IEEE-802.3	LAPB	LAPB
REQUIREMENT	Physical Layer	TBD	TBD	TBD	TBD
	Special Formats/Codes	NAS-MD-311	World Metrlgy. Org. FM92VIII Ext.GRIB	NAS-MD-311	NAS-MD-311
	No. of Channels	1	1	1 to adjacent ARTCC	1
TRANSMISSION	Speed (kbps)	100000	56	TBD	9.6
REQUIREMENT	Simplex Half/Full Duplex	FD	HD	FD	FD
	Service	Bridge to LAN	Pt-to-Pt	NADIN	NADIN
GFE HARDWARE REQUIREMENT		Modems, CSUs	Dial-Modem	N/A	TBD

[1] None currently being implemented. Allowed by system design.

1-02.3.2 Local Interfaces

1-02.3.2.1 CTAS Local Interfaces

CTAS will exchange information with the Host Computer System (HCS) via the HID/NAS LAN and the HCS/ATM Data Distribution System (HADDS). In the future interface to NADIN may be available to CTAS via the NAS LAN Router on the NAS LAN.

1-02.3.2.2 SMA Local Interfaces

The SMA Atlanta prototype system has no local interfaces. The SMA FFP1 system has no local interfaces.

1-02.3.3.3 URET Local Interfaces

URET CCLD will communicate with D-positions by means of a gateway from the EDI LAN to the Primary DS LAN. URET CCLD communications with the HCS will be by means of the Host Gateway interface on the EDI LAN. WARP data for URET CCLD will be accessed through a direct local interface with the WARP system.

1-02.4 ACQUISITION ISSUES

1-02.4.1 CTAS Project Schedule and Status

The CTAS program is in limited development to selected sites to determine benefits. Prototype demonstration of the functional system (Build 2/FAST) is taking place at the ZFW/DFW ARTCC/TRACON pair. Fielding of the system (TMA-single center and Passive FAST) is began in FY00 under Free Flight Phase 1 (FFP1). FFP1 includes deployment to the ARTCCs, TRACONs, and ATCTs. Phase 2 has not been scheduled. Communications facilities will be required between all selected TRACONs and their controlling ARTCCs and between CTAS ATCTs and their controlling TRACONs. Table 1-02-7 depicts the installation schedule through FY01. Actual circuit implementation schedules are too complex for this document and only CTAS to CTAS links are shown in Table 1-02-8. Feeder circuits (track data) are not shown.

Table 1-02-7. CTAS New System Installation Schedule

System Installations	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
TMA Display and PFAST System Installations(TRACON-ATCT Sites)	D10	SCT T75 M98 ATL MIA	C90	TBD	TBD	TBD	TBD	TBD
pFAST Displays at Remote ATCTs		LAX MSP STL	ORD					
Data Feed from Non-CTAS ARTCC Host to CTAS Site								
TMA Displays at ATCTs and non-pFAST TRACONs	SCT D01 MIA LAX	M98 MSP DIA ATL	NCT SFO					
TMA System Installations **(ARTCC/TRACON-ATCT Sites)**	ZFW ZLA ZDV ZMA ZTL	ZDV ZMA	ZOA ZAU	TBD	TBD	TBD	TBD	TBD

Note: 1. Co-located facilities: D10/DFW, D01/DIA, M98/MSP, T75/STL, MIA (TRACO/ATCT), A80/ATL.

1-02.4.1.1 CTAS Interim Communications for Test Support

Interim circuits are in place for support of Operational Assessment Tests. These T-1 and Fractional T-1 (FT-1) circuits connect Fort Worth ARTCC, (ZFW) and Denver ARTCC, (ZDV), Dallas/Fort Worth (D10) and Denver (D01) TRACONs, WJHTC, FAA Headquarters (FAAHQ), National Aeronautics and Space Administration (NASA)/Ames Research Center, and National Weather Service Telecommunications Gateway (NWSTG). The interim circuits will be used for transfer of air traffic messages between ARTCC and TRACON, and for test monitoring by WJHTC, FAAHQ, and NASA/Ames. These circuits have been obtained by the CTAS Program Office (FFP1PO) and will be maintained by the Program Office through the completion of Operational Assessment Testing, or until replaced by operations-supported facilities.

Table 1-02-8. CTAS Interface Implementation Schedule

Build1/ Build2	FROM	TO	DIV REQ?	SYSTEM	QTY	PY	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
B2	ZMP	M98	No	LINCS 1544 kbps	1	-	F	F	O	O	O	O	O
B2	M98	MSP	No	Local cable*	1	-	F	F	O	O	O	O	O
B2	ZMP	-	No	Dial up	2	-	F	F	O	O	O	O	O
B2	M98	-	No	Dial up	2	-	F	F	O	O	O	O	O
B1	ZDV	D01	No	LINCS 1544 kbps	1	O	O	O	-	-	-	-	-
B1	D01	DEN	No	Local cable*	1	O	O	O	-	-	-	-	-
B2	ZDV	D01	No	LINCS 1544 kbps	1	-	F	F	O	O	O	O	O
B2	D01	DEN	No	Local cable*	1	-	F	F	O	O	O	O	O
B2	ZDV	-	No	Dial up	2	-	F	F	O	O	O	O	O
B1	ZLA	LAX	No	LINCS 256 kbps	1	O	O	O	-	-	-	-	-
B2	ZLA	SCT	No	LINCS 1544 kbps	1	-	F	F	O	O	O	O	O
B2	SCT	LAX	No	LINCS 1544 kbps	1	-	F	F	O	O	O	O	O
B2	ZLA	-	No	Dial up	2	-	F	F	O	O	O	O	O
B2	SCT	-	No	Dial up	2	-	F	F	O	O	O	O	O
B1	ZTL	ATL	No	LDRCL 1544 kbps	1	O	O	O	-	-	-	-	-
B2	ZTL	ATL	No	LDRCL 1544 kbps	1	-	F	F	O	O	O	O	O
B2	ZTL	A80	No	LINCS 1544 kbps	1	-	F	F	O	O	O	O	O
B2	ZTL	-	No	Dial up	2	-	F	F	O	O	O	O	O
B2	ATL	-	No	Dial up	2	-	F	F	O	O	O	O	O
B2	A80	-	No	Dial up	1	-	F	F	O	O	O	O	O
B2	ZKC	T75	No	LINCS 1544 kbps	1	-	F	F	O	O	O	O	O
B2	T75	STL	No	LINCS 1544 kbps	1	-	F	F	O	O	O	O	O
B2	Gateway TRACON	STL	No	LINCS 1544 kbps	1	-	-	-	F	F	O	O	O
B2	Gateway TRACON	-	No	Dial up	1	-	-	-	F	F	O	O	O
B2	T75	-	No	Dial up	1	-	F	F	O	O	O	O	O
B1	ZMA	MIA	No	LCRCL 1544 kbps	1	O	O	O	-	-	-	-	-
B2	ZMA	MIA	No	LDRCL 1544 kbps	1	-	F	F	O	O	O	O	O
B2	MIA TRACON	MIA ATCT	No	Local cable*	1	-	F	F	O	O	O	O	O
B2	ZMA	-	No	Dial up	1	-	F	F	O	O	O	O	O

Notes:
1. O designates one (1) prototype/F&E circuit accepted for operational use and to be funded by AOP
2. F designates F&E funded circuits to be funded by Program Office

* Co-located facilities that share on-site intrafacility cabling

Table 1-02-8. CTAS Interface Implementation Schedule (Continue)

Build1/Build2	FROM	TO	DIV REQ?	SYSTEM	QTY	PY	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
B2	ZOA	O90	No	LINCS 1544 kbps	1	-	-	F	F	O	O	O	O
B2	O90	SFO	No	LINCS 1544 kbps	1	-	-	F	F	O	O	O	O
B2	ZOA	-	No	Dial up	1	-	-	F	F	O	O	O	O
B2	O90	-	No	Dial up	1	-	-	F	F	O	O	O	O
B2	ZAU	C90	No	LINCS 1544 kbps	1	-	-	-	F	F	O	O	O
B2	C90	ORD	No	LINCS 1544 kbps	1	-	-	-	F	F	O	O	O
B2	ZAU	-	No	Dial up	1	-	-	-	F	F	O	O	O
B2	C90	-	No	Dial up	1	-	-	-	F	F	O	O	O
B1	ZFW	D10	No	LINCS 1544 kbps	1	O	O	O	O	O	TBD	TBD	TBD
B1	D10	DFW	No	LINCS 1544 kbps	1	O	O	O	O	O	TBD	TBD	TBD
B2	ZFW	D10	No	LINCS 1544 kbps	1	-	-	-	TBD	TBD	TBD	TBD	TBD
B2	D10	DFW	No	LINCS 1544 kbps	1	-	-	-	TBD	TBD	TBD	TBD	TBD
B2	ZFW	-	No	Dial up	1	-	-	-	TBD	TBD	TBD	TBD	TBD
B2	D10	-	No	Dial up	1	-	-	-	TBD	TBD	TBD	TBD	TBD

Notes: 1. O designates one (1) prototype/F&E circuit accepted for operational use and to be funded by AOP
2. F designates F&E funded circuits to be funded by Program Office
* Co-located facilities that share on-site intrafacility cabling

1-02.4.1.2 SMA Schedule and Status

The SMA Atlanta prototype is being used and evaluated at the Hartsfield (Atlanta) International Airport. The SMA FFP1 system is being implemented in two stages. Stage 1 was the implementation of SMA FFP1 servers to Detroit and Philadelphia TRACONs. This stage was completed in December 1998. Stage 2 is the implementation of SMA FFP1 servers to Dallas/Fort-Worth, Chicago O'Hare and New York TRACONs in December 1999. Table 1-02-9 provides SMA prototype and SMA FFP1 interface implementation schedules.

Table 1-02-9. SMA Implementation Schedule (Preliminary)

From	To	Diversity Req'mt	Data Rate/Miles	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
SMA Prototype:											
Atlanta Tower	Atlanta TRACON/ ARTCC	None	Local Loop/19.2 kbps/- LINCS/9.6 kbps/28	1 (R&D)	0	0	0	0	0	0	0
SMA FFP1:											
Detroit TRACON	Volpe Center	None	56 kbps/628	1	0	0	0	0	0	0	0
Philadelphia TRACON	Volpe Center	None	56 kbps/280	1	0	0	0	0	0	0	0
Chicago TRACON	Volpe Center	None	56 kbs/881	0	1	0	0	0	0	0	0
Dallas Ft Worth TRACON	Volpe Center	None	56 kbps/1562	0	1	0	0	0	0	0	0
New York TRACON	Volpe Center	None	56 kbps/175	0	1	0	0	0	0	0	0

1-02.4.2 URET Program Schedule and Status

User Request Evaluation Tool (URET) evaluation and daily use prototype systems have been deployed at the Indianapolis and Memphis Centers. These will become URET CCLD sites, along with five additional ARTCCs. A schedule showing when URET CCLD WAN interfaces are needed is shown in Table 1-02-10. Each location's WAN interface needs to be available by the end of URET CCLD hardware fit-up for that location.

Two FAA WAN ports for URET CCLD use will be needed at the WJHTC—one each for the DSF-2 laboratory and the Integration and Interoperability Facility (IIF). A single FAA WAN port for URET CCLD use will be required at each URET
CCLD- equipped ARTCC.

Table 1-02-10. URET CCLD Interface Implementation Schedule*

	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
WJHTC	N/A	2			TBD	TBD	TBD	TBD
Atlanta (ZTL)	N/A		1		TBD	TBD	TBD	TBD
Chicago (ZAU)	N/A		1		TBD	TBD	TBD	TBD
Memphis (ZME)	1		Upgrade		TBD	TBD	TBD	TBD
Cleveland (ZOB)	N/A		1		TBD	TBD	TBD	TBD
Washington (ZDC)	N/A		1		TBD	TBD	TBD	TBD
Indianapolis (ZID)	1		Upgrade		TBD	TBD	TBD	TBD
Kansas (ZKC)	N/A		1		TBD	TBD	TBD	TBD
(Other ARTCCs)	N/A				TBD	TBD	TBD	TBD
TOTAL	2	2	5+upg.	0	TBD	TBD	TBD	TBD

* Interfaces are needed at the "URET CCLD Hardware Fit-up Complete" milestone. Dates are from development contractor schedules of 10/22/1999.

1-02.4.3 URET Telecommunications Strategies

URET CCLD-to-URET CCLD inter-ARTCC communications needs will be met by a FAA Provided WAN.

1-02.4.4 URET Telecommunications Costs

Funding requirements are as identified in Table 1-02-13. URET CCLD interface requirements shall be met by means of local cabling, local networks, and the FAA WAN. Communications funding, as appropriate, will be in accordance with FAA Order 2500.8A.

Table 1-02-11. Cost Summary - CTAS

[illegible] All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
1. CTAS ARTCC/TRACON <---> Other ARTCC/TRACON Air Traffic Subsystems								
Cost Profile: A-A/LINCS/256 kbps and T-1 Circuits with (2) FT100 CSU/DSUs per Circuit.								
Channel Costs								
Channels Added		7	2	(2) 3	0	0	0	0
Total Channels	3	10	12	13	13	13	13	13
F&E Funded Channels		7	9	5	3	0	0	0
OPS Funded Channels		3	3	8	10	13	13	13
F&E Non-recurring Channel Costs		**$43**	**$10**	**$19**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$108**	**$124**	**$33**	**$16**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$15**	**$15**	**$116**	**$133**	**$149**	**$149**	**$149**
Hardware Costs								
CSU/DSUs Added		14	4	6	0	0	0	0
Total CSU/DSUs	6	20	24	26	26	26	26	26
F&E Funded HW Units		14	18	10	6	0	$	0
OPS Funded HW Units		6	6	16	20	26	$6	26
F&E Non-recurring Hardware Costs		**$28**	**$8**	**$12**	**$0**	**$0**	**$0**	**$0**
Recurring Hardware Costs								
F&E Recurring Costs		**$1**	**$2**	**$1**	**$1**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$1**	**$1**	**$2**	**$2**	**$3**	**$3**	**$3**
2. CTAS TRACON <---> CTAS / ICP-Free Flight (at ARTCCs) - Operational Test Support								
Cost Profile: T-1 and Fractional T-1 connectivity on LINCS and FTS2000								
Channel Costs								
Channels Added		0	0	0	-6	0	0	0
Total Channels	6	6	6	6	0	0	0	0
F&E Funded Channels		6	6	6	0	0	0	0
OPS Funded Channels		0	0	0	0	0	0	0
F&E Non-recurring Channel Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$93**	**$93**	**$93**	**$47**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Hardware Costs (Only Required for LINCS Circuits)								
CSU/DSUs Added		0	0	0	-8	0	0	0
Total CSU/DSUs	8	8	8	8	0	0	0	0
F&E Funded HW Units		0	0	0	0	0	0	0
OPS Funded HW Units		8	8	8	0	0	0	0
F&E Non-recurring Hardware Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Hardware Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$1**	**$1**	**$1**	**$0**	**$0**	**$0**	**$0**

Table 1-02-11. Cost Summary – CTAS (concluded)

CIP # A-05 All costs in 000's		Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
3. CTAS ARTCC/TRACON <---> WJHTC									
Cost Profile: FTS2001 SVS Dial Access Service									
Switched Service Costs									
Dial Access Lines Added			17	2	3	0	0	0	0
Total Lines		0	17	19	22	22	22	22	22
F&E Funded Lines			17	19	5	3	0	0	0
OPS Funded Lines			0	0	17	19	22	22	22
F&E Non-recurring Service Costs			**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Service Costs									
F&E Recurring Costs			**$23**	**$26**	**$7**	**$4**	**$0**	**$0**	**$0**
OPS Recurring Costs			**$0**	**$0**	**$23**	**$26**	**$30**	**$30**	**$30**
SUMMARY									
F&E Totals	Non-recurring		$71	$18	$31	$0	$0	$0	$0
	Recurring		$203	$219	$127	$64	$0	$0	$0
	F&E Totals		**$274**	**$237**	**$158**	**$64**	**$0**	**$0**	**$0**
OPS Totals	Non-recurring		$0	$0	$0	$0	$0	$0	$0
	Recurring		$17	$17	$119	$135	$152	$152	$152
	OPS Totals		**$17**	**$17**	**$119**	**$135**	**$152**	**$152**	**$152**

Table 1-02-12. Cost Summary - SMA

SIP # A-05 All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
1. TRACON <---> VNTSC								
Cost Profile: LINCS DCC-56 Circuits								
Channel Costs								
Channels Added		(1) 3	0	0	0	0	0	0
Total Channels	3	5	5	5	5	5	5	5
F&E Funded Channels		5	3	0	0	0	0	0
OPS Funded Channels		0	2	5	5	5	5	5
F&E Non-recurring Channel Costs		**$12**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$52**	**$31**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$20**	**$52**	**$52**	**$52**	**$52**	**$52**
Hardware Costs		*N/A - All sites already have DDC Platforms*						

SUMMARY

(Excludes R&D Funded Costs)

		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
F&E Totals	Non-recurring	$12	$0	$0	$0	$0	$0	$0
	Recurring	$52	$31	$0	$0	$0	$0	$0
	F&E Totals	**$64**	**$31**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$0	$20	$52	$52	$52	$52	$52
	OPS Totals	**$0**	**$20**	**$52**	**$52**	**$52**	**$52**	**$52**

Table 1-02-13. Cost Summary - URET

All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
ARTCC <--> ARTCC								
Cost Profile: Percentage of BWM Network Usage and Interface Hardware								
Channel Costs								
Channels Added		0	7	0	0	0	0	0
Total Channels	0	0	7	7	7	7	7	7
F&E Funded Channels		0	7	7	0	0	0	0
OPS Funded Channels		0	0	0	7	7	7	7
F&E Non-recurring Channel Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$0**	**$32**	**$32**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$0**	**$0**	**$32**	**$32**	**$32**	**$32**
Hardware Costs								
F&E Non-recurring Hardware Costs		**$0**	**$47**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Hardware Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
SUMMARY								
F&E Totals	Non-recurring	$0	$47	$0	$0	$0	$0	$0
	Recurring	$0	$32	$32	$0	$0	$0	$0
	F&E Totals	**$0**	**$79**	**$32**	**$0**	**$0**	**$0**	**$0**
OPS Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$0	$0	$0	$32	$32	$32	$32
	OPS Totals	**$0**	**$0**	**$0**	**$32**	**$32**	**$32**	**$32**

Note: Costs provided by BWM Program Office.

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CHAPTER 1-03– SUMMARY SHEET

AIR TRAFFIC MANAGEMENT (ATM) SYSTEMS (CAPSTONE)

Program/Project Identifiers:

Project Number(s):	CIP(s) M-36
Related Program(s):	CIPs A-10, A-13, C-17, C-20, C-22, M-37, S-10, W-01
New/Replacement/Upgrade?	New
Responsible Organization:	AND-510
Program Mgr./Project Lead:	Patrick Poe, AAL-001, (907) 271-5645
Fuchsia Book POC:	Randy Kuehler (907) 271-1375 and Elmer Webster (907) 271-3263

Assigned Codes:

PDC(s):	RA
PDC Description:	Circuits for CAPSTONE Project (ADS-B)
Service Code:	IDAT

Cost Estimates*:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$8	$7	$947	$956	$965	$798	$30
F&E Recurring	$74	$32	$1,834	$3,096	$3,875	$4,163	$1,859
Total F&E	**$83**	**$39**	**$2,781**	**$4,052**	**$4,840**	**$4,961**	**$1,889**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$0	$0	$549	$1,014	$2,174	$3,680	$6,147
Total OPS	**$0**	**$0**	**$549**	**$1,014**	**$2,174**	**$3,680**	**$6,147**

* Costs provided by program office

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CIP Category: Automation	1-03.0 AIR TRAFFIC MANAGEMENT SYSTEMS (CAPSTONE)

1-03.1 PROGRAM OVERVIEW

1-03.1.1 Purpose of Capstone Automatic Dependent Surveillance – Broadcast (ADS-B) Systems

The Capstone Program was conceived as an urgent safety initiative to reduce the high accident rate of small aircraft operations in western Alaska. It provides for rapid deployment and field demonstration of advanced avionics capabilities leading toward implementation of the Free Flight concept. Capstone also stimulated the avionics industry to design and produce affordable equipment for small aircraft.

During FY-1999, FAA purchased Capstone avionics suites for installation in small commercial service aircraft operating in the Bethel area. The avionics suites consisted of a Global Positioning System (GPS) navigation unit, an on-board computer with terrain data base, a five-inch, color, multi-function display with moving map, and Automatic Dependent Surveillance-Broadcast (ADS-B) service via a Universal Access Transceiver (UAT) data link system. Deliveries commenced in December 1999. A network of ground stations is being installed to receive and forward aircraft ADS-B position reports to the Anchorage Air Route Traffic Control Center (ARTCC) for processing by the Micro-Enroute Automated Radar Tracking System (M-EARTS) and display at a controller's work station. Preparation of GPS non-precision approach procedures for ten village airports and installation of automated weather observation systems (AWOS) to support these first-time instrument approach procedures has begun. Flight Information Services (FIS) are being contracted for delivery over the Capstone data link system in January 2000. The University of Alaska Anchorage (UAA) was contracted to develop an independent safety analysis and a pilot training program for use of Capstone avionics. Within the Alaskan Region, the Capstone Program is modeling a transition to the future National Airspace System architecture; it is serving as the focal point for unified planning, coordination, and development.

For FY-2000, the Capstone Program will continue its partnerships with the air carrier and avionics industries, the traveling public, the Safe Flight 21 Program office (which is responsible for evaluating ADS-B data link systems), and the national Flight Information Services (FIS) office. The Capstone ground service area will be expanded toward Bristol Bay and a multi-link station will be installed in Anchorage and Fairbanks. Additional village airports will be GPS-surveyed and furnished with first-time non-precision approach procedures. Capstone will continue to incorporate certain "technology-driven" improvements recommended in the March 1995 National Transportation Safety Board (NTSB) Alaska Safety Study, for example, more AWOS will be installed and near real-time weather products will be disseminated via the Capstone FIS system to the pilot. Where possible, automated weather data that supports GPS approaches will include television images of the approach areas.

While the initial Capstone system improved the Visual Flight Rule (VFR) pilot's situational awareness, work will begin in FY-2000 on certification of the system and development of new ADS-B-based air traffic control procedures. Some operational efficiency sought by the air carrier industry will be implemented. In Anchorage and Fairbanks, Traffic Information Service-Broadcast (TIS-B) will be demonstrated. At selected village airports, surface vehicles will be equipped with ADS-B transmitters to reduce the possibility of runway incursion accidents. Air carrier dispatch offices will be provided with

ADS-B position reports for flight following of their aircraft. New Special Visual Flight Rule (SVFR) procedures, strongly desired by participating air carriers in Bethel, will be implemented. The Capstone Program will also work toward demonstration of additional, high priority, operational enhancements recommended by the Radio Technical Commission for Aeronautics (RTCA) in its "Joint Government/Industry Roadmap for Free Flight Operational Enhancements." Capstone will foster an increase in instrument flight rules (IFR) operations, as suggested by NTSB, by development of low-level GPS routes. New separation and sequencing procedures requested by the industry, and enabled by ADS-B technology, will be explored. Capstone will continue to model NAS transition toward full utilization of GPS-driven systems and procedures. The Capstone Program Office will be provided technical support under the National Implementation Support Contract and from Mitre to assist with these efforts.

FY-1999 funding allowed the Capstone Program to begin demonstration and evaluation of three of the nine RTCA-recommended operational enhancements:

- Flight Information System for Special Use Airspace, Weather, Windshear, NOTAMs, and Pilot Reports,
- Cost Effective Controlled Flight into Terrain Avoidance through Graphical Position Display, and
- Enhanced See and Avoid.

1-03.1.2 References

1-03.1.2.1 NAS system Specification, Function and Performance Requirements for the National Airspace System General, NAS-SS-1000, Vol. I, December 1986 (with changes Through May 1993, SCN-21), DOT/FAA

1-03.1.2.2 FAA Capital Investment Plan (CIP), Project M-36, Capstone, January 2000.

1-03.2 SYSTEM DESCRIPTION

1-03.2.1 System Component Descriptions

Currently Capstone consists of the following components/systems: Aircraft Avionics (UAT, MX-20, GX-60), GBT, ANICS, MicroEARTS, Computer displays and AWOS. The entire system is in the developmental stage using operational prototypes and establishing geographic boundaries and system limitations. Each component and system are described in the following paragraphs. Aircraft avionics, ground-based transceivers and other equipment is being supplied by United Parcel Service Aviation Technologies (UPSAT).

1-03.2.2 Aircraft Avionics

The universal access transceiver (UAT) is part of the aircraft avionics package that is being installed in all Capstone test aircraft. The UAT is a radio datalink system supporting broadcast services – Automatic Dependent Surveillance – Broadcast (ADS-B), Traffic Information Service – Broadcast (TIS-B), and Flight Information Service – Broadcast (FIS-B). The UAT datalink is a remote mounted radio that provides this communication capability between aircraft and the ground. The UAT will transmit and receive information to/from the ground-based transceivers and other similarly equipped aircraft. The MX-20 multi-function display will portray processed information to the pilot in several different formats and screens. The GX-60 will use the current U.S. satellite GPS system to compute aircraft position and display this information on the MX-20. Also, in the GX-60 is voice communications software for air-to-ground communications between the pilot and other aircraft or air traffic controllers.

1-03.2.3 Ground Base Transceivers

Current Ground Based Transceivers (GBT) are being supplied by UPSAT. The GBT will function as the focal point for all airborne information to be transmitted to/from the ARTCC for future air traffic control purposes. This transfer of information will be accomplished through the GBTs into the Alaska National Airspace System Inter-facility Communication System (ANICS) or through local telephone lines.

1-03.2.4 Alaska National Airspace System Inter-facility Communication System

The Alaska ANICS will be the preferred method to communicate aircraft position between the ARTCC and the GBTs. ANICS is a satellite-based transmission network that provides circuit connectivity for the following NAS services provided by Alaskan region air traffic controllers and flight service personnel in the performance of their duties.

- En route and Terminal air-to-ground (A/G) radio communications
- En route and terminal Radar Surveillance Data (RDAT) and Beacon Data (BDAT)
- Weather advisories, briefings and products
- AFSS and FSS operations
- Computer Based Instruction (CBI)
- Other NAS Equipment and Services
- Remote Maintenance Monitoring (RMM)
- Switched Service Transmission
- Dial Service Backup

In outer areas of Alaska where ANICS circuits are non-existent, local phone lines will be used to transfer this information.

1-03.2.5 Micro En route Automated Radar Tracking System (Micro EARTS)

The Micro EARTS will provide the processing and prioritizing surveillance function between the field GBTs and the center computer displays.

1-03.2.6 Testing Center Computer Displays

These displays will portray the surveillance information received from the aircraft, in a distinguishable format consistent with current Air Traffic Control displays and requirements. During the developmental phase, the test and training facility at the Anchorage ARTCC will be using Sun Enterprise 250 computer displays. This ADS-B information will be displayed on the current ATC displays in the ARTCC beginning in July 2000. Certification of ADS-B information for use in air traffic control is scheduled for January 1, 2000.

1-03.2.7 Automated Weather Observation System (AWOS)

The Qualimetrics AWOS 900 series was the system selected to support the Capstone program within the Alaskan region. With the addition of this system at selected airports, FAA flight standards will be able to incorporate non-precision instrument approaches at several village airports where none had previously existed. The system will provide real-time weather for pilots inbound to selected airports. It will also have a dial-up function that will allow pilots to access the weather from selected sites via regular telephone service. The system will eventually report into the FAA ADAS system, but that is not a requirement at this time for commissioning. It is estimated that the dial-up feature will be available sometime in FY01 or 02. The Qualimetrics system will be installed at the following airports beginning in fiscal year 00: Mountain Village, Holy Cross, St. Michael, Scammon Bay, Russian Mission, Koliganak, Kalskag, Kipnuk, Platinum and Pilot Point. Eight additional airports will receive this system in FY01 (3) and FY02 (5). These airports have not been selected at this time.

1-03.2.8 Principal Components

1-03.2.8.1 Aircraft Avionics Components

The UAT will process and format incoming and outgoing information to/from the appropriately equipped aircraft. The design employs a single frequency with a bandwidth of approximately 1.5 MHz. The UAT will transmit and receive on the same frequency to allow full aircraft-to-aircraft connectivity for ADS-B. Initially, the UAT will transmit on 966 MHz and later convert to 981 MHz when final approval has been received for the 981 frequency. All aircraft will be able to access the channel autonomously and without the need for centralized ground control. The UAT supports two types of messages. The first is broadcast transmissions from aircraft, supporting aircraft-to-aircraft or aircraft-to-ground surveillance applications. These include position reports, velocity vector, intent and other relevant information about the aircraft. This type of transmission is referred to as ADS-B mode. Aircraft in the same airspace will be able to "see" each other through ADS-B providing immediate benefits. The second type of transmission supported by UAT is the up-link broadcast of information from fixed ground stations. Potential services that can be supported with this up-link capability are listed below:

- Weather broadcast and aeronautical information (e.g. status information on airports, navaids, special-use airspace and uncharted obstacles), referred to as FIS-B mode
- Traffic information broadcasts derived from ground-based radar systems referred to as TIS-B mode.

This information can be received from either another aircraft or through the GBTs. During the early stages of Capstone, the information provided will be aircraft position, direction of flight, altitude, identification and speed vectors. During later stages of Capstone, FIS-B, TIS-B and other information will be added to the system. This will provide enhance planning information to the pilot in real-time formats and timing.

MX-20 Multi-Function Display. The MX-20 MFD display is the main focal point for all information being displayed in the cockpit of Capstone equipped aircraft. It is a commercial-off-the-shelf avionics instrument display available to all customers. This avionics equipment has the ability to display the following information: aircraft position in relation to surrounding terrain, other aircraft within the prescribed area of coverage, Visual Flight Rules (VFR) routes, Instrument Flight Rules (IFR) routes, Military Operation Areas (MOAs), special use airspace, flight planned routes, past flight route history, conflicting terrain in relation to aircraft altitude.

GX-60 Navigation/Communication Unit. The GX-60 Nav/Comm unit has an internal 8-channel parallel GPS receiver and a 760 channel Very High Frequency (VHF) transceiver with a frequency range of 118.000 to 136.975 MHz. This unit is an approach certified GPS receiver with a high-definition moving map display on a large sun light viewable screen. Also available is the aircraft's position relative to airports, runways, VHF Omnidirectional Ranges (VORs), Non Directional Radio Homing Beacon

(NDBs), intersections and Special Use Airspace's (SUAs). The GX-60 used in conjunction with the MX-20 MFD will provide maximum reliability for the pilot.

1-03.2.8.2 Ground Based Transceiver (GBT)

The GBT has two external and one internal communications link. The internal link is an I/O bus between the LDPU and the Universal Access Transceiver (UAT). One of the two external interfaces is the LDPU interface with the telecommunications system. This interface is a serial RS-232 at variable data rates (19.2 Kbps, 32 Kbps, or 56 Kbps). The second external interface is to the airborne systems via the UAT transmission protocols at 966 MHz.

1-03.2.8.3 Alaska National Airspace System Inter-facility Communications System (ANICS)

ANICS components consist of hub earth stations, remote earth stations, leased transponder space segments, and a Network Control Center (NCC). The remote earth stations are linked to their respective hubs and the NCC through leased primary and alternate satellite transponders. An earth station's input/output ports terminate at standard demarcation points and interface with NAS facilities via in-house cabling or external tail circuits. The end state ANICS configuration includes four hub earth stations located at the Fairbanks, Kenai and Juneas Automated Flight Service Stations (AFSSs) and the Anchorage (ANC) ARTCC: The Network Control Center (NCC) also located at the ANC/ARTCC and remote earth stations deployed at various locations throughout the Alaskan Region. System components consist of commercial off-the-shelf (COTS) satellite systems and services.

1-03.2.8.4 Micro En route Automated Radar Tracking System

The Micro EARTS system is explained in detail in chapter 1-09 of the FAA Future Telecommunications Plan 2000.

1-03.2.8.5 Testing/Center Controller Displays

The technical testing & training center uses the Sun Enterprise 250 Pentium II processor with a 17" screen with a Sun Enterprise UPS. The Controller displays are FAA standard Air Traffic control terminals.

1-03.2.8.6 Automated Weather Observation System (AWOS)

The Capstone program has begun installation of the Qualimetrics 900 Series III weather collection system. The AWOS 900 series is based on the model 1190 data acquisition system, a powerful microprocessor-based computer system that collects and processes the data from the sensor array and formats it for display and output. The series III AWOS has the following functions: wind speed/gust/direction, variable wind direction, temperature, dew point temperature, altimeter setting, density altitude, visibility, variable visibility, precipitation, day/night, sky condition, cloud height and type. The 900 series AWOS uses an IBM-compatible computer with a 15" color monitor to process, store and display the AWOS data. The system can archive data for up to 1 year at 5-minute intervals. The PC has an integral time that will ensure automatic restart of the system in the event of a power failure. The Series III will be able to connect into the National Aerospace Data Interchange Network, (NADIN), or the AWOS Data Acquisition System (ADAS). This service will provide weather data to Flight Service Stations and commercial airports for pilot briefings. The modular design of the 900 series AWOS makes the system easy to expand, allowing you to upgrade a system at any time to a higher-level model by adding sensors and any other accessory equipment you need.

1-03.2.9 Functional Component Interface Requirements

1-03.2.9.1 Capstone System Interface

The Capstone program plan defines a developmental system with emphasis on products, which meets the goals of the aviation community and the NAS. The primary services to be provided by Capstone are listed below:

ADS-B Automated Dependent Surveillance – Broadcast (Critical)
FIS-B Flight Information Services – Broadcast (Essential)
TIS-B Traffic Information Services – Broadcast (Essential)

The Capstone functional interfaces are depicted in Figure 1-03-1 below.

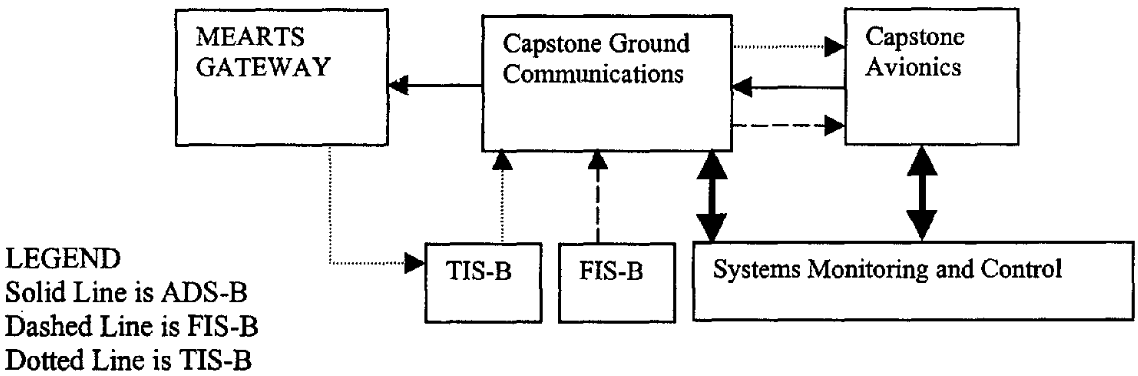

Figure 1-03-1. Capstone Functional Diagram

The arrows in Figure 1-03-1 indicate the direction of information and flow. The boxes correlate to functions in all cases and to specific equipment in some. The correlation between each will be more evident in the architecture description. The Systems Monitoring and Control function is a combination of inline performance monitoring and inline/external line control. This function is a NAS requirement for the maintainability of the system.

1-03.3 TELECOMMUNICATION INTERFACE REQUIREMENTS

1-03.3.1 Telecommunications Interfaces

The Capstone ground communications is shared by each of the services listed above. A system architecture, which meets the most critical will also, supports the least. Of the services listed above the most critical is surveillance. Within the NAS-SR-1000 the surveillance system requirements and communications system requirements are defined separately. The connection between them is clear in NAS-SR-1000 paragraph 3.8.1 where the definitions of the service levels clearly relate surveillance to critical service. Paragraph 3.8.1 goes on to define design goals for the various levels of service in terms of availability and restoration. Paragraph 3.8.1 also defines design goals for single point of failure and system reliability. In addition to the communications service requirements the communications system must also meet the needs of the surveillance system.

The NAS System Requirements have defined the communications service requirements in paragraph 3.8.1 of NAS-SR-1000 as follows.

Critical Functions or services, which if lost, would prevent the NAS from exercising safe separation and control over aircraft.

Essential Functions or services, which if lost, would reduce the capability of the NAS to exercise safe separation and control over aircraft.

Routine Functions or services, which if lost, would not significantly degrade the capability of the NAS to exercise safe separation and control over aircraft.

The availability **goal** for a function or service to the user/specialist is expressed as the ratio of the total time the service is provided to the user/specialist to the maximum available operating time. Service availability shall not be less than that provided by existing capabilities. NAS-SR-1000 paragraph 3.8.1 goes on to identify the communications design goals for each of the services as follows:

1. Critical Services .99999
2. Essential Services .999
3. Routine Services .99

1-03.3.2 System Architecture/Interfaces

The Capstone architecture has been divided into 3 separate parts based on phased certification of the ADS-B, FIS-B and TIS-B services. This document gives the basics for each of these architectures in the following order; End State, Developmental and ADS-B.

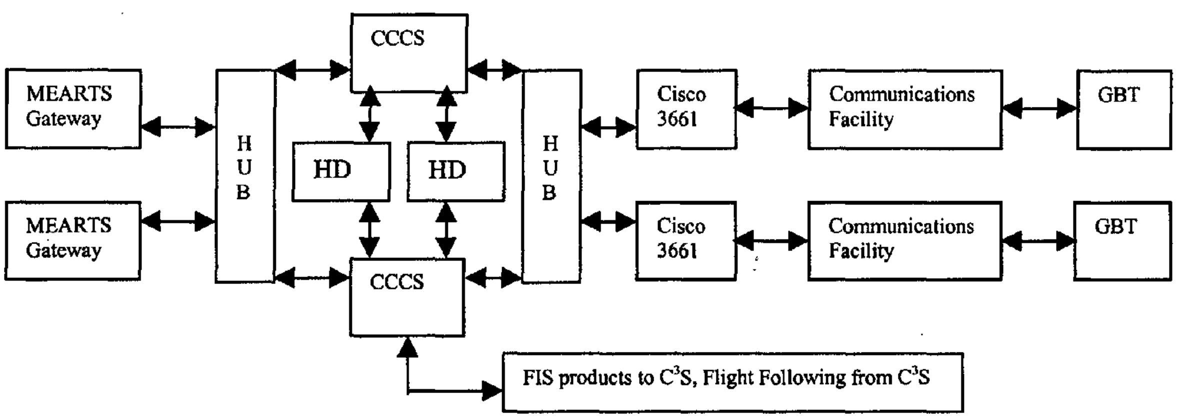

Figure 1-03-2. Capstone End State Architecture/Interface

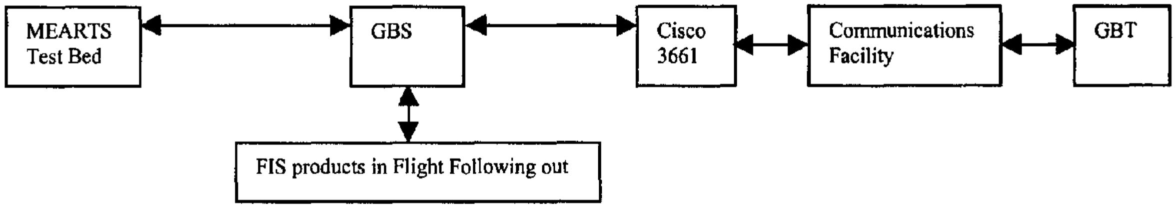

Figure 1-03-3. Capstone Developmental Architecture/Interface

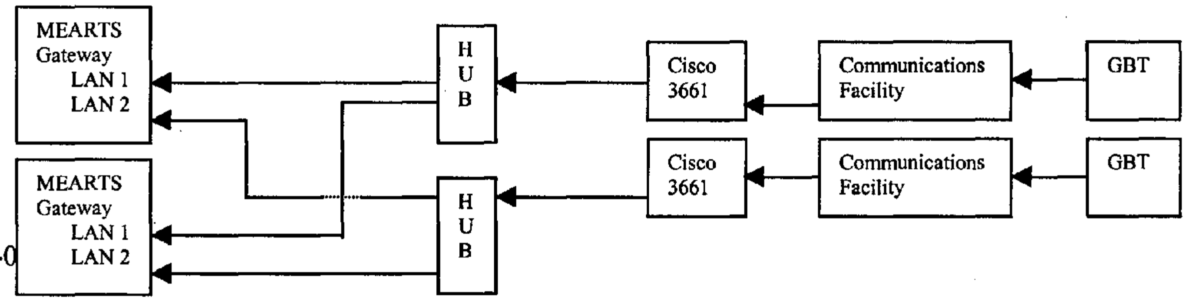

Figure 1-03-4. Capstone ADS-B Architecture/Interface

Currently the Capstone Program is in the developmental stages. There are two internal interfaces that need to be discussed. The first interface occurs from the GBTs to the Capstone Communications Control Server (CCCS). This interface will be via ANICS circuits or local telephone service lines or a combination of the two. This connection will provide surveillance data only (Interface Control Document [ICD] in draft). The second interface occurs between the CCCS and the Micro EARTS gateway. This connection will provide surveillance data in one direction to the Micro EARTS or TIS-B data back to the CCCS. TIS-B data/format are in development, ICD is complete. This interface will be via standard V.35 or RS-232 cabling. Figure 1-03-4 depicts the surveillance (ADS-B) flow of information. This information can only flow in one direction from the GBT through the system into the Micro EARTS gateway. Figure 1-03-3 depicts the developmental/testing system where information can flow in either direction, but this information is limited to FIS-B type data or surveillance data "from" the GBT. This system will be used for first time testing, data formatting, problem solving and other testing functions as necessary. Figure 1-03-2 depicts the final end state diagram, which is where the program desires to be in 1 or 2 years. The System Architecture Description (SAD) for Capstone communications is in draft and when finished will provide more detail of connections and interfaces. Following is a brief description of the interfaces of the principal components.

1-03.3.3.1 Capstone Communications Control Server (CCCS)

The Capstone Communications Control Server is based on the MITRE Ground Broadcast Server (GBS). The functions performed by the C^3S are listed below.

1. Delimit the CAMs received from the GBT.
2. Copy the CAM to the following clients

a) Micro EARTS
b) Flight Following
c) Network Monitoring & Control
d) Communications Data Archive

3. Maintain current database of GBT coverage area cross referenced to Cisco 3661 serial port address.
4. Determine Set of GBTs to receive Capstone FIS-B Message (CFM) for transmission over UAT.
5. Determine Set of GBTs to receive Capstone TIS-R Message (CTM) for transmission over UAT.

1-03.3.3.2 Capstone Terminal Server (Cisco 3661 Router)

This architecture configuration uses the Router as a Terminal Server converting the serial asynchronous telecommunications input to TCP/IP for distribution by the CCCS. The TCP/IP addressed ports of the Cisco 3661 are addressable by only one server. As such the connection is basically a private line between the CCCS and the 3661. The setup procedures for this connection are part of the TCP/IP network software customizing features. The 3661 router connects the telecommunications channels for each GBT through either an 8 port Asynchronous/Synchronous card or a 32 port Asynchronous card.

1-03.3.3.3 Telecommunications (ANICS & Leased)

Provides the full duplex data transmission facility between the 3661 port card and the GBT serial RS-232 data port. The transmission facility will support 19.2 Kbps, 32 Kbps or 56 Kbps and translate between electrical interfaces as required. Where the GBT is co-located with the ANICS the desired speeds and electrical interfaces are coordinated with AAL-470 ANICS program office. Where the GBT requires a local telecommunications company (telco.) 4 wire line to complete the connection from ANICS to the GBT special coordination between the FAA engineer and telco. transmission facility engineer will be required, when speeds greater than 19.2 Kbps are needed. At speeds greater than 19.2 Kbps the DMN 3512 CSU/DSU will be required. The DDS alternate mark inversion signal between the 3512 units requires specific line qualities that are not listed as VG-1 or some other line specification. These line qualities are listed in the 3512 installation manual. A copy of the 3512 line requirements must accompany the Telecommunications Service Request (TSR) submitted to Alaska Region Telecommunication Management and Operations (TM&O) to be attached to the work order for the telco.

Table 1-03-1. Communications Configuration and Operation

Subsystem to Subsystem Link	Configuration	Operation	Data Rate	Supports
CCCS to Cisco 3661	Duplex	Duplex	10 Mbps	Multiple GBT UAT
Cisco 3661 to ANICS/Telecommunications	Duplex	Duplex	19.2 Kbps	Single GBT UAT
ANICS/Telecommunications to GBT LDPU	Duplex	Duplex	19.2 Kbps	Single GBT UAT
GBT LDPU to GBT UAT	Duplex	Duplex	38 Kbps	Single GBT UAT
GBT UAT to Airborne UAT	Half Duplex	Half Duplex	250 Kbps	Multiple UAT

1-03.3.3.4 Ground Based Transceiver (GBT)

The GBT has two external and one internal communications link. The internal link is an I/O bus between the LDPU and the UAT. One of the two external interfaces is the LDPU interface with the telecommunications system. This interface is a serial RS-232 at variable data rates (19.2 Kbps, 32 Kbps, or 56 Kbps). The second external interface is to the airborne systems via the UAT transmission protocols at 966 MHz. Reports received by the UAT are passed to the LDPU, which formats the position reports and wraps the message with the GBS header and transmits the CAM to the Cisco 3661 router via the telecommunications link. In addition to aircraft position reports the LDPU also transmits beacon reports and information on itself to the Cisco 3661 router. The process is reversed for TIS-B and FIS-B data received by the LDPU for transmission by the UAT to the airborne units. Connection of the GBTs into the ANICS will be via tail circuits at most locations, but the use of LDRCL for this connectivity is being explored at some sites. In the out years it may be necessary to develop an IP WAN to support the isolated GBTs.

1-03.3.3.5 Automated Weather Observation System (AWOS)

Currently, there are no internal or external interfaces for the Capstone AWOS system. This weather reporting system is a stand-alone unit with no ties into the Capstone architecture. Eventually, there will be a dial-up function connected to the AWOS to allow direct phone contact with each site station for pilot updates/briefs. It is anticipated that the Capstone AWOS system will feed information into the FAA ADAS in the very near future.

1-03.4 ACQUISITION ISSUES

The Capstone program is in full-scale development. Field demonstration of the ground-based transceivers was completed in August 1999. Phase I has been completed with initial contract award for the GBT units and demo testing. Fielding of the operational system will be at a later date, as yet undetermined. There are two areas of acquisition for the Capstone program, those being the GBTs and the AWOS systems.

1-03.4.1 Ground Based Transceivers

The contract to build the initial order of GBTs was awarded to UPSAT in September of 1999. Initial proposal was for 12 sites in the Yukon/Kuskokwim (YK) region to receive GBTs. It was determined early on that some sites would have both an operational system and a developmental system. First installation was slated for Bethel, Alaska with both a developmental system and an operational system. Each site will have a telco requirement to connect the GBT into either the ANICS or local phone lines or a combination of both. The Capstone program intends to utilize ANICS sites to the maximum extent possible followed by sites that require local phone service connections. Bethel installation for the developmental system was completed in January 2000. Installation of the developmental system for the Anchorage center was also completed in January 2000. The following table depicts the purchase schedule and the installation for the GBTs.

Table 1-03-2. CAPSTONE GBT Installation Schedule

	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
Installations	0	7	6	50	50	50	38	0

1-03.4.2 Automated Weather Observation System

The contract to provide the Capstone weather reporting system was awarded to Qualimetrics in May, 1999. The system that was selected is the Series 900 AWOS. There are 10 initial airports that are scheduled to receive the new weather systems. Initially, these sites will be commissioned without any type of telecommunications service required. Power connections are required to operate the equipment. Local telephone connections will be the norm for most of these sites as they are in areas of the YK region with minimal outside support. The AWOS systems will eventually have dial-up service, but this is not a requirement for commissioning. With the addition of this system, those selected airports will also receive non-precision GPS approaches. The following table depicts the purchase schedule and the proposed installation on the AWOS systems in the YK region.

Table 1-03-3 CAPSTONE AWOS Installation Schedule

	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
Installations	10	3	5	8	8	8	7	0

Table 1-03-4. Cost Summary - CAPSTONE

CIP # M-36	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
GBT <---> ARTCC (ZAN)									
	Cost Profile: ANICS and Channel Costs								
Channel Costs									
	Channels Added		**7**	**6**	**50 (13)**	**50**	**50**	**38**	**0**
	Total Channels	0	7	13	50	100	150	188	188
	F& E Funded Channels		7	13	50	100	100	88	38
	OPS Funded Channels		0	0	0	0	50	100	150
	Non-recurring Hardware Costs								
	F&E Non-recurring Costs		**$8.4**	**$7.2**	**$500**	**$500**	**$500**	**$380**	**$0**
	Recurring Hardware Costs								
	F&E Recurring Costs		**$74.2**	**$31.8**	**$1,192**	**$2,434**	**$3,199**	**$3,515**	**$1,550**
	OPS Recurring Costs		**$0**	**$0**	**$152**	**$284**	**$1,091**	**$2,229**	**$4,313**
AWOS <---> ADAS or DAWN									
	Cost Profile: Leased Circuits								
Channel Costs									
	Channels Added		**3**	**5**	**8**	**8**	**8**	**7**	**0**
	Total Channels	10	13	18	26	34	42	49	49
	F& E Funded Channels		13	8	13	16	16	15	7
	OPS Funded Channels		0	10	13	18	26	34	42
	Non-recurring Costs								
	F&E Non-recurring Costs		**$0**	**$0**	**$417**	**$426**	**$435**	**$388**	**$0**
	Recurring Costs								
	F&E Recurring Costs		**$0**	**$0**	**$635**	**$649**	**$662**	**$634**	**$302**
	OPS Recurring Costs		**$0**	**$0**	**$397**	**$730**	**$1,076**	**$1,437**	**$1,813**
Fusion Server <---> Users									
	Cost Profile: Leased Circuits								
Channel Costs									
	Channels Added		**0**	**0**	**3**	**3**	**3**	**2**	**0**
	Total Channels	1	1	1	4	7	10	12	12
	F& E Funded Channels		1	0	3	6	6	5	2
	OPS Funded Channels		0	1	1	1	4	7	10
	Non-recurring Costs								
	F&E Non-recurring Costs		**$0**	**$0**	**$30**	**$30**	**$30**	**$30**	**$30**
	Recurring Costs								
	F&E Recurring Costs		**$0**	**$0**	**$7**	**$13**	**$14**	**$14**	**$7**
	OPS Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$7**	**$14**	**$21**
SUMMARY									
F&E Totals	Non-Recurring		$8	$7	$947	$956	$965	$798	$30
	Recurring		$74	$32	$1,834	$3,096	$3,875	$4,163	$1,859
	F&E Totals		**$83**	**$39**	**$2,781**	**$4,052**	**$4,840**	**$4,961**	**$1,889**
OPS Totals	Non-Recurring		$0	$0	$0	$0	$0	$0	$0
	Recurring		$0	$0	$549	$1,014	$2,174	$3,680	$6,147
	OPS Totals		**$0**	**$0**	**$549**	**$1,014**	**$2,174**	**$3,680**	**$6,147**

Note: Costs provided by Program Office.

CHAPTER 1-04 - SUMMARY SHEET

REGULATION AND CERTIFICATION INFORMATION SYSTEMS (AVR)

Program/Project Identifiers:

Project Number(s):	CIPS, A-17, A-18, A-19, A-20
Related Program(s):	
New/Replacement/Upgrade?	New Requirements and Upgrade Requirements
Responsible Organization:	AVR
Program Mgr./Project Lead:	TBD
Fuchsia Book POC:	Clint Turnipseed, AFS-650, (405) 954-7065

Assigned Codes:

PDC(s):	HL
PDC Description:	Administrative Data Circuits for AVR Programs
Service Code:	ADDA

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$59	$199	$199	$199	$199	$199	$199
F&E Recurring	$968	$968	$968	$968	$968	$968	$968
Total F&E	**$1,027**	**$1,167**	**$1,167**	**$1,167**	**$1,167**	**$1,167**	**$1,167**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$2,540	$3,049	$3,562	$4,080	$4,602	$5,131	$5,665
Total OPS	**$2,540**	**$3,049**	**$3,562**	**$4,080**	**$4,602**	**$5,131**	**$5,665**

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CIP Category:
Automation

1-04.0 REGULATION AND CERTIFICATION INFORMATION SYSTEM (AVR)

1-04.1 PROGRAM OVERVIEW

The Regulation and Certification Information System provides information technology to the offices and services under the Associate Administrator for Regulation and Certification (AVR). This information technology provides the safety work force with safety analysis tools to maintain and improve safety throughout the aviation industry.

1-04.1.1 Purpose of Regulation and Certification Information Systems

The Regulation and Certification Information System provides information technology programs that serve AVR and its subsidiaries, Flight Standards Service (AFS), Aircraft Certification Service (AIR), the Office of Rulemaking (ARM), the Office of Aviation Medicine (AAM) and the Office of Accident Investigation (AAI). AVR and its subsidiaries' major business processes include:

- Certification and surveillance of air carrier, commercial, general aviation operations, airmen, and air agencies;
- Safety violation, incident, and accident investigation;
- Management of general aviation accident prevention program;
- Approval and surveillance of operational safety aspects of instrument flight procedures aviation weather systems and;
- FAA designee program management; aircraft certification; directive distribution; and rulemaking.

The information technology programs described below, which make up the Regulation and Certification Information System, use the FAA's Agency Data Telecommunications Network (ADTN2000) network for transmission of data. AVR expanded the ADTN network to provide connectivity to AVR's field facilities (approx. 100 locations) in order to ensure accurate and timely data flow from field facilities to regional offices and to Headquarters.

1-04.1.2 References

There are numerous technology programs that make up the Regulation and Certification Information System. These programs are represented in the 1999 FAA Capital Investment Plan (CIP) under the following program titles:

1-04.1.2.1 ASAS (Aviation Safety Analysis System) CIP No. A-17.

1-04.1.2.2 SPAS (Safety Performance Analysis System) CIP No. A-18.

1-04.1.2.3 PENS (Performance Enhancement System), Also known as On-Line Aviation Safety Inspection System (OASIS), CIP Ref Portable Performance Support System (PPSS) No. A-19.

1-04.1.2.4 IFQA (Integrated Flight Quality Assurance) CIP No. A-20.

1-04.2 SYSTEM DESCRIPTION

In FY96, AVR expanded the ADTN network to provide dedicated connectivity to AVR field facilities. This is referred to as the AVR WAN. In future years we will continue to provide connectivity to additional AVR field facilities. AVR's field facilities include, but are not limited to, the following:

- FSDOs Flight Standards District Offices
- IFOs International Field Offices
- CMOs Certificate Management Offices
- ACOs Aircraft Certification Offices
- MIDOs Manufacturing Inspection District Offices

The ADTN backbone network provides connectivity between regional offices, centers and headquarters. The dedicated connectivity that AVR put in place at AVR field facilities (as well as future connectivity) is designed to provide fast, point-to-point connectivity between a field office and a regional office using the ADTN network. Essentially, it is now possible for field facilities to transmit data to any other AVR organization (field facility to regional office, regional office to headquarters or other field offices).

Typical information flow for AVR's Regulation and Certification Information Systems starts at the field facility, where the majority of the information is entered. The information is then transmitted or replicated to the regional office. In many cases, the information is then transmitted or replicated to headquarters and/or Oklahoma City. In other cases, the information is maintained within the region.

1-04.2.1 <u>Program/System Components</u>

1-04.2.1.1 <u>Principal Components</u>

The principal components of the AVR Regulation and Certification Information System are:

- WAN (Wide Area Network, ADTN 2000)
- LAN Hardware (Local Area Network servers, switches, hubs, and client workstations)
- Information Technology Programs (SW applications, analytical tools)

These components are all critical links in ensuring safety data is transmitted timely and accurately to its destination. Typically, data is generated at the field facility using one of the information technology programs residing on the LAN. The data is then transmitted or replicated from the field facility LAN over the WAN to its final destination.

Each of the components is described below.

1-04.2.1.1.1 WAN (Wide Area Network)

As previously noted, the AVR WAN uses the ADTN 2000 network for data transmission between field facilities, regions, and headquarters. At each of the AVR field facilities currently connected to the WAN, there is a Cisco 3620 router and circuit homed to a regional office. This equipment and the circuits at all locations are leased via the ADTN contract. AVR is currently running only TCP/IP protocol.

1-04.2.1.2 LAN (Local Area Network) Hardware

All AVR field facilities in which LANs have been installed are currently operational as Novell networks. During FY98, AVR deployed a NT architecture and NT database servers to support many of the Information Technology Programs listed in the next section. It is AVR's intent to transition the Novell networks to an NT environment in the near future.

A typical field facility is equipped with at least one Novell server, communications server, cc:Mail router, and two NT servers. Client workstations vary in hardware configuration but typically are of 486 vintage or better, running the Windows Operating System, with 16MB of memory or better.

Users enter data at their workstations into applications, which reside for the most part on servers located within their facility. The data is transmitted or replicated from the server(s) over the WAN to the region or headquarters.

1-04.2.1.3 Information Technology Programs

These programs are software applications or analytical tools the AVR safety workforce uses to carry out safety analysis functions and to maintain and improve safety throughout the aviation industry. These programs rely heavily on the WAN and LAN to ensure data is transmitted timely and accurately.

There are nearly a hundred programs within AVR used in support of the safety and regulation functions carried out by AVR. The programs listed below are programs that critically rely on telecommunications to accomplish data transmission and replication (Note: This is not a comprehensive list).

These programs are designed to run in a client/server environment and are accessed by users at their workstations. The data is transmitted or replicated to other servers/databases located throughout AVR using the WAN.

- OPSS (Operations Specification System). Operations Specifications generate the documents specifying Federal Aviation Regulation (FAR) policies and rules governing the operation of commercial carriers. With the commuter rules issued on December 14, 1995, OPSS is designed to facilitate and standardize the process of creating Operations Specifications. Data from OPSS is entered by Aviation Safety Inspectors (ASIs) and replicated to regions, headquarters, and other field offices.

- SPAS (Safety Performance Analysis System) SPAS is an analytical tool for monitoring and evaluating carrier and certified repair station compliance performance. SPAS tracks the performance of certificate holders in four areas: air operators, air agencies, aircraft, and air personnel. SPAS aggregates and summarizes safety-related information into performance measures and provides access to the supporting information. Principal users of SPAS are ASIs who access the data over the WAN.

- PENS (Performance Enhancement System) PENS is also known as Operational and Supportability Implementation System (OASIS). OASIS integrates multiple applications and databases that ASIs are required to access while accomplishing work functions in the field environment. The program operates in a mobile computing environment. Data is transmitted via the WAN to other servers within AVR and to other mainframe applications.

- IFQA (Integrated Flight Quality Assurance). IFQA is a tool which uses recorded detail data gathered from aircraft (from pushback to departure to docking) to monitor flight operations surveillance, aircrew performance and air worthiness. Data is transmitted throughout AVR.

- BOSS (Budget Oversight Status System). BOSS is a national cuff record system designed to assist in managing the budget. "Cuff" record refers to an unofficial budget record used to: report with greater accuracy the budget status of a site, provide greater flexibility in reporting, and provide a mechanism to reconcile data with the official budget system (DAFIS). Data is replicated from field offices to regions and then to headquarters.

- HB (Handbook Modernization). ASIs will access Handbooks and Job Task Analysis (JTA) over the WAN to ensure the most current ASI orders and guidance are used.

- DL (Data Library). This program provides for the establishment of an operational data store and data warehouse. The operational data store is a transaction processing system used for day to day processing. The data warehouse is a subject oriented integrated database structured to facilitate query and analysis in support of management decision making. Programs throughout AVR transmit data to the DL over the WAN.

- DIN (Designee Information Network). DIN tracks and monitors designee applications, delegations and performance. Data is transmitted from field offices to regions and headquarters over the WAN.

- Corporate Repository. The system provides regulatory, guidance and project documentation to AIR. Data is transmitted from field offices to regions and headquarters over the WAN.

- ACSEP (Aircraft Certification Systems Evaluation). ACSEP automates the collection of data resulting from the evaluation process of FAA monitored manufacturing facilities. Data is transmitted from field offices to regions and headquarters over the WAN.

- ASMS (AIR Safety Management System). ASMS is an analytical tool for basing safety judgments, to facilitate taking timely action that can resolve chains of service problems short of developing into aviation accidents. Data is transmitted from field offices to regions and headquarters over the WAN.

- ASAP (Aviation Safety/Accident Prevention). This program is used to issue alerts, write letters of request for information, or check a part's safety history. Data is transmitted from field offices to regions and headquarters over the WAN.

- Rulemaking Document Development. This program uses off-the-shelf software for the creation, management and coordination of rulemaking documents. Data is transmitted from the regions to headquarters over the WAN.

- IAIDS (Improved Accident Incident Database System). This program combines accident information obtained from the National Transportation Safety Board (NTSB) and incident information obtained from the FAA Accident Incident Database System (AIDS) database. Users will access IAIDS and data will be replicated over the WAN.

- AAIRS (Airport/Air Carrier Information Reporting System). AAIRS is a PC-based system for collecting the results of security compliance assessments. These assessments cover US Airports regulated under Part 107 and US and Foreign Carriers regulated under Part 108 and Part 129. Assessment reports are written by Security Special Agents for comprehensive annual reviews of industry compliance with security measures, national focus efforts for initiatives like Security Directive Compliance, results of Security Directive Testing, and other inspection related visits to airports. Data will be replicated to other security organizations over the WAN.

- FIRS (Facility Information Reporting System). This system tracks the activities of ACS special agents in the surveillance and assessment of risk of FAA facilities. Data will be replicated to other security organizations over the WAN.

- CASIS (Civil Aviation Security Information System). This system supports the Hazardous Material, Indirect Air Carrier, Internal Investigations, and other ACS work programs. Data will be replicated to other security organizations over the WAN.

- SIRS (Security Information Reference System). SIRS provides the ACS community, world wide, with current policy, orders, directives, notices, etc.

- AMCS (Aeromedical Certification Subsystem). AMCS automates the certification process for users within the Aviation Medical organization in support of medical safety programs. Data will be replicated over the WAN to other AAM organizations.

- CPDSS (Covered Position Decision Support Subsystem). CPDSS records physical examination results, examiner comments, and the qualification decision. Users will access the system over the WAN.

- DAMIS (Drug and Alcohol Abatement Management Information Subsystem). DAMIS collects, stores and reports on drug and alcohol program testing information for the covered aviation industry entities. Users will access the system over the WAN.

In addition to these programs, there are many AVR programs on mainframes, which users access over the WAN. Typically, both the connections to the mainframe and the terminal emulation are provided. Data transmission over the WAN is usually low.

1-04.2.2 Functional Component Interface Requirements

Data is typically stored on servers at a field facility, then transmitted or replicated over the WAN to a server(s) at the regional office. Depending on the application, the data may then be transmitted or replicated over the ADTN backbone to master servers in headquarters and/or Oklahoma City. The functional component interface requirements are illustrated in Figure 1-04-1.

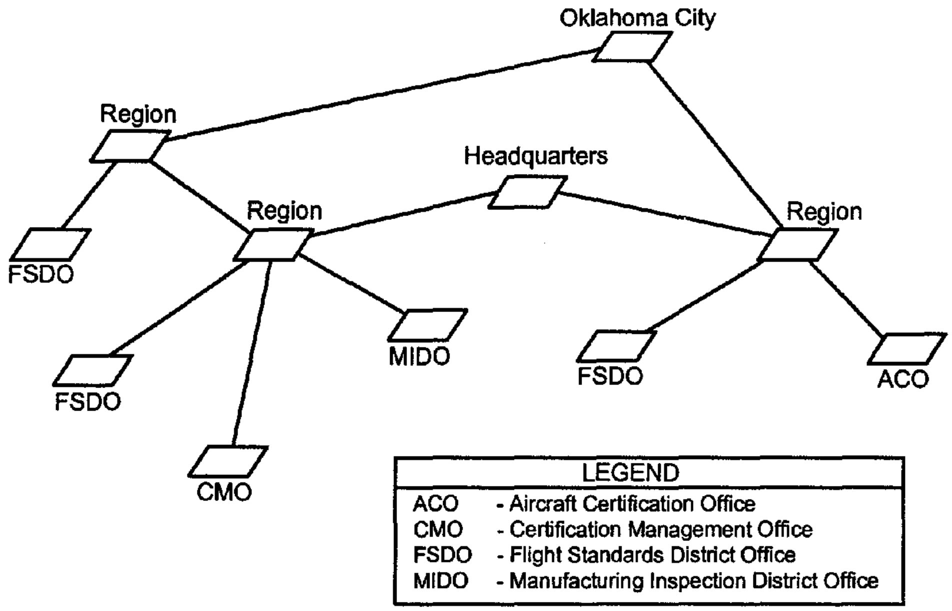

Figure 1-04-1. Functional Component Interface Requirements

1-04.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

AVR's telecommunication requirements are broken out into four groups:

- Sites with current circuit connectivity (Table 1-04-1 below),
- Co-located sites which split into two separate sites with both requiring connectivity,
- Sites with current circuit connectivity, but requiring upgraded connectivity, and
- Sites with no connectivity, but requiring connectivity.

The sites are listed by region. Field sites listed under site location have dedicated circuits installed and homed to the region for which they are grouped.

1-04.3.1 Sites With Current Circuit Connectivity

Table 1-04-1 shows over 100 sites with current circuit connectivity.

Table 1-04-1. Current AVR WAN Locations (Sites With Current Circuit Connectivity)

Regions	No.	Office Type	Site Location	Office Code	Office Name	Line Speed	Comment(s)
Alaska - AAL	1	RO	Anchorage, AK	ANC	AAL-200	T1 (via BB)	
	2	DO	Fairbanks, AK	FAI	AAL-01	T1	
	3	DO	Anchorage, AK	ANC	AAL-03	T1	
	4	DO	Juneau, AK	JNU	AAL-05	T1	
Central - ACE	5	RO	Kansas City, MO	MCI	ACE-200	T1 (via BB)	
	6	DO	Des Moines, IA	DSM	ACE-01	256KB	
	7	DO	St. Louis, MO	STL	ACE-03	256KB	
	8	DO	Kansas City, MO	MCI	ACE-05	256KB	
	9	DO	Wichita, KS	ICT	ACE-07	256KB	
	10	DO	Lincoln, NE	LNK	ACE-09	256KB	
Eastern - AEA	11	RO	Jamaica, NY	AFD	AEA-200	T1 (via BBS)	
	12	DO	Albany, NY	ALB	AEA-01	256KB	
	13	DO	West Mifflin, PA	AGC	AEA-03	256KB	
	14	DO	Allentown, PA	ABE	AEA-05	256KB	
	15	DO	Glen Burnie, MD	BWI	AEA-07	256KB	
	16	DO	Charleston, WV	CRW	AEA-09	256KB	
	17	DO	Farmingdale, NY	FRG	AEA-11	256KB	
	18	DO	New Cumberland, PA	HAR	AEA-13	256KB	
	19	DO	Garden City, NY	QHM	AEA-15	256KB	
	20	DO	Philadelphia, PA	PHL	AEA-17	256KB	Co-located with ACS
	21	DO	Corapolis, PA	PIT	AEA-19	T1	Co-located with SMO
	22	DO	Richmond, VA	RIC	AEA-21	256KB	
	23	DO	Rochester, NY	ROC	AEA-23	256KB	
	24	DO	Teterboro, NJ	TEB	AEA-25	256KB	
	25	DO	Dulles Airport	IAD	AEA-27	256KB	Chantilly, VA
	26	IO	Jamaica, NY	JFK	AEA-29	256KB	
	27	IO	Brussels, BE	EBB	AEA-31	128KB	To Infonet
	28	IO	Frankfurt, GE	FRF	AEA-33	64KB	To Infonet
	29	IO	Gatwick, UK	EGGG	AEA-35	64KB	To Infonet
	30	DO	Valley Stream, NY	ADO	ANE-170	256KB	
Great Lakes - AGL	31	RO	Des Plaines, IL	RGC	AGL-200	T1 (via BB)	
	32	DO	Minneapolis, MN	MSP	AGL-01	256KB	
	33	DO	West Chicago, IL	DPA	AGL-03	256KB	
	34	DO	Cincinnati, OH	LUK	AGL-05	256KB	
	35	DO	Columbus, OH	CMH	AGL-07	256KB	
	36	DO	Grand Rapids, MI	GRR	AGL-09	256KB	
	37	DO	Indianapolis, IN	IND	AGL-11	256KB	
	38	DO	Milwaukee, WI	MKE	AGL-13	256KB	
	39	DO	Minneapolis, MN	MSP	AGL-15	384KB	
	40	DO	South Bend, IN	SBN	AGL-17	256KB	
	41	DO	Springfield, IL	SPI	AGL-19	256KB	
	42	DO	Fargo, ND	FAR	AGL-21	256KB	
	43	DO	Belleville, MI	SUP	AGL-23	T1	Co-located with SMO and ADO
	44	DO	Cleveland, OH	CLE	AGL-25	T1	
	45	DO	Rapid City, SD	RAP	AGL-27	256KB	
	46	DO	Aurora, IL	ORD	AGL-31	256KB	
	47	DO	Cleveland, OH	CLE	CLE-MIDO	256KB	
	48	DO	Vandalia, OH	DAY	CE-MIDO-05	256KB	
	49	DO	Scott AFB, IL	BLV		128KB	
New England ANE	50	RO	Burlington, MA	RBN	ANE-200	T1 (via BB)	
	51	DO	Bedford, MA	BED	ANE-01	T1	
	52	DO	Boston, MA	BOS	ANE-02	T1	
	53	DO	Windsor Locks, CT	BDL	ANE-03	T1	
	54	DO	Portland, ME	PWM	ANE-05	T1	

Legend: HQ = Headquarters, RO = Regional, DO = District, CT = Center, IO = International, CO = Certification.

Table 1-04-1. Current AVR WAN Locations (Sites With Current Circuit Connectivity Con't.)

Regions	No.	Office Type	Site Location	Office Code	Office Name	Line Speed	Comment(s)
Northwest Mountain - ANM	55	RO	Renton-Seattle, WA	RNT	ANM-200	T1 (via BB)	
	56	DO	Renton-Seattle, WA	RNT	ANM-01	T1 (via BB)	In same bldg as RO
	57	DO	Denver, CO	DEN	ANM-03	T1	Same ckt as AWP-30
	58	DO	Casper, WY	CPR	ANM-04	256KB	
	59	DO	Helena, MT	HLN	ANM-05	256KB	Co-located with ADO
	60	DO	Salt Lake City, UT	SLC	ANM-07	256	
	61	DO	Hillsboro, OR	PDX	ANM-09	256KB	
	62	DO	Boise, ID	BOI	ANM-11	256KB	
	63	DO	Spokane, WA	SKA	ANM-13	256KB	
	64	DO	SeaTac, WA	SEAA		T1	
Southern - ASO	65	RO	East Pt, GA	RTL	ASO-200	T1 (via BB)	
	66	DO	Louisville, KY	LOU	ASO-01	256KB	Co-located with ACS
	67	DO	Nashville, TN	BNA	ASO-03	256KB	Co-located with ACS
	68	DO	Winston-Salem, NC	INT	ASO-05	256KB	
	69	DO	Jackson, MS	JAN	ASO-07	256KB	Co-located with ADO
	70	DO	Birmingham, AL	BHM	ASO-09	256KB	
	71	DO	Atlanta, GA	ATL	ASO-11	T1 (via BB)	Same campus as RO
	72	DO	Columbia, SC	CAE	ASO-13	256KB	
	73	DO	Orlando, FL	ORL	ASO-15	256KB	Co-located with ADO
	74	DO	Fort Lauderdale, FL	FLL	ASO-17	256KB	
	75	DO	Miami, FL -FSDO, IFO	MIA	ASO-19	T1	Same ckt as MIA (23)
	76	DO	San Juan, PR	SJU	ASO-21	56KB	
	77	DO	Miami, FL	MIA	ASO-23	T1	Same ckt as MIA (19)
	78	DO	Memphis, TN	MEM	ASO-25	T1	Co-located with ADO, SMO
	79	DO	Charlotte, NC	CLT	ASO-33	256KB	
	80	DO	Tampa, FL	TPA	ASO-35	256KB	
	81	CO	Atlanta, GA	ATL	ACE-115A	T1 (via BB)	
Southwest – ASW	82	RO	Ft. Worth, TX	FTW	ASW-200	T1 (via BB)	
	83	DO	Albuquerque, NM	ABQ	ASW-01	256KB	Co-located with ADO
	84	DO	Baton Rouge, LA	BTR	ASW-03	256KB	
	85	DO	Dallas, TX	DAL	ASW-05	256KB	
	86	DO	Dallas/Ft Worth, TX	DFW	ASW-07	T1	
	87	DO	Houston, TX	HOU	ASW-09	256KB	
	88	DO	Little Rock, AK	LIT	ASW-11	256KB	
	89	DO	Lubbock, TX	LBB	ASW-13	256KB	
	90	DO	Oklahoma City, OK	OKC	ASW-15	256KB	Co-located with ACS
	91	DO	San Antonio, TX	SAT	ASW-17	256KB	Co-located with ACS and MIDO
	92	DO	Ft Worth, TX	FTW	ASW-19	256KB	
	93	DO	Dallas/Ft Worth, TX	DFW	ASW-21	T1	

Legend: HQ = Headquarters, RO = Regional, DO = District, CT = Center, IO = International, CO = Certification.

Table 1-04-1. Current AVR WAN Locations (Sites With Current Circuit Connectivity Con't.)

Regions	No.	Office Type	Site Location	Office Code	Office Name	Line Speed	Comment(s)
Western-Pacific - AWP	94	RO	Hawthorne, CA	AWP	AWP-200	T1 (via BB)	
	95	DO	Van Nuys, CA	VNY	AWP-01	T1	
	96	DO	Burlingame, CA	SFO	AWP-03	256KB	Co-located with ADO and ACS
	97	DO	Long Beach, CA	LGB	AWP-05	256KB	
	98	DO	Scottsdale, AZ	SDL	AWP-07	256KB	
	99	DO	San Diego, CA	SAN	AWP-09	256KB	
	100	DO	Reno, NV	RNO	AWP-11	256KB	
	101	DO	Honolulu, HI	HNL	AWP-13	256KB	To CERAP
	102	DO	San Jose, CA	SJC	AWP-15	256KB	
	103	DO	Fresno, CA	FAT	AWP-17	256KB	
	104	DO	Las Vegas, NV	LAS	AWP-19	256KB	
	105	DO	Riverside, CA	RAL	AWP-21	256KB	
	106	DO	Los Angeles, CA	LAX	AWP-23	T1	
	107	DO	Sacramento, CA	SAC	AWP-25	256KB	
	108	DO	Oakland, CA	OAK	AWP-27	256KB	
	109	DO	Phoenix, AZ	PHX	AWP-28	256KB	
	110	DO	Burlingame, CA	SFO	AWP-29	256KB	
	111	DO	Denver, CO	DEN	AWP-30	T1	Same ckt as ANM (03)
	112	IO	Singapore, Singapore	WSSS	AWP-33	64KB	To Infonet
	113	DO	Scottsdale, AZ	SDL	ANM-108P	256KB	
	114	DO	Van Nuys, CA	VNY	ANM-108V	256KB	
Other Field Offices	115	CT	Oklahoma City, OK	OKC		T1 (via BB)	
	116	BWI	Glen Burnie, MD	BWI	AFS-40	T1	Connected to AHQ
	117	HQ	Herndon, VA	IAD	AFS-500	T1	
	118	HQ	Washington, DC	AHQ		T1 (via BB)	

Legend: HQ = Headquarters, RO = Regional, DO = District, CT = Center, IO = International, CO = Certification.

1-04.3.2 Sites Requiring Circuit Connectivity

There are no new sites requiring connectivity in FY00. However, eight AVR sites are currently scheduled to relocate (move) in FY00.. When an AVR site relocates, these sites are considered to be new sites requiring new circuit connectivity. The leased equipment is moved to the new site. The old circuit is disconnected and a new circuit is ordered for the relocated site. Table 1-04-2 contains the sites scheduled to move in FY00.

Table 1-04-2 Site Move Schedule

Regions	Office Type	Site Location	Office Code	Office Name	Line Speed
Great Lakes - AGL	DO	Columbus, OH	CMH	AGL-07	256KB
Southern - ASO	DO	Winston-Salem, NC	INT	ASO-05	256KB
Southern - ASO	DO	Jackson, MS	JAN	ASO-07	256KB
Southwest – ASW	DO	Oklahoma City, OK	OKC	ASW-15	256KB
Western-Pacific - AWP	DO	Burlingame, CA	SFO	AWP-29	256KB
Western-Pacific - AWP	DO	Oakland, CA	OAK	AWP-27	256KB
Western-Pacific - AWP	DO	Burlingame, CA	SFO	AWP-03	256KB
Western-Pacific - AWP	DO	Los Angeles, CA	LAX	AWP-23	T1

1-04.3.3 Sites Requiring Upgrading of Circuit Connectivity

We estimate that approximately 20% of the AVR sites currently connected may have to upgrade circuit bandwidth, per year. We anticipate this percentage (20%) will increase as AVR data traffic increases. AVR uses the ADTN2000 Summary Network Summary Report and the current status of the deploying applications as the basis for upgrades. The ADTN2000 Summary Network Summary Report provides tables that indicate the ports with more than 50% peak utilization and total port traffic volume.

1-04.4 ACQUISITION ISSUES

Currently, 118 AVR sites are connected to the ADTN network and are operational. Approximately 20 sites currently on the ADTN network were upgraded in FY99.

1-04.4.1 Program Schedule and Status

It's anticipated AVR will require a 1% increase annually in the number of new sites requiring connectivity. This is due to co-located offices splitting into different locations or new offices being established. It's anticipated that about 20% of the current connected sites will require hardware or circuit upgrades, based on AVR's traffic flow.

1-04.4.2 Planned Telecommunications Strategies

As mandated by the FAA, all telecommunications connectivity and hardware between AVR sites (field facilities to regional offices and regional offices to headquarters or other regional offices) are provided by the ADTN network.

1-04.4.3 Telecommunications Costs

Table 2-3 provides a summary of the estimated telecommunications costs for the AVR system. Per FAA Order 2500.8A, leased telecommunications costs (non-recurring and recurring) for the year of activation and the following fiscal year are shown in the table as being funded under the Facilities and Equipment (F&E) account.

The estimated cost of ADTN backbone usage and the cost of "Telecommunications Services" remained unchanged from previous Fuchsia Book figures. The estimated costs of ADTN backbone usage assume an annual traffic increase of 10 percent per year. The cost of "Telecommunications Services" includes contractor labor and travel based upon the number of new sites, upgrades and moves.

Table 1-04-3. Cost Summary – AVR

The following table shows requirements which are captured in the ADTN2000 chapter. They are repeated here for information only.

CIP Note	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
	1. Dedicated Communications Channels								
	Domestic Channel Costs								
	Cost Profile: ADTN2000 Circuits from FSDOs to Regional Offices								
	Channels Added		0	0	0	0	0	0	0
	Channels Upgraded		20	20	20	20	20	20	20
	Total Channels	118	118	118	118	118	118	118	118
	F&E Funded Channels		40	40	40	40	40	40	40
	OPS Funded Channels		78	78	78	78	78	78	78
	Non-recurring Channel Costs								
	F&E Non-recurring Costs		**$0**	**$140**	**$140**	**$140**	**$140**	**$140**	**$140**
	OPS Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring Channel Costs								
	F&E Recurring Costs		**$68**	**$68**	**$68**	**$68**	**$68**	**$68**	**$68**
	OPS Recurring Costs		**$1,667**	**$1,684**	**$1,701**	**$1,718**	**$1,734**	**$1,751**	**$1,768**
	International Channel Costs								
	Cost Profile: Applicable Tariffs to International Locations								
	Channels Added		2	2	2	2	2	2	2
	Total Channels	4	6	8	10	12	14	16	18
	F&E Funded Channels		4	4	4	4	4	4	4
	OPS Funded Channels		2	4	6	8	10	12	14
	F&E Non-recurring Channel Costs		**$59**	**$59**	**$59**	**$59**	**$59**	**$59**	**$59**
	Recurring Channel Costs								
	F&E Recurring Costs		**$900**	**$900**	**$900**	**$900**	**$900**	**$900**	**$900**
	OPS Recurring Costs		**$450**	**$900**	**$1,350**	**$1,800**	**$2,250**	**$2,700**	**$3,150**
	Hardware Costs								
	Cost Profile: Hardware Costs for Codex Modems and Contract Maintenance for 30 Sites Using LINCS.								
	Hardware Units Required		0	0	0	0	0	0	0
	Total Hardware Units	60	60	60	60	60	60	60	60
	F&E Funded Hardware		0	0	0	0	0	0	0
	OPS Funded Hardware		60	60	60	60	60	60	60
	F&E Non-recurring Hardware Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring Hardware Costs								
	F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$2**	**$2**	**$2**	**$2**	**$2**	**$2**	**$2**
	2. ADTN-2000 Backbone Usage								
	Cost Profile: Annual Network Usage Costs. Annual Traffic Increase of 10 Percent Per Year.								
	Traffic Loading in Gigabytes		2.20	2.42	2.66	2.93	3.22	3.54	3.90
	OPS Recurring Costs		**$1**	**$1**	**$1**	**$1**	**$1**	**$1**	**$1**

Table 1-04-3. Cost Summary – AVR (Concluded)

[illegible]	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
3. Telecommunications Services Costs									
Cost Profile: Estimates based on number of sites, upgrades, moves, labor hours (CLIN 25), travel (CLIN 35) and others. Traffic assumed to increase 10% per year.									
OPS Recurring Costs			**$420**	**$462**	**$508**	**$559**	**$615**	**$676**	**$744**
			SUMMARY						
F&E Totals	Non-recurring		$59	$199	$199	$199	$199	$199	$199
	Recurring		$968	$968	$968	$968	$968	$968	$968
	F&E Total		**$1,027**	**$1,167**	**$1,167**	**$1,167**	**$1,167**	**$1,167**	**$1,167**
OPS Totals	Non-recurring		$0	$0	$0	$0	$0	$0	$0
	Recurring		$2,540	$3,049	$3,562	$4,080	$4,602	$5,131	$5,665
	OPS Total		**$2,540**	**$3,049**	**$3,562**	**$4,080**	**$4,602**	**$5,131**	**$5,665**

Notes:

1. This table includes funding requirements for CIP Projects A-17, A-18, A-19, and A-20.
2. Estimates for FY00 assume that all installations and upgrades will be FTS2001 T-1 circuits. Installation costs of new FTS2001 circuits have been waived until FY01.
3. Hardware and contract maintenance costs are included in channel costs for FTS2001 circuits.
4. 1 percent of channels added are new installations; the remaining 99 percent are upgrades.
5. The cost of installed international circuits is included.

CHAPTER 1-05 - SUMMARY SHEET

BANDWIDTH MANAGER (BWM)

Program/Project Identifiers:

Project Number(s):	A-BIIP-981004
Related Program(s):	TBD
New/Replacement/Upgrade?	New
Responsible Organization:	AND-340
Program Mgr./Project Lead:	Derek Bigelow, TIPT, (202) 493-5950
Fuchsia Book POC:	Hong Soi Cho, (301) 577-3200 x223

Assigned Codes:

PDC(s):	UU, UV
PDC Description:	Bandwidth Manager T-1 circuits, BWM Equipment
Service Code:	BWM

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$50	$50	$50	$50	$50	$50	$50
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$50**	**$50**	**$50**	**$50**	**$50**	**$50**	**$50**
OPS Non-recurring	$50	$50	$50	$50	$50	$50	$50
OPS Recurring	$1,458	$1,594	$1,743	$1,857	$2,038	$2,237	$2,456
Total OPS	**$1,508**	**$1,644**	**$1,793**	**$1,907**	**$2,088**	**$2,287**	**$2,506**

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CIP Category:
Automation

1-05.0 BANDWIDTH MANAGER (BWM)

1-05.1 PROGRAM OVERVIEW

1-05.1.1 Purpose of the Bandwidth Manager

The purpose of the Bandwidth Manager (BWM) is to provide advanced multi-service bandwidth management to the National Airspace System (NAS) telecommunications network. Bandwidth Management will enhance the NAS network capabilities by providing automatic restoration; switching and intelligent routing of services between owned and/or leased services. The BWM functionality gives the FAA a platform from which newer technologies can be utilized (e.g., Integrated Services Digital Network [ISDN], Synchronous Optical Network [SONET], Asynchronous Transfer Mode [ATM]). The BWM adds an extra layer of flexibility to the FAA's telecommunications system. Some of the advantages of the BWM are: dedicated and on-demand services; multi-point applications; switched voice and data; switched video conferencing; bandwidth on demand; dynamic adaptive routing (i.e., rerouting to optimize end-to-end circuit path); voice compression from 2:1 to 8:1 ratio; PBX networking; direct routing; re-routing capabilities; frame relay; router capabilities; and ISDN exchanges. These benefits and others will allow the FAA to improve bandwidth performance by cutting costs and increasing availability of services.

1-05.1.2 References

1-05.1.2.1 Federal Aviation Administration Telecommunications Strategic Plan, Vol. II, 1994, Chapter 7, "Operations, Administration, and Maintenance (OA&M)."

1-05.1.2.2 National Airspace System Architecture, Version 2.0, Attachment 3, 1996, Section 7.3.2 through 7.3.4, "Communication Management."

1-05.2 SYSTEM DESCRIPTION

The BWM consolidates network services onto an integrated backbone network of nodes (Figure 1-05-1). The BWM nodes are located in the Continental U.S. (CONUS) Air Route Traffic Control Centers (ARTCC), the Salt Lake City, UT TRACON, the Air Traffic Control Systems Command Center (ATCSCC), the NADIN facilities in Atlanta, GA and Salt Lake City, UT, the San Juan CERAP, the FAA Aeronautical Center, the William J. Hughes Technical Center, Bermuda, and the East Caribbiean (ECARs). The ECARs network is part of the International groups program (AOP-600) and is only listed here as BWM locations, but is not part of this task.

The bandwidth management equipment is N.E.T's Integrated Digital Network Exchange (IDNX/Promina) Communication Resource Managers. The BWM provides 256 Mbps of switching architecture, distributed intelligence, and full redundancy. The BWM can be configured for up to 96 T1 trunks (or 48 redundant trunks), a maximum of 768 originating or terminating active voice calls, or 400 originating or terminating active data calls. Each BWM can support up to four redundant or non-redundant T3 internodal trunks, in addition to other T1/E1 and lower speed trunks. Voice, imaging, circuit switch data, video, frame relay, and LAN services can share the same physical platform and transmission facilities.

THE FAA's BWM NETWORK

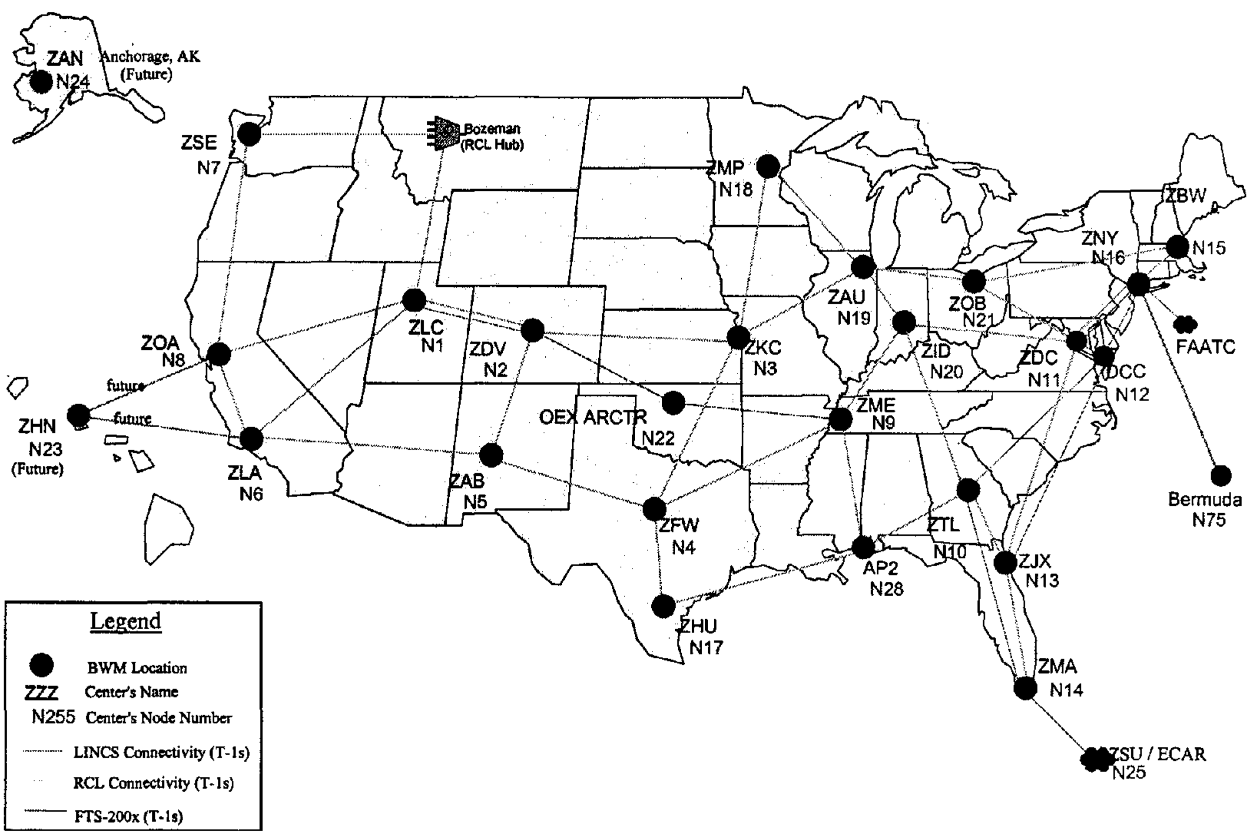

Figure 1-05-1. Bandwidth Management Topology (BWM Backbone)

1-05.2.1 System Components

The BWM network consists of BWM nodes with voice, data, trunk, and packet switching modules and an Advanced Fault Management System (AFMS). Figure 1-05-2 is a block diagram illustrating the connectivity for a typical BWM node. Transmission facilities can be provided by Leased Interfacility NAS Communications System (LINCS), Federal Telecommunications System (FTS-2001), FAA-Owned Microwave System (FOMS), FAA Telecommunications Satellite System (FAASAT), or any FAA owned or leased transmission medium. Currently, connectivity is provided predominately by FOMS and LINCS trunks.

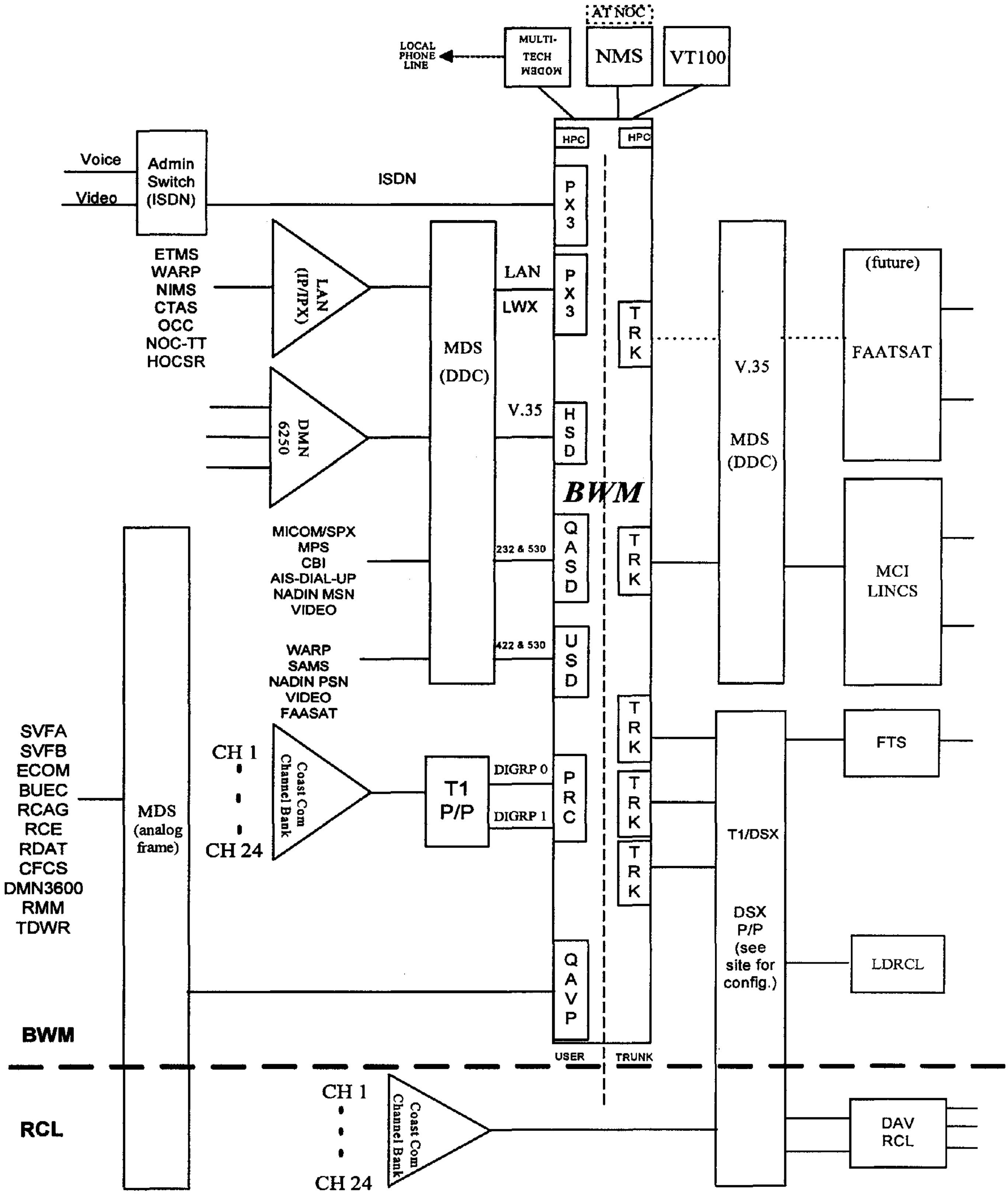

Figure 1-05-2. Node Connectivity

1-05.2.2 Functional Component Interface Requirements

1-05.2.2.1 Voice Modules

The BWM is capable of both analog and digital voice circuits with compression and echo cancellation. The most common voice module in the BWM nodes is a Primary Rate Card (PRC) with 48 digital voice calls on each card. Voice compression modules are used to increase call capacity without losing voice quality. Voice compression modules are being used for connections to locations, such as Bermuda and ECAR locations, where trunk bandwidth is limited.

1-05.2.2.2 Data Modules

Data modules for the BWM provide all of the standard data rates with a variety of features which include asynchronous and synchronous operation, terminal timing, local and remote loopbacks, and industry standard Data Terminating Equipment (DTE) and Data Circuit-Terminating Equipment (DCE) interfaces. The primary data modules in the BWM nodes are the High Speed Data (HSD-2+) module, the Quad Asynch Sync Data (QASD) module, and the Universal Synchronous Data (USD) module.

1-05.2.2.3 Trunk Modules

Trunk modules are the points at which a voice or data call leaves the BWM node and enters the network. Several trunk modules are available including a T1 trunk module providing a DS1 transmission with a rate of 1.544 Mbps, a T3 trunk module with a rate of 44.736 Mbps, and an RS-422 trunk interface with MIL-STD-188 compatible crypto-resync capability with rates from 256 kbps to 2048 kbps. Low speed 56 kbps and 64 kbps trunks are available with V.35 interfaces.

1-05.2.2.4 Packet Switching Modules

The Bandwidth Manager provides Packet Exchange (PX) modules to route Integrated Service Digital Network (ISDN) traffic as well as to route and bridge LAN traffic over a WAN. When the PX module is configured with LAN/WAN Exchange (LWX) software it routes all major networking protocols (e.g. IP, IPX, and SNA) and also supports transparent bridging, token-ring source route bridging, and translational bridging. The BWM network has established an IP nationwide network with approval from AIT. When the PX module is configured with ISDN software, it can route digital voice from one ISDN Private Branch Exchange (PBX switch) to the other ISDN PBX. A possible, future use of this module includes Frame Relay.

1-05.2.2.5 Advanced Fault Management System (AFMS)

The BWM Network Operation Center (NOC) uses an Advanced Fault Management System (AFMS) to monitor the health and status of the BWM nodes installed in the network. The AFMS is a graphical user interface that incorporates all elements of the BWM network into a platform that provides clear access to the operational status of the BWM network.

The AFMS program runs on a Sun Ultra Sparc workstation equipped with a color monitor, a graphics printer, and hard disk drive. The AFMS constantly monitors the operational status of the network and provides real time display updates. Operational updates include changes to system alarms and failures as well as changes in configuration.

In the event of a performance degradation of a trunk or node, the BWM network will automatically switch network channels to alternative paths. This function is performed by the BWM nodes and is independent of the AFMS. The BWM network nodes are designed to operate independently of the AFMS, ensuring that node level functions such as alternate routing will continue in the event of an AFMS failure.

The NOC is set up as a virtual NOC. There are two locations that make up the virtual NOC, Salt Lake City, UT and Atlanta, GA. Either location can monitor, maintain, configure, and control the entire network independent of the other. In the event both locations fail simultaneously, the BWM network can be monitored, maintained, configured, and controlled with a VT-100 terminal at any of the BWM locations.

1-05.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

1-05.3.1 Interface Requirements

Each BWM location is linked to its neighbor BWM location with normally a minimum of three direct transmission trunks creating a diverse coast-to-coast network. The trunks are achieved by the use of trunks from the RCL, LINCS, and/or FTS-2000. Each trunk is a T-1 (1.544 Mbps), carrying up to 24 full-period voice circuits or combination of voice, data, and video information.

1-05.3.1.1 Leased Interfacility Communications System (LINCS) Trunk Interface

LINCS provides operational telecommunication connectivity for critical aviation services. LINCS provides transmission channels of various industry-standard types between any specified end points. Figure 1-05-3 shows the interfaces between LINCS network and BWM node.

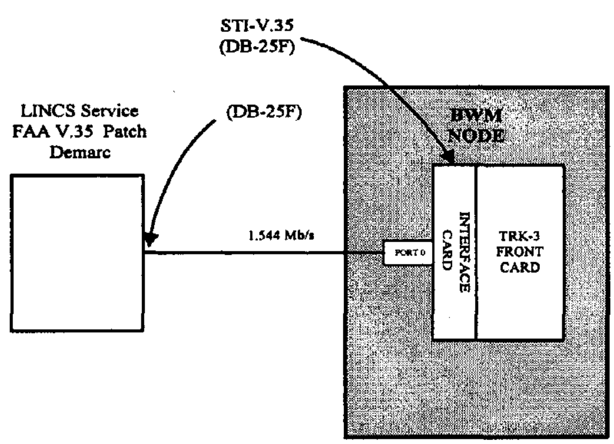

Figure 1-05-3. Interfaces between LINCS network and BWM node

1-05.3.1.2 Radio Communications Link (RCL) Trunk Interface

The RCL backbone network is an integrated voice and data transmission system designed to provide the FAA with cost-effective and reliable service for its high-capacity NAS communications routes. The RCL handles current voice, and data traffic. It will handle future NAS telecom requirements, including redundant and alternate routing capability. Figure 1-05-4 shows the interfaces between RCL network and BWM node with TRK-3 card.

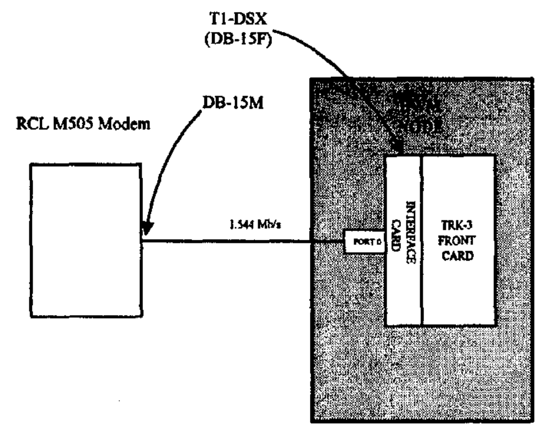

Figure 1-05-4. Interfaces between RCL network and BWM node with TRK-3 card

The interface requirements for the BWM are summarized in Table 1-05-1.

Table 1-05-1. BWM System Interface Requirements Summary

SUBSYSTEM INTERFACE		ARTCC-ARTCC	ARTCC-ATCSCC
INTERFACE CONTROL DOCUMENTATION		NAS-IC-81008408-01	NAS-IC-81008408-01
PROTOCOL REQUIREMENTS	Network Layer		
	Data Link Layer		
	Physical Layer	D4, RS-530, Ethernet LAN, ISDN PRI, MIL-STD-188, RS-232, RS-449, T1/E1, T3/E3, token-ring LAN, V.35, X.21, 4-wire E&M	D4, RS-530, Ethernet LAN, ISDN PRI, MIL-STD-188, RS-232, RS-449, T1/E1, T3/E3, token-ring LAN, V.35, X.21, 4-wire E&M
	Special Formats/Codes		
TRANSMISSION REQUIREMENTS	No. Channels		
	Speed (kbps)		
	Simplex Half/Full Duplex	FD	FD
	Service		
HARDWARE REQUIREMENTS	Modem		
	Cable/ Miscellaneous		

1-05.3.2 Connectivity Requirements

BWM is designed to provide ARTCC-to-ARTCC and ARTCC-to-ATCSCC backbone trunking connectivity for ATC voice and administrative data. To accomplish this mission, BWM nodes need to interface with a variety of the subsystems and perform necessary gateway functions between subsystems, based on the subsystem interface requirements and system fault tolerance. Therefore, an Integrated Digital Network Exchange (IDNX) node consists of a variety of front cards, which function as logic processing modules and rear cards, which provide physical interfaces for subsystems. Typically, subsystems connect to the BWM IDNX nodes either through Time Division Multiplexing (TDM) multiplexers or channel banks for bandwidth aggregation purpose or direct connection via appropriate interface protocols and signaling.

1-05.3.3 Traffic Characteristics

1-05.3.3.1 LINCS Trunk Interface

The trunk modules support a number of transmission facilities such as T1, E1, Fractional T1, and etc.

Trunk interface cards provide the physical connection between the IDNX node and external trunk equipment, such as patch panel or DSU/CSU. The Serial Trunk Interface (STI) card provides a synchronous high-speed serial data interface for a single bundle from the TRK-3, operating at Nx64 kbps rates from 64 kbps to 2.048 Mbps. The STI-V.35 interface card supports V.35 type interfaces.

1-05.3.3.2 RCL Trunk Interface

The T1-DSX interface card provides a channeled 1.544 Mbps DS1 signal. It uses programmable signal equalization to meet the DSX-1 pulse template requirements at distances from 0 to 655 feet. The T1-DSX signal operates in either the D4 Super Frame (SF) format, or the Extended Super Frame (ESF) format.

1-05.4 ACQUISITION ISSUES

1-05.4.1 Program Schedule and Status

The Installation Schedule for the BWM is listed in Table 1-05-2

Table 1-05-2. BWM Site Installation Schedule (includes test beds)

	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
BWM Installations	15	3	3	3	3	3	3	3

1-05.4.2 Telecommunications Strategies

The required transmission facilities will be provided by the Leased Interfacility NAS Communications System (LINCS), FAA-Owned Microwave (FOMS), Federal Telecommunications System (FTS-2001), FAA Telecommunications Satellite System (FAATSAT), or any other FAA owned or leased transmission system.

1-05.4.3 Telecommunications Costs

The projected telecommunications costs for fiscal years 2000 through 2006 are provided in Table 1-05-3. There are four categories of costs for the Bandwidth Management Program that affect the Leased Telecommunications Budget:

· Hardware (i.e., nodal equipment);
· Test support (provided by the FAA Technical Center);
· Program management and engineering; and
· Channels (i.e., leased circuits that represent the backbone trunks).

The recurring hardware costs cover Technical Assistance Center Support and Spare Parts provided by the vendor.

Table 1-05-3. Cost Summary - BWM

CIP#: None — All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
Bandwidth Management Backbone Network								
Hardware Costs								
Cost Profile: Bandwidth Manager Backbone Nodes (Model: IDNX90)								
HW Units Added		0	0	0	0	0	0	0
Total HW Units	31	31	31	31	31	31	31	31
Non-recurring Hardware Costs								
F&E Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Non-recurring Costs (Note 1)		$50	$50	$50	$50	$50	$50	$50
Recurring Hardware Costs								
F&E Recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Recurring Costs (Note 2)		$844	$928	$1,021	$1,123	$1,236	$1,359	$1,495
Tech Center Test Support								
Cost Profile: FAA Technical Center Test Support								
Non-recurring Costs								
F&E Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
Recurring Costs								
F&E Recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Recurring Costs		$100	$100	$100	$50	$50	$50	$50
Program Management and Engineering (PM&E)								
Cost Profile: TIPT Program Management and Engineering Support								
Non-recurring Costs								
F&E Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
Recurring Costs								
F&E Recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Recurring Costs		$514	$565	$622	$684	$753	$828	$911

SUMMARY

		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
F&E Totals	Non-Recurring	$50	$50	$50	$50	$50	$50	$50
	Recurring	$0	$0	$0	$0	$0	$0	$0
	F&E Totals	**$50**	**$50**	**$50**	**$50**	**$50**	**$50**	**$50**
OPS Totals	Non-Recurring	$50	$50	$50	$50	$50	$50	$50
	Recurring	$1,458	$1,594	$1,743	$1,857	$2,038	$2,237	$2,456
	OPS Totals	**$1,508**	**$1,644**	**$1,793**	**$1,907**	**$2,088**	**$2,287**	**$2,506**

Table 1-05-3. Cost Summary – BWM (concluded)

ADDITIONAL COSTS NOT INCURRED BY BWM PROGRAM OFFICE (see Note 3)

CIP # None	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
Channel Costs									
	Cost Profile: Bandwidth Management Network Backbone Trunks (T-1s)								
	Channels Added		10	10	10	10	10	10	10
	Total Channels	7	17	27	37	47	57	67	77
	F&E Funded Channels		10	20	20	20	20	20	20
	OPS Funded Channels		7	7	17	27	37	47	57
	Non-recurring Channel Costs								
	F&E Non-recurring Costs		**$50**	**$50**	**$50**	**$50**	**$50**	**$50**	**$50**
	OPS Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring Channel Costs								
	F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$1,147**	**$1,821**	**$2,496**	**$3,170**	**$3,845**	**$4,520**	**$5,194**

Notes:

1. Non-recurring hardware costs correspond to cardsets and interface equipment Required to support backbone trunks added in those years.
2. Recurring hardware costs based on vendor-provided "TAC and Parts Maintenance." Increase in FY00 corresponds to FAA network monitoring and control.
3. Channel count does not include trunks on FAA-owned networks. Reduction in number of leased trunks Represents trunks disconnected at the mid-point of FY99. The costs associated with the Channel costs (T-1s) are incurred by User Programs.
4. Projected program costs will decrease with service transition to FTI. FTI operations costs will increase by a commensurate amount.

CHAPTER 1-06 - SUMMARY SHEET

DIGITAL BRIGHT RADAR INDICATOR TOWER EQUIPMENT (DBRITE) VIDEO COMPRESSION (DVC)

Program/Project Identifiers:

Project Number(s):	CIP, A-13
Related Program(s):	CIPs, A-02, A-03, A-04, C-05 , F-02, F-23
New/Replacement/Upgrade?	New
Responsible Organization:	AUA-320
Program Mgr./Project Lead:	Malcolm Andrews, AUA-320, (202) 264-3565
Fuchsia Book POC:	Charles Toomer, AUA TAC, (202) 314-1320

Assigned Codes:

PDC(s):	DR, DQ
PDC Description:	Remote Terminal Radar Circuits (TML, DBRITE, etc.); DBRITE-Secondary Circuits
Service Code:	RTRD

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$187	$75	$0	$0	$0	$0	$0
F&E Recurring	$374	$374	$112	$0	$0	$0	$0
Total F&E	**$561**	**$449**	**$112**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$521	$628	$939	$1,051	$1,051	$1,051	$1,051
Total OPS	**$521**	**$628**	**$939**	**$1,051**	**$1,051**	**$1,051**	**$1,051**

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CIP Category:
Automation

1-06.0 DIGITAL BRIGHT RADAR INDICATOR TOWER EQUIPMENT VIDEO COMPRESSION

1-06.1 PROGRAM OVERVIEW

1-06.1.1 Purpose of the Digital Bright Radar Indicator Tower Equipment Video Compression System

The Digital Bright Radar Indicator Tower Equipment (DBRITE) Video Compression (DVC) System will provide a "lossless" transmission of the wide band air traffic control video data between the DBRITE Digital Scan Converter (DSC) and remote towers via a commercially available data link. The DVC will be used in place of the Television Microwave Links (TML) when TMLs are not available or useable.

1-06.1.2 References

1-06.1.2.1 FAA Aviation System Capital Investment Plan (CIP), January 1999, Project Number A-13. (Previously identified as Project Number 32-16.)

1-06.1.2.2 Prime Item Product Function Specification for Digital Video Compression, FAA-E-2897, January 23, 1995.

1-06.1.2.3 System Design Package for Advanced Air Traffic Video Compression System, 680-100001, January 1994.

1-06.2 SYSTEM DESCRIPTION

The DVC consists of three major subsystems: a Video Compression Unit (VCU) which compresses the wide band high-resolution TV raster scan analog signal, a Video Decompression Unit (VDU) which decompresses the data back into an analog composite signal to drive a Tower Display Unit (TDU), and a data transmission system which interconnects the VCU and VDU. The data transmission system includes a T1 Digital Service Unit (DSU)/ Channel Service Unit (CSU) at each end of the T1 line.

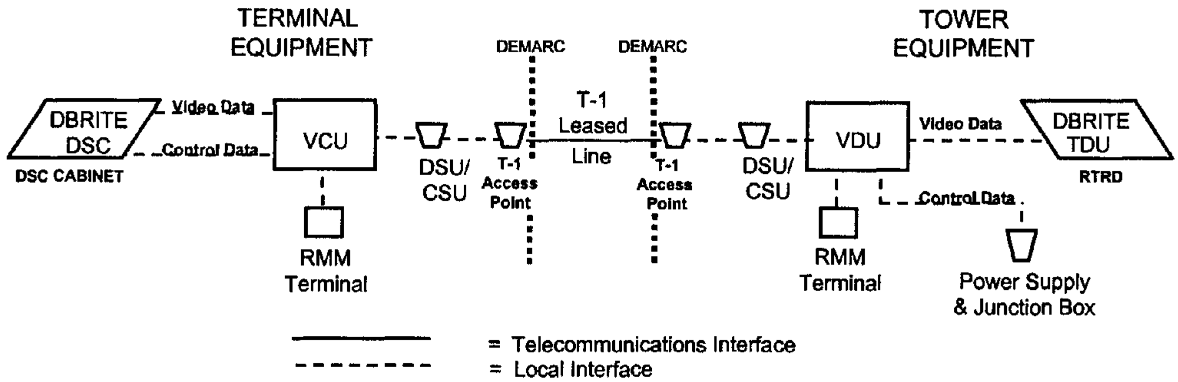
The DVC also includes the capability to support the control data requirement by incorporating the function in the DVC system design, thus eliminating the need for a separate circuit back to the DBRITE DSC.

1-06.2.1 Components

The DVC consists of a VCU, two DSU/CSUs, a VDU, optional remote maintenance monitors, and a T1 leased line.

1-06.2.2 Functional Component Interface Requirements

DVC will communicate between the local DBRITE facility and remote Airport Traffic Control Towers (ATCT) to provide "lossless" transmission of wide band radar video and alphanumeric data to the ATCT controllers. The communications resources for this purpose will support full duplex operation. The DVC telecommunication interfaces are illustrated in Figure 1-06-1.



LEGEND			
CSU	- Channel Service Unit	RMM	- Remote Maintenance Monitoring
DBRITE	- Digital Bright Radar Indicator Tower Equip.	RTRD	- Remote Tower Radar Display
DEMARC	- Point of Interface	TDU	- Tower Display Unit
DSC	- Digital Scan Converter	VCU	- Video Compression Unit
DSU	- Digital Service Unit	VDU	- Video Decompression Unit

Figure 1-06-1. DBRITE Video Compression Interfaces

1-06.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

DVC protocol, transmission, and hardware requirements are summarized in Table 1-06-1.

Table 1-06-1. DBRITE Video Compression Interface Requirements Summary

SUBSYSTEM INTERFACE		Terminal/Tower
INTERFACE CONTROL DOCUMENTATION		TBD
PROTOCOL REQUIREMENTS	Network Layer	
	Data Link Layer	
	Physical Layer	EIA-530
	Special Formats/Code	DS-1 (ANSI T1.403-1989)
TRANSMISSION REQUIREMENTS	No. Channels	1
	Speed (kbps)	1544
	Simplex, Half/Full-Duplex	Full-Duplex
	Service	T1
HARDWARE REQUIREMENTS	Modem	
	Data Bridge	
	Clock	
	A/B Switch	
	DSC	
	Cable/Misc.	

1-06.3.1 Performance Requirements

Performance requirements are documented in the Prime Item Functional Specification for Digital Video Compression, FAA-E-2897.

1-06.3.2 Diversity Requirements

Although the connectivity is not listed in FAA Order 6000.36, it is anticipated the DVC interfaces will require diversity based on the type of service provided. Where available, the diversity routing inherent in the LINCS program will be utilized.

1-06.4 ACQUISITION ISSUES

1-06.4.1 Project Schedule and Status

The DVC contract was awarded on April 10, 1996. The contract duration is for four years ending April 2000, and will result in the procurement of a minimum of 25 DVC systems up to an expected maximum of 75 DVC systems. Table 1-06-2 shows the implementation schedule per year. To date, 50 DVC systems, procured through the National purchase, have been installed and are in operational use in the field. Another 18 DVC systems were procured through the regions and are not reflected in the National purchase or in Table 1-06-2.

Table 1-06-2. DBRITE Video Compression Interface Implementation Schedule

From	To	Diversity Req'mt	System/Rate/ Miles	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
Operational Sites											
TRACON	ATCT	Yes Pri: 3	LINCS/ T1 (1.544Mbps)/ 50 mi.	47	20	8	0	0	0	0	0

1-06.4.2 Telecommunications Costs

The projected estimated budget, based on the installation schedule of Table 1-06-2 is detailed in Table 1-06-3. Funding will be in accordance with FAA Order 2500.8A.

Table 1-06-3. Cost Summary – DBRITE

CIP# A-13	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
TRACON <---> ATCT									
	Cost Profile: LINCS T-1 Circuits (1.544Mbps, Bulk Format)								
Channel Costs									
	Channels Added		20	8	0	0	0	0	0
	Total Channels	47	67	75	75	75	75	75	75
	F&E Funded Channels		28	28	8	0	0	0	0
	OPS Funded Channels		39	47	67	75	75	75	75
	Non-recurring Channel Costs								
	F&E Non-recurring Costs		**$107**	**$43**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring Channel Costs								
	F&E Recurring Costs		**$368**	**$368**	**$110**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$513**	**$618**	**$925**	**$1,036**	**$1,036**	**$1,036**	**$1,036**
Hardware Costs									
	CSU/DSUs Required		40	16	0	0	0	0	0
	Total CSU/DSUs	94	134	150	150	150	150	150	150
	F&E Funded HW Units		56	56	16	0	0	0	0
	OPS Funded HW Units		78	94	134	150	150	150	150
	Non-recurring Hardware Costs								
	F&E Non-recurring Costs		**$80**	**$32**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring Hardware Costs								
	F&E Recurring Costs		**$6**	**$6**	**$2**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$8**	**$9**	**$13**	**$15**	**$15**	**$15**	**$15**

SUMMARY

		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
F&E Totals	Non-recurring	$187	$75	$0	$0	$0	$0	$0
	Recurring	$374	$374	$112	$0	$0	$0	$0
	F&E Total	**$561**	**$449**	**$112**	**$0**	**$0**	**$0**	**$0**
OPS Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$521	$628	$939	$1,051	$1,051	$1,051	$1,051
	OPS Total	**$521**	**$628**	**$939**	**$1,051**	**$1,051**	**$1,051**	**$1,051**

Notes: Channel costs for installations during Prior Years are based upon the site-specific implementation schedule for the DVC National Program.
Channel costs for installations between FY00-FY06 are based upon the average per channel derived from previous implementations.

CHAPTER 1-07 - SUMMARY SHEET

EN ROUTE AUTOMATION PROGRAM (ERAP)

Program/Project Identifiers:

Project Number(s):	CIP A-01
Related Program(s):	CIPs A-02, A-03, A-04, A-05, A-06, A-07, A-11, C-03, C-11, C-20, F-06, M-07, S-04, W-02, W-04, R,E&D 021-110, 031-110, 032-110
New/Replacement/Upgrade?	New
Responsible Organization:	AUA-200
Program Mgr./Project Lead:	Nancy Chapman, AUA-200, (202) 493-0027
Fuchsia Book POC:	Gary Burke, (202) 366-4614

Assigned Codes:

PDC(s):	KP
PDC Description:	Operational Data Circuits for ERAP (DSR to DSSC)
Service Code:	IDAT

Cost Estimates *:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$71	$0	$0	$0	$0	$0	$0
Total F&E	**$71**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$151	$222	$222	$222	$222	$222	$222
Total OPS	**$151**	**$222**	**$222**	**$222**	**$222**	**$222**	**$222**

* Cost data provided by the Program Office.

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CIP Category:
Automation

1-07.0 EN ROUTE AUTOMATION PROGRAM

1-07.1 PROGRAM OVERVIEW

The primary function of the En Route Automation Program (ERAP) is to provide automated support for air traffic services at the area en route level. The en route phase of flight occurs between the departure terminal area and the destination terminal area. En route controllers obtain needed flight and radar data on each controlled aircraft through a variety of automated support systems, i.e., the Host Computer System (HCS), radar data processors, weather processors, communications processors, automated flight service stations, etc. Today, essential air traffic control data is provided to controller workstations via radar displays and flight strips generated by mainframe computer systems. Future enhancements to the existing en route automation support system will replace the outdated components with state-of-the-art hardware and software, and provide controllers with new user workstations.

1-07.1.1 Purpose of the Program/System

The purpose of the En Route Automation Program is to replace equipment as it reaches end-of-service life and provide an infrastructure for future growth and enhancement.

1-07.1.2 References

1-07.1.2.1 Aviation System Capital Investment Plan (CIP), January 1999, Project A-01.

1-07.1.2.2 DSR Requirements Specification, FAA-ER-130-006.

1-07.1.2.3 Host Sustainment Contract, Attachment J21, DTFA01-97-C-00039.

1-07.1.2.4 HID/NAS LAN Prime Item Specification, FAA-E-2916.

1-07.1.2.5 URET CCLD System Specification, FAA-ER-2929.

1-07.2 SYSTEM DESCRIPTION

1-07.2.1 Program/System Components

The Host Computer System (HCS), Direct Access Radar Channel (DARC), Peripheral Adapter Module Replacement Item (PAMRI), Computer Display Channel (CDC), Display Channel Complex Rehost (DCCR) and Display System Replacement (DSR) systems are key components of the national en route air traffic control system.

1-07.2.1.1 Host Computer System (HCS)

The HCS is part of the primary air traffic control equipment used in the 20 continental United States Air Route Traffic Control Centers (ARTCCs). It provides Radar Data Processing (RDP) for en route controllers and Flight Data Processing (FDP) services for ARTCC, Terminal Radar Approach Control (TRACON) and Airport Traffic Control Tower (ATCT) controllers. The FDP portion of the HCS software assists the en route controller in associating flight plans with radar tracks, assuring safe separation of flights, and maintaining the currency and validity of each flight plan. It checks the source and format of all flight plans and amendments received and validates the part of the route within the ARTCC airspace. Additionally, it detects potential spatial conflicts between aircraft and the close proximity of controlled aircraft to ground. The FDP also prepares flight strips that are delivered electronically to the appropriate sector controller within the ARTCC and terminal facilities. Recently, the HCS was replaced by the Host and Oceanic Computer System Replacement (HOCSR) system.

1-07.2.1.2 Direct Access Radar Channel (DARC)

The DARC provides a backup channel, which displays limited flight data to the controllers in the ARTCCs. The DARC supports two modes of operation: NAS/DARC mode, and DARC only mode. In the NAS/DARC mode, the HCS is fully operational, and provides DARC with limited flight data. In the DARC only mode, flight data previously received from the HCS cannot be updated, and therefore, the currency of the flight data degrades over time. Plans are to replace the DARC system under the Eunomia Program. The evolution of a prototype Enhanced DARC system began in 1999 under this program.

1-07.2.1.3 Peripheral Adapter Module Replacement Item (PAMRI)

PAMRI is an interface peripheral device to the HCS for exchanging radar and flight plan data. Flight Data Input/Output (FDIO) is driven through the PAMRI. PAMRI also provides a separate path for radar data to DARC. Plans are to replace the PAMRI beginning in the Year 2003 under the Eunomia Phase 1.

1-07.2.1.4 Computer Display Channel (CDC)

The CDC is a custom-built computer system installed in the late 1960s and early 1970s. It drives the Plan View Displays (PVDs) through Display Generators (DGs) at all but five ARTCCs. Replacement of the CDC, DG and PVD equipment is expected to be complete in Year 2000.

1-07.2.1.5 Display Channel Complex Rehost (DCCR)

The DCCR was installed at five ARTCCs. It interfaces directly to the HCS and PVDs. Removal and replacement of the DCCR/PVD equipment with Display System Replacement (DSR) is expected to be complete in Year 2000.

1-07.2.1.6 Display System Replacement (DSR)

DSR will interface with the HCS through the Local Communications Network (LCN). DSR interfaces with the DARC through the Backup Communications Network (BCN) and Enhanced Direct Access Radar Channel (EDARC) System Interface (ESI). DSR will also interface with Weather and Radar Processor (WARP) to receive Next Generation Radar (NEXRAD) weather data and other weather products. DSR furnishes a display for radar data as well as the capability to send messages from the position console to the HCS It provides new position equipment for the Air Traffic Radar (R-), Data (D-), and Assistant (A-) Controllers. This includes new high-resolution color displays, keyboard entry devices, track balls, back-lit chart holders, flight strip printers, flight strip holders, work surfaces, and provisions for Voice Switching and Control System (VSCS) and VSCS Training and Backup Switch (VTABS) communications equipment.

1-07.2.1.7 Functional Component Interface Requirements

Figure 1-07-1 shows the En Route Automation System interfaces for presently planned improvements through the Year 2003.

1-07.2.1.7.1 PAMRI to PAMRI (Adjacent ARTCCs)

The PAMRI to PAMRI interface between adjacent ARTCCs carries the exchange of real time flight plans, flight plan amendments and radar track data. This information is required to pass control of flights between ARTCCs. The active flight plan, including amendments is forwarded over this interface 30 minutes prior to boundary crossing. Real time track data, generated with each sweep of the radar is exchanged, starting about five minutes prior to boundary crossing and continuing until the receiving controller has positively correlated the track data with the receiving ARTCC radar. At this point, an acceptance message is returned to the originating ARTCC. The PAMRI interface also carries general information messages. All messages, except the general information messages, are positively acknowledged or rejected over the PAMRI interface. In addition, status messages to assure operational condition of adjacent automation systems are periodically exchanged.

1-07.2.1.7.2 PAMRI to ATCT/TRACON FDIO

The PAMRI to ATCT/TRACON FDIO interface carries flight plans, amendment departure messages and general text messages. The flight plans are sent from the HCS through the PAMRI approximately 30 minutes before estimated takeoff time to the FDIO at the TRACON and/or ATCT serving the departure airport. Any amendments requested by the pilots are passed back to the HCS over this interface, and the resulting amended flight plan is again forwarded to the TRACON and/or ATCT. At present, the FDIO system is undergoing replacement.

1-07.2.1.7.3 DSR to DSSC

The interface between Display System Replacement (DSR) and the DSR System Support Center (DSSC) will provide continuous connectivity for centralized software maintenance and problem determination activities, including use of graphic user interface tools and electronic deployment of full logic releases of new software. This interface will be provided by a network service.

1-07.2.1.7.4 URET CCLD to URET CCLD

The User Request Evaluation Tool Core Capability Limited Deployment (URET CCLD) program will provide an initial conflict probe (CP) capability to ARTCC locations. The CP functionality will be used as an advisory tool for strategic planning.

Bandwidth Manager (BWM) will be used as the interface between URET CCLD locations. BWM will carry inter-facility messages such as current plans, amendments, facility/sector ownership, track history and other traffic. Connection to BWM is through a Router on the EDI LAN.

1-07.2.1.7.5 NEXRAD to WARP

The Next Generation Radar (NEXRAD) to Weather and Radar Processor (WARP) interface will carry Doppler Radar data from NEXRAD to DSR for display to the controllers. Details of the interface requirements are covered under the chapters on NEXRAD and WARP.

1-07.2.1.7.6 Radar to PAMRI

The Radar/PAMRI interface carries digitized radar track and weather data to the PAMRI for connection to HCS. For the most part, the radar information is from Air Route Surveillance Radar (ARSR) sites, but in some instances, the radar information is from Airport Surveillance Radar (ASR) sites.

1-07.2.1.7.7 PAMRI to TRACON ARTS/STARS

This interface supplies the connectivity between the HCS and the Automated Radar Terminal System (ARTS) or future Standard Terminal Automation Replacement System (STARS). Flight plans, amendments, radar track data and general information messages are exchanged over this interface in the same manner as with adjacent ARTCCs. This interface also carries the departure messages that the ARTS generate when initially acquiring a track.

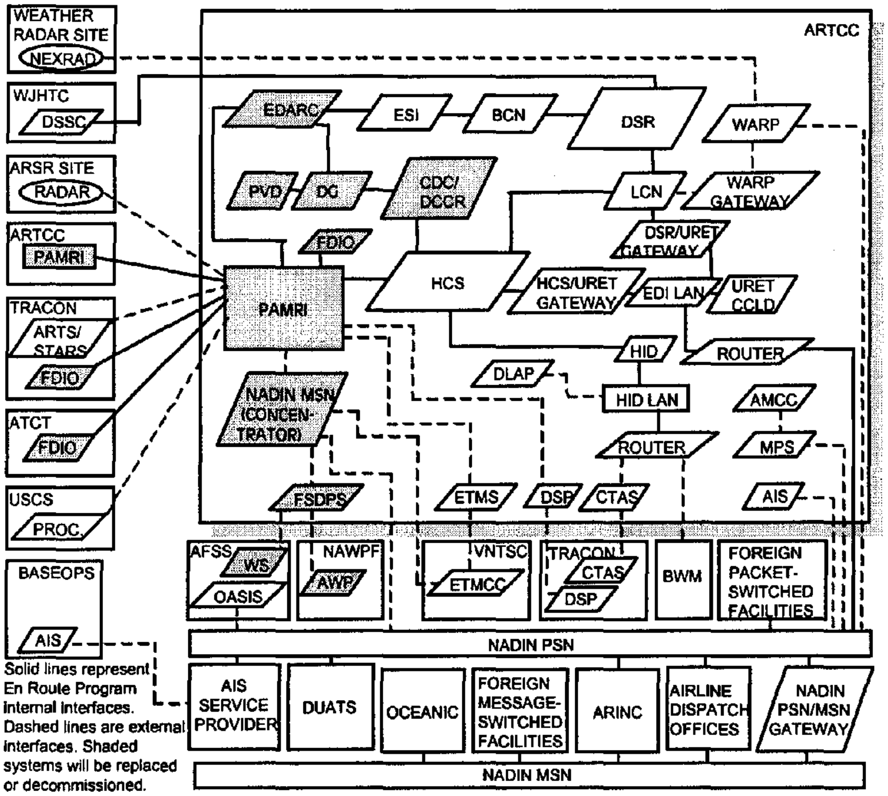
1-07.2.1.7.8 PAMRI to USCS

The PAMRI to US Customs Service (USCS) is an interface funded and maintained by USCS. It provides USCS with radar and flight plan data from the HCS through the PAMRI. Because the responsibility for this interface lies with US Customs service, no further details are supplied herein.

1-07.2.1.7.9 ARTCC AIS to MBO LABS

The ARTCC Aeronautical Information System (AIS) to Military Base Operations (MBO) AIS interfaces conveys weather information, flight plans and general information between the ARTCC and MBO. The AIS recently replaced the Leased A/B Service (LABS).

With AIS, computer workstations are provided to MBOs, Automated Flight Service Stations (AFSSs) and ARTCCs. For filing a flight plan from the MBO, the operator dials in to the AIS Virtual Private Network (VPN) who connects directly to a mainframe computer at Chantilly, VA (or Colorado Springs) via a T-1 line. The mainframe, in turn, is connected to NADIN PSN. At the ARTCC, connection to AIS terminals at Flight Data Positions is through the NADIN PSN node. Additionally, AIS flight plan data is transported from the NADIN PSN node to the NADIN Concentrator, PAMRI and HCS.



ABBREVIATIONS			
AFSS	Automated Flight Service Station	ETMCC	Enhanced Traffic Mgmt Computer Complex
AIS	Aeronautical Information System	ETMS	Enhanced Traffic Management System
AMCC	ARTCC Maintenance Control Center	FDIO	Flight Data Input Output
ARINC	Aeronautical Radio, Inc.	FSDPS	Flight Service Data Processing System
ARSR	Air Route Surveillance Radar	HID	Host Interface Device
ARTCC	Air Route Traffic Control Center	HCS	Host Computer System
ARTS	Automated Radar Terminal System	LAN	Local Area Network
ATCT	Airport Traffic Control Tower	LCN	Local Communications Network
AWP	Aviation Weather Processor	MPS	Maintenance Processor Subsystem
BASEOPS	Base Operations (Military)	MSN	Message Switching Network
BCN	Backup Communications network	NADIN	National Airspace Data Interchange Network
BWM	Bandwidth Manager	NAWPF	National Aviation Weather Processing Facility
CDC	Computer Display Channel	NEXRAD	Next Generation Radar
CCLD	Core Capability Limited Deployment	OASIS	Operational & Supportability Implementation System
CTAS	Center TRACON Automation System	PAMRI	Peripheral Adapter Module Replacement Item
DCCR	Display Channel Complex Rehost	PVD	Plan View Display
DG	Display Generator	STARS	Standard Terminal Automation Replacement System
DLAP	Data Link Applications Processor	TRACON	Terminal Radar Approach Control
DSP	Departure Spacing Program	URET	User Request Evaluation Tool
DSR	Display System replacement	USCS	United States Customs Service
DSSC	DSR System Support Center	VNTS	Volpe National Transportation Systems Center
DUATS	Dual User Access Terminal Service	WARP	Weather and Radar Processor
EDARC	Enhanced Direct Access Radar Channel	WJHTC	William J Hughes Technical Center
EDI	Enhanced Display System Infrastructure	WS	Work Station
ESI	EDARC System Interface		

Figure 1-07-1. En Route Automation System Interface

1-07.2.1.7.10 FSDPS to WS

The Flight Service Data Processing System (FSDPS) to Automated Flight Service Station (AFSS) Workstation (WS) equipment interface is used to transmit flight plans, flight plan amendments and weather information. The FSDPS and WS equipment are a part of the present Model 1, Full Capacity (M1FC) system. These components will be replaced by the Operational & Supportability Implementation System (OASIS). OASIS will use the NADIN PSN as the telecommunications interface with the HCS, and the current FSDPS/AFSS WS interface will be discontinued. Details of these interfaces are included in the chapter on FSAS.

1-07.2.1.7.11 FSDPS to AWP

The FSDPS to Aviation Weather Processor (AWP) interface is for the exchange of weather information and Notice to Airmen (NOTAM). The AWPs are located at the National Aviation Weather Processing Facilities (NAWPFs) at Atlanta, GA, and Salt Lake City, UT. They are a part of the Model 1, Full Capacity System, and will be replaced by OASIS. Details of this interface are included in the chapter on FSAS.

1-07.2.1.7.12 ETMS to ETMCC

The Enhanced Traffic Management System (ETMS) connection with the Enhanced Traffic Management Computer Complex (ETMCC) is an interface for Traffic Flow Management (TFM) information. This two-way interface carries flight plan and track data from the HCS, through the ETMS, to the ETMCC where such data are combined with the output from all HCS locations and certain international sources into a common database of flight plans and current position information. The return flow over this interface provides the common data back to the ETMS equipment at the ARTCC where it is displayed to the specialists in the Traffic Management Unit (TMU). The interface between the NADIN MSN Concentrator and the ETMCC is for access to Aeronautical Fixed Telecommunications Network (AFTN) through NADIN. The ETMCC hub site is presently at the Volpe National Transportation Systems Center (VNTSC), Cambridge, MA. Plans are to move the hub site to Herndon, VA, after Year 2000. A discussion of this interface is included in the chapter on TFM.

1-07.2.1.7.13 ARTCC DSP to TRACON DSP

The ARTCC Departure Spacing Program (DSP) to TRACON DSP interface is for transmitting flight plan information between the ARTCC and adjacent TRACONs and ATCTs for departure sequencing. The ARTCC DSP furnishes the TRACON/ATCT with amended flight plans by emulating the existing FDIO Keyboard Video Data Terminals (KVDT) operation through the PAMRI. In the succeeding operation, enhanced DSP software will provide for exchange of full flight plans and two-way operation. T1 circuits between ARTCC and adjacent TRACONs/ATCTs will be used as the interface medium. Details of the ARTCC/TRACON interface are included in the TFM chapter.

1-07.2.1.7.14 ARTCC CTAS to TRACON CTAS

Center TRACON Automation System (CTAS) will provide the controller a tool for optimizing the scheduling and sequencing of aircraft into major airports. The ARTCC CTAS to TRACON CTAS interface is for transmitting scheduling and sequencing information for aircraft arriving at a terminal. Further details of the ARTCC/TRACON interface are included in the Free Flight Phase 1 chapter.

1-07.2.1.7.15 WARP to NADIN PSN

The WARP to NADIN PSN interface will carry multiple weather products and NAS Infrastructure Management System (NIMS) data. Details of this interface are covered under the chapters on NIMS and WARP.

1-07.2.1.7.16 HNL Router to NADIN PSN

The Host Interface Device National Airspace System Local Area Network (HNL) Router to NADIN PSN connection will be a major connection point between the HCS and external facilities. All traffic now carried by the NADIN MSN concentrators at the ARTCCs will be moved to this interface. The NADIN MSN concentrators will be decommissioned and removed from service when the transition is complete.

1-07.2.1.8 Local Functional Component Interface Requirements

Local interfaces for internal program systems not requiring telecommunications support include interconnections between the PAMRI, EDARC, FDIO, CDC/DCCR, DG, PVD, ESI, BCN, LCN, DSR, HNL components and URET CCLD components. External collocated systems with local interfaces include AIS, AMCC, CTAS, DSP, ETMS, FSDPS, MPS, NADIN MSN Concentrator, and WARP.

1-07.2.1.8.1 DSR LCN to WARP

The DSR LCN to WARP interface through the gateway carries the Doppler Radar data from NEXRAD for DSR display to the controllers.

1-07.2.1.8.2 HID LAN to DLAP

The HID LAN to DLAP interface will carry data link messages destined for the pilot concerning sector hand-off, change of radio frequencies, altimeter settings and other predefined messages. This service is referred to as Controller-Pilot Data Link Communications (CPDLC).

1-07.2.1.8.3 HNL Router to CTAS

The HNL Router to CTAS connection will carry messages that will enable controllers to provide optimal sequencing of flights into high volume terminal areas with minimal impact on flight plans.

1-07.2.1.8.4 AMCC to MPS

The AMCC to MPS interface carries monitor status and maintenance management information on systems in the en route environment. This information will be gathered through sensors in the various systems and disseminated through the interface with NADIN PSN to NIMS.

1-07.2.1.8.5 ETMS to PAMRI

The ETMS to PAMRI interface is the current path for ARTCC area flight plan and radar track data destined for the ETMCC. It is also the path to the HCS for the delay times of individual flights computed by the ETMCC. Delay times are computed in conjunction with ground delay programs imposed to control flights into airports temporarily experiencing reduced capacity. Tentative plans are to delete this connection in the future and connect the ETMS to the HCS through HNL.

1-07.2.1.8.6 HCS to URET CCLD

The HCS to URET CCLD interface is through the HCS/URET Gateway and EDI LAN. This interface will carry flight plan information for projecting potential conflicts of aircraft and airspace, and for conducting strategic flight planning.

1-07.2.1.8.7 LCN to URET CCLD

The Local Communications Network (LCN) to URET CCLD interface provides a gateway connection to the DSR for displaying Conflict Probe flight planning information.

1-07.2.1.8.8 NADIN MSN Concentrator to PAMRI

The NADIN MSN Concentrator to PAMRI interface is the current path for all flight plan, weather and NOTAM information in the HCS. This local interface will be discontinued when the NADIN MSN Concentrator is decommissioned, which is expected during the latter part of Year 2000. Traffic will then be directed from NADIN PSN through the HNL to HCS.

1-07.2.1.8.9 FSDPS to NADIN MSN Concentrator

The FSDPS to NADIN MSN Concentrator local interface is used for sending flight plan information to the NADIN MSN Switch at Atlanta or Salt Lake City for storage and forwarding to HCS. This interface will be discontinued after implementation of OASIS.

1-07.2.1.8.10 PAMRI to DSP

The PAMRI to DSP interface will carry flight plan information from the HCS to DSP for departure sequence planning.

1-07.2.1.8.11 NADIN MSN Concentrator to NADIN PSN

The NADIN MSN Concentrator to NADIN PSN interface is for exchange of flight plans with the NADIN MSN Switch for storage and forwarding to HCS.

1-07.2.1.8.12 HCS to HID, HID LAN, and Router

The HCS interface Device (HID), HID LAN and Router (components of HNL) will become a major interface between the HCS and users such as CTAS, ETMS and flight plan filers. HNL is presently being installed at 20 ARTCC facilities, WJHTC and the FAA Academy.

1-07.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

1-07.3.1 Telecommunications Interfaces

Table 1-07-1 summarizes the interface requirements for the DSR/DSSC interface.

Table 1-07-1 Interface Requirements Summary

Subsystem Interface Interface Control Documentation		DSR to DSSC AAS-DEN18-DSR
Requirements	**Type Interface**	**Internal Interface**
Protocol Requirements	Network Layer Data Link Layer Physical Layer Special Formats	Internet Protocol TBD V.35
Transmission Requirements	No. of Channels Speed Simplex or Duplex Service Type	1 Access Per Site 56.6 To 512 Kbps Full Duplex TBD
Hardware Requirements	Modem Data Bridge Clock A/B Switch DSC Cable/Misc	Data Service Unit Cisco Router AT&T Encrypt. Device

1-07.3.1.1 DSR to DSSC

1-07.3.1.1.1 Interface Requirements

A high-speed data transfer capability is required to enable the DSSC to support the field units adequately, and to distribute new releases in an expeditious manner. Site level software problems must be solved at the DSSC, and modified software, including full system releases, must be downloaded to all sites.

1-07.3.1.1.2 Connectivity Requirements

The DSSC requires high-speed data connectivity to all 20 CONUS ARTCCs and the FAA Academy. Continuous 24-hour per day connectivity is required. Due to changes in plans for the DDF function, the requirement for service at that location was discontinued during FY99.

1-07.3.1.1.3 Traffic Characteristics

The traffic will vary from day to day and from hour to hour over a wide range of intensity. At the least, it will be within 12 Kbps. The high-end information rate is required for download of full system releases of 90 MB to all sites, preferably within an eight-hour period. It is estimated that one 90 MB file can be transferred on a T1 line in eight minutes.

1-07.4 ACQUISITION ISSUES

1-07.4.1 Program Schedule and Status

Table 1-07-2 shows the site installation chart schedule for DSR. All Frame Relay service was installed in prior years. Implementation of the service interfaces between DSR and DSSC is shown in Table 1-07-3.

Table 1-07-2 DSR Site Installation Start Schedule

SITE	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
WJHTC	1	0	0	0	0	0	0	0
ARTCCs	20	0	0	0	0	0	0	0
FAAAC	1	0	0	0	0	0	0	0

Table 1-07-3 Interface Implementation Schedule

FROM	TO	DIVERSITY REQ'MT	SYSTEM/ RATE/MILES	PRIOR YEARS	FY00	FY01	FY02	FY03	FY04	FY05	FY06
ARTCC	TBD	No	TBD (512 Kbps)	20	0	0	0	0	0	0	0
FAAAC	TBD	No	TBD (T1)	1	0	0	0	0	0	0	0
WJHTC	TBD	No	TBD (T1)	1	0	0	0	0	0	0	0

1-07.4.2 Telecommunications Strategies

1-07.4.2.1 DSR to DSSC

The telecommunications service is yet to be determined. Leading candidates include the BWM IP service and a leased Frame Relay service. The BWM IP service is discussed in the BWM Chapter. Frame Relay is a network service provided by telecommunications carriers that guarantees a certain amount of information rate to each subscriber and allows each subscriber to use excess capacity. Although excess capacity is not guaranteed, it is usually available due to random access of all users on the network. The guaranteed bit rate is set by a Committed Information Rate (CIR), and the maximum bit rate is set by the port speed. These parameters are adjustable and can differ from site to site and from month to month. Plans are to increase the CIR at the ARTCCs from 64 Kbps to 256 Kbps to allow for the additional downloading of Host and Oceanic Computer System Replacement (HOCSR) software releases.

1-07.4.2.2 All Other Interfaces

No significant changes are anticipated in the telecommunications requirements for the other key En Route Automation Systems. Telecommunications requirements for external automation systems collocated at ARTCCs are covered in their respective chapters.

1-07.4.3 Telecommunications Costs

Table 1-07-4 provides a summary of the estimated telecommunications costs for the ERAP program assuming a Frame Relay service to support the DSR to DSSC requirement. Per FAA Order 2500.8A, leased telecommunications costs (recurring and non-recurring) for the year of activation and one year following are shown in the table as being funded under the Facilities and Equipment (F&E) account.

Table 1-07-4 Cost Summary – En Route Automation Program

CIP # A-01	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
DSR <--> DSSC									
	Cost Profile: FTS-2000/2001 Frame Relay Service with Port Speeds of 512 kbps, and a Committed Information Rate (CIR) of 256 kbps. HW Includes Modems w/ Contract Maintenance.								
Channel Costs									
	Channels Added		0	0	0	0	0	0	0
	Total Channels	22	22	22	22	22	22	22	22
	F&E Funded Channels		7	0	0	0	0	0	0
	OPS Funded Channels		15	22	22	22	22	22	22
	F&E Non-recurring Channel Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring Channel Costs								
	F&E Recurring Costs		**$71**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$151**	**$222**	**$222**	**$222**	**$222**	**$222**	**$222**
Hardware Costs			Included in Channel costs						

SUMMARY

		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
F&E Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$71	$0	$0	$0	$0	$0	$0
	F&E Total	**$71**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$151	$222	$222	$222	$222	$222	$222
	OPS Total	**$151**	**$222**	**$222**	**$222**	**$222**	**$222**	**$222**

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CHAPTER 1-08 - SUMMARY SHEET

FLIGHT SERVICE AUTOMATION SYTEM (FSAS)

Program/Project Identifiers:

Project Number(s):	CIP A-07
Related Program(s):	OASIS, IGWDS, DUAT Service
New/Replacement/Upgrade?	FSAS Replacement
Responsible Organization:	AUA-400
Program Mgr./Project Lead:	Rudolph Watkins, AUA-420, (202) 366-4751
Fuchsia Book POC:	Alfred Moosakhanian, AUA-420, 202-493-0043

Assigned Codes:

PDC(s):	BJ, NA
PDC Description:	FSDPS Model 1 Full Capacity (AFSS/ARTCC) Data Circuits; Operations and Supportability Implementation System (OASIS) Circuits.
Service Code:	FSSA

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$17	$96	$416	$559	$497	$0	$0
F&E Recurring	$70	$243	$1,179	$2,080	$1,791	$835	$0
Total F&E	**$87**	**$339**	**$1,595**	**$2,639**	**$2,288**	**$835**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$1,195	$1,232	$1,276	$1,414	$2,487	$3,346	$4,139
Total OPS	**$1,195**	**$1,232**	**$1,276**	**$1,414**	**$2,487**	**$3,346**	**$4,139**

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CIP Category:
Automation

1-08.0 FLIGHT SERVICE AUTOMATION SYSTEM

1-08.1 PROGRAM OVERVIEW

The Flight Service Automation System (FSAS) is the current data processing system used by Air Traffic Control Specialists (ATCS) to provide flight service functionality for the aviation community. The primary services are the filing and processing of flight plans and flight information and providing pilots and aircrew with weather data briefings. The current FSAS is the Model 1 Full Capacity (M1FC) system, comprised of two Aviation Weather Processors (AWP), 21 Flight Service Data Processing Systems (FSDPS), and the workstation terminal equipment located at 61 Automated Flight Service Stations (AFSSs). The Operational and Supportability Implementation System (OASIS) is planned to be a decentralized system deployed in the AFSS facilities that contain the current functionality of the M1FC AWPs and FSDPSs, as well as the workstations now contained in the AFSSs.

1-08.1.1 <u>Purpose of the Flight Service Automation System Replacement</u>

The purpose of the FSAS replacement is to sustain and enhance the current flight service automation system by replacing the M1FC components, which have reached the end of their supportable life-cycle, through incorporation of graphic weather display and Direct User Access Terminal (DUAT) service capabilities at the AFSSs.

The Weather and Flight Service Integrated Product Team, AUA-400, is responsible for the FSAS.

1-08.1.2 <u>References</u>

1-08.1.2.1 FAA Aviation System Capital Investment Plan (CIP) A-07, January 1999.

1-08.1.2.2 National Airspace System Plan, April 1985; Chapter III, ATC Systems-Flight Service and Weather, Project 1.

1-08.2 SYSTEM DESCRIPTION

The planned OASIS implementation will provide new logistically supportable FSAS AFSS state-of-the-art workstation equipment. The hardware and software will be mainly comprised of Commercial-Off-The-Shelf (COTS) and/or Non-Developmental Item (NDI) acquisitions. The OASIS will include functionality to store, retrieve, display, highlight, zoom, and transfer information applying to any set of weather conditions, route of flight, or aircraft type. A simultaneous display of weather and flight route information will allow a specialist to review visual notification of flight route problems including severe weather and other safety concerns. Flight plans or routes, winds aloft and a variety of other flight plan information will be displayed graphically. In addition, the planned capabilities will include automated retrieval of the complete set of Federal Aviation Administration (FAA) required flight service information, including pilot, flight, weather, airport procedures, and regulations.

1-08.2.1 FSAS Components

1-08.2.1.1 Model 1 Full Capacity (M1FC) Phase

The M1FC phase consists of the following: FSDPS, AFSS and AWP.

1-08.2.1.1.1 Flight Service Data Processing Systems (FSDPS)

Twenty-one (21) FSDPS will be employed, one at each ARTCC.

1-08.2.1.1.2 Automated Flight Service Stations (AFSS)

Automated equipment will be provided at 61 AFSS locations.

1-08.2.1.1.3 Aviation Weather Processors (AWPs)

AWPs are located at the two National Aviation Weather Processor Facilities (NAWPFs), located in Atlanta and Salt Lake City. The AWPs work in conjunction with the collocated Weather Message Switching Center Replacement (WMSCR) to store and distribute weather products to the FSAS.

1-08.2.2 OASIS Components

The OASIS will be installed in 61 Automated Flight Service Station (AFSS) sites, three government support facilities and one at the contractor's facility. Remote AFSS Workstations (AFSSWSs) will be installed at the Alaskan Flight Service Stations with portable AFSSWSs available for temporary installations in the contiguous states.

1-08.2.3 Functional Component Interface Requirements

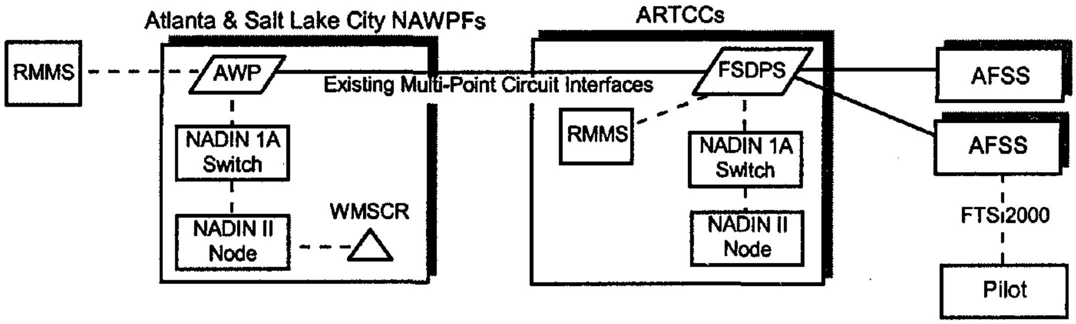
The final interface configuration will result from M1FC implementation shown in Figure 1-08-1.

1-08.2.3.1 FSDPS to AFSS

This interface supports the exchange of Service A (weather) and Service B (flight plan) data.

1-08.2.3.2 AWP to FSDPS

The AWP and FSDPS will exchange data over this interface for weather product distribution, Notice to Airmen (NOTAM), and law enforcement data.



ABBREVIATIONS			
AFSS	- Automated Flight Service Station	NADIN	- National Airspace Data Interchange Network
ARTCC	- Air Route Traffic Control Center	NAWPF	- National Airspace Weather Processing Facility
AWP	- Aviation Weather Processor	RMMS	- Remote Maintenance Monitoring System
FSDPS	- Flight Service Data Processing System	WMSCR	- Weather Message Switching Center Replacement

Figure 1-08-1. Flight Service Automation System Interfaces, Model 1 Full Capacity

1-08.2.3.3 AWP to AWP

The two AWPs, which are considered part of the FSAS, will exchange data for product distribution, updates, and status.

1-08.2.3.4 AWP-to-NADIN-IA Concentrator

This interface supports Service B data acquisition.

1-08.2.3.5 Pilot to AFSS

The pilot to AFSS interface is for the exchange of voice and weather data.

1-08.2.3.6 WJHTC to WJHTC via TELCO

This interface establishes connectivity through the local TELCO office and back to WJHTC. It supports WJHTC system development functions.

1-08.2.3.7 AWP to WMSCR

The AWPs work in conjunction with the collocated WMSCR to store and distribute weather products to the FSAS.

1-08.2.3.8 FSDPS to RMMS

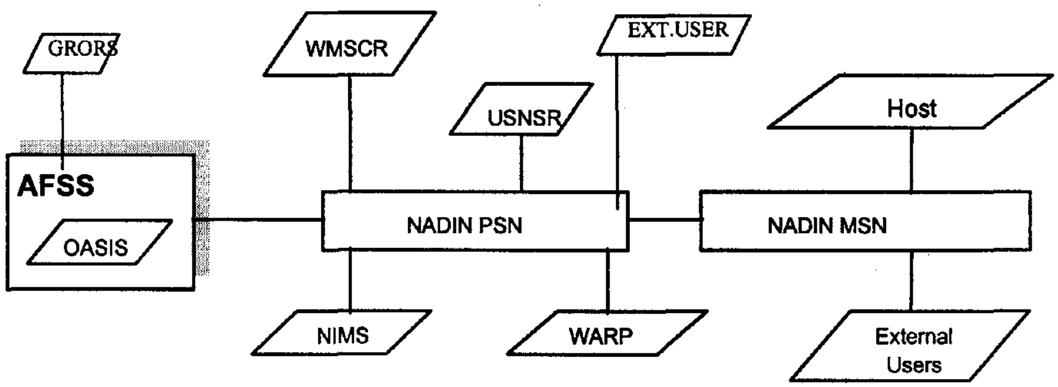
This local interface supports the reporting of maintenance information.

1-08.2.3.9 AWP to RMMS

This local interface supports the reporting of maintenance information.

1-08.2.3.10 OASIS Final Interface Configuration

The final interface configuration resulting from the OASIS implementation is provided in Figure 1-08-2.



ABBREVIATIONS			
AFSS	- Automated Flight Service Station	ODMS	- Operational Data Management System
	-	PSN	- Packet Switched Network
MSN	- Message Switching Network	RMMS	- Remote Maintenance Monitoring System
NADIN	- National Airspace Data Interchange Network	WARP	- Weather and Radar Processor
NIMS	- NAS Infrastructure Management System	WMSCR	- Weather Message Switching Center Replacement
OASIS	- Operational and Supportability Implementation System		

Figure 1-08-2. OASIS Final Interface Configuration

1-08.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

FSDPS interfaces are summarized in Table 1-08-1.

1-08.3.1 Telecommunications Interfaces

1-08.3.1.1 AFSS to Associated FSDPS

The circuit requirements between each AFSS and its associated FSDPS are two full-duplex voice grade data channels or one 56 kbps, full-duplex, Digital Data Service (DDS) channel. These circuits carry the data streams from the four 9.6 kbps DTE processor ports. Because each AFSS covers a large geographical area (typically an entire state), the availability required of the FSDPS service is higher than that achievable with single thread media. Therefore, dial backup is required for the dedicated voice grade circuits while the DDS service back up uses switched 56 kbps service.

Table 1-08-1. Flight Service Automation System Interface Requirements Summary

FSAS INTERFACES		FSDPS to AFSS	FSDPS to AFSS Dial up	AWP to AWP/FSDPS
Configuration Described is:		New	New	Existing
INTERFACE CONTROL DOCUMENTATION				
PROTOCOL REQUIREMENT	Network Layer			
	Data Link Layer	X3.66 ADCCP	X3.66 ADCCP	X3.28-X2.7BA
	Physical Layer	TDM CSU/DSU compliant w/ FED-STD-1007 RS-449 connector CSU/DSU EIA-530		
	Special Formats/ Codes	To FSDPS via 4 -9.6 kbps DTE ports. Muxed into 2 -19.2 kbps		Each primary and secondary ckt connects to half of the FDDPSs and the other AWP
TRANSMISSION REQUIREMENT	No. of Channels	2 (19.2 kbps) or 1 (56 kbps DDS)	One 9.6 kbps Backups for ea. FSDPS/AFSS 19.2 kbps pt-to-pt	8 Multi-points (4 pri & 4 sec.)
	Speed (kbps)	19.2 or 56kbps	9.6	9.6
	Simplex Half/Full Duplex	FD, VG, D6 Conditioning		Multi-drop D5 conditioning
	Service	Dedicated w/dial backup for 19.2 & switched backup for 56 kbps	Automatic Dial-up by Dedicated modems	1 AWP is Master and other AWP and FSDPSs are slave on each ckt
HARDWARE REQUIREMENT	MODEM			DMN Phase III 9.6 fast-poll modems
	Cable/Misc			
FSAS INTERFACES		AWP to NADIN 1A	WJHTC to TELCO	PILOTS to AFSS
Configuration Described is:		Existing	Existing	DUAT
INTERFACE CONTROL DOCUMENTATION				
PROTOCOL REQUIREMENT	Network Layer	X3.28-X2.7BA	X3.66 ADCCP	
	Data Link Layer			
	Physical Layer			
	Special Formats/ Codes			
TRANSMISSION REQUIREMENT	No. of Channels	2	8	
	Speed (kbps)	1.2	9.6	
	Simplex Half/Full Duplex	FD, VG	FD, Data-grade D1 conditioning	
	Service	Point to Point	Point to Point	
HARDWARE REQUIREMENT	MODEM	1.2 kbps Asynchronous	9.6 kbps Synchronous	
	Cable/Misc			

1-08.3.1.2 AWP to FSDPS

Multi-point circuits are currently meeting this interface.

Note: Satellite transmission may be used to provide either the primary or diverse path for the AWP to FSDPS and AFSS to associated FSDPS interfaces identified above. Leased circuits to NADIN nodes will provide a secondary path for these interfaces.

1-08.3.1.3 AWP to AWP

This interface is currently being met by multi-point circuits.

1-08.3.1.4 Pilot to AFSS

The pilot will interface via a Direct User Access Terminal (DUAT) connected to the AFSS with FTS2000 dial circuit.

1-08.3.1.5 WJHTC to WJHTC

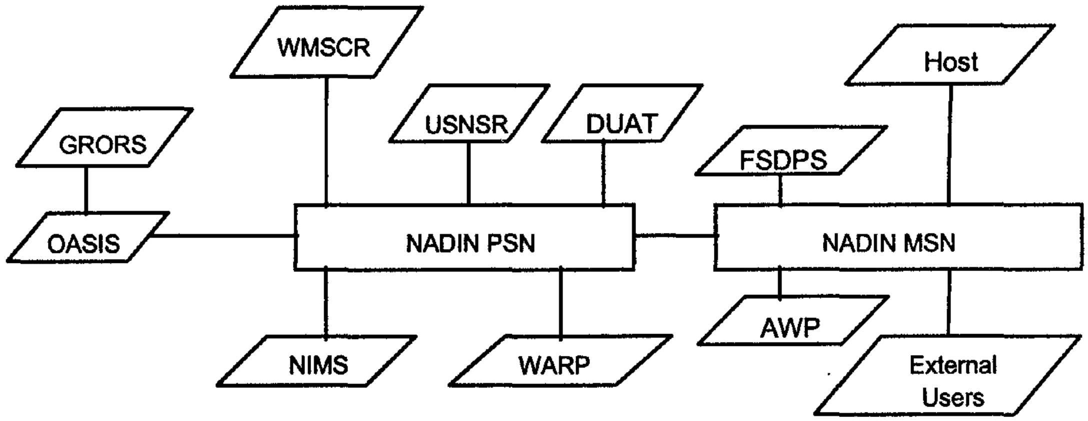
There are eight voice grade data circuits from FAATC through the local TELCO office and back to FAATC, used for system development.

1-08.3.1.6 OASIS Telecommunications Interfaces

All OASIS sites will be connected to the NADIN PSN for exchange of data. The OASIS to external user interfaces will be handled primarily through the NADIN PSN with the exception of the GRORS, which will be a dial-up interface. Figure 1-08-3 depicts the OASIS system telecommunications interfaces.

1-08.3.1.7 OASIS/WMSCR

The interface between the OASIS and WMSCR will be provided by NADIN PSN. This interface will allow for the dissemination of NOTAMs, alphanumeric weather information, local weather messages, weather information requests, Pilot Reports (PIREPs), and Circuit Notices (CIRNOTs).



ABBREVIATIONS			
AWP	- Aviation Weather Processor	NIMS	- NAS Infrastructure Management System
DUAT	- Direct User Access Terminal	OASIS	- Operational and Supportability Implementation System
	-	ODMS	- Operational Data Management System
FSDPS	- Flight Service Data Processing System	PSN	- Packet Switched Network
MSN	- Message Switching Network	WARP	- Weather and Radar Processor
NADIN	- National Airspace Data Interchange Network	WMSCR	- Weather Message Switching Center Replacement

Figure 1-08-3. OASIS Telecommunications Interfaces

1-08.3.1.8 <u>OASIS/DUATS</u>

An interim interface between the OASIS and the DUATS uses the NADIN PSN to exchange a variety of flight data and search and rescue data with the DUATS vendors. The flight data will include Visual Flight Rule (VFR), Defense Visual Flight Rule (DVFR), and International Civil Aviation Organization (ICAO) flight plan proposals, QALQ, Alert Notice (ALNOT), and INREQ messages, responses and cancellations, corrections, errors, and rogers.

1-08.3.1.9 <u>OASIS/NIMS</u>

The interface between the OASIS and the NIMS will use NADIN PSN to exchange health status and remote maintenance monitoring information with the NIMS.

1-08.3.1.10 <u>OASIS/ODMS (USNSR)</u>

The interface between the OASIS and the USNSR will be use NADIN PSN to exchange NOTAM information (domestic, military, and international) with the USNSR.

1-08.3.1.11 <u>OASIS/WARP</u>

A proposed interface between the OASIS and the WARP using the NADIN PSN will exchange weather graphics and pilot reports with the WARP. In Alaska, the OASIS will receive NEXRAD and other weather graphic data from the WARP system.

1-08.3.1.12 OASIS/HOST

The interface between the OASIS and the HOST will use the NADIN PSN to exchange various traffic management advisories with the HOST computers located at the ARTCC's and ATCSCC. These messages include IFR, ICAO, and Stereo Flight Plans, General Information, rejection, rogers, unsuccessful transmission, amendments, QALQ, INREQ, ALNOT messages, responses and cancellations, IR, VR, and MOA messages.

1-08.3.1.13 OASIS/M1FC

During the transition from the M1FC, OASIS will exchange messages with the M1FC system components, AWPs, FSDPSs, and FSSs using the NADIN PSN. The interface between the OASIS and the FSS/XFSS (Auxiliary FSS) will use remote connectivity; dial service in the CONUS and dedicated connections via ANICS in Alaska. The messages exchanged include general information, Military IFR and VFR inbound, Military inbound change destination, VFR, DVFR, and ICAO flight plan proposal, VFR inbound flight plan, change of Estimate Time of Arrival (ETA), cancellation, DVFR outbound flight plan, rogers, QALQ, INREQ, ALNOT messages, responses and cancellations, and SAR acknowledgments.

1-08.3.1.14 OASIS/External Users

External users include Military Base Operations (BASOPS), law enforcement agencies, Foreign ATCs, and the North American Air Defense Command (NORAD). The interface between the OASIS and external users will use the NADIN MSN through the NADIN PSN with the exception of Domestic Air Interdiction Coordination Center (DAICC), which will be via NADIN PSN only. The OASIS will exchange various flight service messages, search and rescue (SAR) messages, law enforcement data and accident/incident messages. These include correction, error, rogers, VFR, DVFR, and ICAO flight plan proposals, QALQ, INREQ, ALNOT messages, responses and cancellations.

1-08.3.1.15 Traffic Characteristics

The OASIS provides timely and accurate alphanumeric (A/N) weather, graphic weather product, aeronautical information and flight planning assistance to users of the NAS. Message delivery times between facilities shall not exceed 5 seconds. Message delivery times will be measured from the initiation of transmission to completion of the reception of the message. The OASIS data rates are shown in Table 1-08-2.

1-08.3.1.16 OASIS Interface Requirements

The circuit requirement for the OASIS is full duplex, point-to-point to NADIN PSN and the GRORS.

Table 1-08-2 summarizes the protocol, transmission, and hardware interface requirements for each interface.

Table 1-08-2. OASIS Interface Requirements Summary Table

SUBSYSTEM INTERFACE		OASIS to GRORS	OASIS to NADIN II Node
INTERFACE CONTROL DOCUMENTATION		GRORS Interface Cont. Document (ICD)	NADIN Interface Cont. Document (ICD)
	Type Interface:	External Interface	External Interface
PROTOCOL REQUIREMENTS	Network Layer	None	ISO 8208
	Data Link Layer	HDLC	HDLC
	Physical Layer	EIA-530	EIA-530
	Special Formats/Codes	None	None
TRANSMISSION REQUIREMENTS	No. Channels	2	1
	Speed (kbps)	9.6 - 56 kbps	9.6 - 56 kbps
	Simplex Half/Full Duplex	FD Synchronous	FD Synchronous
	Service	Pt. to Pt.	NADIN II
HARDWARE REQUIREMENTS	Modem	Modem	
	Data Bridge		
	Clock		
	A/B Switch		
	DSC		
	Cable/ Miscellaneous	None	A cable is used for this interface. Requires minimum of 13 pairs

1-08.3.2 Local interfaces

1-08.3.2.1 AWP to WMSCR

The AWP interfaces with the collocated WMSCR uses the NADIN MSN to connect to the NADIN PSN, providing connectivity for the WMSCR. Two full-duplex, point-to-point, voice-grade data circuits and modems are required between each AWP and the collocated NADIN MSN concentrators. The WMSCR is connected to the NADIN PSN. This will support Service B data acquisition (see Figure 1-08-1).

1-08.3.2.2 FSDPS to RMMS

This interface is satisfied locally.

1-08.3.2.3 AWP to RMMS

This interface is satisfied locally.

1-08.4 ACQUISITION ISSUES

1-08.4.1 Project Schedule and Status

The Site Installation and the Project Schedule will be determined. The FSAS telecommunication interface implementation schedule is in Table 1-08-3.

1-08.4.2 Planned Telecommunications Strategies

The FSAS transmission requirements will be satisfied as described below. Planned telecommunications cost estimates for FY00 to FY06 are provided in Table 1-08-4.

1-08.4.2.1 FSDPS to AFSS

This interface is transitioning from four 9.6 kbps leased channels per interface to two DMN voice-grade circuits using two 3600P series DMN multiplexing modems. The 3600P series modems use dial service for backup. Selected interfaces will use satellite communications.

1-08.4.2.2 AWP to WMSCR

This transmission interface will use the collocated NADIN equipment.

1-08.4.2.3 AWP to FSDPS and AWP to AWP

This transmission interface uses dedicated weather network multi-point circuits. Selected interfaces will use satellite communications.

1-08.4.2.4 OASIS to NADIN II

This interface will use LINCS circuits connecting the 61 OASIS AFSS sites and 5 support sites (includes 2 WJHTC systems, 2 DUATs, and 1 contractor site) to the NADIN PSN at each ARTCC.

1-08.4.2.5 OASIS Weather Feed to Alaskan AFSS

The interface between the OASIS Weather subsystem located at the Anchorage ARTCC and the three AFSSs in Kenai, Juneau, and Fairbanks will be via ANICS network.

1-08.4.2.6 Hawaiian NEXRAD to AFSS

The NIDS provider will provide this interface.

Table 1-08-3. Flight Service Automation System Interface Implementation Schedule

	From	To	Diversity Req'mt	System/Rate/ Miles	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
1	FSDPS	AFSS/ ARTCC	No	Leased/Four 9.6kbps/300 (Old Config)	154	0	0	0	0	0	0	0
2	FSDPS	AFSS	No	Dial Back Up/via FTS-2001 for 1	39	0	0	0	0	0	0	0
3	AWP	FSDPS/ AWP	Yes	LINCS/Multipoint	87	0	0	0	0	0	0	0
4	Alaskan FSDPSs	Alaskan AFSSs	No	Dial Back Up/via FTS-200 (Alaska) (New Config.)	8	0	0	0	0	0	0	0
5	ARTCR	FAATC	N/A	FTS2000/pt-to-pt. VC96	0	0	0	0	0	0	0	0
6	AWP	FAAHQ (NOTAMs)	N/A	Leased/backup/dial-up lines	2	0	0	0	0	0	0	0
7	OASIS	NADIN II	Yes	LINCA/56kbps/ DDC Service	**6**	**1**	**2**	**15**	**22**	**22**	0	0
8	Alaskan AFSSs	NADIN II	No	ANICS 56kbps	0	0	**0**	**3**	0	0	0	0
9	Alaskan AFSSs	NADIN II To WARP data	No	ANICS 256kbps	0	0	**0**	**3**	0	0	0	0
10	Alaskan Radar	Seattle ARTCC	No	ANICS 19.2kbps	0	0	**0**	**2**	0	0	0	0
11	Alaskan AFSSs	Remote Workstation	No	ANICS 64kbps	0	0	**0**	**14**	0	0	0	0
12	AFSSs	Remote, WX backup, RM&C	No	Dial-up/Analog/via FTS-2000	0	7	**14**	**105**	**154**	**154**	0	0
13	Specific Regional AFSS	Regional remote	No	Dial-up/Analog/via FTS-2000	0	0	0	**40**	**40**	0	0	0
14	Pilot	Seattle DUAT	No	Four T1 lines/supporting 120 Dial-up lines.	0	0	**0**	**120**	0	0	0	0
15	Pilot	DTC DUAT	No	Four T1 lines/supporting 120 Dial-up lines.	0	0	**0**	**120**	0	0	0	0
16	OASIS Help Desk		No	Dial-up/Analog	12	0	0	0	0	0	0	0
17	Harris Facility	GPS/RAIM Volpe	No	Dial-up/Analog/ Remote Monitoring Control	2	0	0	0	0	0	0	0

1-08.4.2.7 DUAT/Pilot

The two DUAT facilities in Seattle and the DTC site in Turnersville, NJ, require four FTS2000 T1 channels for each location to accommodate 120 dial circuits.

1-08.4.2.8 OASIS Help Desk to AFSSs

Twelve dial circuits will be required to support the OASIS Help Desk function from the contractor facility in Melbourne, FL.

1-08.4.2.9 OASIS Remote Sites Connectivity

OASIS will require 14 dedicated ANICS circuits for Alaska remote FSS applications. In addition, OASIS will require 10 circuits for regional and 4 circuits for all regular sites for the CONUS AFSSs using FTS2000 dial circuits to support remote stations.

1-08.4.2.10 OASIS to GRORS

This interface requires two FTS2000 dial circuits for use between the GRORS system in Herndon, VA, and the OASIS contractor facility in Melbourne, FL, to receive GPS/RAIM data.

1-08.4.3 Telecommunications Costs

Table 1-08-4 provides a summary of the estimated telecommunications costs for the FSAS program. Per FAA Order 2500.8A leased telecommunications costs (non-recurring and recurring) for the year of activation and one year following are shown in the table as being funded under Facilities and Equipment (F&E) account.

Table 1-08-4. Cost Summary - FSAS

CIP # A-01 All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
1 . FSDPS (Model 1A) <---> ARTCC/AFSS								
Cost Profile: Actual TIMS Billing Costs for BI FSSA Service								
Channel Costs								
Channels Added		0	0	0	0	0	0	0
Total Channels	31	31	31	30	26	19	7	1
F&E Funded Channels		0	0	0	0	0	0	0
OPS Funded Channels		31	31	30	26	19	7	1
F&E Non-recurring Channel Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$243**	**$243**	**$236**	**$200**	**$150**	**$53**	**$11**
Hardware Costs								
Hardware Units Required		0	0	0	0	0	0	0
Total Hardware Units	62	62	62	60	51	38	13	3
F&E Funded Hardware		0	0	0	0	0	0	0
OPS Funded Hardware		62	62	60	51	38	13	3
F&E Non-recurring Hardware Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Hardware Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$2**	**$2**	**$2**	**$2**	**$2**	**$2**	**$2**
2 . FSDPS <---> AFSS								
Cost Profile: Dial Back-up (SVS) Service via FTS-2000/2001 (Provides Dial Back-up for 1)								
Actual TIMS Billing Costs for BJ FSSA Dial-up Service								
Channel Costs								
Channels Added		0	0	0	0	0	0	0
Total Channels	46	46	46	46	46	46	46	46
F&E Funded Channels		0	0	0	0	0	0	0
OPS Funded Channels		46	46	46	46	46	46	46
F&E Non-recurring Channel Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$67**	**$67**	**$67**	**$67**	**$67**	**$67**	**$67**
Hardware Costs		*N/A - Dial-up Capability is Built-into CODEX Modems*						
3 . ARTCCs <---> AFSS								
Cost Profile: LINCS VG-8 Circuits								
Actual TIMS Billing Costs for BJ FSSA Dial-up Service								
Channel Costs								
Channels Added		0	0	0	0	0	0	0
Total Channels	93	93	93	93	93	93	93	93
F&E Funded Channels		0	0	0	0	0	0	0
OPS Funded Channels		93	93	93	93	93	93	93
F&E Non-recurring Channel Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Recurring Costs		**$250**	**$250**	**$262**	**$262**	**$262**	**$262**	**$262**
Hardware Costs		*N/A - Dial-up Capability is Built-into CODEX Modems*						

Table 1-08-4. Cost Summary - FSAS (Continued)

CIP # A-01	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
4. AWP <---> FSDPS/AWP									
Cost Profile: Actual Cost of ARTCCs Dedicated Weather Network Circuits - Multipoint Connections, per TIMS CC&O Report									
Channel Costs									
Channels Added			0	0	0	0	0	0	0
Total Channels		7	7	7	7	7	7	7	7
F&E Funded Channels			0	0	0	0	0	0	0
OPS Funded Channels			7	7	7	7	7	7	7
F&E Non-recurring Channel Costs			**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs									
F&E Recurring Costs			**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs			**$606**	**$606**	**$606**	**$606**	**$606**	**$606**	**$606**
Hardware Costs			*N/A - Dial-up Capability is Built-into CODEX Modems*						
5 . FSDPS <---> AFSS (New Configuration)									
Cost Profile: Dial Back-up (SVS) Service via FTS-2000/2001 (Alaska) Calling Profile is 30 Minutes per Day.									
Channel Costs									
Channels Added			0	0	0	0	0	0	0
Total Channels		8	8	8	8	8	8	8	8
F&E Funded Channels			0	0	0	0	0	0	0
OPS Funded Channels			8	8	8	8	8	8	8
F&E Non-recurring Channel Costs			**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs									
F&E Recurring Costs			**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs			**$24**	**$24**	**$24**	**$24**	**$24**	**$24**	**$24**
Hardware Costs			*N/A - Dial-up Capability is Built-into CODEX Modems*						
6. AWP <--> HQ FAA NOTAM Office									
Cost Profile: Dial Back-up (SVS) Service via FTS2000/2001									
Channel Costs									
Channels Added			0	0	0	0	0	0	0
Total Channels		2	2	2	2	2	2	2	2
F&E Funded Channels			0	0	0	0	0	0	0
OPS Funded Channels			2	2	2	2	2	2	2
F&E Non-recurring Channel Costs			**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs									
F&E Recurring Costs			**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs			**$2**	**$2**	**$2**	**$2**	**$2**	**$2**	**$2**
Hardware Costs			*N/A - Dial-up Capability is Built-into CODEX Modems.*						

Table 1-08-4. Cost Summary - FSAS (Continued)

CIP # A-01 All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
7. OASIS <---> NADIN II								
Cost Profile: LINCS DDS-56 Circuits								
61 AFSS and 4 vendor-to-FAATC connectivities								
Channel Costs								
Channels Added		1	2	15	22	22	0	0
Total Channels	6	1	8	23	45	67	67	67
F&E Funded Channels		6	3	17	37	44	22	0
OPS Funded Channels		0	6	7	9	24	46	68
F&E Non-recurring Channel Costs		**$4**	**$14**	**$107**	**$156**	**$156**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$29**	**$14**	**$86**	**$187**	**$222**	**$111**	**$0**
OPS Recurring Costs		**$0**	**$29**	**$35**	**$45**	**$121**	**$232**	**$343**
Hardware Costs		*N/A - Separate Modems not required*						
8. OASIS <---> NADIN II via ANICS								
Cost Profile: AK AFSSs Access to NADIN II via ANICS (Based upon Premium Service)								
F&E Recurring Costs		**$0**	**$0**	**$25**	**$60**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$60**	**$60**	**$60**
9. OASIS <---> NADIN II via ANICS								
Cost Profile: AK Access to WARP Data via ANICS (Based upon Premium Service) 256 kbps								
F&E Recurring Costs		**$0**	**$0**	**$58**	**$138**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$138**	**$138**	**$138**
10. OASIS <---> NADIN II via ANICS								
Cost Profile: Alaskan Radar Data via ANICS to Seattle ARTCC (Based upon Premium Service)								
F&E Recurring Costs		**$0**	**$0**	**$1**	**$3**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$3**	**$3**	**$3**
11. Remote FSS WS (Alaska) Dedicated Lines via ANICS								
Cost Profile: Alaskan Cummulative Kilobit Requirement via ANICS (Based upon Premium Service)								
Each WS Requires 64 kbps								
Kilobit Requirement		0	0	1280	1280	1280	1280	1280
F&E Recurring Costs		**$0**	**$0**	**$230**	**$230**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$230**	**$230**	**$230**

Table 1-08-4. Cost Summary - FSAS (Continued)

CIP # A-01 All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
12. Telecommunications Services Costs								
Cost Profile: Dial-up lines between AFSSs and ARTCCs via FTS2001								
Regular AFSS Remote Dial-up Lines (Four Lines per Site)								
AFFS Remote Monitoring & Control (RM&C) Dial-up Lines (2 Lines per Site)								
AFSS WX Back-up Dial-up Lines (1 Line per Site)								
Estimates are Based on a Medium Volume Range Estimated at 60 Hours of Usage per Month								
FTS2001 Estimates include a 10 Percent Charge for GSA Overhead								
Channel Costs								
Channels Added		7	14	105	154	154	0	0
Total Channels		7	21	126	280	434	434	434
F&E Funded Channels		7	21	119	259	308	154	0
OPS Funded Channels		0	0	7	21	126	280	434
F&E Non-recurring Channel Costs		**$13**	**$31**	**$232**	**$340**	**$340**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$33**	**$99**	**$559**	**$1,217**	**$1,448**	**$724**	**$0**
OPS Recurring Costs		**$0**	**$0**	**$33**	**$99**	**$592**	**$1,316**	**$2,040**
13. Telecommunications Services Costs								
Cost Profile: Dial-up Lines between AFSSs and ARTCCs via FTS2000/FTS2001								
Regional AFSS Remote WS Dial-up Lines (10 Lines per Site)								
NRCs are Based on an Average Installation Cost for Dial-up Lines for FTS2000								
Estimates are Based on a Medium Volume Range Estimated at 60 Hours of Usage per Month								
FTS2000/2001 Estimates Include a 10 Percent Charge for DITCO/GSA Overhead								
Channel Costs								
Channels Added		0	0	40	40	0	0	0
Total Channels	0	0	0	40	80	80	80	80
F&E Funded Channels		0	0	40	80	40	0	0
OPS Funded Channels		0	0	0	0	40	80	80
F&E Non-recurring Channel Costs		**$0**	**$0**	**$62**	**$62**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$0**	**$0**	**$122**	**$244**	**$122**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$122**	**$244**	**$244**
14. Pilot <---> Seattle (Direct User Access Terminal (DUAT) Connectivity)								
Cost Profile: FTS2001 T-1 Circuits								
120 Dial-up Lines for Seattle DUAT								
Channel Costs								
Channels Added		0	4	4	0	0	0	0
Total Channels	0	0	4	8	8	8	8	8
F&E Funded Channels		0	4	8	4	0	0	0
OPS Funded Channels		0	0	0	4	8	8	8
F&E Non-recurring Channel Costs		**$0**	**$16**	**$16**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**0**	**$65**	**$58**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$0**	**$0**	**$58**	**$58**	**$58**	**$58**

Table 1-08-4. Cost Summary - FSAS (Continued)

CIP # A-01 All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
15. Pilot <---> (Direct User Access Terminal (DUAT) Connectivity)								
Cost Profile: FTS2001 T-1 Circuits								
120 Dial-up Lines for the DTC Facility in NJ								
Channel Costs								
Channels Added		0	4	0	0	0	0	0
Total Channels	0	0	4	4	4	4	4	4
F&E Funded Channels		0	4	4	0	0	0	0
OPS Funded Channels		0	0	0	4	4	4	4
F&E Non-recurring Channel Costs		**$0**	**$36**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**0**	**$65**	**$39**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$0**	**$0**	**$39**	**$39**	**$39**	**$39**
16. OASIS Help Desk								
Cost Profile: Analog Circuits for Remote Monitoring & Control (RM&C) (8) and Voice/Fax Support (4)								
Service provided by FTS2001								
Channel Costs								
Channels Added		0	0	0	0	0	0	0
Total Channels	12	12	12	12	12	12	12	12
F&E Funded Channels		12	0	0	0	0	0	0
OPS Funded Channels		0	12	12	12	12	12	12
F&E Non-recurring Channel Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$7**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$7**	**$7**	**$7**	**$7**	**$7**	**$7**
17. Harris GSPS/RAIM Dial-up Lines								
Cost Profile: FTS2001 Dial-up Circuits								
Channel Costs								
Channels Added		0	0	0	0	0	0	0
Total Channels	0	2	2	2	2	2	2	2
F&E Funded Channels		2	0	0	0	0	0	0
OPS Funded Channels		0	2	2	2	2	2	2
F&E Non-recurring Channel Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$1**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$1**	**$1**	**$1**	**$1**	**$1**	**$1**

SUMMARY

		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
F&E Totals	Non-recurring	$17	$96	$416	$559	$497	$0	$0
	Recurring	$70	$243	$1,179	$2,080	$1,791	$835	$0
	F&E Totals	**$87**	**$339**	**$1,595**	**$2,639**	**$2,288**	**$835**	**$0**
OPS Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$1,195	$1,232	$1,276	$1,414	$2,487	$3,346	$4,139
	Total OPS	**$1,195**	**$1,232**	**$1,276**	**$1,414**	**$2,487**	**$3,346**	**$4,139**

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CHAPTER 1-09 - SUMMARY SHEET

MICROPROCESSOR EN ROUTE AUTOMATED RADAR TRACKING SYSTEM (Micro-EARTS)

Program/Project Identifiers:

Project Number(s):	CIP A-10
Related Program(s):	CIP A-01, A-03, A-05
New/Replacement/Upgrade?	Upgrade system; new ADS-A connectivity; enhanced weather data
Responsible Organization:	AUA-640
Program Mgr./Project Lead:	Jack Neuberger, AUA-600, (202) 366-5152
Fuchsia Book POC:	Mervin Davis, AUA-610, (202) 863-2175

Assigned Codes:

PDC(s):	CR
PDC Description:	M-EARTS Tracking Program (Service Contract)
Service Code:	ARIN

Cost Estimates *:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$360	$0	$0	$0	$0	$0	$0
Total F&E	**$360**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$0	$360	$360	$360	$360	$360	$360
Total OPS	**$0**	**$360**	**$360**	**$360**	**$360**	**$360**	**$360**

*Cost data provided by the Program Office.

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CIP Category:
Automation

1-09.0 MICROPROCESSOR EN ROUTE AUTOMATED RADAR TRACKING SYSTEM

1-09.1 PROGRAM OVERVIEW

The Microprocessor En Route Automated Radar Tracking System (Micro-EARTS) is installed at eight operational locations in the United States. These sites are the Anchorage ARTCC and the CERAPs in Honolulu, San Juan, and Guam, as well as four Department of Defense locations.

The Micro-EARTS basic function is to receive, process, and display radar images for the air traffic controller. New functionality has been added to the system to allow processing of Automatic Dependent Surveillance (ADS-A) reports from aircraft. This affects the communications requirements at the Anchorage Center.

1-09.1.1 Purpose of the Program/System

This project provides for the display of aircraft position to controllers. In addition, Micro-EARTS provides the following: minimum safe altitude warning, tracking, remote tower situation display, flight data processor interface, interfacility communications, remote data buffer memory/DBRITE interface, Mode C intruder alert, conflict alert, approach path monitoring, system data recording and archiving, quick analysis of radar sites, real time quality control, automatic failure recovery, simulation and training, and geographic map display.

1-09.1.2 References

1-09.1.2.1 FAA Capital Investment Plan (CIP), Project No. A-10, January 1999.

1-09.1.2.2 Micro-EARTS Functional Specification, NAS-MD-672 to 692.

1-09.2 SYSTEM DESCRIPTION

Micro-EARTS is a local area network based system that interfaces to radar systems and flight data processors. Figure 1-09-1 is an architectural diagram of the Micro-EARTS.

1-09.2.1 Program/System Components

1-09.2.1.1 Principal Components

The major subsystems of Micro-EARTS are:

- Radar Interface Subsystem that receives and formats radar input for output on the LAN.
- Central Processor Subsystem that maintains system information, tracks aircraft, provides conflict alerts, receives and responds to keyboard input, evaluates the quality of the system, and formats outputs to the displays.

1-09.2.2 Program/System Components

1-09.2.2.1 Principal Components

The major subsystems of Micro-EARTS are:

- The Communications Interface Processor that communicates with external devices.
- The Display Subsystem that interfaces the various display systems to the Micro-EARTS.
- The System Monitor Subsystem that displays alarms and diagnostic information.
- The local area network that provides a communications path between the subsystems.

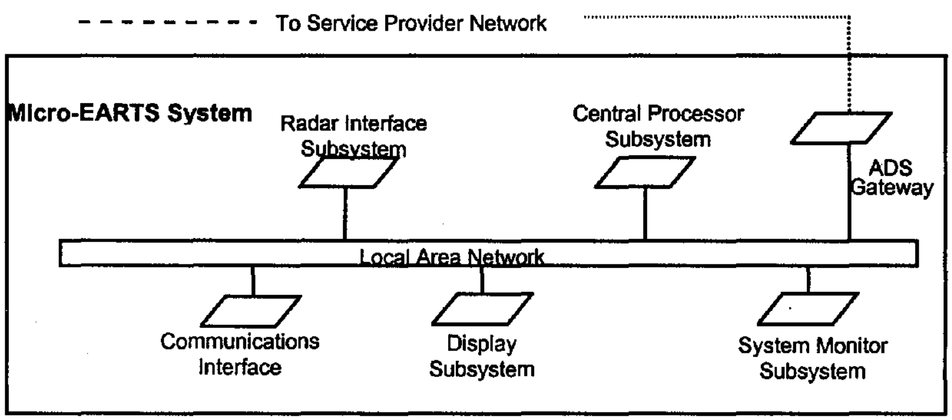

Figure 1-09-1. Hierarchical Diagram of Micro-EARTS

1-09.2.2.2 Functional Component Interface Requirements

Other systems interface to Micro-EARTS mainly through the Radar Input Subsystem, and the Communications Interface Subsystem (for flight data processors, remote displays, and ARTS facilities). Micro-EARTS interfaces to the Societe Internationale de Telecommunications Aeronautiques (SITA) or Aeronautical Radio Inc. (ARINC) network for ADS-A messages via a connection from the Micro-EARTS LAN gateway.

1-09.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

1-09.3.1 Telecommunications Interfaces

Micro-EARTS supports interfaces to radar systems, remote displays, and flight data processors. Micro-EARTS may also send data to adapted ARTS facilities. An interface to SITA for Automatic Dependent Surveillance (ADS-A) reports is being developed for Anchorage and will be installed by June 2000.

1-09.3.1.1 ADS-A Interface

Micro-EARTS interfaces to SITA's or ARINC's data network via the ADS-A gateway. The gateway is responsible for network protocol translations and will provide the ADS-A reports to Micro-EARTS.

1-09.3.1.1.1 Interface Requirements

The ADS-A gateway interfaces directly to the Micro-EARTS LAN (IEEE 802.3).

1-09.3.1.1.2 Connectivity Requirements

ADS-A reports are only required at the Anchorage Center.

1-09.3.1.1.3 Traffic Characteristics

Traffic loads will depend on the number of aircraft flying in Anchorage airspace that are equipped with ADS-A and Future Air Navigation capabilities. It is estimated that each aircraft operating with ADS-A will deliver 42 reports to the Anchorage Center. The fiscal year estimates for the number of aircraft operating daily and using ADS-A is contained in Table 1-09-1.

1-09.3.2 Local Interfaces

All local interfaces are via the Ethernet LAN interface (IEEE 802.3).

Table 1-09-1. Estimated Number of Aircraft Using ADS-A

	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
Aircraft Operations Daily w/ADS-A	24	48	100	120	150	200	250

1-09.4 ACQUISITION ISSUES

Lockheed Martin Air Traffic Management Systems, under contract DTFA01-95-C-00009, is developing Micro-EARTS. AUA-600 has a contract with SITA for providing ADS-A reports, contract number DTFA01-99-C-00063.

1-09.4.1 Program Schedule and Status

The Anchorage ARTCC is using Micro-EARTS in their ADS-A trials. Based on the outcome of the trials, full implementation of ADS-A capabilities at Anchorage will be in FY00.

1-09.4.2 Planned Telecommunications Strategies

ADS-A reports will be provided by SITA or ARINC, depending on air carrier and airspace.

1-09.4.3 Telecommunications Costs

A summary of the projected telecommunications costs for the Micro-EARTS Program is provided in Table 1-09-2. All costs are allocated in accordance with FAA Order 2500.8A; specifically, leased telecommunications costs (non-recurring and recurring) for the year of activation and one year following are shown as being funded under the Facilities and Equipment (F&E) account. Beyond the second year, costs associated with a particular interface implementation are OPS Funded.

Table 1-09-2. Cost Summary Table - Micro-EARTS

CIP # A-10	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
ARINC ADS Message Costs									
	Cost Profile: ARINC Message Charges								
Message Traffic Costs									
Recurring Costs									
	F&E Recurring Costs		**$360**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$0**	**$360**	**$360**	**$360**	**$360**	**$360**	**$360**
			SUMMARY						
F&E Totals		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$360	$0	$0	$0	$0	$0	$0
		F&E Totals	**$360**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Totals		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$360	$360	$360	$360	$360	$360
		OPS Totals	**$0**	**$360**	**$360**	**$360**	**$360**	**$360**	**$360**

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CHAPTER 1-10 - SUMMARY SHEET

OCEANIC AUTOMATION PROGRAM (OAP)

Program/Project Identifiers:

Project Number(s):	CIP A-10; combines old CIPs: 21-05 (ODAPS); 61-22 (ADS); 61-23 (OAP)
Related Program(s):	C-07, C-20, N-12, W-04
New/Replacement/Upgrade?	Upgrade with new communications costs
Responsible Organization:	AUA-600; Oceanic and Offshore IPT
Program Mgr./Project Lead:	Nancy J. Graham, AUA-600, (202) 366-5316
Fuchsia Book POC:	Mervin G. Davis, (202) 863-2175

Assigned Codes:

PDC(s):	BO, KO
PDC Description:	ODAPS Circuits; Oceanic Traffic Planning System (OTPS) data Circuits.
Service Code:	ODAP, ARIN

Cost Estimates *:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$17,445	$15,417	18,286$	$15,465	$12,104	$9,599	$10,170
Total OPS	**$17,445**	**$15,417**	**$18,286**	**$15,465**	**$12,104**	**$9,599**	**$10,170**

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CIP Category: Automation

1-10.0 OCEANIC AUTOMATION PROGRAM

1-10.1 PROGRAM OVERVIEW

The Oceanic and Offshore Integrated Product Team (IPT) is devoted primarily to the life cycle management of the development, implementation, and operational support of enhancements to the Oceanic Air Traffic Control (ATC) Automation System. Requirements for system enhancements are being derived based on user needs and anticipated benefits. Requirements validation is based largely on whether associated cost/benefit ratios show a demonstrative payback.

System enhancements will be developed to capitalize on the latest communications, navigation, and surveillance technologies. They will be deployed incrementally to help ensure a successful and manageable transition. Limited data link communications are already being employed in the Oceanic ATC environment, and data link message traffic is likely to increase steadily during the foreseeable future.

System capability evolution increasingly will require use of digital networks and datalink communication services. However, most message delivery to the oceanic automation system will continue to take place through existing physical communications services.

Oceanic automation systems now operating at Oakland, New York, and Anchorage centers will be upgraded. Communications requirements for approximately the next four years are fairly well defined, with Oceanic Display and Planning Systems (ODAPS) at Oakland and New York serving as the platform for the Oceanic Automation System Build 1 enhancements and the Offshore Computer System (OCS) at Anchorage continuing to exist as an independent architecture.

In addition to the two major systems - ODAPS and OCS - there are two systems that support oceanic ATC operations: Oceanic Traffic Planning System (OTPS) and Air Traffic Services Interfacility Data Communications System (AIDC). OTPS is addressed in a separate section of this plan.

1-10.1.1 Purpose of the Program/System

The purpose of the Oceanic Automation System is to manage oceanic air route traffic such that aircraft separation standards are observed while providing user access to the most advantageous route options.

The Oceanic and Offshore Integrated Product Team, AUA-600, is responsible for Oceanic Automation System life-cycle management.

1-10.1.2 References

1-10.1.2.1 FAA Aviation System Capital Investment Plan (CIP), Project Number A-10, January 1999.

1-10.1.2.2 Radio Technical Commission for Aeronautics (RTCA) DO-219 - Minimum Operational Performance Standard for ATC Two-Way Data Link Communications.

1-10.1.2.3 AEEC 745-2 - Automatic Dependent Surveillance.

1-10.1.2.4 AEEC 622-1 - ATS Data Link Applications Over ACARS Air-Ground Network.

1-10.1.2.5 ICAO - ATN Manual, June 1993.

1-10.1.2.6 FED STD 1003A - Portable Operating System Interface for Computer Environments.

1-10.1.2.7 ISO 8802-5 - Local Area Networks, Part 5: Token Ring Access Method & Physical Layer Specifications.

1-10.1.2.8 NAS-SR-1000 - NAS System Requirements Specification.

1-10.1.2.9 FAA-ER-130-005H-AP - The Advanced Automation System Level Specification.

1-10.1.2.10 Report: New York Center Oceanic Display and Planning System (ODAPS); MIT Lincoln Laboratory, dated November 29, 1994.

1-10.1.2.11 Report: Oakland Center Oceanic Display and Planning System (ODAPS); MIT Lincoln Laboratory, dated November 22, 1994.

1-10.1.2.12 Report: Anchorage Center Offshore Computer System (OCS); MIT Lincoln Laboratory, dated October 21, 1994.

1-10.2 SYSTEM DESCRIPTION

The Oceanic Automation System today consists of Oceanic Display And Planning Systems (ODAPS) located at Oakland and New York Centers and an Offshore Computer System (OCS) located at Anchorage Center. The two ODAPS facilities are architecturally identical with minor differences in numbers of interface connections. The OCS is an entirely different architecture, but it uses some of the same data services as ODAPS. Consequently, it has some interface similarities. In this description, the two ODAPS facilities will be treated together with differences noted. OCS will be presented separately, even though some of its interface requirements are the same as those for ODAPS.

1-10.2.1 ODAPS Components

The Oceanic Display and Planning System is operational at New York and Oakland Centers. No major changes to its communications architecture are planned.

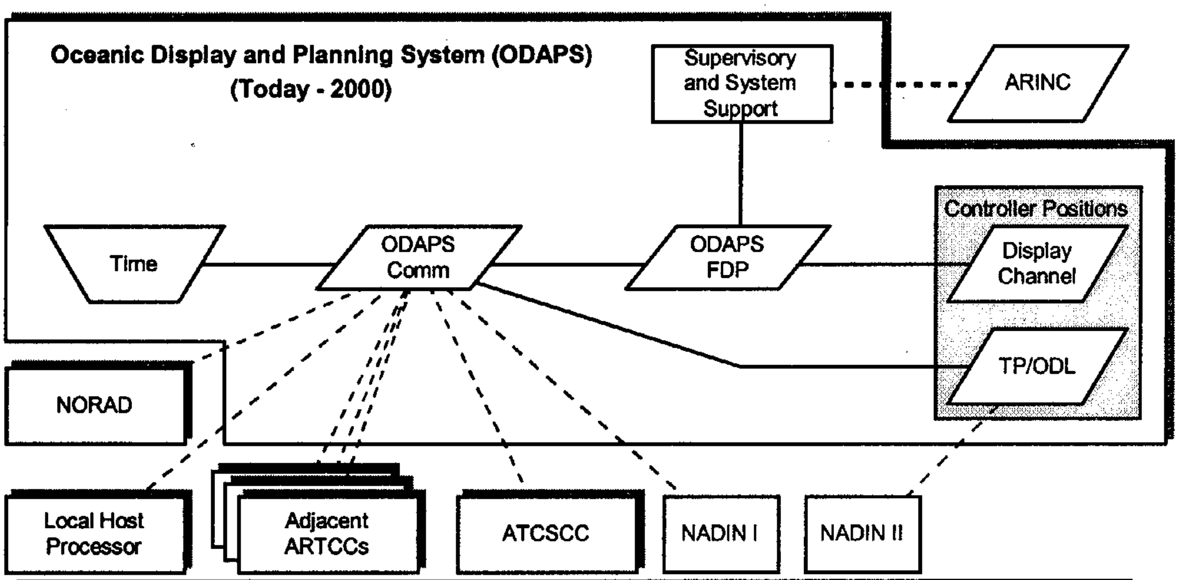
1-10.2.1.1 Current Principal Components

ODAPS consists of an IBM 9672 (Generation 3) processor-based mainframe flight data processing system similar to en route systems. Within ODAPS, there is a communications subsystem responsible for data input and output and a display channel subsystem responsible for processing and distributing aircraft situation display data to controller positions.

The communications subsystem manages and communicates with local flight data input and output equipment through a dedicated local area network. It communicates with external data services using appropriate interface devices as summarized in the figure below.

1-10.2.1.2 Functional Component Interface Requirements

Figure 1-10-1 shows the ODAPS interface architecture in place today.



LEGEND			
ARINC	- AeronauticalRadio, Inc.	NADIN	- National Airspace Data Interchange Network
ARTCC	- Air Route Traffic Control Center	NORAD	- North American Aerospace Defense Command
ATCSCC	- Air Traffic Control System Command Center	ODL	- Oceanic Data Link
FDP	- Flight Data Processor	TP	- Telecommunications Processor

Figure 1-10-1. ODAPS Interface Architecture

1-10.2.2 Anchorage OCS Components

The Anchorage OCS architecture was developed and is maintained locally. Anchorage technical staff and the Oceanic and Offshore Integrated Product Team (IPT) are currently assessing how to deliver performance enhancements to Anchorage with an objective of commonality with Oakland and New York oceanic systems.

1-10.2.2.1 Principal Components

The Anchorage OCS consists of a flight data processing system based on a Hewlett Packard HP-1000 processor. OCS includes 12 sector control positions with associated flight strip printers and terminal input/output equipment. The Anchorage flight data processing subsystem differs from the Oakland and New York systems in that it shares flight data with the local radar-based surveillance system, Micro-Processor En Route Automated Radar Tracking System (M-EARTS). The mix of radar and non-radar airspace managed from Anchorage is the principal reason development of a common system architecture for the three oceanic facilities is so difficult.

The OCS process flight data and prints flight strips for the Micro-EARTS radar sectors and communicates with and processes messages to and from external data services.

1-10.2.2.2 Functional Component Interface Requirements

The functional component interface requirements for OCS are shown in Figure 1-10-2.

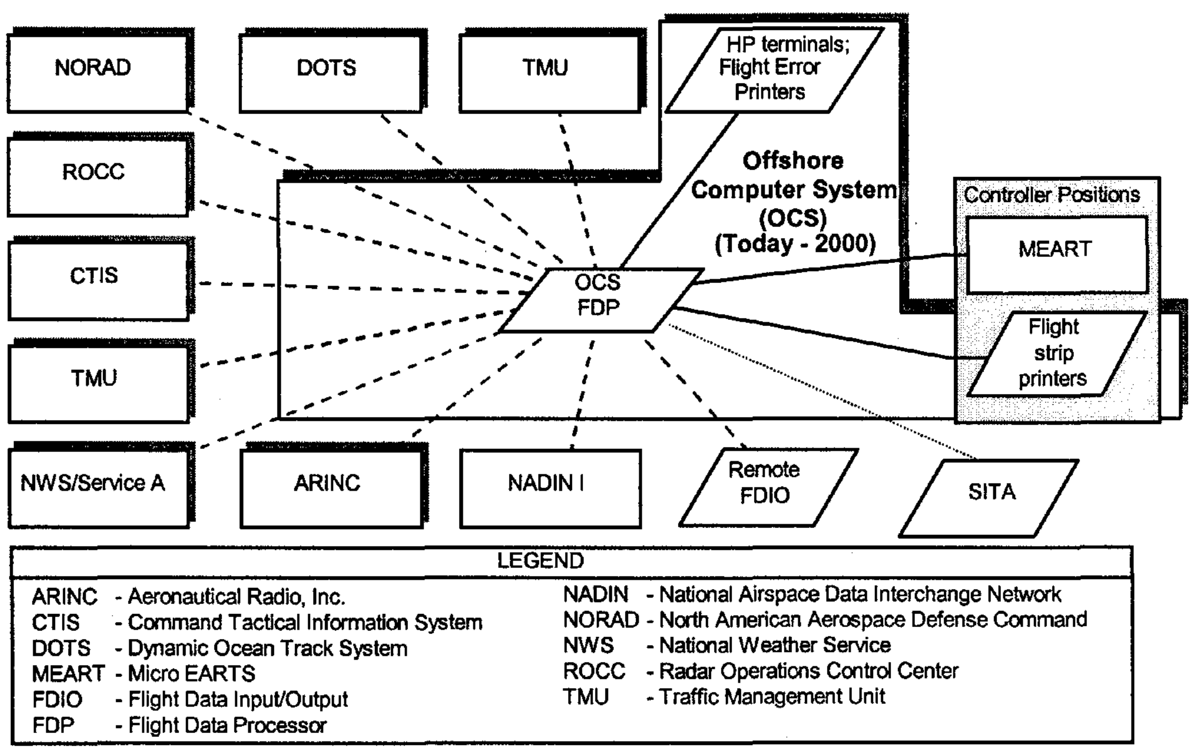


Figure 1-10-2. Functional Component Interface Requirements for OCS

1-10.2.3 AIDC Components

AIDC is currently installed at the New York, and Oakland Air Route Traffic Control Centers (ARTCCs). In New York, it provides automatic communication of flight plan information between the ODAPS at the Center and controllers in Gander (Canada) Flight Information Region (FIR). In Oakland, the AIDC provides communications to the Tokyo FIR via NADIN II. Connectivity at both New York and Oakland is provided via NADIN II. AIDC connections at New York and Oakland may be expanded to other adjacent FIRs [Santa Maria (Portugal) and Auckland (New Zealand)] via NADIN II/Aeronautical Fixed Telecommunications Network (AFTN).

1-10.2.3.1 Current Principal Components

The current principal components for AIDC are shown in Figure 1-10-3.

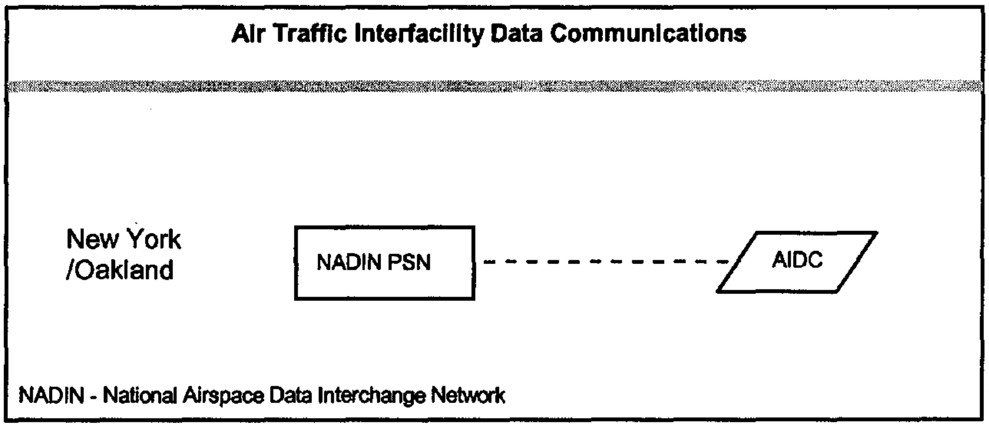
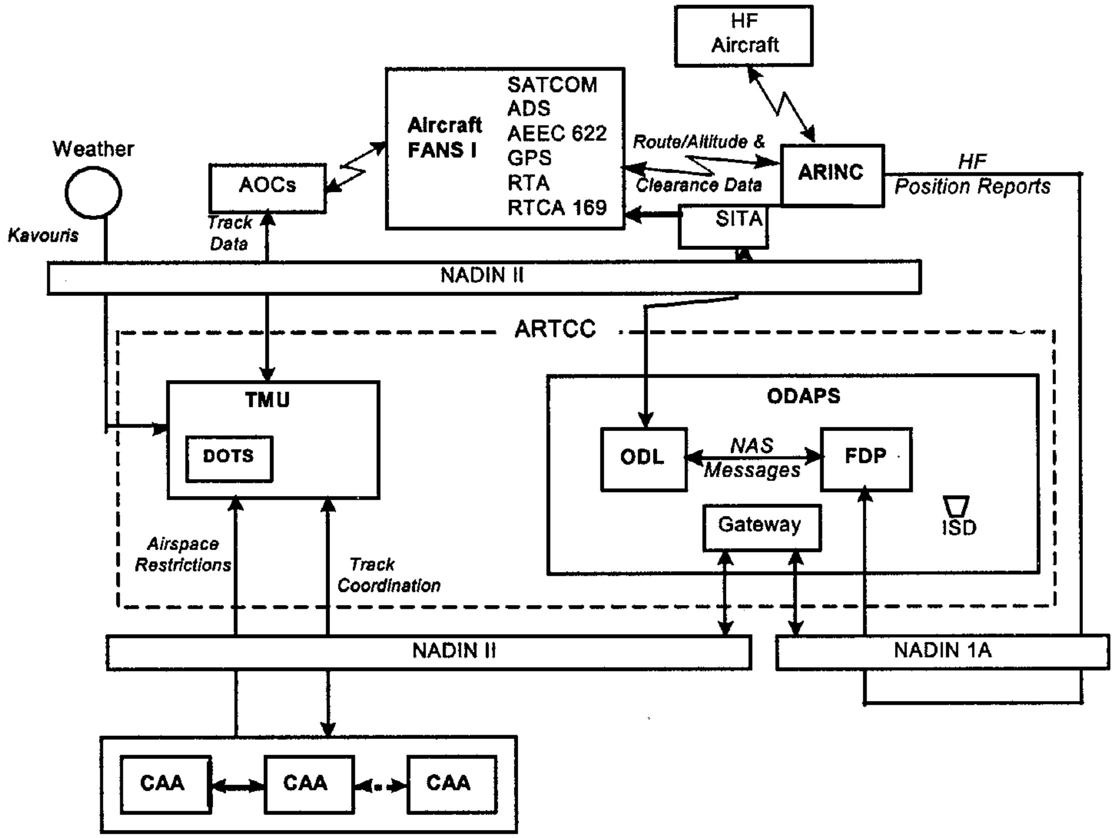


Figure 1-10-3. Current Principal Components for AIDC

1-10.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

1-10.3.1 ODAPS Interfaces

The Oceanic Display And Planning System (ODAPS) interfaces provide for the exchange of flight plan, flight progress, and weather data between the ODAPS flight data processor and other ATC systems and services 24 hours per day, 7 days per week. Figure 1-10-4 shows the ODAPS and Oceanic Data Link Connectivity.



ABBREVIATIONS			
ADS	- Automatic Dependent Surveillance	GPS	- Global Positioning System
AEEC- 622	- ARINC Specification	HF	- High Frequency
AOC	- Aeronautical Operation Control	ISD	- Interim Situation Display
ARINC	- Aeronautical Radio, Inc	NADIN IA	- National Airspace Data Interchange Network 1A
CAA	- Civil Aeronautics Authority	NADIN II	- National Airspace Data Interchange Network II
DOTS	- Dynamic Ocean Track System	ODAPS	- Oceanic Display and Planning System
FANS I	- Future Air Navigation Systems I	ODL	- Oceanic Data Link
FDP	- Flight Data Processor	SATCOM	- Satellite Communications
		TMU	- Traffic Management Unit

Figure 1-10-4. ODAPS and Oceanic Data Link Connectivity

1-10.3.1.1 <u>ODAPS Telecommunications Interfaces</u>

1-10.3.1.1.1 <u>ODAPS to Adjacent ARTCC Host Processor</u>

Oakland ODAPS has external interfaces with Host flight data processors at Los Angeles and Seattle and with the Honolulu Offshore Flight Data Processing System (OFDPS). These interfaces use NAS Interfacility protocol: 2400 bps, EBCDIC, RS-232C.

1-10.3.1.1.2 ODAPS to NADIN MSN

ODAPS connects to NADIN MSN for ICAO flight plans and amendments and ARINC communications. At New York, one NADIN MSN line currently serves ODAPS.

1-10.3.1.1.3 ODAPS to NORAD

At Oakland and New York, ODAPS sends selected flight plans to NORAD. ODAPS does not receive messages from NORAD. The communications protocol to NORAD is TTY-PER10055 at 75 bps, half-duplex, synchronous.

1-10.3.1.1.4 ODAPS to ETMS

The ODAPS interface to ETMS is currently active. The current design includes a 2400 bps line, EBCDIC, RS-232C interface.

1-10.3.1.1.5 ODAPS to NADIN PSN

The ODAPS ODL subsystem interfaces directly with the NADIN PSN. The link is used to send and receive data link messages to aircraft (via the SITA Network), send messages to the ARINC Radio Operator (also via the SITA Network), and send position reports to ODAPS (via NADIN MSN). The interface is RS-232 at 9600BPS. The protocol is X.25.

This interface provides for the transfer of standardized RTCA DO-219 messages between the ATC facility and aircraft.

1-10.3.1.1.6 ODAPS to ARINC

The ODAPS to ARINC interface supports direct ARINC message printout independently of the ODAPS flight data processing complex and the ARINC messages routed to it via NADIN MSN.

1-10.3.1.2 ODAPS Local Interfaces

1-10.3.1.2.1 ODAPS to Local Host Processor

ODAPS at New York and Oakland Centers each connect to the local en route Host processor through a NAS Interfacility interface.

1-10.3.2 OCS Interfaces

The Offshore Computer System (OCS) interfaces provide for the exchange of flight plan, flight progress, and weather data between the OCS flight data processor and other ATC systems and services 24 hours per day, 7 days per week.

1-10.3.2.1 OCS Telecommunications Interfaces

1-10.3.2.1.1 OCS to Traffic Management Unit (TMU)

Selected flight plan messages are forwarded to the TMU through this interface. This service is 9600 bps, ST8-ETX protocol.

1-10.3.2.1.2 OCS to NADIN MSN

OCS connects to NADIN MSN for flight plan data, NOTAMs, messages from other facilities and certain military communications. This service is 2400 bps, Category B.

1-10.3.2.1.3 OCS to NORAD

OCS sends selected flight plans to North American Aerospace Defense Command (NORAD). OCS does not receive messages from NORAD. The communications service to NORAD is 75 bps, 5 bit Baudot.

1-10.3.2.1.4 OCS to Regional Operations Control Center (ROCC)

The OCS interface with the ROCC allows Air Force personnel to query the OCS for flight plan information. Requested flight plans are delivered at 9600 bps.

1-10.3.2.1.5 OCS to Command Tactical Information System (CTIS)

Flight plan information is transmitted to the CTIS computer at the USAF ROCC at 9600 bps, ST8-ETX protocol.

1-10.3.2.1.6 OCS to ARINC

ARINC communications services are provided via a 2400 bps Category B RS-232 digital data link. This communications link delivers weather, position reports, and other air-ground messages.

1-10.3.2.1.7 OCS to SITA

SITA communications services are provided via a 2400 bps Category B RS-232 digital data link. This communications link is used to send and receive air traffic control data link messages with FANS-1 aircraft.

1-10.3.2.1.8 OCS to National Weather Service

OCS requests and receives weather data from the National Weather Service via a GS-200 concentrator located at ALASCOM. The OCS interface operates at 4800 bps, Level 1 MDL, 8100 Terminal Emulator.

1-10.3.2.1.9 OCS to Flight Data I/O

OCS communicates with flight data input/output equipment located at remote TRACONs and towers via 2400 bps lines through an RS-232 interface.

1-10.3.2.2 OCS Local Interfaces

The OCS passes flight plan data to Micro-EARTS via a NAS Interfacility interface operating at 9600 bps and to flight strip printers at associated controller positions via 2400 bps lines. OCS also communicates with HP terminals (for flight data input/output) and Flight Error Printers via 9600 bps lines.

OCS passes track information with the Oceanic Traffic Planning System via 9600 bps interface.

1-10.3.3 AIDC Interfaces

1-10.3.3.1 AIDC Telecommunications Interfaces

AIDC interfaces are connected discretely to AIDC.

1-10.3.3.1.1 AIDC to NADIN MSN and NADIN PSN

AIDC, located in New York, receives flight plan data from controllers in Santa Maria and Gander via NADIN PSN. AIDC in Oakland exchanges flight information with Tokyo Area Control Centers (ACCs) via NADIN PSN. In Anchorage, the AIDC communicates with Russian Far East ATC facilities. AIDC located in Anchorage receives flight plans via NADIN MSN and NADIN PSN.

1-10.3.3.2 AIDC Local Interfaces

Not applicable.

1-10.4 ACQUISITION ISSUES

The Oceanic Data Link (ODL) upgrade to the ODAPS will result in additional telecommunications costs for third-party message services. The cost estimates through FY06 are reflected in Table 1-10-2. There will be increased message volumes over the NADIN and AFTN networks to provide the RTCA DO-219 messages. This will result in additional cost for message traffic over the ARINC Packet Network.

1-10.4.1 Program Schedule and Status

1-10.4.1.1 ODAPS/OAS Schedule

The implementation schedule is shown in Table 1-10-1. ODAPS is operational at Oakland and New York. There are no other ODAPS sites. OAS - ODAPS enhanced with Build capabilities is under development and will be fielded incrementally through early 2000.

Table 1-10-1. OAP Implementation Schedule

04/98	AIDC capability in Oakland,
01/00	AIDC capability at New York
04/99	Multisector ODL in Oakland,
02/00	Multisector ODL in New York,

1-10.4.1.2 <u>OCS Sites</u>

OCS is operational at Anchorage Center. There are no other OCS sites.

1-10.4.1.3 <u>AIDC Schedule</u>

AIDC is operational at Oakland and New York.

1-10.4.2 <u>Telecommunications Costs</u>

The estimated telecommunications costs associated with the OAP Program are provided in Table 1-10-2. Since OAP is an ongoing program, the projection of future telecommunications costs is based upon actual costs to-date and the forecasted increases in aircraft operations through fiscal year 2006. The majority of the Oceanic telecommunications costs result from per message fee-based services that are provided by ARINC. All costs are OPS Funded.

Table 1-10-2. Cost Summary – Oceanic Automation Program (OAP)

All costs in 000's	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
Oceanic Automation Program								
Cost Profile: Assumptions as Shown								
Aircraft Equipment for SATCOM		283	319	350	385	385	385	385
No. Aircraft Operating/Day		255	287	315	346	346	346	346
Aircraft Reporting in US								
Pacific		111	125	140	155	155	155	155
Atlantic		172	194	210	236	236	236	236
OAP Telecommunications Services - Fixed Costs								
All Systems								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$2**	**$2**	**$2**	**$2**	**$2**	**$2**	**$2**
OAP Telecommunications Services - Variable Costs								
1. Oceanic Display and Planning System (ODAPS)								
HF Voice (ARINC)								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$15,258**	**$13,187**	**$16,011**	**$13,144**	**$9,736**	**$7,182**	**$7,634**
2. Oceanic Data Link (ODL) & SITA								
A. 622 CPDLC/ADS								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$500**	**$500**	**$500**	**$500**	**$500**	**$500**	**$500**
B. FIR-to-FIR Comm								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$1,685**	**$1,728**	**$1,773**	**$1,819**	**$1,866**	**$1,915**	**$2,034**
SUMMARY								
F&E Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$0	$0	$0	$0	$0	$0	$0
	F&E Total	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$17,445	$15,417	$18,286	$15,465	$12,104	$9,599	$10,170
	OPS Total	**$17,445**	**$15,417**	**$18,286**	**$15,465**	**$12,104**	**$9,599**	**$10,170**

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CHAPTER 1-11 - SUMMARY SHEET

NATIONAL AIRSPACE SYSTEM RESOURCES (NASR)

Program/Project Identifiers:

Project Number(s):	CIP A-08
Related Program(s):	CIPs A-05, M-29
New/Replacement/Upgrade?	New/Replacement
Responsible Organization:	ASU-510
Program Mgr./Project Lead:	Ken O'Brien, ASU-510, (202) 267-7463
Fuchsia Book POC:	Chuck Eng, ASU-510, (202) 267-3364

Assigned Codes:

PDC(s):	HO
PDC Description:	Administrative Data Circuits for ODMS
Service Code:	ADDA

Cost Estimates *:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$1	$1	$1	$1	$1	$1	$1
Total OPS	**$1**	**$1**	**$1**	**$1**	**$1**	**$1**	**$1**

*Cost data provided by the Program Manager.

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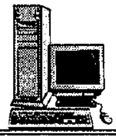
**CIP Category:
Automation**



1-11.0 NATIONAL AIRSPACE SYSTEM RESOURCES (NASR)

1-11.1 PROGRAM OVERVIEW

1-11.1.1 Purpose of NAS Resources

The NAS Resources (NASR) will provide a larger, more efficient and effective automated system to manage the collection, validation, and timely dissemination of aeronautical data within the National Airspace System (NAS).

1-11.1.2 References

1-11.1.2.1 FAA Aviation System Capital Investment Plan (CIP) Project A-08, January 1999.

1-11.1.2.2 FAA Memorandum, Dated: May 13, 1992, Subject: ACTION: Mission Need Statement Approval for the Operational Data Management System.

1-11.2 SYSTEM DESCRIPTION

NASR is utilized by the National Flight Data Center (NFDC) staff to maintain the database that provides aeronautical data to all aviation interests world-wide, including the NAS subsystems. NASR data is static in that changes to aeronautical data are coordinated to meet specific change dates every 56 days. There are three receive-only drops of the Aeronautical Information System (AIS) data that provide chart makers and aeronautical publishers of data with the current AIS database. These are the National Ocean Service (NOS), producer of official government maps; the National Imagery and Mapping Agency Aerospace Center (NIMAAC), producer of military maps and charts; and the Jeppesen/Sanderson Company, a private enterprise that supplies maps to industry and other customers world-wide. The NFDC distributes the National Flight Data Digest (NFDD) daily to all users (85 subscribers and 436 ad hoc users), defining the changes to the AIS. The NFDDs provide input to the NOTAM and vice versa.

The NASR processes AIS aeronautical data from the source through dissemination. NASR will reside at Headquarters, Washington, DC.

In the future, NASR will provide: 1) increased accessibility and dissemination of Aeronautical Information, 2) data standardization of Aeronautical data, and 3) integration of Aeronautical Information with the United States Notice to Airmen System (USNS). NASR will have a dedicated database management system with internal security, data integrity, and transaction logging to provide services to users of the data, including the aviation industry. Users will be allowed to retrieve data in a format that will be most useful to them.

1-11.2.1 Components

The NASR platform at Headquarters, Washington, DC consists of Windows NT servers and Windows NT workstations. Connection between the clients and servers are via TCP/IP using the Headquarters Data Network (HDN).

1-11.2.2 Functional Component Interface Requirements

1-11.2.2.1 Functional Requirements

NASR will provide traffic management and universal access to Aeronautical information retrieval services and computing resources for FAA and non-FAA clients using TCP/IP. Controlled, high-performance gateways will be utilized to control access to strategic data to support specific as well as unique traffic management and FAA decision-making requirements. A client server architecture will be used to ensure accurate copies of strategic and other operational data from multiple databases can be dispatched quickly and efficiently to the appropriate processor complex for priority processing.

1-11.2.2.2 Performance Requirements

NASR requires a network that can accommodate high-speed communications. The required data rates identified in Table 1-11-1 were determined in FAA studies of the files that will be bulk file transferred between the ARTCCs and the NASR repository site and the interactive retrieval services and computer resources requirements.

Table 1-11-1. NASR Interface Requirements Summary

SUBSYSTEM INTERFACE		NASR to HDN	
INTERFACE CONTROL DOCUMENTATION		TCP/IP	
PROTOCOL REQUIREMENTS	Network Layer	TCP	
	Data Link Layer	IP	
	Physical Layer	100BaseFL	
	Special Formats/Codes	TBD	
TRANSMISSION REQUIREMENTS	No. Channels	1	
	Speed (kbps)	100Mbps	
	Simplex Half/Full Duplex	Full	
	Service	TBD	
HARDWARE REQUIREMENTS	Modem	TBD	
	Cable/ Miscellaneous	TBD	

In addition, the NASR system has a minimum availability requirement of .999. Availability requirements for the telecommunications interfaces are outlined in Table 1-11-2.

1-11.2.2.3 Functional/Physical Interface Requirements

Physical interface requirement is for 100BaseT or 100BaseFL.

1-11.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

NASR workstations at FAA Headquarters are connected via local area networks that will have gateways bridged into the HDN. Onward connectivity from the HDN to other sites is ADTN.

The protocol, transmission, and FAA hardware requirements related to the NASR interfaces with the switched networks are summarized in Table 1-11-1.

As data exchange integration is achieved with NIMA and NOS, communication links will be required for access and tr4ansfer of data.

1-11.4 ACQUISITION ISSUES

Table 1-11-2 presents the schedule of circuit activation for NASR.

1-11.4.1 Telecommunications Costs

The circuit activation information provided by the program office, and displayed in Table 1-11-2 is the basis for the projected cost figures as shown in Table 1-11-3. Although the exact connectivity requirements between the ATCSCC and the Defense Mapping Agency Aerospace Center (DMAAC) St. Louis, MO, and the ATCSCC and International Airline Passengers Association (IAPA) Oklahoma City, OK, have not yet been specified, 56 kbps circuits between those locations are included in Table 1-11-3 as placeholders for the cost of those circuits in FY01-FY06.

In accordance with FAA Order 2500.8A, leased telecommunications costs (non-recurring and recurring) for the year of activation and one year following are shown in the table as being funded under Facilities and Equipment (F&E).

Table 1-11-2. Circuit Activation Schedule

To	From	Avail. Req'mt	System/ Rate/ Miles	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
Telecommunications Interfaces											
Aeronautical Information System											
ATCSCC (Herndon, VA)	NOS (Silver Spring, MD)	None Specified	DMN/LINCS/ 28.8 kbps/40 mi.	0	0	1	0	0	0	0	0
ATCSCC (Herndon, VA)	NIMA (St. Louis, MO)	None Specified	Unknown	0	0	0	1	0	0	0	0
ATCSCC (Herndon, VA)	*IAPA (Oklahoma City)	None Specified	Unknown	0	0	0	1	0	0	0	0

Notes: * This circuit provided on existing T-1 with no cost to ODMS ** This circuit provided by EDS
*** This circuit provided by DoD **** IAPA = Instrumented Approach Procedures Automation

Notes: * IAPA = Instrumented Approach Procedures Automation

Table 1-11-3. Cost Summary - NASR

CIP # A-08	All costs in 000's	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
ATCSCC <---> NADIN II									
	Cost Profile: A-A / DMN / LINCS 19.2 kbps Circuits with 1 Pair of Codex 3600P Modems per Circuit								
Channel Costs									
	Channels added		0	0	0	0	0	0	0
	Total channels	1	1	1	1	1	1	1	1
	F&E Funded Channels		0	0	0	0	0	0	0
	OPS Funded Channels		1	1	1	1	1	1	1
	F&E Non-recurring Channel Costs		$0	$0	$0	$0	$0	$0	$0
	Recurring Channel Costs								
	F&E Recurring Costs		$0	$0	$0	$0	$0	$0	$0
	OPS Recurring Costs		$1	$1	$1	$1	$1	$1	$1
Hardware Costs									
	Hardware Units Added		0	0	0	0	0	0	0
	Total Hardware Units	2	2	2	2	2	2	2	2
	F&E Funded HW Units		0	0	0	0	0	0	0
	OPS Funded HW Units		2	2	2	2	2	2	2
	F&E Non-recurring Hardware Costs		$0	$0	$0	$0	$0	$0	$0
	Recurring Hardware Costs								
	F&E Recurring Costs		$0	$0	$0	$0	$0	$0	$0
	OPS Recurring Costs		$0.1	$0.1	$0.1	$0.1	$0.1	$0.1	$0.1

SUMMARY

		FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$0	$0	$0	$0	$0	$0	$0
	F&E Total	$0	$0	$0	$0	$0	$0	$0
OPS Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$1	$1	$1	$1	$1	$1	$1
	OPS Total	$1	$1	$1	$1	$1	$1	$1

CHAPTER 1-12 - SUMMARY SHEET

OCEANIC AIR TRAFFIC MANAGEMENT SERVICE (OATMS)

Program/Project Identifiers:

Project Number(s):	CIP A-10
Related Program(s):	CIPs A-05, C-07, C-20, N-12, W-04
New/Replacement/Upgrade?	New/Replacement
Responsible Organization:	AUA-600
Program Mgr./Project Lead:	Nancy Graham, AUA-600, (202) 366-5316
Fuchsia Book POC:	Steve Holliday, (202) 493-0479

Assigned Codes:

PDC(s):	KO
PDC Description:	Oceanic Traffic Planning System (OTPS) Data Circuits
Service Code:	ARIN

Cost Estimates *:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$121	$121	$121	$121	$121	$121	$121
Total OPS	**$121**	**$121**	**$121**	**$121**	**$121**	**$121**	**$121**

*Cost data provided by the Program Office.

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CIP Category: Automation	1-12.0 OCEANIC AIR TRAFFIC MANAGEMENT SERVICE (OATMS)

1-12.1 PROGRAM OVERVIEW

The Dynamic Ocean Track System (DOTS Plus) is part of the Oceanic Air Traffic Management Service (OATMS) which is a traffic management and planning system for the United States and the surrounding oceanic areas. The OATMS supports the Ocean Control Area Air Traffic Control Supervisors and Traffic Management Unit (TMU) Traffic Management Specialists in managing and planning air traffic in the oceanic airspace at the following air traffic control centers: New York Air Route Traffic Control Center (ARTCC), Oakland ARTCC, Anchorage ARTCC, the Air Traffic Control System Command Center (ATCSCC) and the William J. Hughes Technical Center (WJHTC).

1-12.1.1 Purpose of the Oceanic Air Traffic Management Service

The purpose of the OATMS is to provide near-term improvements, using current technology, to air traffic control (ATC) oceanic operations to reduce controller workload, reduce ground delays, and allow for a more efficient use of oceanic airspace. The system consists of Track Advisory (TA), Track Generation, and Traffic Monitor Display.

1-12.1.2 References

1-12.1.2.1 FAA Aviation System Capital Investment Plan (CIP), Project No. A-10, January 1996.

1-12.1.2.2 The 1994 Federal Aviation Administration Plan for Research, Engineering and Development.

1-12.1.2.3 Dynamic Ocean Track System Plus Requirements Document (DOTS-RD-1.1.1).

1-12.2 SYSTEM DESCRIPTION

The OATMS is being developed to manage oceanic air traffic through the use of automated information gathering techniques and a route development and analysis tool. DOTS Plus generates the most fuel and time efficient oceanic tracks based upon current wind and weather data. These tracks are coordinated with the users and then published on a daily basis. A Track Advisory system permits users to establish gateway reservations for departures of oceanic flights. The resulting tracks provide more efficient, minimum time routes that directly benefit the airlines.

1-12.2.1 Program/System Components

1-12.2.1.1 Principal Components

The present OATMS consists of four computer workstations (two workstations are servers and two are workstations), printers, a plotter, and interface devices. The workstations are connected via a token ring local area network. The OATMS functions are: (1) Traffic Monitoring Display (TMD), (2) Traffic Planning Display (TPD), and (3) System Management Unit (SU). The TMD is used to monitor airspace. Traffic Management Unit Specialists use one of the two TMDs; oceanic Air Traffic Control Supervisors use the other TMD. TMU Specialists who are responsible for generating flexible tracks and Track Advisory use the TPD. The SU is used by the System Manager to provide System Management and monitoring functions. The present OATMS was installed and operational at all oceanic centers by May 1, 1998.

The systems are located at Oakland ARTCC, Anchorage ARTCC, New York ARTCC, the Air Traffic Control System Command Center, and the FAA William J. Hughes Technical Center. The physical location for the equipment at Oakland is in the En Route Operations Area. At Anchorage, the equipment is adjacent to the MVP/MAP AREA WORKSTATION in the Control Area First Floor. At New York, the equipment has been moved into the new oceanic and en route control room. At the Technical Center, the equipment is in the Oceanic Development Facility (ODF) Lab. The equipment is in the Command Room at the Air Traffic Control System Command Center.

1-12.2.1.2 Functional Component Interface Requirements

The OATMS connectivity and information flow is shown in Figure 1-12-1.

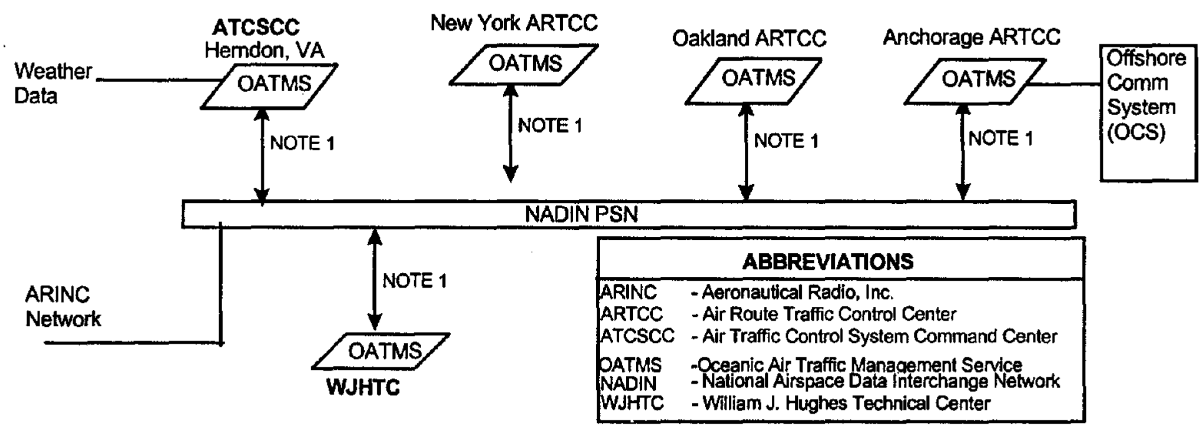

Figure 1-12-1. OATMS Telecommunications Connectivity and Information Flow

NOTE 1 - Connectivity with dial back up (DOTS Plus). Plus VG8 Leased lines ATCSCC to Leesburg NADIN Node.

1-12.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

The FAA requires dial backup and buffer storage capability for message integrity and error handling. International diversity and routing requirements are under study by the International Civil Aviation Organization (ICAO) in several regional-working groups. Additional cost to the FAA to implement ICAO-recommended diversity measures will be identified, as these requirements become known.

1-12.3.1 Telecommunications Interfaces

The OATMS has three Telecommunications interfaces, one to the NADIN packet switched network, one to the ISDN lines and for ZAN, and one to the Offshore Communications System (OCS). The system has the capability to route all OCS messages from the Anchorage (ZAN) OATMS to the Oakland (ZOA) OATMS. In addition, the OATMS has the ability to send approved generated tracks to the defined external addresses through the NADIN PSN network over the ARINC PSN Gateway to the ARINC network. OATMS connects indirectly to the ARINC network, via the NADIN PSN. The interfaces are summarized in Table 1-12-1. The new OATMS system will use NADIN PSN as a primary communication link. In addition, as an interim until the Command Center has a NADIN PSN node, one VG8 leased line carries NADIN PSN data from the Command Center to the Leesburg NADIN Node using CODEX 3600 modems at 19.2 kbps.

Table 1-12-1. OATMS Telecommunications Interface Summary

SUBSYSTEM INTERFACE		OCS	NADIN PSN
INTERFACE CONTROL DOCUMENTATION		OCS ICD	
PROTOCOL REQUIREMENTS	Network Layer		X.25
	Data Link Layer		
	Physical Layer	RS232-C	RS-232-C
	Special Formats/ Codes	STX/ETX	
TRANSMISSION REQUIREMENTS	No. Channels	1	1
	Speed (kbps)	9.6	19.2
	Simplex Half/Full Duplex	FD	FD
	Service	Subscriber	Subscriber
HARDWARE REQUIREMENTS	Modem	GFE	GFE X.25 interface card
	Cable/ Miscellaneous		

Note: The ISDN lines are leased from various communications vendors. They have RJ45 connectors, 1 channel, 128K, FD Subscriber, RETOURA router.

1-12.3.2 Local Interfaces

The workstations are connected via a Token Ring local area network. The network is connected in a ring configuration using CAT 5 twisted pair with a line terminator at each end.

Weather data is received at the ATCSCC weather server and distributed to the other OATMS systems via ISDN dial up lines.

1-12.4 ACQUISITION ISSUES

The project completed its initial F&E activities in early 1993. The DOTS Plus system, which is a hardware and software re-host effort, is presently installed and operational at all sites.

1-12.4.1 Planned Telecommunications Strategies

OATMS telecommunications strategies call for leased service support under F&E. O&M support began in FY99. Transition to NADIN commenced in FY97 and was completed by May 1, 1998. The ARINC lines were terminated as of May 1, 1998 with an annual saving of $800,000.

1-12.4.2 Telecommunications Costs

Table 1-12-2 provides the estimated program costs for FY00 through FY06. The OATMS completed F&E funding in FY93. The OATMS will be using NADIN PSN as a primary communication link and the following telecommunications costs are confined to ARINC-related message processing.

Table 1-12-2. Cost Summary - OATMS

CIP # A-10	All costs in 000's	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
1. OTPS <---> OTPS									
	1a. ARTCC to ARTCC and WJHTC via NADIN PSN								
Channel Costs			*N/A - No Chargeback for Use of NADIN PSN*						
	1b. ATCSCC to ZDC ARTCC								
Channel Costs									
	F&E Recurring Costs		**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.0**
	OPS Recurring Costs		**$0.9**	**$0.9**	**$0.9**	**$0.9**	**$0.9**	**$0.9**	**$0.9**
Hardware Costs									
	Cost profile: Codex 3600 Modems								
	Hardware Units Added		0	0	0	0	0	0	0
	Total Hardware Units	2	2	2	2	2	2	2	2
	F&E Funded HW Units		0	0	0	0	0	0	0
	OPS Funded HW Units		2	2	2	2	2	2	2
	F&E Non-recurring HW Costs		**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.0**
	OPS Recurring HW Costs		**$0.1**	**$0.1**	**$0.1**	**$0.1**	**$0.1**	**$0.1**	**$0.1**
	1c. ARTCC to ARTCC and WJHTC via ISDN Dial Backup								
Channel Costs									
	F&E Recurring Costs		**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.0**
	OPS Recurring Costs		**$120.0**	**$120.0**	**$120.0**	**$120.0**	**$120.0**	**$120.0**	**$120.0**
2. OTPS <---> ARINC									
	Cost Profile: ARINC Network Usage								
Processing Usage Costs									
	F&E Recurring Costs		**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.0**
	OPS Recurring Costs		**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.0**
3. OTPS <---> OCS via NADIN PSN			*N/A - No Chargeback for Use of NADIN PSN*						
			SUMMARY						
	F&E Totals	Non-recurring	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
		Recurring	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
		F&E Totals	**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.0**
	OPS Totals	Non-recurring	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
		Recurring	$120.9	$120.9	$120.9	$120.9	$120.9	$120.9	$120.9
		OPS Totals	**$120.9**	**$120.9**	**$120.9**	**$120.9**	**$120.9**	**$120.9**	**$120.9**

ARINC usage costs provided by the Program Office.

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CHAPTER 1-13 - SUMMARY SHEET

STANDARD TERMINAL AUTOMATION REPLACEMENT SYSTEM (STARS)

Program/Project Identifiers:

Project Number(s):	CIP A-01 AND A-02
Related Program(s):	CIPs A-03, A-05, A-11, A-13, C-20, F-01, F-02, F-04, S-03, W-03, W-07, W-09, R,E&Ds 031-110, 032-110
New/Replacement/Upgrade?	Replacement
Responsible Organization:	AUA-310
Program Mgr./Project Lead:	Alan Feinberg, AUA-310, (202) 264-3545
Fuchsia Book POC:	Ralph Allen, AUATAC, (202) 314-1455

Assigned Codes:

PDC(s):	BF, BR, DA, DC, DO, DS, DT, MT, OR, NF, NS, RB, RC, RD, US, WC
PDC Description:	ARINC, DBRITE, FDIO, CTAS, ETMS, SMA, ITWS, Mode-S, Radar, TDWR, TML circuits
Service Code(s):	ARIN, FDAT, HCAP, IDAT, METI, MNTC, MODS, RDAT, RTRD, TDWR, TRAD

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$408	$1,299	$2,385	$1,381	$1,321	$66	$1,294
F&E Recurring	$407	$1,809	$4,416	$4,488	$3,112	$1,731	$5,620
Total F&E	**$816**	**$3,108**	**$6,801**	**$5,870**	**$4,433**	**$1,797**	**$6,914**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$0	$48	$424	$1,940	$4,840	$6,428	$7,952
Total OPS	**$0**	**$48**	**$424**	**$1,940**	**$4,840**	**$6,428**	**$7,952**

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CIP Category:
Automation

1-13.0 STANDARD TERMINAL AUTOMATION REPLACEMENT SYSTEM

1-13.1 PROGRAM OVERVIEW

1-13.1.1 Purpose of the Standard Terminal Automation Replacement System

The Standard Terminal Automation Replacement System (STARS) program is a component of the Terminal Integrated Management Team. The mission of STARS is to standardize and modernize the automation of operational Air Traffic Control (ATC) terminal facilities while providing the capacity to meet current and projected air traffic demand. STARS will replace the existing Automated Radar Terminal System (ARTS) located at the FAA Terminal Radar Approach Control (TRACON), Digital Bright Radar Indicator Tower Equipment (DBRITE) located at FAA Airport Traffic Control Towers (ATCTs), and various ATC systems located at DoD terminal control facilities.

The FAA and DoD jointly sponsor the STARS program. The STARS Integrated Product Team is responsible for managing the STARS program.

1-13.1.2 References

1-13.1.2.1 FAA-E-2904, STARS System Level Specification (SLS), February 8, 1996.

1-13.1.2.2 FAA Aviation Systems Capital Investment Plan (CIP), CIP # A-04, January 1999.

1-13.1.2.3 Phase 3 STARS Operational Requirements Document (ORD), May 30, 1996.

1-13.1.2.4 ASR-9/STARS ICD, NAS-IC-34032105, August 24, 1999

1-13.1.2.5 En Route Surveillance Radar/Terminal Air Traffic Control System ICD, NAS-IC-34130001, March 01, 1999

1-13.1.2.6 DASR/ASR-11 ICD, Raytheon G710794 Rev D, August 31, 1999

1-13.1.2.7 Terminal/En Route Interfacility Interface NAS-IC-21058217 ICD, March 01, 1999

1-13.1.2.8 STARS/ETMS ICD NAS-IC-2052100, March 01, 1999

1-13.1.2.9 STARS Operational Site to Local/Remote Towers ICD, STARS CDRL E004-004G, September 10, 1999

1-13.1.2.10 STARS Operational Site to Operational Support Facility ICD, STARS CDRL E004-002E, November 30, 1999

1-13.1.2.11 STARS Central Support Complex (SCSC) ICD, STARS CDRL E004-008E, August 30 1999

1-13.2 SYSTEM DESCRIPTION

STARS is a fully digital system consisting of software, processors, displays, local and remote connectivity, and interfaces. STARS will be used to support both primary and secondary radar target identification, maintenance of target identity, radar separation, traffic and weather advisory services, and navigational assistance to participating aircraft. The STARS design approach allows for system evolution and growth needed to facilitate increasing levels of ATC automation functionality, improved weather display and surveillance through system upgrades and the establishment of new system interfaces.

Additional functionality and user benefits will be achieved via a program of Pre-Planned Product Improvements (P3I). Completion of the defined P3I will result in the implementation of capabilities such as data link communications between the pilot and controller, traffic management enhancements, and parallel runway monitoring. The successfully developed, individual P3I will interface to STARS through the Applications Interface Gateway (AIG) through group software releases called Enhanced System Capability (ESC) packages. Updated release packages are scheduled once each year.

1-13.2.1 System Components

STARS consists of an automation subsystem with tower displays and three remote support subsystems as follows:

- The automation subsystem will provide processing and display functions at operational terminal ATC facilities, including tower display functions. Processors, workstations, and communications gateway and routers will be located at FAA TRACONs to accept, process, and display single-sensor or multi-sensor surveillance, intrafacility, National Airspace System (NAS) interfacility, and other input data. The data displayed will include aircraft position data, aircraft status, flight plan information, weather, and general information. Terminal ATC data will be displayed both in the TRACONs and in ATCTs within the terminal area. The STARS Tower Display Workstations (TDWs) will have the same functionality as the workstations in the TRACONs. The automation subsystem will exchange data with each type of STARS support subsystem.

- The Operational Support Facility (OSF) subsystem will support hardware and software maintenance, including site adaptation and site support, for up to 41 automation subsystems. The subsystem will be able to interface with up to six automation subsystems simultaneously. There will be up to nine OSF locations.

- The STARS Central Support Complex (SCSC) located at the William J. Hughes Technical Center (WJHTC) will provide field support and software development. The SCSC will interface to each OSF subsystem via a wide area network (WAN). The WAN specifications are to be determined, but at this time it will consist of dial up lines. The SCSC will be able to interface with up to 12 automation subsystems simultaneously.

1-13.2.2 Functional Component Interface Requirements

The STARS interfaces are shown in Figure 1-13-1.

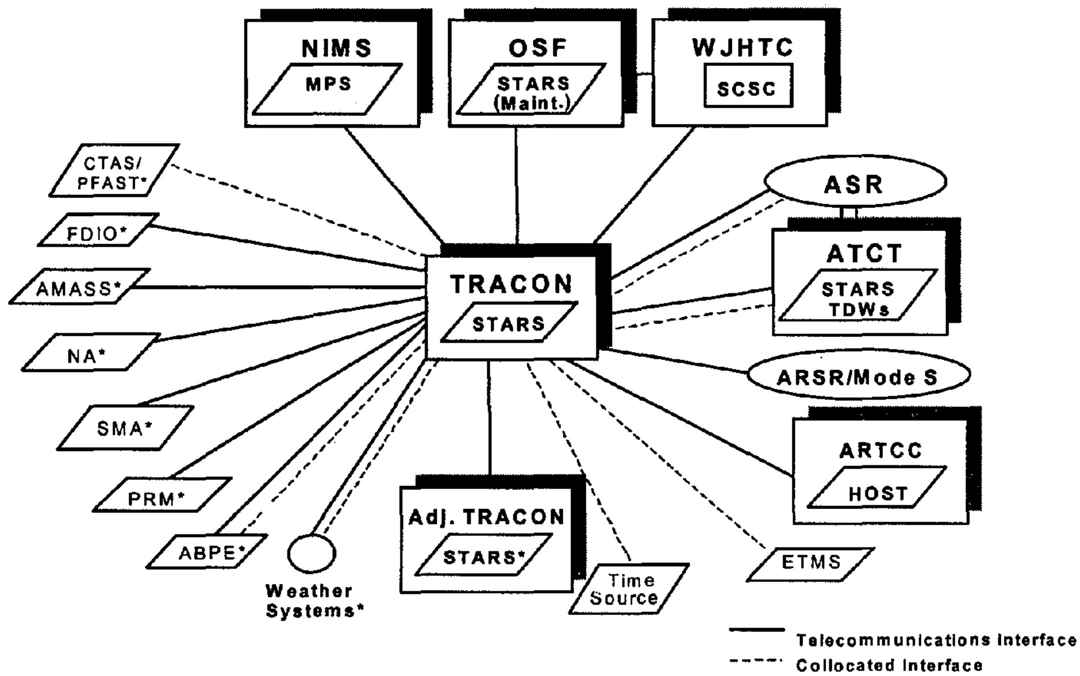
1-13.2.2.1 Telecommunications Interfaces

1-13.2.2.1.1 Automation to Remote Tower Display Workstation (TDW)

These interfaces will provide for the transmission of radar, beacon, weather, and ATC data to STARS TDWs located at local and remote ATCTs. These interfaces will replace the existing ARTS to DBRITE interface. Automation systems collocated with the tower will be connected via local cable. The remote tower connects will require circuit speeds varying from one T1 to four T1s. The percentage of total remote towers that require: one T1 is 41%, two T1s is 32%, three T1s is 17%, and four T1s is 10%. The bandwidth requirements are expected to be revised downward as one or more alternatives are explored and implemented to reduce the bandwidth.

1-13.2.2.1.2 Automation to Operational Support Facility (OSF) and STARS Central Support Complex (SCSC)

The STARS operational systems will have the capability to interface to an OSF subsystem or to the SCSC to support the transfer of system software, system performance data, resource status data, diagnostic data, and system resource control data. Operational sites collocated with the OSF will be connected via local cable.



*Note: Asterisk indicates future interface (Preplanned Product Improvement)

ABBREVIATIONS

ABPE – Automated Barometer Pressure Entry	MODE-S – Mode Select Beacon System Sensor
Adj. – Adjacent	MPS-Maintenance Processor System
AMASS – Airport Movement Area Surveillance System	NA – Noise Abatement
ARSR – Air Route Surveillance Radar	NIMS-NAS Infrastructure Management System
ARTCC – Air Route Traffic Control Center	OCC – Operations Control Center
ASR – Airport Surveillance Radar	OSF – Operations Support Facility
ATCT – Airport Traffic Control Tower	PRM – Precision Runway Monitor
CTAS/pFAST – Center TRACON Automation System/ Passive Final Approach Spacing Tool	SCSC – STARS Central Support Complex
ETMS – Enhanced Traffic Management System	SMA – Surface Movement Advisor
FDIO – Flight Data Input/Output	STARS – Standard Terminal Automation Replacement System
M&C – Monitor and Control	TRACON – Terminal Radar Approach Control
Maint. – Maintenance	WJHTC – William J. Hughes Technical Center

Figure 1-13-1. Standard Terminal Automation Replacement System Interfaces

1-13.2.2.1.2 STARS OSF to SCSC

The STARS OSF subsystem will interface to the SCSC to support the transfer of system software, system performance data, resource status data, diagnostic data, and system resource control data.

1-13.2.2.1.3 Airport Surveillance Radar (ASR) to STARS

STARS will interface with the ASR-9/11 and the (upgraded) ASR-8. This interface is functionally equivalent to the existing ASR to ARTS surveillance interface. STARS will receive primary and beacon target surveillance and weather data. This interface will also provide surveillance and weather data directly to the STARS TDWs in the remote ATCTs whenever the automation subsystem is not available.

1-13.2.2.1.4 Air Route Surveillance Radar (ARSR)/Mode S to STARS

STARS will interface with the ARSR-3/4, Common Digitizer-1/2 collocated with the ARSR-1/2, or with Mode S beacon sensors collocated with the CD-2/ARSR-1/2. STARS will receive long range primary and beacon target surveillance data and weather data.

1-13.2.2.1.5 NAS Infrastructure Management System (NIMS)

The STARS operational systems will interface with the NIMS Maintenance Processor System (MPS) to support remote monitoring and control. Each STARS equipped TRACON will exchange monitoring and control information for itself and the attached towers.

1-13.2.2.1.6 STARS to HOST

The STARS interface is identical to the existing ARTS to ARTCC Host Computer System interface. The data exchanged will include flight plan and track messages.

1-13.2.2.1.7 P3I Interfaces

The following interfaces are future requirements based on P3I. Some of these interfaces will require telecommunications services and equipment. Additional information on these interfaces will be provided as telecommunications requirements are identified. The systems to be interfaced include:

- STARS-to-STARS Interface
- Automated Barometric Pressure Entry (ABPE)
- Weather Systems (Integrated Terminal Weather System (ITWS), Terminal Doppler Weather Radar (TDWR), ASR-9 Wind Shear Processor)
- Precision Runway Monitor (PRM)
- Flight Data Input/Output (FDIO) Integration into STARS
- Center TRACON Automation System (CTAS)
- Enhanced Traffic Management System (ETMS) (interface upgrade)
- Automatic Dependent Surveillance (ADS) (surveillance interface upgrade)
- Surface Movement Advisor (SMA)
- pFast passive Final Approach Spacing Tool (pFAST)
- Noise Abatement/Monitoring (NA)
- Airport Movement Area Surveillance System (AMASS)

1-13.2.2.2 Local Interfaces

1-13.2.2.2.1 STARS to Enhanced Traffic Management System

STARS will interface with a collocated ETMS which is part of the Traffic Management Unit (TMU) to utilize traffic flow information. A local cable will provide the connection for collocated facilities and dedicated lines are needed for remote facilities. The TMU/ETMS will be located at 30 of the total TRACON facilities.

1-13.2.2.2.2 National Time Standard to STARS

This unidirectional interface will provide STARS a calibrated time reference for data synchronization and time stamping of data. A local cable will provide the connection.

1-13.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

The protocol, transmission, and hardware requirements for the STARS interfaces are summarized in Table 1-13-1. After certification of the STARS, the current communications equipment and network services supporting the ARTS interfaces to the DBRITE will be decommissioned.

Table 1-13-1. STARS INTERFACE REQUIREMENTS SUMMARY

SUBSYSTEM INTERFACE		ASR-9	ARSR-3/4 CD-2, MODE S	ETMS	DASR/ASR-11	EN ROUTE HOST COMPUTER
INTERFACE CONTROL DOCUMENTATION		NAS-IR-34032105	NAS-IC-34130001	NAS-IC-2052100	Raytheon G710794	NAS-IC-21058217
PROTOCOL REQUIREMENTS	NETWORK LAYER					
	DATA LINK LAYER	CD/ASR	CD-2	ASCII	HDLC	CD
	PHYSICAL LAYER	EIA-530	EIA-232-E	EIA-232-C	EIA-530	EIA-232-E
	SPECIAL FORMATS/CODE			SEE ICD		EBCDIC
TRANSMISSION REQUIREMENTS	NO. CHANNELS	4	4	1	2	1
	SPEED (KBPS)	9.6	2.4	2.4-9.6	56	2.4-9.6
	SIMPLEX, HALF/FULL DUPLEX	FULL-DUPLEX	FULL-DUPLEX	FULL-DUPLEX	FULL-DUPLEX	FULL-DUPLEX
	SERVICE	POINT-TO-POINT	POINT-TO-POINT	POINT-TO-POINT	POINT-TO-POINT	POINT-TO-POINT
HARDWARE REQUIREMENTS	MODEM	GFE	GFE	GFE	GFE	GFE
	DATA BRIDGE					
	CLOCK					
	A/B SWITCH					
	DSC					
	CABLE/MISC.					

TABLE 1-13-1. STARS INTERFACE REQUIREMENTS SUMMARY (CONTINUED)

SUBSYSTEM INTERFACE		REMOTE TOWER (DISPLAYS)	NIMS (REMOTE M&C)	OSF (REMOTE MAINT)	SCSC
INTERFACE CONTROL DOCUMENTATION		VENDOR PROVIDED	NAS-IR-510700001	VENDOR PROVIDED	VENDOR PROVIDED
	ASSOCIATED CDRL	E004-004	TBD	E004-002	E004-008
PROTOCOL REQUIREMENTS	NETWORK LAYER	TCP/IP	UDP	TCP/IP	TCP/IP
	DATA LINK LAYER	PPP	HDLC	PPP	PPP
	PHYSICAL LAYER	V.35	V.35	V.35	V.35
	SPECIAL FORMATS/CODE				
TRANSMISSION REQUIREMENTS	NO. CHANNELS	DEPENDS UPON TOWER LEVEL	1LINE PER OPERATIONAL SITE	6 DIALUP LINE S	6 DIALUP LINES
	SPEED (KBPS)	1 X T1-4XT1	64	28.8 OR BETTER	28.8 OR BETTER
	SIMPLEX, HALF/FULL DUPLEX	FULL-DUPLEX	FULL-DUPLEX	FULL-DUPLEX	FULL-DUPLEX
	SERVICE	POINT-TO-POINT	POINT-TO-POINT	DIAL-UP SYNC.	DIAL-UP SYNC
HARDWARE REQUIREMENTS	MODEM	GFE	GFE	GFE	GFE
	DATA BRIDGE				
	CLOCK	GFE	GFE	GFE	GFE
	A/B SWITCH				
	DSC				
	CABLE/MISC.				

1-13.4 ACQUISITION ISSUES

1-13.4.1 Program Schedule and Status

The STARS FAA initial sites to be installed are shown below. Table 1-13-2 shows the planned implementation schedule for the STARS interfaces.

Contract Award	September 1996
Initial/Operational Capability (IOC) El Paso	December 1999
Initial/Operational Capability (IOC) Syracuse	February 2000

Table 1-13-2. STARS INTERFACE IMPLEMENTATION SCHEDULE

See Notes

INTERFACE	DIVERSITY REQ'MT	SYSTEM/ NO. CHANNELS X RATE	PRIOR YEARS	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
External Interfaces										
ARSR TO STARS	NO	9.6 KBPS	0	2	3	11	5	5	5	5
STARS OPERATIONAL SITE TO REMOTE TOWER	SITE DEPENDENT	1-4 T1S SITE DEPENDENT	0	3	16	43	21	5	19	57
STARS OPERATIONAL SITE /NIMS	NO	64 KBPS	0	3	14	36	43	45	40	3
STARS OPERATIONAL SITE /OSF	NO	DIAL-UP	0	1	5	3	0	0	0	0
OSF/ SCSC	NO	DIAL-UP	0	1	5	3	0	0	0	0

Notes Existing ASR interfaces will be used. No new telecommunications required.
Existing HOST/ARTS interfaces will be used. No new telecommunications required.
Existing TRACON to D-BRITE interfaces to be decommissioned.
FY00 Implementation is on hold pending test results at Syracuse and El Paso.

1-13.4.2 Planned Telecommunications Strategies

The planned implementation strategy assumes the Automation to OSF interface will utilize FTS-2000. All other interfaces in Table 1-13-2 are served by a combination of LINCS, RCL, and field cable.

The terminal surveillance to STARS interfaces will re-use existing automation communications.

The terminal surveillance to remote tower interfaces will be accomplished via a passive tap of the surveillance to automation interface using fan-out equipment at the TRACON.

Long-range radar to automation interfaces will be provided via new communications.

The STARS to Host interface will utilize the existing Host to ARTS communications.

The STARS to Remote towers will require the largest demand for new communications bandwidth. The bandwidth requirements will vary greatly depending upon several factors including: tower level, number of radars, number of workstations at the tower, and the reliability demanded of the communications pathway. It is expected that bandwidth optimization will occur by sharing the communications circuits with other tower communications users.

1-13.4.3 Telecommunications Costs

The leased telecommunications costs identified in the Cost Summary, Table 1-13-3, are based on the interface implementation schedule contained in Table 1-13-2. These costs reflect the program's current connectivity requirements. It must be stressed that the communications costs are tentative and that the

STARS program is actively exploring ways to significantly reduce the communications requirements for remote towers. More concrete numbers will be available by the next revision of this book.

Table 1-13-3. Cost Summary – STARS

CIP # A-01 & A-02 All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
1a. STARS <---> ATCT - Automation/Remote Tower Display								
Cost Profile: 1 LINCS DDC T-1 per Site (see Note 1)								
Channel Costs								
Channels Added		0	0	1	0	0	2	1
Total Channels	0	0	0	1	1	1	3	4
F&E Funded Channels		0	0	1	1	0	2	3
OPS Funded Channels		0	0	0	0	1	1	1
F&E Non-recurring Channel Costs		**$0**	**$0**	**$4**	**$0**	**$0**	**$9**	**$4**
Recurring Channel Costs								
F&E Recurring Costs		**$0**	**$0**	**$25**	**$25**	**$0**	**$51**	**$76**
OPS Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$25**	**$25**	**$25**
1b. STARS <---> ATCT - Automation/Remote Tower Display								
Cost Profile: 2 LINCS DDC T-1s per Site (see Note 1)								
Channel Costs								
Channels Added		6	30	58	32	32	6	20
Total Channels	0	6	36	94	126	158	164	184
F&E Funded Channels		6	36	88	90	64	38	26
OPS Funded Channels		0	0	6	36	94	126	158
F&E Non-recurring Channel Costs		**$25**	**$126**	**$255**	**$141**	**$141**	**$26**	**$88**
Recurring Channel Costs								
F&E Recurring Costs		**$145**	**$868**	**$2,228**	**$2,278**	**$1,620**	**$962**	**$658**
OPS Recurring Costs		**$0**	**$0**	**$152**	**$911**	**$2,380**	**$3,190**	**$4,000**
1c. STARS <---> ATCT - Automation/Remote Tower Display								
Cost Profile: 3 LINCS DDC T-1s per Site (see Note 1)								
Channel Costs								
Channels Added		0	0	0	0	0	0	3
Total Channels	0	0	0	0	0	0	0	3
F&E Funded Channels		0	0	0	0	0	0	3
OPS Funded Channels		0	0	0	0	0	0	0
F&E Non-recurring Channel Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$13**
Recurring Channel Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$76**
OPS Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
1d. STARS <---> ATCT - Automation/Remote Tower Display								
Cost Profile: 4 LINCS DDC T-1s per Site (see Note 1)								
Channel Costs								
Channels Added		0	0	0	0	0	0	188
Total Channels	0	0	0	0	0	0	0	188
F&E Funded Channels		0	0	0	0	0	0	188
OPS Funded Channels		0	0	0	0	0	0	0
F&E Non-recurring Channel Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$826**
Recurring Channel Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$4,759**
OPS Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

Table 1-13-3 Cost Summary - STARS (Continued)

CIP # [illegible]1 & [illegible]02 — All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
1e. STARS <---> ATCT - DDC Platform and Related Hardware								
Cost Profile: 1 DDC Platform/Spare per TRACON and each Remote Tower (see Note 2)								
DDC Platform/Spare Costs								
Platforms/Spares Added		27	54	66	50	49	5	59
Total Platforms/Spares	28	55	109	175	225	274	279	338
F&E Funded Platforms		55	81	120	116	99	54	64
OPS Funded Platforms		0	28	55	109	175	225	274
F&E Non-recurring Platform Costs		**$158**	**$315**	**$405**	**$307**	**$301**	**$31**	**$362**
Recurring Platform Costs								
F&E Recurring Costs		**$42**	**$61**	**$95**	**$92**	**$79**	**$43**	**$51**
OPS Recurring Costs		**$0**	**$21**	**$44**	**$87**	**$139**	**$179**	**$218**
2. STARS <---> NIMS								
Cost Profile: LINCS DDS 64 kbps Circuits (see Note 3)								
Channel Costs								
Channels Added		25	69	113	69	65	0	0
Total Channels	4	29	98	211	280	345	345	345
F&E Funded Channels		29	94	182	182	134	65	0
OPS Funded Channels		0	4	29	98	211	280	345
F&E Non-recurring Channel Costs		**$116**	**$321**	**$552**	**$337**	**$318**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$130**	**$421**	**$856**	**$856**	**$630**	**$306**	**$0**
OPS Recurring Costs		**$0**	**$18**	**$136**	**$461**	**$992**	**$1,317**	**$1,622**
Cost Profile: CSU/DSU Units								
Hardware Costs								
Hardware Units Added		50	138	226	138	130	0	0
Total Hardware Units	8	58	196	422	560	690	690	690
F&E Funded HW Units		58	188	364	364	268	130	0
OPS Funded HW Units		0	8	58	196	422	560	690
F&E Non-recurring Hardware Costs		**$100**	**$276**	**$452**	**$276**	**$260**	**$0**	**$0**
Recurring Hardware Costs								
F&E Recurring Costs		**$6**	**$19**	**$36**	**$36**	**$27**	**$13**	**$0**
OPS Recurring Costs		**$0**	**$1**	**$6**	**$20**	**$42**	**$56**	**$69**
3. ARSR <---> STARS								
Cost Profile: LINCS DDC 9.6 kbps Circuits (see Note 4)								
Channel Costs								
Channels Added		1	29	76	34	32	0	0
Total Channels	0	1	30	106	140	172	172	172
F&E Funded Channels		1	30	105	110	66	32	0
OPS Funded Channels		0	0	1	30	106	140	172
F&E Non-recurring Channel Costs		**$4**	**$109**	**$300**	**$134**	**$126**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$8**	**$243**	**$892**	**$935**	**$561**	**$272**	**$0**
OPS Recurring Costs		**$0**	**$0**	**$8**	**$255**	**$901**	**$1,190**	**$1,462**

Table 1-13-3 Cost Summary - STARS (Concluded)

CIP # A-01 & A-02	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
	Cost Profile: 1 DDC Platform/Spare per ARSR								
DDC Platform/Spare Costs									
	Platforms/Spares Added		1	29	76	34	32	0	0
	Total Platforms/Spares	0	1	30	106	140	172	172	172
	F&E Funded Platforms		1	30	105	110	66	32	0
	OPS Funded Platforms		0	0	1	30	106	140	172
	F&E Non-recurring Platform Costs		**$5**	**$151**	**$417**	**$186**	**$176**	**$0**	**$0**
	Recurring Platform Costs								
	F&E Recurring Costs		**$1**	**$19**	**$70**	**$74**	**$44**	**$21**	**$0**
	OPS Recurring Costs		**$0**	**$0**	**$1**	**$20**	**$71**	**$94**	**$115**
4. STARS <---> OSF									
	Cost Profile: 1 FTS2000/2001 SVS Dial Access Line per STARS Location (TRACON) (see Note 5)								
Switched Service Costs									
	Dial Lines Added		24	39	36	34	33	0	0
	Total Dial Lines	4	28	67	103	137	170	170	170
	F&E Funded Lines		28	63	75	70	67	33	0
	OPS Funded Lines		0	4	28	67	103	137	170
	F&E Non-recurring Switched Service Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring Switched Service Costs								
	F&E Recurring Costs		**$54**	**$121**	**$144**	**$134**	**$129**	**$63**	**$0**
	OPS Recurring Costs		**$0**	**$8**	**$54**	**$129**	**$198**	**$263**	**$326**
5. STARS OSF <---> SCSC									
	Cost Profile: 6 FTS2000/2001 SVS Dial Access Lines per OSF, 6 Lines at the SCSC (see Note 5)								
Switched Service Costs									
	Dial Lines Added		12	18	18	12	0	0	0
	Total Dial Lines	0	12	30	48	60	60	60	60
	F&E Funded Lines		12	30	36	30	12	0	0
	OPS Funded Lines		0	0	12	30	48	60	60
	F&E Non-recurring Switched Service Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring Switched Service Costs								
	F&E Recurring Costs		**$23**	**$58**	**$69**	**$58**	**$23**	**$0**	**$0**
	OPS Recurring Costs		**$0**	**$0**	**$23**	**$58**	**$92**	**$115**	**$115**
		SUMMARY							
	F&E Totals	Non-recurring	$408	$1,299	$2,385	$1,381	$1,321	$66	$1,294
		Recurring	$407	$1,809	$4,416	$4,488	$3,112	$1,731	$5,620
		F&E Total	**$816**	**$3,108**	**$6,801**	**$5,870**	**$4,433**	**$1,797**	**$6,914**
	OPS Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$48	$424	$1,940	$4,840	$6,428	$7,952
		OPS Total	**$0**	**$48**	**$424**	**$1,940**	**$4,840**	**$6,428**	**$7,952**

<u>Notes:</u>
1. Average distance from TRACON to remote tower is 75 miles; 40% of TRACONS are EUL-A sites
2. 40% of TRACONS are EUL-A sites which require only a DDC spare
3. Average distance from TRACON to ARTCC (NIMS) is 100 miles.
4. Average distance from ARSR to TRACON is 300 miles.
5. Estimated usage is 2 hours/day/line

CHAPTER 2-01 - SUMMARY SHEET

AERONAUTICAL DATA LINK (ADL)

Program/Project Identifiers:

Project Number(s):	CIP C-20
Related Program(s):	CIPs A-01, 02, 04, 06, 10, 12, S-02, W-04, R,E&D 021-190, 022-110, 022-150, 031-110, 031-120, 031-130, 032-110, 041-110, 042-110
New/Replacement/Upgrade?	New
Responsible Organization:	AND- 370
Product Lead:	James H. Williams, AND- 370, (202) 493-4693
Fuchsia Book POC:	Doris Rinkus AND-370, (202) 493-4706

Assigned Codes:

PDC(s):	RL
PDC Description:	Operational Data Circuits for Aeronautical Data Link (ADL)
Service Code:	IDAT

Cost Estimates *:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	TBD	TBD	TBD	TBD
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$0	$0	$0	$0	$0	$0	$0
Total OPS	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

*No external leased telecommunications requirements have been identified.

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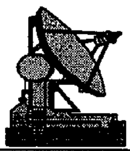
CIP Category:
Communications



2-01.0 EN ROUTE AERONAUTICAL DATA LINK

2-01.1 PROGRAM OVERVIEW

2-01.1.1 Purpose of the En Route CPDLC Program

The En Route Controller-Pilot Data Link Communications (CPDLC) Program supports the exchange of Air Traffic Control (ATC) information between FAA controllers and pilots using digital data link applications and technology based on CNS/ATM-1 standards and using Very High Frequency Digital Link (VDL) Mode 2 air-ground sub-networks. En route CPDLC will be implemented in a phased approach.

CPDLC Build I, or "CPDLC I" will provide early operational use and experience with recurring, routine, and repetitive controller-pilot messages in en route airspace by implementing a subset of the International Civil Aviation Organization (ICAO), Aeronautical Telecommunication Network (ATN), Standards and Recommended Practices' (SARPs), and CPDLC message set. CPDLC I will implement the messages/services required to perform Transfer of Communications (TOC), Initial Contact (IC), Altimeter Setting (AS), and Pre-Defined free text Messages (PDMs). These messages will be sent to data link-equipped aircraft using a service provider's VDL Mode 2 air/ground communications subnetwork. VDL Mode 2 is an evolutionary step satisfying performance and reliability requirements for situations in which the message is not time-critical and sufficient time is available for retransmission by voice or data if there is not confirmed receipt of the message. CPDLC Build I also includes the development and implementation of the ICAO ATN SARPs compliant Context Management Application (CMA) that provides aircraft log-in and supports the correlation of aircraft flight identifiers to aircraft network addresses. CPDLC Build I will be implemented at a key site only. The Build I key site Initial Operating Capability (IOC) date is in June 2002.

CPDLC Build IA or "CPDLC IA" will leverage the FAA's investment in the development of CPDLC Build I. CPDLC Build IA will increase the ATN compliant CPDLC message set to accommodate assignment of speeds, headings, and altitudes as well as a route clearance function. A capability to handle pilot-initiated altitude requests will also be implemented. CPDLC Build IA will continue to use the VDL Mode 2 air/ground communication subnetwork. CPDLC Build IA will be deployed nationally to all 20 domestic Air Route Traffic Control Centers (ARTCCs). The Build IA key site IOC date is June 2003. The national deployment of CPDLC IA will begin installation waterfall in January 2004 and complete by December 2004.

CPDLC Build II or "CPDLC II" will provide two-way digital exchange of numerous ATC messages between the ground and air. The additional messages in CPDLC II will include expanded altitude assignment, speed, heading, free text, menu text capabilities, additional pilot-initiated down link requests, and other enhancements to be determined. CPDLC II will also provide ATN services in the Oceanic Airspaces. This enhancement of CPDLC I and CPDLC IA will result in further reductions of voice congestion and associated problems and, therefore, further enhance safety, improve NAS efficiency, and provide additional economic benefits to users. As with CPDLC I and CPDLC IA, CPDLC II will be incorporated into controller displays, keyboards, and procedures to provide a fully integrated digital communications capability. CPDLC II will use CNS/ATM-1 ATN compliant communications processing and handling via the FAA NADIN Packet Switched Network or its replacement.

The En Route CPDLC is the responsibility of the Aeronautical Data Link Product Team, AND- 370.

2-01.1.2 References

2-01.1.2.1 FAA Aviation System Capital Investment Plan (CIP), Project C-20, Aeronautical Data Link, January 1999

2-01.1.2.2 Level I Design Document, NAS-DD-1000, May 1986, Section IV.

2-01.1.2.3 Level II System Specification, NAS-SS-1000, Vol. II, December 1986.

2-01.1.2.4 NAS System Requirements Specification, NAS-SR-1000, November 1991.

2-01.1.2.5 Draft Functional Specification for Data Link ATC Services in the En Route Computer System dated November 30, 1993.

2-01.1.2.6 Mission Need Statement (MNS) for Aeronautical Data Link Program (October 23, 1991)

2-01.1.2.7 Operational Requirements for the Aeronautical Data Link System (January 3, 1995)

2-01.1.2.8 Revalidated MNS #42 (May 20, 1998)

2-01.1.2.9 CPDLC I & IA Requirements Document (October 28, 1998)

2-01.1.2.10 Functional Specification for Controller-Pilot Data Link Communications (CPDLC IA), FAA-E-2930, December 16, 1998

2-01.1.2.11 CPDLC IA Hardware Requirements Document, August 31, 1999

2-01.2 EN ROUTE ADL SYSTEM DESCRIPTION

2-01.2.1 CPDLC Components

The CPDLC software and associated equipment will be located at the 20 ARTCCs in the Continental US (CONUS), as well as the FAA Technical Center (FAATC), and FAA Academy (FAAAC). The initial en route CPDLC system will comprise the following components:

a. CPDLC software in the Host Computer System (HCS) to provide the Computer Human Interface (CHI) functionality to the en route controller and HCS CPDLC message processing within the ARTCCs. The software to be fielded will be integrated with the Display System Replacement (DSR) environments.

b. Host Interface Device (HID) hardware and software to provide data link communications processing by the en route Data Link Application Processor (DLAP) via a Fiber Distributed Data

Interface (FDDI) National Airspace System (NAS) Local Area Network (LAN) and an interface to the HCS.

c. Router, consisting of commercial off-the-shelf (COTS) product connected to the HID/NAS LAN, providing an X.25 interface to the NADIN II network and an "Ethernet bridge" for non-FDDI users, e.g., Traffic Flow Management (TFM) systems.

d. Network System Manager (NSM) hardware and software and terminals on the NAS LAN to manage network resources and support the menu build functions.

e. Data Link Applications Processor (DLAP) hardware and software to provide ATN-compliant data link air/ground communications processing.

f. Context Management Application (CMA) hardware and software to provide aircraft log-in, log-out, archiving, and other measures monitoring, controlling, and recording system use.

2-01.2.1.1 Principal Components

As a result of the CPDLC effort, the en route computer systems will be capable of supporting the exchange of most routine ATC messages by way of Data Link. This capability will be integrated with current ATC procedures and sector control displays to provide the controller with a flexible, well-integrated, Data Link communications system.

2-01.2.1.1.1 CPDLC HCS Software

The CPDLC HCS software will interface with and complement the DLAP software functionality by providing the computer-human interface for controller inputs and display of data link messages and instruction symbology on the DSR platform. It will also provide essential Host NAS monitor software for HID/NAS LAN services.

2-01.2.1.1.2 Host Interface Device (HID)/National Airspace System (NAS) LAN

This component adds a HID to an existing Host channel and supports data exchanges between Host applications (e.g., data link) and applications processors on the NAS LAN (e.g., DLAP). The HID performs functions similar to those of the Peripheral Adapter Module Replacement Item (PAMRI) component of the HCS, serving as the interface between the HCS and the NAS LAN user systems such as DLAP, CTAS, etc. The router provides connectivity between the NAS LAN and NADIN PSN. The NAS LAN provides connectivity between the HCS, DLAP and UBI automation systems with NADIN PSN. The NAS LAN will be managed by way of the NSM, which will support the monitoring of health, status, and configuration of the NAS LAN components.

2-01.2.1.1.3 Data Link Applications Processor (DLAP)

The DLAP is a hardware/software platform used to partition data link processing in order to minimize the impact on the HCS. The DLAP performs the ATN formatting of CPDLC messages for transmission between the HCS and the aircraft avionics and provides the ability to edit and use "fill in the blank" and other menu selection features for the controller. The DLAP performs Extended Binary Coded Decimal Interchange Code (EBCDIC) to American Standard Code for Information Interchange (ASCII) conversions.

2-01.2.1.2 Functional Components Interface Requirements

The HID will interface with the HCS for all ADL and UBI automation systems' messages intended for HCS processing. The NAS LAN will be the access path among these End Systems (ESs). The DLAP on the NAS LAN will interface with the commercial service provider via a router connected to the NADIN PSN access path. All ADL messages exchanged between the HCS and airborne aircraft avionics will follow the HID/ NAS LAN, DLAP, router, NADIN PSN, and commercial service provider path.

2-01.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

The ADL interfaces are illustrated in Figure 2-01-1.

2-01.3.1 Telecommunications Interfaces

Table 2-01-1 summarizes the ADL interface requirements.

2-01.3.1.1 NSM to DLAP

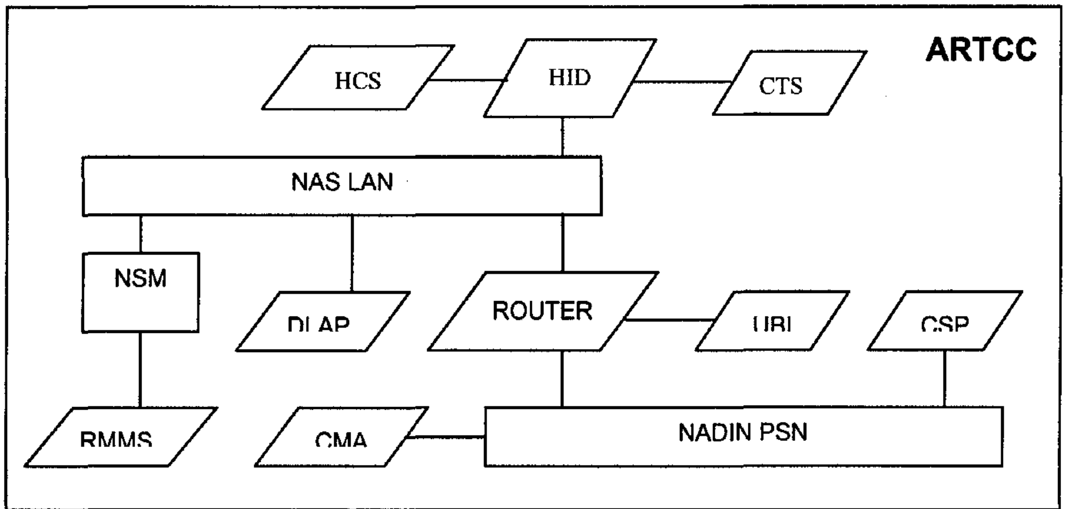
The NSM to DLAP interface will provide the path for monitoring and configuration messages for CPDLC.

2-01.3.1.1.1 Interface Requirements

There are no unique interface requirements for the NSM to DLAP interface.

2-01.3.1.1.2 Connectivity Requirements

The NSM and DLAP will interface via a TCP/IP network employing the SNMP protocol for status and configuration reporting.



ABBREVIATIONS			
CTS	- Coded Time Source	HID	- Host Interface Device
CSP	- Comm. Service Provider	NSM	- Network System Manager
DLAP	- Data Link Applications Processor	PSN	- Packet Switched Network
HCS	- Host Computer System	UBI	- User Benefits Infrastructure
RMMS	- Remote Maintenance Monitoring System	CMA	- Context Mgt. Application

Figure 2-01-1. ADL Interfaces

2-01.3.1.1.3 <u>Traffic Characteristics</u>

The message traffic between the NSM and the DLAP will be limited to periodic SNMP messages conveying status and event reports. The SMMC operator will also have the capability to turn the DLAP on/off via the NSM.

2-01.3.1.2 <u>HCS to HCS</u>

The HCS to HCS interface will support the interfacility ADL messages exchanged by the ADL automation system when aircraft transition from one ARTCC to the next.

2-01.3.1.2.1 <u>Interface Requirements</u>

There are no unique interface requirements for the HCS to HCS interface.

2-01.3.1.2.2 <u>Connectivity Requirements</u>

The HCS will interface to the HCS via the NADIN PSN network.

2-01.3.1.2.3 <u>Traffic Characteristics</u>

The HCS to HCS interface will support the exchange of all interfacility ADL messages among ARTCCs.

2-01.3.1.3 ADL to Commercial Service Provider (CSP) via NADIN PSN

The ADL to CSP interface supports all the air-to-ground CPC and CPDLC messages exchanged between the ADL automation system and the airborne avionics.

2-01.3.1.3.1 Interface Requirements

There are no unique interface requirements for the ADL to CSP interface.

2-01.3.1.3.2 Connectivity Requirements

The commercial service provider will have access to NADIN PSN.

2-01.3.1.3.3 Traffic Characteristics

The estimated message traffic exchanged between the ADL ground automation system and the airborne avionics is one message per Data Link equipped aircraft every four (4) minutes. The upper limit number of Data Link equipped aircraft within the boundaries of a typical ARTCC is approximately 540.

2-01.3.1.4 ADL DLAP to Context Management Application (CMA) Platform via NADIN PSN

2-01.3.1.4.1 Interface Requirements

There are no unique interface requirements for the DLAP to CMA platform interface.

2-01.3.1.4.2 Connectivity Requirements

The DLAP will interface with the CMA platform via the NADIN PSN network.

2-01.3.1.4.3 Traffic Requirements

A minimum of one DLAP-CMA data exchange is required for each data link equipped aircraft flight.

Table 2-01-1. ADL Interface Requirements Summary

HDL EXTERNAL INTERFACES		Ext. DLAP	CSP	UBI Systems	RMMS
INTERFACE DOCUMENTS		NAS-IR-43020001 NAS-IC-25139402	NAS-IR-25139402 NAS-IC-25039402	TBD TBD	NAS-IR-51030002
PROTOCOL REQUIREMENTS	Network Layer		CCITT X.25, 1984	IP (RFC 791)	CCITT X.25, 1988
	Data Link Layer	ISO 8073	ISO 7776 (LAPB)	ISO 8802-2	ISO 8073
	Physical Layer	EIA-530 balanced	EIA-530 balanced	ISO 8802-3	EIA-530 balanced
	Special Formats Codes		via NADIN PSN		
HARDWARE	No. Channels	1	1	N/A	1
	Speed	56 Kbps	56 Kbps	10, 16, 70 Mbps	2.4 - 56 Kbps
	Simplex Half/Full Duplex	FD	FD	N/A	FD
	Service	Dedicated	Dedicated	CSMA LAN	Dedicated
HARDWARE REQUIREMENTS	Modem	GFE	GFE		GFE
	Router/ Bridge			RFC 1218 ISO 10038	
	Clock				
	A/B Switch				
	DSC				
	Cable/ Misc				

2-01.3.1.5 HCS to UBI Automation Systems

All UBI automation systems will interface to the collocated HCS via the router and HID/NAS LAN in that order.

2-01.3.1.5.1 Interface Requirements

There are no unique interface requirements for the HCS to UBI interface.

2-01.3.1.5.2 Connectivity Requirements

The UBI Automation Systems or their subnetworks will connect directly to the router.

2-01.3.1.5.3 Traffic Characteristics

This is TBD.

2-01.3.1.6 ADL to RMMS

This interface will be implemented at all ARTCCs that have a collocated MPS.

2-01.3.1.6.1 Interface Requirements

There are no unique interface requirements for the ADL to RMMS interface.

2-01.3.1.6.2 Connectivity Requirements

This is TBD.

2-01.3.1.6.3 Traffic Characteristics

This is TBD.

2-01.4 ACQUISITION ISSUES

2-01.4.1 Project Schedule and Status

The ADL hardware and software are being developed under separate contracts.

Note: The ADL DLAP hardware delivery schedule beyond keysite has not been established.

2-01.4.2 Planned Telecommunications Strategies

Telecommunications between ADL platforms will be provided through the HCS-to HCS end DLAP-to-CMA interfaces via NADIN PSN. Intrafacility connectivity will be provided through the HID/NAS LAN and router (refer to Figure 2-01-1). Two sites have been identified for the FY03 for ADL interfaces. The cost will be provided when the connectivity requirements are determined.

2-01.4.3 Telecommunications Costs

The interface requirements will be met through intrafacility cabling/networks and connections to other ARTCC facilities through NADIN PSN. External leased telecommunication requirements, e.g., interfacility channels and/or air-ground communications costs, have been identified. The NADIN program is bearing the cost. No charge back is expected. However, if usage is significant and or upgrades are required, funding will be in accordance with FAA Order 2500.8A. Refer to table 2-01-2 for cost summary.

Table 2-01-2. Cost Summary - ADL

CIP # C-20	All Costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
Channel Costs									
1. ADL <--> CSP									
	Cost Profile: NADIN Backbone Transport		*N/A - No chargeback for the NADIN backbone usage*						
2. CSP <--> Airborne (Au)									
	Cost Profile: VDL Mode 2 Service								
Message Charges (see Note)									
	Total Messages	0	0	0	0	0	0	0	0
	F&E Non-recurring Message Costs		**$0**	**$0**	**$0**	**TBD**	**TBD**	**TBD**	**TBD**
	Recurring Message Costs								
	F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
3. DLAP <--> DLAP									
	Cost Profile: NADIN Backbone Transport		*N/A - No chargeback for the NADIN backbone usage*						

SUMMARY

		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
F&E Totals	Non-Recurring	$0	$0	$0	TBD	TBD	TBD	TBD
	Recurring	$0	$0	$0	$0	$0	$0	$0
	F&E Totals	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Totals	Non-Recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$0	$0	$0	$0	$0	$0	$0
	OPS Totals	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

Note:

AOP / ARINC currently conducting message traffic studies to determine costs which will take effect in FY03.

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CHAPTER 2-02 - SUMMARY SHEET

FAA AGENCY DATA TELECOMMUNICATIONS NETWORK 2000 (ADTN2000)

Program/Project Identifiers:

Project Number(s):	BIIP-982001
Related Program(s):	FTS2000 & LINCS
New/Replacement/Upgrade?	Continuing
Responsible Organization:	AOP-400
Program Mgr./Project Lead:	Doug Kay, AOP-400 (202) 493-5955
Fuchsia Book POC:	Gil Carlson, contractor, (202) 479-6915

Assigned Codes:

PDC(s):	IO, IP, IY, IT
PDC Description:	ADTN 2000 Telecommunications Services; Direct charge back to NISC Video Teleconferencing; ADTN Circuits; ADTN Training;
Service Code:	ADTN, TRNG

Cost Estimates: *

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$1,486	$3,625	$321	$336	$353	$371	$389
OPS Recurring	$12,024	$14,907	$16,721	$18,957	$21,222	$23,521	$25,855
Total OPS	**$13,510**	**$18,532**	**$17,042**	**$19,293**	**$21,575**	**$23,892**	**$26,244**

*Cost data provided by the Program Office.

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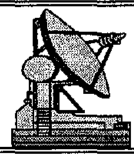
CIP Category: Communications



2-02.0 FAA AGENCY DATA TELECOMMUNICATION NETWORK 2000

2-02.1 PROGRAM OVERVIEW

ADTN2000 is the FAA's Wide Area Network (WAN) serving 250 FAA sites and dial access for over 7000 remote uses. It is essential for day-to-day agency business management (e.g. Payroll, Personnel, and e-mail) and to serve some NAS systems/applications designated as mission support. Failure to fund and sustain ADTN2000 would severely impact the ability of the FAA to function as an agency and to provide NAS mission support.

2-02.1.1 Purpose Of Agency Data Telecommunications Network 2000

The purpose of ADTN2000 is to provide a Wide Area Network (WAN) service, both dedicated and dial-up, for world-wide connectivity between users, host computers and Local Area Networks (LANs) for interactive, as well as bulk file transfer sessions. ADTN2000 supports client server applications and Intranet web server operation and also indirectly provides FAA user access to the Internet. The services of ADTN2000 are available to other administrations of the Department of Transportation on a reimbursable basis.

The administration of the ADTN2000 Project is assigned to the Network Engineering and Management Division, AOP-400. The ADTN2000 Contract is managed by the Defense Information Technology Contracting Office (DITCO) with an assigned Contracting Officer's Technical Representative (COTR) from AOP-400.

2-02.1.2 References

2-02.1.2.1 ADTN2000 Contract, DCA200-94-D-0089.

2-02.1.2.2 GSA FTS2000 Contract, GS00K-89-AHD-0008.

2-02.1.2.3 LINCS Contract, DCA200-92-D-0021.

2-02.1.2.4 FAA Information Resources Management Five Year Plan.

2-02.2 SYSTEM DESCRIPTION

The ADTN2000 is a contractor provided, operated and maintained leased network service. The service encompasses providing all required equipment, installation, cutover, user training, maintenance, user adds, moves and changes, user assistance and technology refreshment. The contract, originally awarded to Government Systems Inc. on September 17, 1994, was novated to CACI International, Inc. in November

1997. It is a requirements type contract with a five-year base period and five one-year options. The first option was exercised effective September 17, 1999.

ADTN2000 is a private FAA Wide Area Network (WAN) comprised of a high-level network backbone layer and a user access layer. The backbone layer includes a Node at major FAA locations interconnected by multiple trunk circuits. It provides high-speed data transport and alternate path routing among the Nodes. The user access layer, which employs the backbone for routing and long haul connectivity, includes user interface equipment and leased circuits between the User End Points and the nearest backbone Nodes. Physical connectivity is provided by FTS2000 for all long haul (interLATA) circuits and by the Leased Interfacility NAS Communications System (LINCS) for short haul (intraLATA) circuits. Network management and user assistance are provided by the ADTN2000 Contractor at either the primary or backup Network Control Center (NCC) located at the Contractor's facilities.

The fourteen primary Nodes are located at the nine FAA Regional Offices, FAA Headquarters, the William J. Hughes Technical Center, the Mike Monroney Aeronautical Center, the Integrated Computing Environment - Mainframe and Network (ICE-MAN) at the U.S. Department of Agriculture National Information Technology Center located in Kansas City, Missouri, and the FAA Command Center at Herndon, VA. Some of the larger non-node sites have recently been upgraded to secondary Nodes with alternate path connectivity. As of the end of FY99, there are nine secondary Nodes, seven of which are at Air Route Traffic Control Centers (ARTCCs). The other two are at the DOT John Volpe National Transportation Systems Center (VNTSC) in Cambridge, MA and the Combined Center Radar Approach Control (CERAP) in Honolulu, HI. The remaining sites are User End Points ranging in size from small Flight Inspection Area Offices (FIAOs) to sites with larger user concentrations, such as the Department of Transportation (DOT) Headquarters Building located in Washington, DC, and the fourteen other ARTCCs.

Sites not served by dedicated connectivity, i.e. sites that are neither Nodes nor User End Points, are served by dial access to six ADTN2000 modem pools via FTS2000 Switched Voice Service.

ADTN2000 also supports international FAA sites via gateways to the INFONET international Public Data Network (PDN). Users at four major FAA international offices have dedicated connectivity to INFONET and are automatically routed to the ADTN2000 international gateway. Smaller international sites and individuals have access to ADTN2000 via INFONET dial-up service. The U. S. Coast Guard Data Network (CGDN) is physically connected to ADTN2000 via two X.25 gateways.

An ADTN2000 Node serves the ICE-MAN facility at the U.S. Department of Agriculture computer center in Kansas City, Missouri. Additional communications support for access to the IBM ES/9021 Model 962 central mainframe includes IBM 3745 front-end processors, COMTEN 5665 front-end processors, and Renex Protocol Converters. The ICE-MAN emergency restoration facility is located at an IBM facility in Bolder CO. Connectivity to this site to support ICE-MAN emergency restoration functions is also provided by ADTN2000.

Table 2-02-1 lists the facility types that are either network Node sites or User End Point sites. Figure 2-02-1 depicts the ADTN2000 backbone topology.

Table 2-02-1. Node and User End Points by Facility or Facility Type

TYPE FACILITY SERVED	LOCATION
NODE Primary	
FAA Headquarters	Washington, DC
Aeronautical Center	Oklahoma City, OK
FAA Regional Offices	9 locations
Technical Center	Atlantic City, NJ
ICE-MAN Facility	Kansas City, MO
FAA Command Center (ATCSCC)	Herndon, VA
NODE Secondary	
ARTCCs	7 locations
VNTSC	Cambridge, MA
CERAP	Honolulu, HI
USER END POINTS (LARGE)	
ARTCCs	13 locations
CERAP	San Juan, PR
DOT Headquarters	Washington, DC
USER END POINTS (SMALL)	
TRACONs	8 locations
FIAOs	7 CONUS, 2 International
FSDOs	80 locations
IFOs	1 location
AFSFOs	3 locations
AFSS	5 locations
ACOs	2 locations
CMOs	4 locations
ADOs	28 locations
SMOs	32 locations
MIDOs	5 locations
NOCC	1 location
OCCs	3 locations
CASFU	22 locations
CASFO	19 locations
CASPD	2 locations
FAA Management Training Center	Palm Coast, FL
National Airport	Washington, DC
Dulles Airport	Washington, DC
NTSB	Washington, DC
SAIC	Washington, DC
Mitre Corp	McLean, VA
IBM (Backup ICE-MAN)	Boulder, CO
Flight Standard National Field Office	Herndon, Virginia
TASC, Inc.	Reading, MA
BCATS	Plymouth, MA
Air Traffic Evaluations	3 locations
Federal Railroads Admin.	1 location
Maritime Admin.	1 location
U.S. Treasury	1 location
Office of Personnel Management	1 location
National Transportation Safety Admin.	1 location

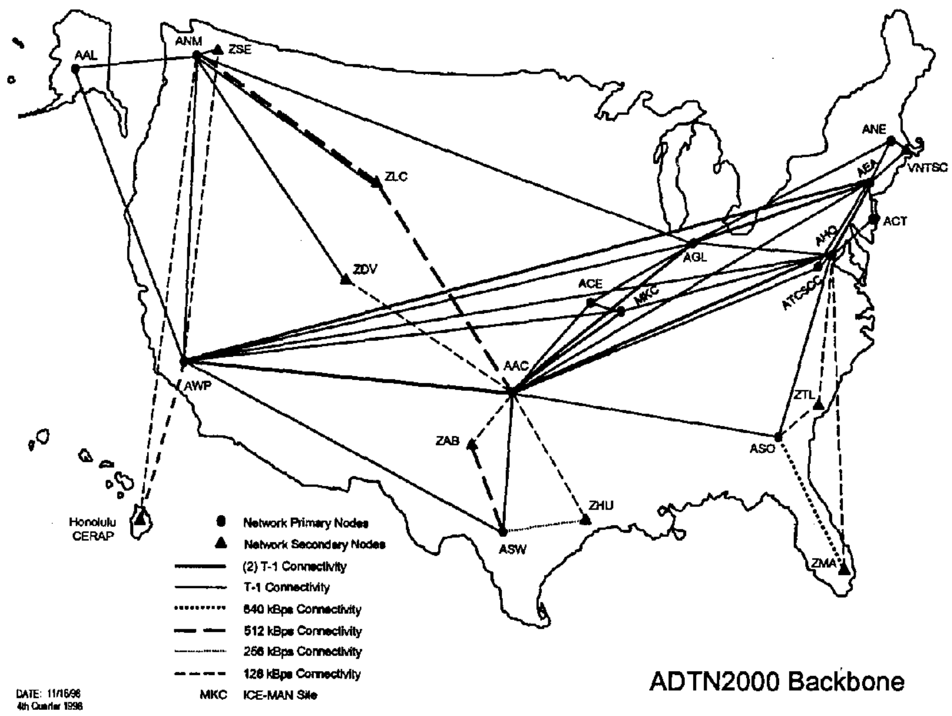


Figure 2-02-1. FAA Agency Data Telecommunications Network 2000

2-02.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

2-02.3.1 <u>Functional Requirements</u>

2-02.3.1.1 <u>Network Service Requirements</u>

The following network services are required to support FAA and the other modal administration users:

- End-to-end data transfer between users and hosts, hosts and other hosts, users, and remote LANs/servers and between LANs and other LANs.
- Dial-IP and asynchronous dial access for users not served by dedicated connections to ADTN2000.
- Gateway service to an international public data network to provide ADTN2000 access to FAA international offices.
- Gateway services to the U.S. Coast Guard Data Network (CGDN).
- Security services to include network access control (i.e. asynchronous user ID/Passwords, Dial-IP RADIUS authentication servers, and origin authentication), virtual private networks, transmission integrity and intrusion detection.
- Network management and user assistance via a fully manned (7 X 24) Network Control Center (NCC) with backup site.

- Data transport services for the FAA electronic mail service (LOTUS cc:Mail).
- Data transport service for user access to the FAA's public Internet gateways.

2-02.3.1.2 User Requirements

2-02.3.1.2.1 Information Systems - General

ADTN2000provides WAN support for hundreds of information systems, many having multiple applications. In addition, ADTN2000 supports indirect access to the Internet for many FAA users. For discussion purposes these systems are divided into four groups.

1. The first group includes all of the FAA and DOT information systems and applications residing on the Integrated Computing Environment - Mainframe and Network (ICE-MAN) facility. As of the end of FY99, there were over 100 identified systems/applications operating on the mainframe. Some of these systems are used not only by the FAA, but also by all of the DOT modal administrations. Some systems are used nationally and some are used at a regional level. This group although including some of the most important FAA/DOT information systems represents less than one percent of the total data transmitted via the network.

2. The second group encompasses information systems and applications that reside on LANs/Servers at the FAA National Headquarters, Air Traffic Control System Command Center, the nine Regional Offices and the three Centers (Aeronautical, Technical, and Volpe National Transportation System). As with systems in the first group, some are used nationally and others are regionally oriented. Traffic volume carried by ADTN2000 supporting these systems may represent as much as three fourths of the total.

3. The third group includes information systems residing on LANs/Servers or individual workstations at field offices. These systems are only used within the region or at the local site. Although it is not known what percentage of ADTN2000 traffic volume is contributed by these more locally oriented systems, it is estimated in the range of five percent. Since the traffic is within the region, there is little impact on the high-level backbone network.

4. The fourth group is all Internet related systems and services traversing ADTN2000. This is the fastest growing type of traffic supported by the network and may be approaching twenty percent or more of the total measured volume. FAA users reach the Internet via ADTN2000 and gateway/firewall services at FAA Headquarters, the Aeronautical Center, Technical Center and Western Pacific Regional Office. Users at the gateway sites as well as the Technical Center have direct local access to the Internet and do not normally involve ADTN2000 during Internet sessions.

2-02.3.1.2.2 Major User Information Systems

It is not feasible to fully discuss all information systems requiring ADTN2000 service in this chapter of the Fuchsia Book. Fore more detailed information, readers should consult the FAA Information Resources Management Five Year Plan. However, in order to provide a high-level picture of ADTN2000 data communications requirements the more significant systems and/or applications are listed in Table 2-02-2 and Table 2-02-3 below.

Table 2-02-2. DOT-Wide Systems Processed on the ICE-MAN Mainframe

DOT-wide system	Acronym
Consolidated Personnel Management Information System	CPMIS (Being phased out by IPPS).
Departmental Accounting Financial Information System	DAFIS
Consolidated Uniform Payroll System	CUPS
Integrated Financial Management System	IFMS (Future)
Integrated Personnel and Payroll System	IPPS

Some significant FAA information systems requiring ADTN2000 support are listed in Table 2-02-3. However, this is only a small sampling of supported systems.

Table 2-02-3. Major FAA Standard Systems Requiring ADTN2000 Support

Major Information Systems on ADTN2000	Acronym
Air Traffic Computer Based Instruction	CBI
Air Traffic Operations Management System	ATOMS
Aircraft Certifications Systems	ACS
Aircraft Information System	AIS
Aircraft Management Information System	AMIS
Airman & Aircraft Registry Modernization Program	AARMP
Automated Frequency Management	AFM
Aviation Safety Analysis System	ASAS
Security Information Reporting System	SIRS
Computer Aided Engineering Graphics	CAEG
Energy Management & Reporting System	EMERS
FAA Electronic Mail	LOTUS cc:Mail
Instrument Approach Procedures Automation	IAPA
Integrated Material Management	IMM
Logistics Information System	LIS
Operational Data Management System	ODMS
Personal Property In Use Management System	PPIUMS
Financial Information Management System	FIMS
Acquisition Information Requirements System	ACQUIRE
Resource Tracking Program	RTP
Safety Performance Analysis System	SPAS
Special Airspace Management System	SAMS
Telecommunications Information Management System	TIMS
Training Management Information System	TMIS

2-02.3.1.2.3 Growth in ADTN2000 Support

When ADTN2000 became operational, the initial focus was on support of mainframe facility communications to the ADTN2000 major user sites. Support for LANs at these major sites as well as at ARTCCs was also provided in addition to dial-up service for small sites. Following full ADTN2000 implementation in late FY95, user requirements have been increasing dramatically. Mainframe computer traffic has shown some increase. However LAN to LAN, client server, and web based data exchange are growing exponentially. ADTN2000 traffic volume historically increases by 9% every month.

A major expansion of ADTN2000 was completed in FY 96 providing connectivity to over 80 additional Flight Standards District Offices (FSDOs). Traffic from these sites experienced major growth and will continue to grow in the future. In addition, dedicated network service has been extended to other FAA field offices such as System Maintenance Offices (SMOs), Airport District Offices (ADOs), Civil Aviation Security Field Offices (CASFOs) and Civil Aviation Security Field Units (CASFUs).

ENET completed implementation of three Internet firewall/gateway systems that are connected to ADTN2000. Indirect access to these gateways via ADTN2000 has resulted in a significant traffic volume increase on the backbone and has required expansion of bandwidth facilities.

Implementation of the Special Airspace Management System (SAMS) represented the first operational (mission support) system on ADTN2000. SAMS, an Air Traffic Management System, is a client server application using TCP/IP. Workstations are located at all ARTCCs and Regional Offices and several other sites. The NAS Infrastructure Management System (NIMS) with servers and workstations at the National Operations Control Center (NOCC) located at the ATCSCC and OCCs at the ARTCC in Kansas City, MO, NADIN facility in Atlanta, GA, and Southern California TRACON is another NAS mission support system served by ADTN2000. In 1999, OPSNET, a NAS operations status reporting system, began using ADTN2000 Dial-IP service for automated reporting by over 100 sites. Other operational systems such as the Collaborative Decision Making System (CDMS) are considering the use of ADTN2000 to meet requirements.

The Airport Systems require LAN to LAN connectivity utilizing the ADTN2000 network between the ICE-MAN Facility and the nine Regional Offices and between the Regional Offices and the Airport District Offices. Initial traffic between these sites has focused on text information. However, in the near future, graphics, terrain maps, and flight plans will be transmitted between LANs located at field sites. This type of data transfer is causing a large increase in network traffic volume among these sites.

Client server and web server systems are being developed and fielded rapidly and will soon dominate the information system environment with servers at most of the major FAA sites. An example of this trend is the fielding of the client server application ACQUIRE, that replaced the System for Acquisition Management (SAM). Another application known as DELPHI will soon replace the DOT DAFIS system. The growth of traffic volume associated with client server and web applications such as ACQUIRE and DELPHI will escalate in the future very sharply.

Development of the FAA NAS Implementation (ANI) Engineering Center concept involving a national engineering center with connectivity to regional centers will have a major impact on ADTN2000. Requirements include collaborative use of applications, processing and exchange of engineering drawings and other graphics, video teleconferences and access to other applications across the entire FAA.

2-02.3.1.2.4 Integrated Service and the Emergence of Multimedia Communications

With the emergence of IP Video systems, support of interactive desktop video sessions as well as point-to-point and even point-to-multi-point videoconferences will be a logical extension of ADTN2000 networking service, resulting in increased traffic volume.

2-02.3.2 Performance Requirements

2-02.3.2.1 Network Performance Requirements

Detailed network performance requirements are described in the ADTN2000 Contract Functional Specification. The principal performance requirements are listed herein.

- The availability of all equipment provided by CACI (the ADTN2000 contractor) is contractually specified as .999. Service availability is specified at 99.95% where alternate routing using dual connectivity is provided. Monthly calculations for actual network service availability have routinely been in the range .9995.

- Packet network delay is specified to not exceed 300 milliseconds for 95% of the traffic. The 95-percentile delay shall not exceed 255 milliseconds. When a satellite circuit is part of the transmission path, the maximum network delay shall be 1.0 second or less.

- Subscriber access to the ADTN2000 network shall conform to the following requirements:

  - Virtual call connections shall be completed within 500 milliseconds.
  - Access to dial ports shall have a first attempt call success rate of 95%.

- Network accuracy requirements are as follows:

  - Transmission Error - All data transmitted over trunk circuits, and tail circuits employing High-level Data Link Control (HDLC), shall have no more than one undetected bit error in 1 x 10^8 bits.
  - Inserted/Lost Bits - The nodal inserted/lost bit error rate shall be less than one error in 1 x 10^{12} bits.

- Packet Misdelivery - The Packet Misdelivery rate shall be less than one packet in 1 x 10^7 packets.

2-02.3.2.2 User System Performance Requirements

Some user applications or end systems have specific communications performance requirements. In general, these requirements are less demanding than the basic performance offered by ADTN2000. However, in the future, there may be client server or web based applications that demand better performance than currently provided by the network. Should that situation develop, ADTN2000 may require upgrading or reconfiguration to meet the more demanding performance requirements. The following are known user performance requirements.

2-02.3.2.2.1 ICE-MAN Application Performance Requirements

The ICE-MAN interactive response time requirements between the host and work stations for production sites is a maximum one (1) second for 99% of transactions between 0700-2300 eastern time. ICE-MAN interactive response time between the host and development work stations are two (2) seconds for 95% of prime user times. ICE-MAN scheduled batch queue time is a maximum of 15 minutes of notification for 99% of jobs. The unscheduled batch queue time is 15 minutes of notification for 99% of jobs. The ICE-MAN system must have 98% availability.

2-02.3.2.2.2 LAN Based Client Server Applications Performance

As client server applications are developed and fielded, latency requirements (delay) are more demanding. Rather than latency requirements in seconds, the applications require the network to support response in milliseconds.

2-02.3.2.3 Functional/Physical Interface Requirements

ADTN2000 is required to support a variety of functional interfaces. However, in accordance with a joint memorandum signed by AAF-1 and AIT-1 on June 22, 1998, support for obsolete protocols will be phased out as noted in the below list of supported interfaces.

- IBM Bisynchronous 3270 and 3780 RJE interfaces to a PAD. *These interfaces were phased out as of July 1, 1999.*

- Direct interface between the Node router and a PAD/Concentrator or a host computer via X.25. *These interfaces will no longer be supported after July 1, 2000.*

- IBM 3270 X.25 Cluster Controller interface to a PAD/Concentrator or router. *These interfaces will no longer be supported after July 1, 2000.*

- IBM SNA Gateway Servers using SDLC or X.25 to a multi-protocol PAD. *These interfaces will no longer be supported after July 1, 2000.*

- ICE-MAN bulk file and bulk print service to primary node sites using X.25. *These interfaces will no longer be supported after July 1, 2000.*

- Asynchronous LAN communications server to Asynchronous PAD. *These interfaces will no longer be supported after July 1, 2000.*

- LAN cc:Mail communications server using X.25. *These interfaces will no longer be supported after July 1, 2000.*

- LAN communications server using X.25 to router port configured for X.25. *These interfaces will no longer be supported after July 1, 2000.*

- Ethernet LAN interface via 10BaseT and 100BaseT connection to router running IP and IPX protocols. *IPX interfaces will no longer be supported after July 1, 2000.*

- FDDI LAN interface via Fiber connection to router supporting IP and IPX protocols. *IPX interfaces will no longer be supported after July 1, 2000.*

- Token Ring LAN via 10BaseT connection to router.

- Dial-up asynchronous terminal via FTS2000 SVS to integrated channel bank/dial modem and asynchronous PAD. *These interfaces will no longer be supported after July 1, 2000.*

- Dial-IP using Point-to-Point Protocol (PPP) via FTS2000 SVS to integrated channel bank/dial modem thence to an ADTN2000 router with temporary IP addresses assigned.

- Node router X.25 interface to USCG X.25 packet switch for CGDN gateway. *These interfaces will no longer be supported after July 1, 2000.*

- Router frame relay interface to router frame relay port.

- LAN cc:Mail communications server using TCP/IP

- IBM Channel interfaces from router to IBM mainframe computer.

2-02.3.2.4 Diversity Requirements

Currently there is no requirement for ADTN2000 to provide diverse routing to comply with FAA Order 6000.36. ADTN2000 does provide alternate routing at primary and secondary Nodes, but the different circuits do not necessarily traverse separate (diverse) physical paths. The LINCS, FTS2000 and follow-on FTS2001 contracts are capable of supporting diversity requirements and should there be a network user that requires diversity in accordance with FAA Order 6000.36, it could be supported by ADTN2000 using either diverse path FTS2000/2001 and/or LINCS circuits.

2-02.3.3 COMPONENTS

2-02.3.3.1 ADTN2000 Equipment and Configurations

Network backbone layer node switching is performed by high end Cisco model 7500 (series) routers. Network access layer equipment includes Cisco 7507, 3620 and 2514 routers, Netrix Series 100 multi protocol PAD/Concentrators, Netrix BRX PADs, and U.S. Robotics Total Control Hub integrated channel bank/dial modem systems. The Netrix packet switches have been removed at all Node sites with the exception of FAA Headquarters, the Aeronautical Center and at ICE-MAN. These three switches have been retained temporarily to support X.25 protocol service but will be removed in FY00.

2-02.3.3.2 Primary Node Configurations

Each of the 14 nodes has a Cisco 7513 or 7507 router connected to a minimum of two other nodes via backbone T-1 trunk circuits. On the user side of the router, backbone LANs are connected via Ethernet ports. Data to and from individual LANs is routed via the backbone LAN to the node router for transport across the ADTN-2000 WAN. Legacy protocol support is provided via serial ports connecting the following access layer user interface devices. The Netrix BRX asynchronous PADs are used primarily for network dial-up access but also provide ports for asynchronous communication servers. The Netrix S-100 multi-protocol PADs are used for System Network Architecture (SNA) gateways requiring IBM SDLC PADs. Two Codex bisynchronous PADs are located at each node to support IBM 3270 bisynchronous controllers and IBM 3780 Remote Job Entry (RJE) host transactions with the ICE-MAN mainframe. A companion bisync PAD is also located at the ICE-MAN site with multiple direct connections to the mainframe FEP. Support for bisync was phased out on June 30, 1999 and the order to remove the Codex PADs was issued. Mainframe bulk file and print servers at each node site are also supported via X.25 ports on the node router. Figure 2-02-2 is a simplified block diagram showing the node equipment configuration at one of the sites having a dial service modem but without a Netrix S-10 switch. The three node sites with Netrix S-10 switches are similar to the others except that the switches are used in supporting the X.25 service for the network.

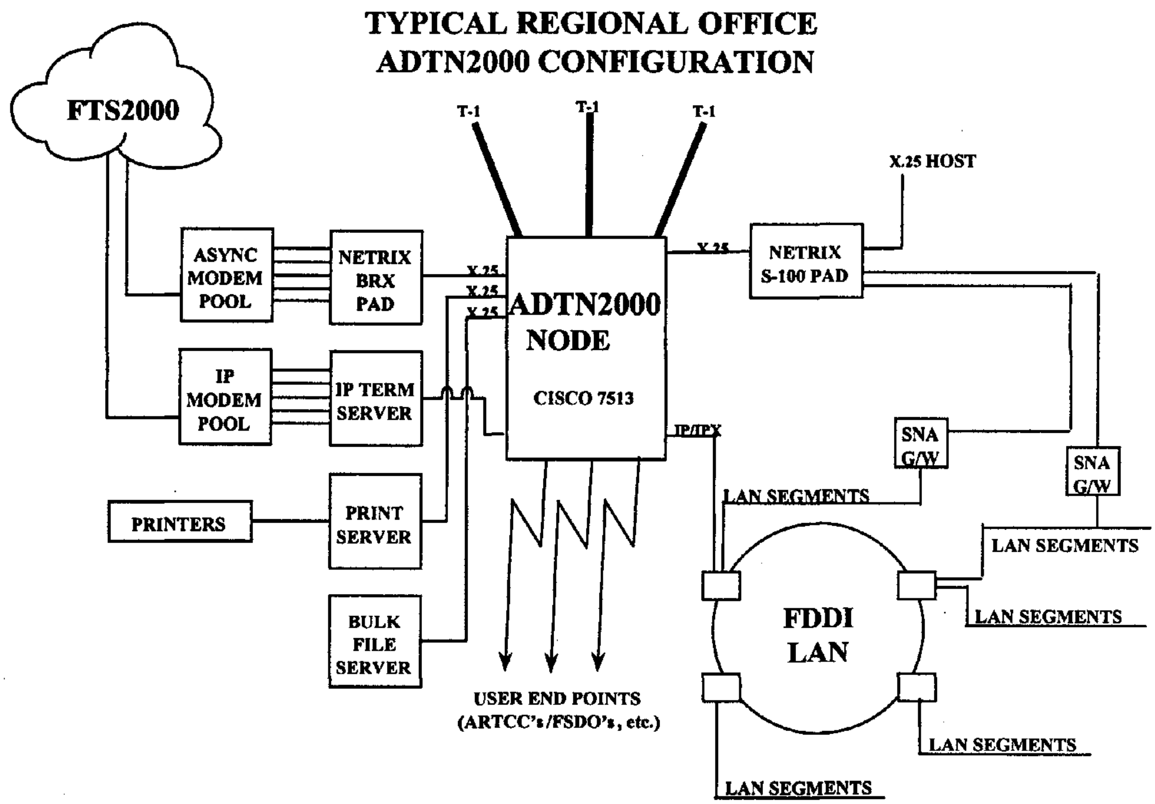


Figure 2-02-2. Simplified Primary Node Configuration

2-02.3.3.3 <u>ICE-MAN Node ADTN-2000 Configuration</u>

This node differs from the nodes at FAA sites. Although this node is an important part of the backbone design, it does not provide direct support to collocated users. By contract, ICE-MAN must use ADTN2000 for user access to the mainframe. The ADTN2000 Cisco 7513 node router connects directly to the mainframe via an IBM channel as well as to the Netrix S-10 switch. The switch has a connection to the Netrix switch at the Aeronautical Center, which has a connection to the switch at FAA Headquarters forming an X.25 service subnetwork. The ICE-MAN switch connects to the mainframe via two high-speed (1024 Kbps) connections to the IBM 3745 Front End Processor (FEP) and via a 512 Kbps link from the Aeronautical Center Computerm IBM channel extender to its companion Computerm at ICE-MAN. The switch also provides X.25 connections for Renex protocol converters and a Codex bisynchronous PAD that supports IBM 3270 and 3780 RJE. The Cisco 7513 router direct connection to the mainframe host supports TCP/IP user access via IP SNA servers at the Aeronautical Center and ICE-MAN. Figure 2-02-3 depicts the basic ICE-MAN node equipment configuration. The ICE-MAN backup site located at an IBM facility in Bolder, CO is connected to ADTN2000 but is not a Node site.

ICE-MAN NODE EQUIPMENT CONFIGURATION

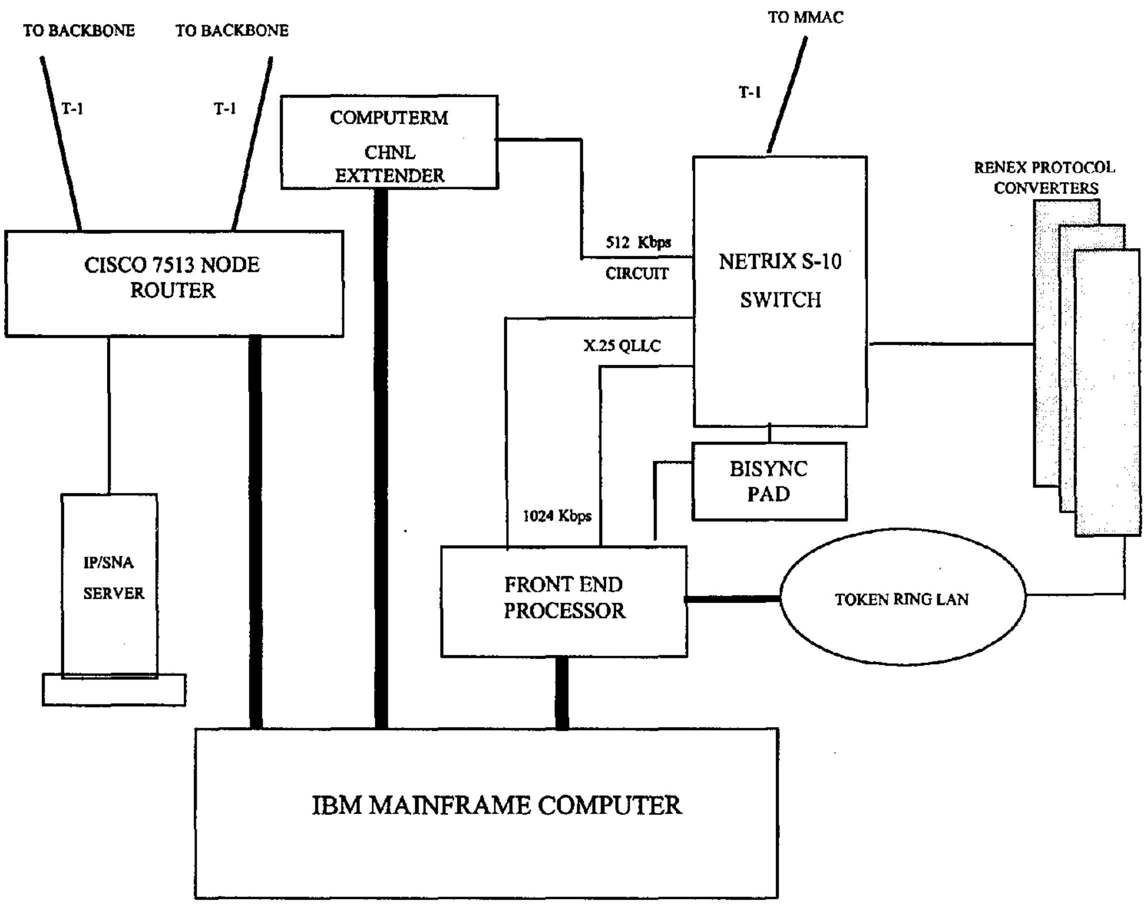


Figure 2-02-3. Simplified ICE-MAN Primary Node Configuration

2-02.3.3.4 <u>User End Point Configurations</u>

User End Points are user sites served by dedicated access to ADTN2000, via a single circuit for connectivity. The network device supporting the connection to the nearest Node is a Cisco model 3620 or 2514 router. A Cisco 7507 router may serve large User End Points. The routers are configured with Ethernet ports to interface LANs and serial ports to support an X.25 host or a PAD supporting an SNA gateway. The router at the User End Point interfaces the router at the Node using circuit data rates from 64 Kbps to T-1 as required and the highly efficient link layer protocol HDLC. Figure 2-02-4 depicts the configuration of a typical User End Point.

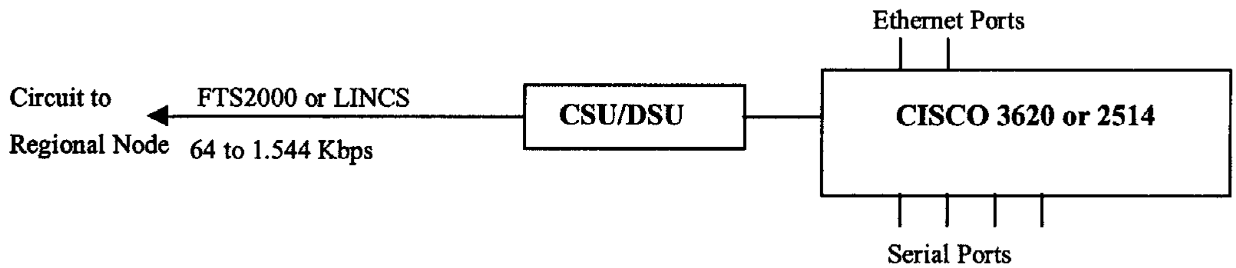


Figure 2-02-4. Typical User End-Point Configuration

2-02.3.4 TELECOMMUNICATIONS INTERFACES

2-02.3.4.1 Protocol Requirements

Protocol requirements are summarized as follows:

- OSI Layer 1 (Physical): RS232, V.24, V.35, RS-449, X.21, EIA-530
- OSI Layer 2 (Data Link): HDLC, FRAME, IEEE 802.2, IEEE 802.3, IEEE 802.5
- OSI Layer 3 (Network): X.25, IP, IPX
- OSI Layer 4 (Transport): TCP
- OSI Layer 7 (Application): SNMP, CMIP

2-02.3.4.2 Transmission Requirements

See Section 2-02.6.1.3 below on *Node to Subscriber (User)*. Backbone circuits are unchannelized T-1 lines.

2-02.3.4.3 Hardware Requirements

RS232, V.24, V.35, RS-449, X.21, EIA-530, 10BaseT, 100BaseT, and FDDI interface ports are used, depending upon customer equipment, transmission speed and distance required.

2-02.3.5 PHYSICAL AND OTHER TELECOMMUNICATIONS REQUIREMENTS

2-02.3.5.1 Telecommunications Interfaces

2-02.3.5.1.1 Node to Network Control Center (NCC)

This interface is provided by ADTN2000 in accordance with provisions of the contract. The primary NCC has one 384 Kbps circuit to FAA HQ and one 128 Kbps circuit to the Aeronautical Center. The backup NCC has one 128 Kbps circuit to FAA HQ and one 128 Kbps circuit to ICE-MAN. Since the Netrix Security Management System (SMS) and the Dial-IP Security Servers reside at the NCC, adequate bandwidth between the connecting Node and the NCC is required to support the dial-up user access to the security servers for user ID/password validation and processing of the calls.

2-02.3.5.1.2 Access Layer Devices to Node

Routers and the remaining PADs and packet switches provide the user interfaces with the Node routers. Currently the interfaces between the access layer routers and the Node router is HDLC at speeds from 64 Kbps to T-1. The interface between the Node routers and the PADs and switches is X.25. The physical interfaces are EIA-RS-232 for 19.2 Kbps and V.35 for higher speeds. The equipment also supports EIA-530, as required by the ADTN2000 Contract, but it has not been used during implementation.

2-02.3.5.1.3 Node to Subscriber (User)

In general, user devices that connect directly to the Node routers are site backbone LANs and host computers equipped with X.25 software. The connection speeds range from 64 Kbps to T-1. The following types of subscriber to Node interfaces are implemented:

- The ICE-MAN mainframe is connected to the Node router in two ways. The CIP2 card in the router connects directly to a mainframe channel using IBM proprietary protocol. In addition, the Node connects to a Netrix packet switch that in turn connects to the mainframe via IBM 3745 front end processors. Host connection speeds up to 1.54 Mbps (T-1) are supported. The interfaces are X.25 with V.35 physical connection.

- Secondary X.25 communications servers supporting the FAA cc:Mail system at Node sites are connected to the Node routers. The servers connect at 56 Kbps using V.35 physical connections. The primary support for cc:Mail is via TCP/IP. As X.25 support is phased out, these connections will be discontinued.

- A few remaining hosts connect to Nodes using X.25 at speeds from 19.2 Kbps to 256 Kbps.

2-02.3.5.1.4 Multi-Protocol PAD (Netrix S-100and BRX) to Subscriber (User)

Protocols supported are asynchronous and SNA/SDLC. The S-100 serving as a concentrator also supports X.25 user connections. The ADTN2000 PADs can accommodate speeds of up to 19.2 Kbps. All PADs will be discontinued after June 30, 2000.

2-02.3.5.2 DIVERSITY IMPLEMENTATION

Diversity has not been implemented on ADTN2000. Node sites incorporate multiple backbone T-1 circuits to at least two other Nodes to provide alternate routing capability (multiple paths). User End Points with single circuit connections (single path) do not have alternate routing. Should there be a requirement in the future for path diversity at one or more sites, this capability can be achieved through the use of additional diverse path FTS2000 or LINCS circuits.

2-02.4 ACQUISITION ISSUES

2-02.4.1 Planned Telecommunications Strategies

The ADTN2000 program office will pursue the following strategies:

- Continue to monitor traffic volume and increase network bandwidth to accommodate growth, pending availability of funding.

- New user sites will be added to the network as requested subject to availability of funds.
- The network will be enhanced by new technology insertions to improve security, reliability and to reduce costs. Subject to availability of funds, upgrade of Dial-IP SofToken I to SofToken II will be initiated.
- Legacy protocol support (i.e. X.25 and IPX) will be phased out and remaining PADs and packet switches will be removed.
- A major security enhancement will be implemented in early FY00. The CISCO NetRanger intrusion detection system will be installed with sensors at 18 initial sites and system directors at the NCC and the ADTN2000 Program Office Oversight and Monitoring facility.
- Transition of FTS2000 circuits to FTS2001 will be initiated in second quarter FY-00.
- The carrier for FAA International service will be changed from INFONET to MCIWorldcom in the third quarter FY-00.
- Planning for the transition of ADTN2000 to services under the FAA Telecommunications Infrastructure (FTI) acquisition will be continued.

2-02.4.2 Telecommunications Costs

Table 2-02.4 identifies the projected costs associated with the ADTN2000 Program. All costs are OPS Funded. There are three cost categories: circuits, hardware, and program support. The circuit counts approximate the required connectivity to support the facilities listed in Table 2-02-1. Similarly, the hardware costs represent the ADTN2000 leased equipment required at those facilities. The year-to-year increases in the total costs are consistent with projected site and historical traffic growth on the network.

2-02.4.3 Video Teleconference Systems and Services

The ADTN2000 contract has provisions for supplying video teleconference systems and services. There has been little interest in use of this offering and the equipment on contract is now old technology. Adding new video equipment to the contract does not appear to be a worthwhile endeavor and would likely not prove to be cost effective for the FAA.

Table 2-02-4. Cost Summary - ADTN2000

All costs in 000s	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
1. ADTN Circuits								
Cost Profile: LINCS and FTS2000/2001 circuits								
Circuit Costs								
Circuits Added		0	25	20	20	15	15	10
Total Circuits	295	295	320	340	360	375	390	400
F&E Funded Circuits		0	0	0	0	0	0	0
OPS Funded Circuits		295	320	340	360	375	390	400
Non-recurring Channel Costs								
F&E Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring Costs		**$612**	**$1,900**	**$184**	**$193**	**$203**	**$213**	**$223**
Recurring Circuit Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$5,423**	**$6,643**	**$8,398**	**$10,153**	**$11,908**	**$13,663**	**$15,418**
2. ADTN Hardware								
Cost Profile: Routers, PAD/Switches, CSUs, and Modem Pools								
Hardware Costs								
Non-recurring Hardware Costs								
F&E Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring Cost		**$874**	**$1,725**	**$137**	**$143**	**$150**	**$158**	**$166**
Recurring Hardware Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Cost		**$5,536**	**$6,699**	**$7,034**	**$7,386**	**$7,755**	**$8,143**	**$8,550**
3. Contractor Support								
ADTN Support Costs								
Non-recurring Costs								
F&E Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$1,065**	**$1,565**	**$1,289**	**$1,418**	**$1,559**	**$1,715**	**$1,887**

SUMMARY

		FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Totals	Non-Recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$0	$0	$0	$0	$0	$0	$0
	F&E Totals	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Totals	Non-Recurring	$1,486	$3,625	$321	$336	$353	$371	$389
	Recurring	$12,024	$14,907	$16,721	$18,957	$21,222	$23,521	$25,855
	OPS Totals	**$13,510**	**$18,532**	**$17,042**	**$19,293**	**$21,575**	**$23,892**	**$26,244**

Notes:

1. All costs provided by the ADTN2000 Program Office.
2. Projected program costs will decrease with service transition to FTI. FTI operations costs will increase by a commensurate amount.

CHAPTER 2-03 - SUMMARY SHEET

FAA SKYLINKS

Program/Project Identifiers:

Project Number(s):	CIP, C-24
Related Program(s):	
New/Replacement/Upgrade?	New
Responsible Organization:	AOP-500
Program Mgr./Project Lead:	Melvin Banks, AOP-500, (202) 493-5931
Fuchsia Book POC:	John L.Thomas, AOP-400, (202) 554-1680

Assigned Codes:

PDC(s):	CS, NC, NS
PDC Description:	ARINC Air to Ground Voice; ARINC Pre-departure Clearance; Pre-departure Clearance, Flight Data, and Digital ATIS Data Transmission.
Service Code:	ARIN

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	TBD	TBD	TBD	TBD	TBD	TBD	TBD
F&E Recurring	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Total F&E	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**
OPS Non-recurring	TBD	TBD	TBD	TBD	TBD	TBD	TBD
OPS Recurring	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Total OPS	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**

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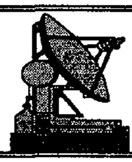
CIP Category: Communications



2-03.0 FAA SKYLINKS

2-03.1 PROGRAM OVERVIEW

Note: AOP-500 support of this program is on indefinite hold due a lack of funding. This chapter is included in the 2000 Fuchsia Book as a placeholder.

Air Traffic Services (ATS) in international airspace are governed by standards promulgated by the International Civil Aviation Organization (ICAO) and recognized by the United States. ICAO normally delegates this responsibility to nations willing to accept delegated airspace management responsibilities. The United States has been delegated Air Traffic Management responsibilities in four international Flight Information Regions (FIR). The United States, through the FAA, is responsible for a portion of the western half of the North Atlantic, the North American Arctic, the Caribbean, and most of the Pacific Ocean. A portion of the FAA's total mission is to provide Air Traffic Management (ATM) in these oceanic FIR's.

Since the oceanic environment has no radar capability, Air Traffic Control (ATC), communications and surveillance exist based upon voice procedures only and is currently satisfied via high frequency (HF) voice radio through a service provider. The service provider uses communicators to provide the voice interface between the FAA controller and the aircraft crewmembers. These communicators are not responsible for any air traffic management functions, but only provide a communication link to the aircraft.

HF voice radio procedures create delayed communications between aircraft and controllers and cause controller uncertainty in aircraft position and pilot intent. To compensate for this uncertainty, large blocks of airspace are reserved for each aircraft in order to maintain separations in the FIRs. In order to maintain an adequate margin of safety, aircraft in the FIRs are required to maintain predetermined speeds and follow predetermined routes, called tracks, across the airspace. Tracks and reporting points are changed every day according to the forecast winds over the oceans. The wind forecast is updated every twelve hours. A typical track is able to accept one aircraft every ten minutes at a given altitude. Aircraft operators file flight plans requesting the best available track for the forecast winds aloft. Once a track has been selected and the aircraft begins its flight, a change in track is time consuming and difficult due to congestion and communications delays. Therefore, the amount of air traffic causes these tracks to remain congested, and aircraft awaiting takeoff must wait until the required spacing is available.

The HF analog voice environment contributes to the communications delay. The HF spectrum is very noisy, making communications difficult between the service provider and the aircraft. Also, the HF system is affected by physical phenomena such as the atmospheric changes due to the time of day and the sunspot cycle. A wide spectrum of HF frequencies are required to accommodate these physical and atmospheric changes. Due to these stated limitations of procedural and environmental aspects, aeronautical operations are restricted and contribute to the difficulties of decreasing the time to communicate with aircraft in the oceanic regions.

The primary deficiency with the current system is the length of time required to communicate with aircraft in oceanic airspace. Several factors contribute to the delayed communications between aircraft and controller. The controller bases ATC actions on calculated or estimated positions of aircraft, but must depend on the pilot to follow the action. This turnaround time from ATC voice action to pilot confirmation averages more than six minutes per contact. This process is labor intensive and is affected by the typical problems associated with the use of HF analog voice. The result of this deficiency is the inability to accommodate increasing traffic numbers due to the large blocks of airspace reserved for each aircraft.

The altitudes at which jet aircraft are most efficient in fuel consumption and speed is, by statute, controlled airspace. In controlled airspace, the amount of separation airspace is dependent on three variables; communications performance, navigation performance of the aircraft, and level of surveillance available. The recognized worldwide system that encompasses these factors is the Communications, Navigation, Surveillance/Air Traffic Management (CNS/ATM) program. The oceanic airspace offers the least capable CNS/ATM of all airspace. The navigation systems are being updated to reflect a more accurate capability based upon the Global Position System (GPS). There are no active surveillance systems for beyond line of sight and, therefore, dependent surveillance is required which incorporates automatic position reports from the aircraft to the controller based upon the more accurate navigation positions. To increase the traffic and information flow, automated methods must be used, requiring a data link.

The primary obstacle to reducing separation standards in oceanic airspace is the communications system in use, HF voice. The major contributor to this deficiency is the delay inherent in the system that includes procedural, as well as environmental aspects. These problems are more acute when increases in oceanic usage are projected at even the most conservative figures.

To meet mission need requirements beyond 2000, the FAA requires the functional capability to communicate directly, rapidly, and reliably with aircraft beyond line of sight in oceanic airspace. These communications are necessary to provide voice, data link, and surveillance functions.

2-03.1.1 Purpose of FAA SKYLINKS

The FAA SKYLINKS program is intended to provide the telecommunications capability to satisfy the oceanic mission need requirements beyond 2000. A new, well thought out and planned communications system for beyond line of sight air traffic management is the stated goal of the FAA SKYLINKS program. The planned FAA SKYLINKS capability is to provide digital voice and data link communications in oceanic regions beyond line of sight and comply with future Aeronautical Telecommunications Network (ATN) requirements.

The Telecommunications Satellite Program Office of the Telecommunications Leased Communications Programs Division, AOP-500, is responsible for the FAA SKYLINKS program under the guidance of the Telecommunications Service Management (TSM).

2-03.1.2 References

2-03.1.2.1 FAA Capital Investment Plan, Project No. C-24, January 1999.

2-03.1.2.2 Guidance on Aeronautical Mobile Satellite Service (AMSS) End-to-End System Performance, RTCA/DO-215, May 13, 1993.

2-03.1.2.3 HF Data Link Alternative Analysis, Draft Version 1.0, July 18, 1996.

2-03.1.2.4 FAA SKYLINKS Satellite Alternative Analysis, Draft, July 15, 1996.

2-03.1.2.5 Draft FAA SKYLINKS, Phase 1 Initial Operational Requirements Document (ORD), September 9, 1996.

2-03.2 SYSTEM DESCRIPTION

FAA SKYLINKS' planned, space-based oceanic communications system has an end-to-end structure consisting of four separate and distinct parts:

- Oceanic automation systems residing in ARTCCs;
- NAS Interfacility Communications System (NICS) or ground-to-ground link;
- FAA SKYLINKS provided telecommunications subnetwork, e.g. ground stations and satellites; and
- Aeronautical mobile earth station (aircraft).

Figure 2-03-1 depicts an engineering concept of what FAA SKYLINKS would look like if a space-based system were selected.

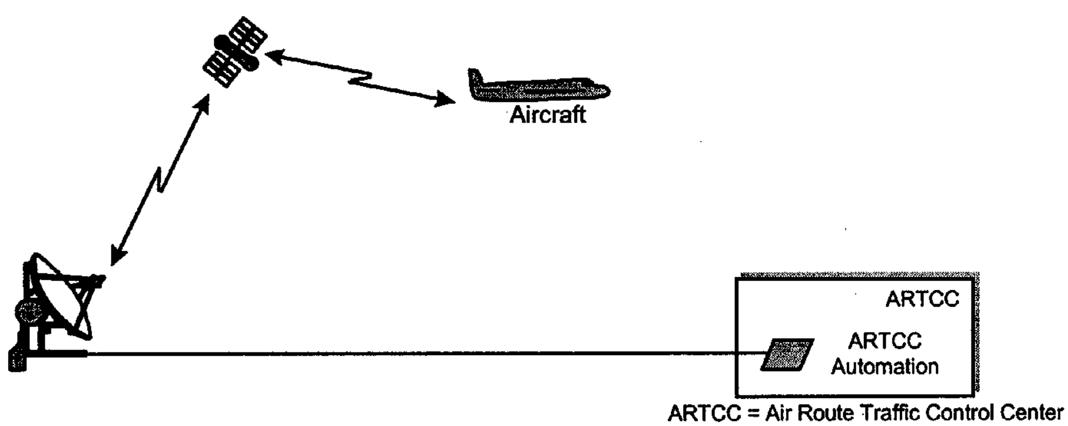


Figure 2-03-1. FAA SKYLINKS Architecture

The ARTCC automation system is being developed under another program, the Advanced Technologies and Oceanic Procedures (ATOP) Program. The ground-to-ground link is in place (i.e. NADIN, LINCS). The planned telecommunications subnetwork will be provided by the FAA SKYLINKS program and may include one or all of the following: satellites, fixed ground stations, and High Frequency Data Link (HFDL) systems. The final portion of the system includes the customers, the air carriers, business and personal aircraft.

2-03.2.1 Program/System Components TBD

2-03.2.1.1 Functional Component Interface Requirements TBD

2-03.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

Table 2-03-1 provides the System Interface Requirements Summary.

Table 2-03-1. FAA SKYLINKS Interface Requirements Summary

SUBSYSTEM INTERFACE		AIR to GROUND	GROUND to GROUND
INTERFACE CONTROL DOCUMENTATION		RTCA DO 219 RTCA DO 215	
PROTOCOL REQUIREMENTS	Network Layer	8205DCE	
	Data Link Layer	429W	
	Physical Layer	429	
	Special Formats/Codes	AEEC 622 & ATN	
TRANSMISSION REQUIREMENTS	No. Channels	1 per ARTCC	
	Speed (kbps)	0.6	
	Simplex Half/Full Duplex	Full Duplex	
	Service	Broadcast and Point-to-Point	Point-to-Point
HARDWARE REQUIREMENTS	Modem	TBD	
	Cable/Miscellaneous	TBD	

2-03.3.1 Telecommunications Interfaces TBD

2-03.3.1.1 Interface Requirements TBD

2-03.3.2 Local interfaces TBD

2-03.4 ACQUISITION ISSUES

2-03.4.1 Program Schedule and Status TBD

CHAPTER 2-04 - SUMMARY SHEET

ALASKAN NAS INTERFACILITY COMMUNICATIONS SYSTEM (ANICS)

Program/Project Identifiers:

Project Number(s):	CIP, C-17
Related Program(s):	CIPs, C-14, C-15, F-05, W-01
New/Replacement/Upgrade?	New
Responsible Organization:	AOP-500
Program Mgr./Project Lead:	Melvin Banks, AOP-500, (202) 493-5931
Fuchsia Book POC:	same

Assigned Codes:

PDC(s):	UD, UJ, UN, UX, VJ
PDC Description:	Leased satellite transponder bandwidth, ANICS equipment CLIN/SLINS using non-ANICS program funds, National Satellite Test Bed data circuits for satellite navigation, Wide Area Augmentation System circuits, Alaska NAS Interfacility Communications System Equipment
Service Code:	SAT

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$50	$50	$50	$50	$50	$50	$50
OPS Recurring	$4,252	$4,829	$5,140	$5,997	$6,744	$7,476	$8,243
Total OPS	**$4,302**	**$4,879**	**$5,190**	**$6,047**	**$6,794**	**$7,526**	**$8,293**

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CIP Category:
Communications

2-04.0 ALASKAN NAS INTERFACILITY COMMUNICATIONS SYSTEM

2-04.1 PROGRAM OVERVIEW

The Federal Aviation Administration's (FAA) ability to accomplish its air traffic control mission depends upon the availability of reliable telecommunications services between National Airspace System (NAS) facilities and system users. Unlike the lower-48 states, the "single-threaded" commercial telecommunications infrastructure in the Alaskan Region does not have the capability of meeting FAA NAS telecommunications requirements. The Alaskan NAS Interfacility Communications System (ANICS) program has implemented reliable NAS telecommunications services, replacing the "single-thread" communications architecture of the commercial interfacility communications system. The functions of ANICS are similar to those of the Leased Interfacility NAS Communications System (LINCS), Radio Communications Link (RCL), Low Density RCL (LDRCL), and Network Management and Control Equipment (NMCE).

2-04.1.1 Purpose of the Alaskan NAS Interfacility Communications System

ANICS is a satellite-based network designed to provide the FAA's Alaskan Region with reliable interfacility voice and data communications capabilities. It provides circuit connectivity for critical, essential, and routine air traffic control services from existing NAS facilities. ANICS uses primary and alternate satellites to provide system circuit diversity and backup. It can be expanded as needed to provide service to new NAS facilities.

This project has established an FAA-owned private line network using satellite earth station technology, creating a government-owned telecommunications network within the Alaskan Region. The system provides NAS voice, control, and data telecommunications in support of enroute and terminal air traffic control, navigation, flight service, weather operations, and associated functions. Based on an FAA analysis of transmission alternatives, plans for a comprehensive, satellite-based network were developed. Where it is operationally feasible, FAA owned satellite earth stations will be deployed to provide the backbone system needed to support existing and future NAS telecommunications requirements in Alaska.

ANICS supports the FAA's strategy for implementing cost-effective interfacility communications systems. It fulfills the requirements of FAA Order 6000.36, Communications Diversity, requiring redundancy and diversity for critical and essential NAS circuits.

The Telecommunications Leased Communications Programs Division, AOP-500, and the Alaskan Region ANICS Special Program Office in AAL-473 are responsible for the management of the ANICS program.

2-04.1.2 References

2.04.1.2.1 FAA Capital Investment Plan (CIP), CIP Project Number C-17. Establish Alaskan NAS Interfacility Communications System (ANICS) Satellite Network, January 1999. (Formerly CIP Project No. 45-24).

2-04.1.2.2 Contract No. DCA200-93-D-0004, Harris Corporation, July 7, 1993.

2-04.2 SYSTEM DESCRIPTION

ANICS is a satellite-based transmission network that provides circuit connectivity for the following NAS services provided by Alaskan Region air traffic controllers and flight service personnel in the performance of their duties:

- Enroute and Terminal Radar Surveillance Data (RDAT) and Beacon Data (BDAT)
- Remote Control Air Ground (RCAG) and Remote Communications Outlets (RCO) (ECOM & FCOM)
- Weather Advisories, Briefings, and Products
- Automated Flight Service Station (AFSS) and Flight Service Station (FSS) Operations
- Computer Based Instruction (CBI) (not at present time)
- Other NAS Equipment and Services
- Remote Maintenance Monitoring (RMM)
- Switched Service Transmission (not at present time)
- Dial Service Backup (not at present time)

2-04.2.1 ANICS Components

ANICS components consist of hub earth stations, remote earth stations, leased transponder space segments, and a Network Operations Control Center (NOCC). The remote earth stations are linked to their respective hubs and the NOCC through leased transponders on the primary and alternate satellites. An earth station's input/output ports terminate at standard demarcation points and interface with NAS facilities via in-house cabling or external tail circuits.

The end-state ANICS configuration will include 4 hub earth stations located in Fairbanks, Kenai, and Juneau AFSSs and the Anchorage Air Route Traffic Control Center (ARTCC); and the NOCC also located at the ZAN ARTCC; and 77 remote earth stations deployed at various locations throughout the Alaskan Region. System components consist of commercial off-the-shelf (COTS) satellite systems and services.

Network Monitoring and Control System (NMCS) functions are performed from the central, continually manned NOCC. Most functional areas will be fully redundant with 1:N automatic backup should any portion of the network fail. Each functional area contains sufficient monitor and control capabilities to determine and ensure a fully functional system. Manual and remote overrides of automated protection systems are part of the redundancy package. Failure of the NMCS function will not affect communications or cause failure or reconfiguration of the system or services.

2-04.2.2 Functional Component Interface Requirements.

The ANICS network is a satellite-based communications system under central network management that can be easily expanded to provide voice, control, and data circuits necessary to support air traffic control and flight service operations within the Alaskan Region. Implementation funding has been approved through the year 2001. The ANICS is compatible with the FAA's Radio Control Equipment (RCE) and Voice Switching and Control System (VSCS) and meets all interface requirements of the Radio Communications Link (RCL) and the Leased Interfacility NAS Communications System (LINCS), as implemented in the contiguous United States. The ANICS system provides the capabilities needed by air traffic controllers and flight service personnel in the performance of their duties. These capabilities are described below.

2-04.2.2.1 Air-to-Ground (A/G) Radio

Communications between controllers/flight specialists and system users is provided using ANICS circuit connectivity between the ARTCC/AFSS and VHF/UHF air-to ground radios located at Remote Control Air Ground (RCAG) and Remote Communications Outlets (RCO) facilities.

2-04.2.2.2 Terminal Radar

The ANICS provides telecommunications circuits for terminal radar data in support of air traffic control activities.

2-04.2.2.3 Surveillance (RDAT) and Beacon (BDAT) Radar

Controllers receive processed data at the ZAN ARTCC via ANICS circuits from the surveillance and beacon radar facilities used to control oceanic and domestic enroute air traffic in the Alaskan Region.

2-04.2.2.4 Weather Facilities

The ANICS provides circuit connectivity for the transmission of weather data from remote weather facilities, including Automated Weather Observing Systems (AWOS), Automated Surface Observing Systems (ASOS), FAA, NWS (National Weather Service), Contractor Weather Observers (CWOs), and Next Generation Weather Radar (NEXRAD) to major FAA facilities such as the AFSS/FSS, Airport Traffic Control Towers (ATCT), and the ZAN ARTCC.

2-04.2.2.5 AFSS and FSS Facilities

ANICS is used to provide circuit connectivity between AFSS and FSS, and associated NAS support facilities in the Alaskan Region.

2-04.2.2.6 Computer Based Instruction (CBI) (Not at present time)

The ANICS can provide interfacility communications for CBI equipment and services programmed for accomplishment in the Alaskan Region.

2-04.2.2.7 Other NAS Equipment and Services

The ANICS provides interfacility communications for all NAS equipment and services programmed for accomplishment in the Alaskan Region.

2-04.2.2.8 Remote Maintenance Monitoring (RMM)

The ANICS provides redundant circuits for the FAA RMM system and all associated subsystems at remote sites.

2-04.2.2.9 Switched Service Transmission (Not at present time)

The ANICS is capable of providing operational switched voice circuits between remote sites and the ARTCC or AFSS and the administrative Private Automatic Branch Exchange (PABX) at the ARTCC and AFSS. ANICS can also provide telecommunications circuits for the transmission of interfacility Air Traffic Voice Services (Service F) between major Air Traffic Control facilities.

2-04.2.2.10 Dial Backup (Not at present time)

At selected locations, dial backup capability will be provided to transition critical NAS facility circuits to commercial services in case of catastrophic failures at remote ANICS sites.

2-04.2.3 Performance Requirements

2-04.2.3.1 Architecture

The ANICS system architecture meets the operational reliability, maintainability, availability (RMA), and performance requirements specified in the ANICS contract.

The ANICS satellite ground equipment has sufficient antenna size and up-link and down-link RF capacity to support projected voice and data traffic forecast through the year 2003.

2-04.2.3.2 Adaptability

ANICS consists of an open-ended system architecture, capable of operating at specified system performance levels during system expansion, and as changes are made in the number and types of terminations, volume and mix of voice and data traffic, or channel or network configurations. Routine additions or reductions to the on-line ANICS configuration will be implemented without disruption of existing services.

2-04.2.3.3 Failure Impact Limitation

The system architecture, by design, limits the impact of the failure of individual components to single functions [e.g., transmit (TX), receive (RX), and to single terminations (e.g., one channel interface)]. All functional areas through which more than one voice or data channel passes simultaneously are auto-protected at each hub site with local and remote manual override capability.

2-04.2.3.4 Reconfiguration Functions

ANICS has the capability to reconfigure communications connectivity for each operational channel. A/B Switch reconfigurations are executed in accordance with predetermined maps in response to initiated reconfiguration commands. Execution of system reconfigurations will not result in the loss or prolonged interruption of existing services.

2-04.2.3.5 Tail Circuits at Remote Facilities

The ANICS circuits are capable of interfacing at required levels with existing and planned NAS facilities at the local FAA or TELCO tail circuit demarcation point.

2-04.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

The ANICS ground equipment is physically connected to the designated demarcation point at end user facilities. The FAA facility demarcation points are connected by cable or line to the earth station's input/output ports. The interface conforms to current FAA standards.

ANICS provides circuit diversity for critical and essential circuits. In the event of an aggregate, earth station, or satellite system failure, impacted circuits are automatically switched from the primary to the alternate path in each functional area. The Alaskan Region is working to achieve communication diversity for critical and essential circuits at all levels of the NAS telecommunications network. Critical circuits have been identified by class of connectivity in accordance with FAA Order 6000.36A. The Alaskan Region pursued telecommunications architecture consisting of diversely routed tail circuits, facility and metroplex loops, and an FAA-owned NAS interfacility network. The ANICS is part of an integrated effort aimed at achieving regional telecommunications system diversity.

2-04.3.1 Specific Applications

The ANICS telecommunications connectivity is used to facilitate the transmission of the following types of information: radar data from remote enroute sites to the ZAN ARTCC;

- Radio air-to-ground voice communications between RCAGs/RCOs and the ZAN ARTCC, AFSSs, and FSSs;
- Flight data between ATCTs, the ZAN ARTCC, AFSSs, and FSSs;
- NAVAID data from remote sites to AFSSs, FSSs, and the ANC Maintenance Control Center (MCC);
- NEXRAD and weather graphics data to the ZAN ARTCC, AFSSs, and FSSs;
- Flight Service Data Processing System (FSDPS) data between the ZAN ARTCC, AFSSs, and FSSs; and operational support voice and data communications between major air traffic control facilities in the Alaskan Region.

2-04.3.2 Protocol Requirements

No special ANICS protocols will be required. The satellite-based system provides transparent communications voice and data channels for the information being transmitted between regional NAS facilities.

2-04.3.3 Transmission Requirements

Adequate capability and capacity is provided for the transmission of analog or digital data with asynchronous or synchronous transmission. The required capacity is a function of the number of channels needed at a specific location to support existing and planned NAS interfacility connectivity requirements.

2-04.3.4 Hardware Requirements

Earth station hardware requirements include modular buildings or radomes, antennas and supporting structures, transmitters and receivers, up/down converters, multiplexing equipment, satellite modems, system monitor and control equipment, demarcation equipment, spare parts, and maintenance service. The C-band transponder space segment will be leased from commercial sources.

2-04.3.5 Local and Other Telecommunications Interfaces

The earth station's circuits connect to the FAA facility demarcation points and are interfaced directly to the NAS facility or through leased /FAA owned tail circuits. All interfaces are in accordance with current FAA standards.

2-04.3.6 Diversity Implementation

The ANICS project is an essential element in the Alaskan Region's plan for achieving system-wide NAS interfacility telecommunication diversity throughout the Alaskan Region. Overall point-to-point circuit diversity has been addressed, including tail circuits and long haul circuit requirements. Diversity has been achieved between remote locations and central FAA facilities by maintaining parallel communications paths using redundant earth stations or an earth station in conjunction with leased service. Single points of failure have been eliminated by co-locating ANICS earth stations at FAA facilities. The monitor and control of the ANICS network are accomplished from the Network Operations Control Center (NOCC) located in the ZAN ARTCC. When a failure occurs, channel paths are reconfigured from the NOCC.

2-04.4 ACQUISITION ISSUES

2-04.4.1 Project Schedule and Status

The ANICS project was implemented throughout the Alaskan Region in three phases as described in the following sections.

2-04.4.1.1 Phase 1

Phase 1 established dual satellite earth station facilities at 52 locations. All Phase 1 sites were completed as of November 1999. The Phase 1 ANICS sites provide critical and essential services in support of the FAA's air traffic control mission within regional domestic and oceanic airspace. Additionally, Phase 1 provides telecommunications diversity and ensured compliance with NAS System Specification availability/reliability requirements at these facilities. The Network Monitor and Control System (NMCS) was also established as part of this phase of the project.

This initial phase of deployment provides highly reliable interfacility circuit connectivity for critical and essential NAS facilities, while maximizing leased circuit cost avoidance at these sites. Whenever it is deemed cost beneficial, ANICS facilities have been co-located with existing NAS facilities to preclude the need for implementing tail circuit diversity.

Figure 2-04-1 depicts the site locations for the earth stations that were deployed under Phase 1 and planned Phase 2 locations.

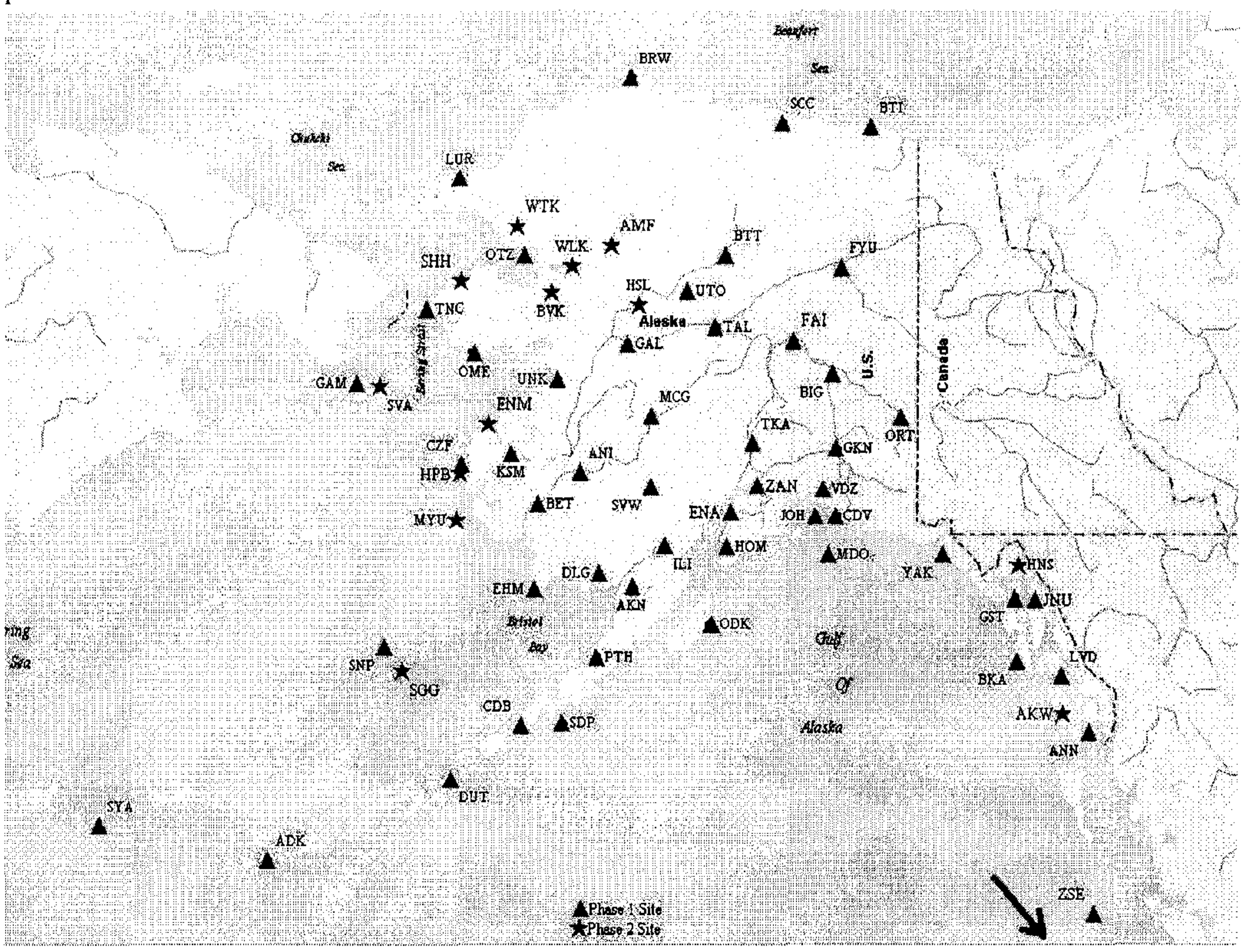

Figure 2-04-1. Phase I and II Earth Station Site Locations

2-04.4.1.2 Phase 2:

Phase 2 will establish single satellite earth station facilities providing essential communications services at 29 locations. Phase 2 deployment started in FY99. Four sites have been ordered, with construction of one site to be completed in early FY00 and the remaining sites by the end of the fiscal year. If it is determined to be operationally advantageous, additional single earth station facilities will be deployed at qualifying sites under Phase 2.

2-04.4.1.3 Phase 3

Phase 3 implements circuit connectivity for non-FAA aviation related requirements from other government agencies by expanding FAA earth stations or the deployment of additional earth stations. The Department of Defense (DoD) and the National Weather Service (NWS) are expected to be the principal agencies requiring services for airspace command/control and weather sensor data to support air traffic control activities. The U.S. Air Force has begun implementing service on ANICS for the USAF – FAA Joint Surveillance System (JSS) radar sites in Alaska. The NWS provides weather data product services to the FAA via ANICS. Phase 3 requirements will be implemented through the life of the ANICS contract based on needs of each agency and the availability of funding.

2-04.4.2 Implementation Schedules

Estimated site installation and interface implementation schedules are outlined in Table 2-04-1 and Table 2-04-2. Note: The circuit information in these tables is dynamic and subject to change. No attempt to correct mathematical errors in these tables was made due to insufficient information from the program office.

Table 2-04-1. ANICS Site Installation Schedule

Site Installation	Prior Years	FY 99	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
Hub Earth Stations	4	-	-	-	-	-	-	-	-
Remote Earth Stations	41	6	5	2	9	8	0	0	0
Remote Earth Stations Cumulative Total	41	47	52	54	63	75	75	75	75

Table 2-04-2. ANICS Interface Implementation Schedule

Interface Implementation	Prior Years	FY 99	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
Phase I Channels	348	183	48	34	32	44	32	32	32
Phase II Channels	0	0	13	8	36	32	5	5	5
Cumulative Totals	348	530	590	657	732	813	850	887	924
Circuits Awaiting Cutover	422	240	180	113	38	33	33	33	33

2-04.4.3 Planned Telecommunications Strategies

The Alaskan Region completed an extensive study of existing NAS facility and regional CIP interfacility communications requirements to define the approach that should be taken to address the limitations of the current leased NAS interfacility communications system. This study included an analysis of near-term and long-term options, with these specific objectives:

- Determining the effectiveness of continued use of the existing leased NAS interfacility communications system;

- Mitigating anticipated cost increases in the leased telecommunications services; and
- Identifying a plan for the orderly upgrade and replacement of that system in light of increased CIP requirements and exchange system limitations and obsolescence.

The study found that toll and local exchange network options fell into two broad groups. These were: (1) solving near-term reliability, capacity, and obsolescence issues; and (2) providing, in the long-term, a system capable of satisfying FAA CIP requirements for improved performance, economy, maintainability, flexibility and system capacity.

The Alaskan Region has developed a circuit requirement database forecast future FAA telecommunications requirements to the circuit level at regional NAS facilities. The database is updated with individual circuit requirements from the present to the year 2003. All telecommunication circuits have been categorized by criticality of service in accordance with the NAS System Specification and FAA Order 6000.36A, Communication Diversity.

Based on an FAA analysis of transmission alternatives, plans for an overall, comprehensive, end-to-end, diverse circuit network were developed. The ANICS project has establish a FAA-owned private network employing satellite earth station technology. In addition, the project has created a diverse backbone communications network within the Alaskan Region that interfaces with FAA and/or Local Exchange Carrier (LEC) end-point distribution networks to support existing and future NAS telecommunications requirements.

2-04.4.4 Telecommunications Costs

The cost projections on the summary sheet for the ANICS project were provided by the program office.

Table 2-04-3. Cost Summary - ANICS

CIP C-17 All costs in 000s	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
1. TRANSMISSION COSTS								
Space Segment Costs								
Cost Profile: Based on ANICS contract costs through 3Q FY03, then estimated at $16.00/kbps/month thereafter.								
Non-recurring Costs (associated with circuit changes)								
OPS Non-recurring Costs		$50	$50	$50	$50	$50	$50	$50
Recurring Costs								
Phase I Channels	335	512	540	556	578	600	621	643
Phase II Channels	0	4	29	40	58	65	65	65
OPS Recurring Costs		$3,477	$3,972	$4,242	$5,037	$5,742	$6,446	$7,183
Tail Circuit Costs								
Cost Profile: Based on estimated tail circuit charges of $207 per tail circuit per month.								
OPS Recurring Costs								
Phase I Sites		$690	$728	$750	$779	$809	$838	$867
Phase II Sites		$5	$39	$54	$78	$88	$88	$88
Switched Service Usage (Admin Phones and Toll Charges)								
Cost Profile: Average of $1.5K per site.								
OPS Recurring Costs		$80	$90	$95	$102	$105	$105	$105
SUMMARY								
F&E Totals Non-recurring		$0	$0	$0	$0	$0	$0	$0
Recurring		$0	$0	$0	$0	$0	$0	$0
F&E Total		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
(F&E Totals Note 3)								
OPS Totals Non-recurring		$50	$50	$50	$50	$50	$50	$50
Recurring		$4,252	$4,829	$5,140	$5,997	$6,744	$7,476	$8,243
OPS Total		**$4,302**	**$4,879**	**$5,190**	**$6,047**	**$6,794**	**$7,526**	**$8,293**

Note 1: Funding shows requirement for sites ordered.
Note 2: Program Management & Engineering (PM&E) Costs included in non-recurring costs (NRC).
Note 3: FY99 funding for ANICS frozen as of 5/1/00. Funding requirement will move to FY00 - FY01.

CHAPTER 2-05 - SUMMARY SHEET

BACKUP EMERGENCY COMMUNICATIONS (BUEC)

Program/Project Identifiers:

Project Number(s):	CIP, C-09
Related Program(s):	CIPs, C-01, C-04, C-06,C-12, F-02, F-11, M-03, M-15, M-21, M-27
New/Replacement/Upgrade?	Replacement
Responsible Organization:	AND-360
Program Mgr./Project Lead:	Dieter Thigpen, AND-360, (202) 493-4822
Fuchsia Book POC:	Ed Wilhelm, Contractor, AND-360, (301) 577-3200 x239

Assigned Codes:

PDC(s):	CE, CY
PDC Description:	BUEC Circuits; BUEC Circuits diverse from RCAG circuits for same frequency & airspace
Service Code:	ECOM

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$810	$756	$842	$864	$864	$1,145	$1,242
F&E Recurring	$2,511	$630	$657	$747	$765	$999	$1,314
Total F&E	**$3,321**	**$1,386**	**$1,499**	**$1,611**	**$1,629**	**$2,144**	**$2,556**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$2,331	$3,006	$3,681	$4,311	$5,013	$5,733	$6,453
Total OPS	**$2,331**	**$3,006**	**$3,681**	**$4,311**	**$5,013**	**$5,733**	**$6,453**

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CIP Category: Communications

2-05.0 SUSTAINING BACKUP EMERGENCY COMMUNICATIONS

2-05.1 PROGRAM OVERVIEW

Sustaining Backup Emergency Communications (BUEC) replaces the current BUEC equipment at selected Air Route Traffic Control Centers (ARTCC) and their associated remote sites. The BUEC remote control group and transceivers replaced will be used by the FAA Logistic Center to maintain the current BUEC equipment at the remaining ARTCCs.

2-05.1.1 Purpose of Sustaining Backup Emergency Communications

The existing backup emergency communications system was completed in the late 1970's using 1950's technology. This project will replace the system at ARTCCs that have parts supply problems and rising maintenance costs.

The Voice and Data Communications Team, AND-340, is responsible for planning and coordinating the facility expansion strategy. Regions are responsible for the selection, engineering, and implementation of specific sites.

2-05.1.2 References

2-05.1.2.1 FAA Aviation System Investment Plan (CIP) Project Number C-09, January 1999.

2-05.1.2.2 FAA Instruction Book, TI 6650.17A, Remote Control Group, July 1974.

2-05.1.2.3 FAA Instruction Book, TI 6610.4A, VHF Transceiver, 20 Watt, July 1974.

2-05.1.2.4 VSCS to Backup Emergency Communication Interface Control Document, NAS-IR 64024201, June 1994.

2-05.1.2.5 Radio Control Equipment System Manual, TI 6650.48, June 1996.

2-05.2 SYSTEM DESCRIPTION

The BUEC Systems consist of radio equipment from the Communications Facility Enhancement Program, CIP C-06, and radio control equipment (RCE) from the Radio Control Equipment Program, CIP C-04. These components are radios and remote site RCE and are sited and installed by the regions with guidance and supervision by AND-340. The control site RCE is installed at the ARTCC. The functional connectivity is depicted in Figure 2-05-1.

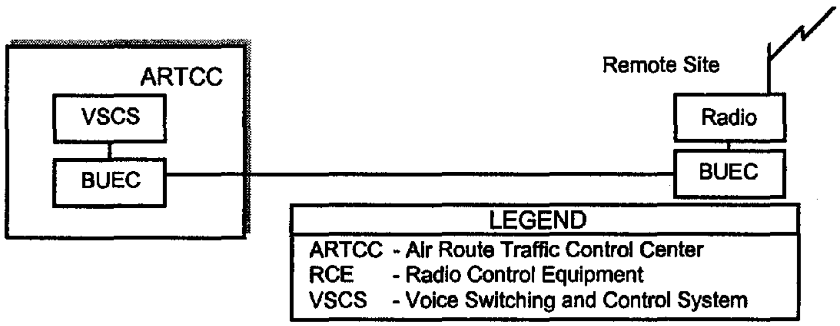

Figure 2-05-1. Functional Component Connectivity Diagram

2-05.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

2-05.3.1 Telecommunications Interface

The interface requirement for BUEC is one dedicated VG-6 phone line, or RCL equivalent, for each BUEC channel. Since the BUEC channel must furnish diversity for the primary channel for which it provides a backup, this line must be completely separate from the phone line connecting the primary channel. The specific requirements of the phone line are defined in the RCE instruction book, TI 6650.48.

2-05.3.2 Local Interface

The BUEC equipment has local interfaces with the Voice Switching and Control System (VSCS) at the ARTCC. This interface is defined by NAS-IR-64024201. The only local interface is the connection between the control and remote site RCE described above.

2-05.4 ACQUISITION ISSUES

BUEC is planned to be installed in the twenty ARTCCs that currently have BUEC equipment through FY09.

2-05.4.1 Program Schedule and Status

At the present funding level, BUEC is scheduled to be installed in twenty ARTCCs. Of these twenty ARTCCs, nine have started implementation. The planned completion dates and the number of BUEC channels to be installed are shown in Table 2-05-1.

Table 2-05-1. BUEC Interface Implementation Schedule

ARTCC	Total Previous Yrs.	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	Total
ZAB								15	15	23		53
ZAU				10	25	20						55
ZBW	33											33
ZDC							20	25				45
ZDV	55											55
ZFW				8	10	15	20					53
ZHI	10											10
ZHU		10	36	10								56
ZID							10	20	15			45
ZJX				15	25							40
ZKC		15	34	10								59
ZLA	46											46
ZLC	24	11										35
ZMA								25	8			33
ZME						15	26					41
ZMP						30	30	30				90
ZNY				25	20							45
ZOA		32										32
ZOB									15	15	15	45
ZSE	45											45
ZTL	46	7										53
Total	**259**	**75**	**70**	**78**	**80**	**80**	**106**	**115**	**53**	**38**	**15**	**969**

2-05.4.2 Planned Telecommunications Strategies

The RCE software has been modified to provide the signals needed for the VSCS interface. All interfaces are defined by the RCE. The telecommunication link between the control and remote sites is monitored by the RCE, with the status reported to its own maintenance monitoring system.

The requirement of spatial diversity between the telecommunication path for the primary Air/Ground channel and the BUEC channel is satisfied by the regional implementation. The telecommunication link for the BUEC channel can use the Leased Interfacility NAS Communication System (LINCS) or the Radio Communications Link (RCL). The actual implementation is determined by each region.

2-05.4.3 Telecommunication Costs

The projected cost of leased terrestrial connectivity to BUEC sites is summarized in Table 2-05-2. The channel installations are based upon the interface implementation schedule outlined in Table 2-05-1. In accordance with FAA Order 2500.8A, non-recurring charges and recurring charges in the year of installation plus the next full fiscal year are included in the F&E Funded totals. After the second year, the recurring charges for a particular interface implementation are OPS Funded.

The channel costs are derived from the connectivity costs to the existing BUEC sites. According to the TIMS database, the annual recurring cost for existing leased connectivity to BUEC sites is $2.1 million. Until it is confirmed that particular channels can be carried on other networks (such as the FAA-owned RCL microwave network), it is assumed that all channels will be placed on the LINCS network.

Table 2-05-2. Cost Summary - BUEC

CIP [illegible] All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
ARTCC <---> Remote Site								
Cost Profile: A-B/LINCS/VG-6								
Channel Costs								
Channels Added		75	70	78	80	80	106	115
Total Channels	259	334	404	482	562	642	748	863
F&E Funded Channels		279	70	73	83	85	111	146
OPS Funded Channels		259	334	409	479	557	637	717
Non-recurring (F&E) Channel Costs		**$810**	**$756**	**$842**	**$864**	**$864**	**$1,145**	**$1,242**
Recurring Channel Costs								
F&E Recurring Costs		**$2,511**	**$630**	**$657**	**$747**	**$765**	**$999**	**$1,314**
OPS Recurring Costs		**$2,331**	**$3,006**	**$3,681**	**$4,311**	**$5,013**	**$5,733**	**$6,453**

SUMMARY

		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
F&E Totals	Non-recurring	$810	$756	$842	$864	$864	$1,145	$1,242
	Recurring	$2,511	$630	$657	$747	$765	$999	$1,314
	F&E Totals	**$3,321**	**$1,386**	**$1,499**	**$1,611**	**$1,629**	**$2,144**	**$2,556**
OPS Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$2,331	$3,006	$3,681	$4,311	$5,013	$5,733	$6,453
	OPS Totals	**$2,331**	**$3,006**	**$3,681**	**$4,311**	**$5,013**	**$5,733**	**$6,453**

Notes:

1. Until it is confirmed that particular channels can be carried on other networks (such as the FAA-owned RCL microwave network), all channels are assumed to be placed on LINCS.
2. According to the TIMS database, the annual recurring cost of leased connectivity to existing BUEC sites is $2.1 million.

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CHAPTER 2-06 - SUMMARY SHEET

COMMUNICATIONS FACILITY EXPANSION (CFE)

Program/Project Identifiers:

Project Number(s):	CIP, C-06
Related Program(s):	CIPs, C-04, C-09, C-21, F-02, F-03, F-04, M-03
New/Replacement/Upgrade?	New/Upgrade
Responsible Organization:	AND-340
Program Mgr./Project Lead:	George O'Neill, AND-340, (202) 493-4821
Fuchsia Book POC:	Steve McMahon (202) 479-4832 x237

Assigned Codes:

PDC(s):	CA, CB, CC, CF, CH, CI, CT, CU, EX
PDC Description:	RCAG, RTR, RCO circuits
Service Code:	ECOM, FCOM, TCOM

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$56	$166	$220	$138	$44	$32	$16
F&E Recurring	$134	$398	$528	$331	$106	$77	$38
Total F&E	**$190**	**$564**	**$748**	**$469**	**$150**	**$109**	**$54**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$1,013	$1,013	$1,147	$1,411	$1,675	$1,742	$1,781
Total OPS	**$1,013**	**$1,013**	**$1,147**	**$1,411**	**$1,675**	**$1,742**	**$1,781**

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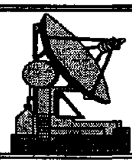
CIP Category: Communications



2-06.0 COMMUNICATIONS FACILITY EXPANSION

2-06.1 PROGRAM OVERVIEW

Air/Ground (A/G) radio communications are essential services provided to pilots, air traffic controllers, and flight service specialists, allowing voice contact with aircraft for both control and advisory purposes. The array of transmitters and receivers, taken collectively, must be able to send and receive radio signals to aircraft virtually anywhere in the country above designated altitudes. Since radio transmission distances are limited, a large and geographically diverse number of antenna facilities are necessary. There are presently about 4,000 such facilities.

2-06.1.1 Purpose of Communications Facility Expansion

This project will establish additional remote communications capabilities to satisfy air traffic demands from Remote Communications Facilities (RCFs), including Remote Center Air/Ground (RCAG) communications facilities, Remote Communications Outlets (RCO), and Remote Transmitter/Receiver (RTR) facilities. Increasing air traffic operational needs for A/G communications coverage has made it essential to expand existing RCFs by adding A/G communications frequencies and relocating owned/leased facilities for proper communications coverage.

The Air/Ground Voice Product Team, AND-360, is responsible for planning and coordinating the facility expansion strategy. Regions are responsible for the selection, engineering, and implementation of specific sites.

2-06.1.2 References

2-06.1.2.1 FAA Aviation System Capital Investment Plan (CIP) Project Number C-06, January 1999.

2-06.1.2.2 National Airspace System Plan, April 1985, Chapter IV, "Ground to Air Systems," Project 2.

2-06.1.2.3 System Program Plan and System Implementation Plan, Remote Communications Facilities, FAA Order 6580.1, October 18, 1985.

2-06.2 SYSTEM DESCRIPTION

As the National Airspace System grew, A/G radio communications for en route, terminal, and flight service requirements developed independently. Thus, the approximately 4,000 transmitter/receiver A/G remote communications facilities include a mix of RCAGs, and Backup Emergency Communications

(BUEC) for Air Route Traffic Control Center (ARTCC) facilities, RTRs for Airport Traffic Control Tower (ATCT) facilities, and RCOs for Flight Service Stations (FSSs). Each A/G remote communications facility typically has its own building, even though another A/G remote communications facility serving a different set of users may be nearby. The operation and maintenance of these buildings, whether leased or FAA owned, is expensive.

2-06.2.1 Components

Communication Facility Expansion includes two major components: radio control equipment and transmitters/receivers.

2-06.2.1.1 Radio Control Equipment

Located at both the control facility and antenna facility, Radio Control Equipment (RCE) allows the operator to control the radios (i.e., key the transmitter, monitor the receiver, and select main or standby).

2-06.2.1.2 Transmitter/Receivers

The radio transmitter/receivers are located at the A/G remote communications facility.

2-06.2.2 Functional Component Interface Requirements

The functional component interfaces are illustrated in Figure 2-06-1.

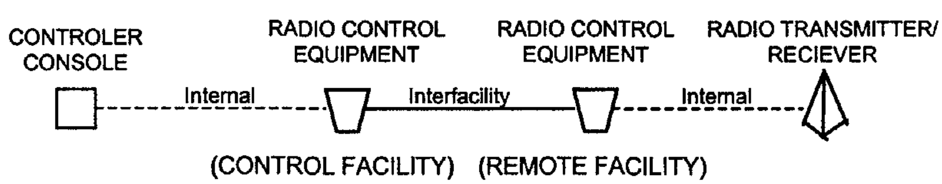


Figure 2-06-1. Communications Facility Expansion

2-06.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

The protocol, transmission, and hardware requirements for the interfaces are summarized in Table 2-06-1.

2-06.3.1 Telecommunications Interfaces

2-06.3.1.1 RCE to RCE

The communications interface between operator and radio locations must provide clear, intelligible speech on-demand between parties. This requirement is the same before and after expansion. RCE control uses a periodic, digital message. There is no protocol for voice. Transmission requirements after expansion are the same as before expansion. Various control locations, including ARTCCs, TRACONs, ATCTs, and FSSs will continue to require access to radios in specific local areas. No major hardware external to the RCE will be required.

Table 2-06-1. CFE System Interface Requirements Summary

CFE SYSTEM INTERFACES		RCE to RCE
INTERFACE CONTROL DOCUMENTATION		N/A Vendor developed
PROTOCOL REQUIREMENT	Network Layer	N/A
	Data Link Layer	N/A
	Physical Layer	N/A
	Special Formats/ Codes	Periodic, digital message
TRANSMISSION REQUIREMENT	No. of Channels	N/A
	Speed (kbps)	N/A
	Simplex Half/Full Duplex	Full Duplex
	Service	VG-6 or VG-8
HARDWARE REQUIREMENT	MODEM	N/A
	Cable/Misc	

2-06.3.2 Local Interfaces

2-06.3.2.1 Radio Control Equipment to Transmitter/Receiver

This interface is local to the remote facility. Physical connectivity is provided by direct wiring.

2-06.4 ACQUISITION ISSUES

2-06.4.1 Project Schedule and Status

Some expansion has already occurred. A first-level communications networking plan has been completed. The regions are responsible for implementation. Table 2-06-2 shows the interface implementation schedule for FY00 to FY06.

Table 2-06-2. RCE Interface Implementation Schedule

Interface Implementation	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
RCE to RCE	211	28	55	55	14	8	8	0

2-06.4.2 Telecommunications Strategies

A network of circuits connecting control facilities to A/G remote communications facilities is already in place. Although communications facility expansion may decrease building operations and maintenance costs, the distance between control and A/G remote communications facilities may not change significantly. See Table 2-06-3 for cost estimates for FY00 to FY06.

2-06.4.3 Telecommunication Costs

The Interface Implementation Schedule is used to derive the cost summary shown in Table 2-06-3. The costs are based on the average of existing leased circuits between ATC and RCF facilities. In accordance with FAA Order 2500.8A, the non-recurring cost and recurring costs during the year of installation and the next full fiscal year are listed as F&E Funded costs. After the second fiscal year, the recurring costs are included in the OPS Funded totals.

Compared to the 1999 Fuchsia Book, there are some noteworthy changes to the cost summary. Since the number of interface implementations has been reduced significantly, the F&E Funding requirements have decreased accordingly. In addition, the OPS Funded costs in the out years are lower since the total number of channels to be implemented is lower.

In addition to the impact of the lower channel counts on the F&E and OPS totals, the hardware costs are also lower. In the 1999 Fuchsia Book, the hardware requirements were incorrectly identified as DMN modems when, in actuality, radio control equipment is required at both ends of each channel. This correction is incorporated into the cost summary for the 2000 Fuchsia Book and the appropriate cost factors are applied. Since the initial purchase price of the radio control equipment includes the warranty, there are no recurring contract maintenance charges in the out years.

Table 2-06-3 Cost Summary – CFE

CIP # C-06 All costs in 000's	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
1. RCE <---> RCE								
Cost Profile: Based Upon Average of Existing Connectivity to RCFs Plus Radio Control Equipment on Each Circuit.								
Channel Costs								
Channels Added		28	55	55	14	8	8	0
Total Channels	211	239	294	349	363	371	379	379
F&E Funded Channels		28	83	110	69	22	16	8
OPS Funded Channels		211	211	239	294	349	363	371
F&E Non-recurring Channel Costs		**$56**	**$166**	**$220**	**$138**	**$44**	**$32**	**$16**
Recurring Channel Costs								
F&E Recurring Costs		**$134**	**$398**	**$528**	**$331**	**$106**	**$77**	**$38**
OPS Recurring Costs		**$1,013**	**$1,013**	**$1,147**	**$1,411**	**$1,675**	**$1,742**	**$1,781**
		SUMMARY						
F&E Totals	Non-recurring	$56	$166	$220	$138	$44	$32	$16
	Recurring	$134	$398	$528	$331	$106	$77	$38
	F&E Total	**$190**	**$564**	**$748**	**$469**	**$150**	**$109**	**$54**
OPS Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$1,013	$1,013	$1,147	$1,411	$1,675	$1,742	$1,781
	OPS Total	**$1,013**	**$1,013**	**$1,147**	**$1,411**	**$1,675**	**$1,742**	**$1,781**

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CHAPTER 2-07 - SUMMARY SHEET

DATA MULTIPLEXING NETWORK, PHASE III (DMN-III)

Program/Project Identifiers:

Project Number(s):	CIP, C-11
Related Program(s):	CIPs C-14, F-02, F-04, W-01, W-02, W-03
New/Replacement/Upgrade?	New
Responsible Organization:	AND-340 and AOP-400
Program Mgr./Project Lead:	Derek Bigelow, TIPT, (202) 493-5950 Paul Nagi, AOP-400, (202) 493-5953
Fuchsia Book POC:	Arthur Smith, (202) 863-7352

Assigned Codes:

PDC(s):	NG, UF, UI, UL, VF, VG, VH
PDC Description:	Multiplexing-exchange service dial back up circuits; Critical DMN circuits: RDAT, BDAT, IDAT, FDAT, RMMs, etc.; DMN critical circuits (backup critical path); Non-critical DMN circuits for ASOS, CBI and MMS; Data multiplexing equipment; DMN equipment Phase III; DMN statmux equipment.
Service Code:	DMN

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	$0	$0	$0	$0	$0	$0	$0
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$1,650	$1,650	$1,650	$1,650	$1,650	$1,650	$1,650
Total OPS	$1,650	$1,650	$1,650	$1,650	$1,650	$1,650	$1,650

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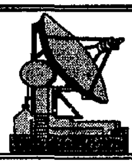
CIP Category:
Communications



2-07.0 DATA MULTIPLEXING NETWORK PHASE III

2-07.1 PROGRAM OVERVIEW

The Data Multiplexing Network (DMN) is a FAA-owned telecommunications network created to satisfy many of the data communications requirements of the National Airspace System (NAS). Using multiplexing techniques, a number of independent data signals to be consolidated into a single transmission channel. DMN equipment will work with a variety of transmission systems, such as analog and digital leased channels, voice-grade dial-up circuits, Radio Communications Link (RCL) channels, Low Density RCL, and satellites.

2-07.1.1 Purpose of the Data Multiplexing Network

The purpose of the DMN is to provide data telecommunications services to the NAS as part of the transmission subelement of the NAS Interfacility Communications element. The use of multiplexing modems allows consolidation of independent NAS data circuits onto common transmission channels between FAA sites. Because multiplexing modems improve transmission bandwidth utilization, transmission efficiency is increased while NAS Interfacility Communications System (NICS) costs are reduced.

The DMN Network is a split procurement effort. The Telecommunications Network Planning and Engineering Division, AOP-400, is responsible for requirements consolidation and network engineering. The Interfacility Communications Organization, AND-340, is responsible for providing and installing DMN Phase III equipment. The Network Planning and Engineering, AOP-400, and Regional offices provide the telecommunications circuit and responsible for managing the existing and planned DMN systems (i.e., Phases I, II, and III).

2-07.1.2 References

2-07.1.2.1 Data Multiplexing Network Equipment Specification, FAA-E-2786, February 1989.

2-07.1.2.2 Draft Data Multiplexing Network (DMN) Diversity Policy, April 25,1991.

2-07.1.2.3 National Airspace System Communications Network Design, October 1985.

2-07.1.2.4 Data Multiplexing Network Statistical Multiplexer Specification, FAA E 2860, March 1989.

2-07.1.2.5 Capital Investment Plan (CIP), Project C-11, January 1999.

2-07.1.2.6 The Data Multiplexing Network Phase III Statistical Time Division Multiplexing Equipment Project Implementation Plan, FAA Order 6170.12.

2-07.1.2.7 The Data Multiplexing Network Phase III Deterministic Time Division Multiplexing Equipment Project Implementation Plan, FAA Order 6170.11.

2-07.1.2.8 Data Multiplexing Network Engineering Design Drawings, Release 5.0.

2-07.1.2.9 Data Multiplexing Network (DMN) Phase IIIB Network Design Guidelines.

2-07.2 SYSTEM DESCRIPTION

The DMN design and implementation strategy uses a systems approach to meet NAS data transmission requirements in a cost-effective manner. The DMN provides network backbone routing, real-time monitoring and control, diverse routing, and automatic backup systems. The Phase I and II networks were designed to multiplex embedded base connectivity and to meet certain near-term NAS requirements. The Phase III network replaced the Phase I and II networks, providing opportunities for multiplexing existing and future NAS data requirements. The Phase III network is subdivided into categories, Phase III-A, the statistical multiplexing modem network and Phase III-B, the Deterministic Time Division Multiplexing (DTDM) modem network. For interfacility transmission, DMN uses a variety of services, such as LINCS, radio, satellite and FAA cables.

The Phase III-A network is complete. The Phase III-B expansion will provide additional services and equipment to satisfy new or expanded NAS requirements. This project description describes the strategy for continuing implementation of the DMN. Table 2-07-1 lists some of the NAS subsystems that requirements for DMN Phase III. Interface and connectivity requirements for these programs are addressed in Section 2-07.4.

2-07.2.1 <u>Components</u>

The DMN consists of nodes, equipment, and transmission facilities. Transmission currently is provided by conditioned voice-grade circuits, digital circuits, dial-up circuits, RCL transmission paths, and FAATSAT circuits. Network nodes and major equipment items are described below.

2-07.2.1.1 <u>Data Multiplexing Network Nodes</u>

DMN nodes are defined points of user access. Since the modems, high-speed time division multiplexers (HSTDM) and CSU/DSUs, are the points of access, all facilities having DMN equipment are classified as DMN nodes. This includes the ARTCCs, CERAPS, ATCTs, TRACONs, AFSSs, ARSRs, Air Traffic Control System Command Center (ATCSCC), and ASOS sites.

Table 2-07-1. NAS Plan Projects for Which DMN Provides Connectivity

NAS PLAN PROJECTS	ACRONYM
AWOS Data Acquisition System	ADAS
Air Route Surveillance Radar	ARSR
Flight Service Station Consolidation and Automated Flight Service Station Establishment	FSS Consol & AFSS Est
Automated Surface Observing System	ASOS
Computer Based Instruction	CBI
Flight Service Automation System	FSAS
Discrete Addressable Secondary Radar System with Data Link	MODE S
NAS Infrastructure Management System	NIMS
Terminal Doppler Weather Radar	TDWR
Tower Data Link System	TDLS
VHF Omnidirectional Range (VOR) collocated with Tactical Air Navigation (TACAN)	VORTAC

2-07.2.1.2 Deterministic Time Division Multiplexing (DTDM) Modems

DTDM modems are used in dedicated (point-to-point and multipoint) and dial-up configurations. Multiplexing modems available from the Phase III contract accept input data rates in multiples of 2.4 kbps and are configured for aggregate point-to-point rates up to 19.2 kbps and a multipoint rate of 4.8 kbps. The point-to-point modems can be configured for digital operation over DDS at rates of 56 kbps. In either mode, the modems have dial back-up capability to restore service at rates up to 19.2 kbps.

2-07.2.1.3 High-Speed Time Division Multiplexers (HSTDMs)

The HSTDMs combine multiple synchronous and digital input channels in up to five composite, digital output links. As currently configured, the output of the individual composite links are 64 kbps and 128 Kbps where LINCS DDC circuits are used and 256 kbps where digital RCL circuits are used.

2-07.2.1.4 Channel Service Units/Data Service Units (CSUs/DSUs)

The CSUs/DSUs provide the data terminal equipment and network interface for connection to leased DDS and LDRCL. The CSU/DSU receives the output of the multiplexer and converts the digital information to the appropriate form for input to the digital transmission network. The digital interface will conform to CCITT Recommendation V.35 and RS-232-C/D. Interfaces are convertible between RS-232-C/D or V.35 characteristics and pin configurations. The CSUs/DSUs are installed in accordance with AT&T Publication PUB 62310 for interfacing with DS-1 (1.544 Mbps) leased services. The CSU/DSU will accept timing signals from the leased digital network or other external clock sources. The CSU/DSU will support data rates of 2.4 kbps, 4.8 kbps, 9.6 kbps, 19.2 kbps, and 56/64 kbps. With the availability of digital RCL and LINCS DDC channels, few CSU/DSUs remain in the DMN program.

2-07.2.1.5 Statistical Time Division Multiplexers (STDM)

Three types of STDMs are deployed. Type I STDMs have a minimum of four and a maximum of eight asynchronous input data channels and one synchronous composite output link with a speed up to 19.2

kbps. Type II STDMs have a minimum of eight and maximum of 32 input data channels and one composite output link. Type II STDMs can combine up to three type I STDMs and eight local channels onto one composite link. Type III STDMs support a maximum of 240 asynchronous input channels and 14 composite output links. The composite link speed for each type III STDM does not exceed 64 kbps. Ancillary equipment includes the following interface cards: Automated Network Monitoring System (ANMS), bisynchronous, X.25, 23.25 Monitor, composite link, and asynchronous.

2-07.2.1.6 Automated Network Management System (ANMS)

The ANMS performs the following five basic network functions:

1) Monitoring and diagnostic testing of the multiplexing modem equipment;
2) Identification and isolation of network troubles;
3) Restoral function, either rerouting or equipment substitution;
4) Recording of network performance statistics; and
5) Monitoring of VF line performance parameters using modems to detect line impairments.

The ANMS conducts performance monitoring of the major components of the DMN equipment without interruption of continuous operation during data transmission.

2-07.2.2 Component Interface Requirements

Telecommunications requirements for projects that will utilize the DMN appear in the appropriate chapters in this publication. Typical FAA sites that utilize the DMN are shown in Figure 2-07-1.

2-07.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

Transmission, protocol and hardware requirements for some of the telecommunications interfaces are summarized in Table 2-07-2.

2-07.3.1 Protocol Requirements

This interface will comply with RS-232-D or V.35.

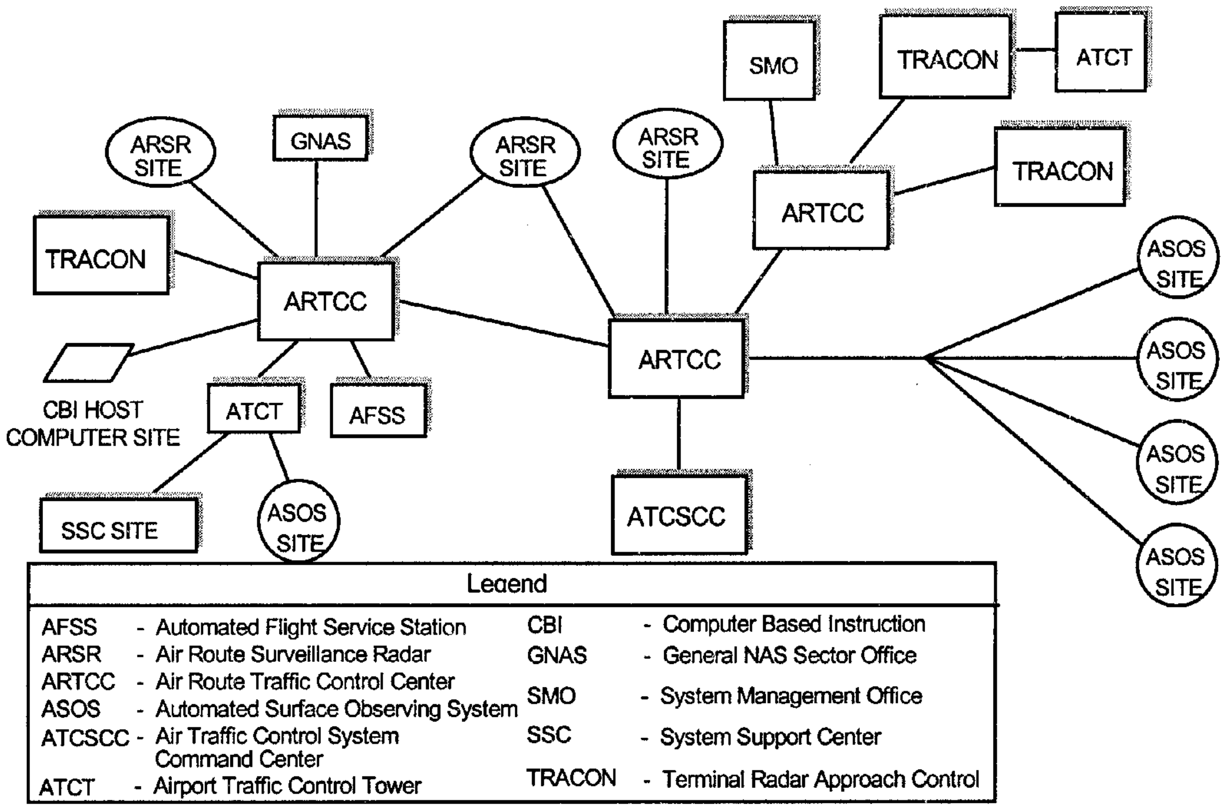


Figure 2-07-1. Typical Data Multiplexing Network Interfaces

2-07.3.2 Transmission Requirements

Transmission is primarily through LINCS VG-8 voice-grade channels and digital data channels. Synchronous and asynchronous transmission paths are provided using DTDMs and STDMs. CSUs/DSUs and HSTDMs provide connectivity for digital networks where applicable.

2-07.3.3 Hardware Requirements

The DMN program provides the required communications hardware.

2-07.3.4 Local and Other Telecommunications Interfaces

The DMN operates over a broad range of telecommunications media. The typical media are identified in sections 2-07.3.4.1 through 2-07.3.4.6 below.

2-07.3.4.1 FAA Owned Microwave System (FAA-OMW)

2-07.3.4.1.1 Radio Communications Link (RCL)

The RCL is predominantly an analog system. The digital capability of the RCL was introduced in 1993. Refer to the Fuchsia Book chapter on FAA Owned Microwave Systems for more information.

2-07.3.4.1.2 Low Density Radio Communications Link (LDRCL)

The LDRCL is a FAA-owned microwave radio system used for low density, short distance requirements. It is to be used where other transmission facilities are unavailable. Refer to the chapter on FAA Owned Microwave Systems for more information.

Table 2-07-2. DMN Interface Requirements Summary

SUBSYSTEM INTERFACE		ARTCC to ARTCC	ARTCC To ARSR/MODE S	ARTCC to FAATC
INTERFACE CONTROL DOCUMENTATION			Chap 40 Chap 39	
PROTOCOL REQUIREMENTS	Network Layer			
	Data Link Layer			
	Physical Layer	V.35	RS-232-C/D	RS-232-C/D
	Special Formats/ Codes	CBI Data Surv Radar Data InterFac Data	RDAT Pri/Sec RMS Data PSTN - B/U	Host Maint Dat
TRANSMISSION REQUIREMENTS	No. Channels			
	Speed (kbps)	Up to 256	19.2	
	Simplex Half/Full Duplex			
	Service			
HARDWARE REQUIREMENTS	Modem			
	Cable/ Miscellaneous			

Table 2-07-2. DMN Interface Requirements Summary (Concluded)

SUBSYSTEM INTERFACE		ARTCC To TRACON	ARTCC To ATCT	ARTCC To CBI HOST
INTERFACE CONTROL DOCUMENTATION				
PROTOCOL REQUIREMENTS	Network Layer			
	Data Link Layer			
	Physical Layer	RS-232-C/D	RS-232-C/D	RS-232-C/D
	Special Formats/ Codes	ARTS Data FDIO Data CBI Data RMMS Data	CBI Data FDIO Data TDLS Data ASOS Data RMMS Data	CBI Data
TRANSMISSION REQUIREMENTS	No. Channels			
	Speed (kbps)			
	Simplex Half/Full Duplex			
	Service			
HARDWARE REQUIREMENTS	Modem			
	Cable/ Miscellaneous			

SUBSYSTEM INTERFACE		ATCT To ASOS Sites	ARTCC to AFSS	ARTCC To GNAS	ARTCC to AFSFO
INTERFACE CONTROL DOCUMENTATION		Chap 2-07 Chap 2-13	Chap 2-15		
PROTOCOL REQUIREMENTS	Network Layer				
	Data Link Layer				
	Physical Layer	RS-232-C/D	RS-232-C/D	RS-232-C/D	RS-232-C/D
	Special Formats/ Codes	ASOS Data RMMS Data	M1FC Data RMMS Data	GMCC Data RMMS Data	MPS Data CBI Data
TRANSMISSION REQUIREMENTS	No. Channels				
	Speed (kbps)	ASOS 2.4 RMMS 2.4	(4) 9.6 muxed into (2) 19.2		
	Simplex Half/Full Duplex				
	Service				
HARDWARE REQUIREMENTS	Modem				
	Cable/ Miscellaneous				

2-07.3.4.2 <u>Leased Interfacility NAS Communications Systems (LINCS)</u>

LINCS capabilities and services are reflected in DMN drawings. See the Fuchsia Book chapter on LINCS for further discussion of the LINCS program.

2-07.3.4.3 Federal Telecommunications System 2000 (FTS2000)

The FTS2000 is a Government Switched Telecommunications System for voice and data services. See Section III-B of the Current FAA Telecommunications System and Facility Description Manual (Currant Book) for a brief description of the FTS.

2-07.3.4.4 FAA Telecommunications Satellite (FAATSAT)

FAATSAT utilizes satellite telecommunications for voice and data service. See the Fuchsia Book chapter on FAA Telecommunications Satellite System for further discussion of the system.

2-07.3.4.5 Other Leased Services

Other leased telecommunications services will be used to support the FAA's telecommunications needs when the transmission facilities described above are not available.

2-07.3.4.6 FAA Fiber and Copper Cable

FAA cables are used where they are available.

2-07.3.5 Diversity Implementation

As a telecommunications provider, the DMN, itself, requires no diversity. The diversity implemented is dictated by the diversity/backup/restoral requirements of the services utilizing the DMN. The diversity implemented on any given circuit will be what is required by the highest priority service on that circuit.

2-07.4 ACQUISITION ISSUES

2-07.4.1 Program Schedule and Status

The Phase III implementation has been and will be accomplished using equipment procured under three contracts. The Phase III-A contract for STDM equipment was awarded in the third quarter of FY92. The Phase III-B contract for DTDM equipment was awarded in the third quarter of FY90. The third contract covers miscellaneous equipment required to support the DTDM applications. Each contract is for indefinite delivery/indefinite quantity of equipment and services during a 10-year period from contract award. The Phase III-B contract has been extended to 2000.

The DMN Phase III-A program and the portion of the DMN Phase III-B program that is replacing the Phase I and II equipment are complete. However, requirements for DMN in support to new NAS Plan projects will result in continued growth of the network. The numbers of circuits added each year will be determined by the Telecommunications Network Planning and Engineering Division (AOP-400).

2-07.4.2 Planned Telecommunications Strategies

Additional procurements are intended to meet the demands of emerging FAA programs.

2-07.4.3 Telecommunications Costs

Implementation cost estimates for Phase III-B during the period FY00 to FY06 are summarized in Table 2-07-3. The cost estimates are based on the requirements to complete the current Phase III-B design plus estimates of growth in demand for the years after 1999. Funding will be in accordance with FAA Order 2500.8A. Other costs outlined in the cost summary are explained below.

2-07.4.3.1 Total Hardware Costs

Hardware costs include the cost of procuring, deploying, and maintaining the various program required hardware. Hardware costs include those that are funded through the DMN program. Additional hardware requirements will be funded by the DMN-user programs and are shown in the separate program chapters.

2-07.4.3.2 Channel Costs

Channel costs include non-recurring installation costs and recurring costs for new leased channels. The costs for leased channels have been determined using LINCS and FTS2000 pricing tools.

The channel counts used in the summary is based on an estimated 10% annual growth rate. Channel costs reflect the consolidation of DMN requirements for all DMN-user programs. These consolidated costs are generally less than the sum of costs shown in the individual program chapters, because the individual programs cannot fully reflect the savings from DMN multiplexing. For planning and budgetary purposes, the costs shown should not be combined with the DMN channel costs presented in other chapters.

2-07.4.3.3 Dial Backup Costs

Dial backup capability is inherent in the DTDMs. These costs are associated with use of the public switched telephone network for this service. The number of drops is the number of dial-in or dial-out installations required for the channels shown under Channel Costs.

2-07.4.3.4 Operational Enhancement Costs

Operational enhancement costs refer to the one-time costs of introducing new or enhanced technologies into the DMN. In the past, such enhancements have included the replacement of the original HSTDM with the 6250 multiplexer, the migration from analog to digital transmission, and the elimination of many CSU/DSUs by using LINCS DDC and digital RCL. The costs for developing supplemental training and acquiring specialized new test equipment also fall into this category. Cost estimates assume the trend in enhancements will continue.

2-07.4.3.5 Program Management and Engineering Costs

Program Management and Engineering (PM&E) costs correspond to the costs associated with the management of the DMN Program, along with the engineering support required when new services are added to the network or modifications are made. The PM&E costs also cover the configuration management of the network, including DMN drawings that identify the individual port assignments and a database to maintain this data.

Table 2-07-3. Cost Summary – Data Multiplexing Network (DMN)

CIP # C-11	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY06
Total Hardware Costs									
	Cost Profile: Procurement of Hardware to Support Establishment of DMN Network								
	Non-recurring Hardware Costs								
	F&E Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring Hardware Costs								
	F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$651**	**$716**	**$788**	**$866**	**$953**	**$1,048**	**$1,153**
Channel Costs									
	Cost Profile: AOP Costs for Establishing Internodal Connectivity								
	Channels Added		307	338	371	409	449	494	544
	Total Channels	2882	3189	3527	3898	4307	4756	5251	5795
	Non-recurring Channel Costs								
	F&E Non-recurring Costs		**$520**	**$572**	**$630**	**$693**	**$762**	**$838**	**$838**
	OPS Non-recurring Costs		**$247**	**$271**	**$299**	**$328**	**$360**	**$396**	**$436**
	Recurring Channel Costs								
	F&E Recurring Costs		**$1,113**	**$994**	**$864**	**$721**	**$563**	**$389**	**$205**
	OPS Recurring Costs		**$9,174**	**$10,120**	**$11,162**	**$12,310**	**$13,216**	**$14,737**	**$16,412**
Dial Backup Costs									
	Cost Profile: AOP Costs for Establishing Dial Backup for Internodal Connectivity								
	Drops Added		100	105	111	116	122	128	133
	Total Drops	2008	2108	2213	2324	2440	2562	2690	2823
	Non-recurring Dial Backup Costs								
	F&E Non-recurring Costs		**$6**	**$7**	**$7**	**$8**	**$9**	**$10**	**$11**
	OPS Non-recurring Costs		**$6**	**$7**	**$7**	**$8**	**$9**	**$10**	**$11**
	Recurring Dial Backup Costs								
	F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$570**	**$599**	**$628**	**$660**	**$693**	**$727**	**$764**
DMN Operational Enhancement Costs									
	Cost Profile: AOP Costs to Sustain Operational Improvements								
	Non-recurring Costs								
	F&E Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring Costs								
	F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$1,650**	**$1,650**	**$1,650**	**$1,650**	**$1,650**	**$1,650**	**$1,650**

Table 2-07-3. Cost Summary – Data Multiplexing Network (DMN) (concluded)

CIP# C-11	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY06
DMN Program Management and Engineering (PM&E) Costs									
Cost Profile: AOP Costs for DMN Program Management and Engineering									
Non-recurring Costs									
F&E Non-recurring Costs			**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring Costs			**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Costs									
F&E Recurring Costs			**$2,530**	**$2,783**	**$3,061**	**$3,367**	**$3,704**	**$4,075**	**$4,482**
OPS Recurring Costs			**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
			SUMMARY						
F&E Totals		Non-recurring	$589	$648	$713	$784	$863	$949	$1,044
		Recurring	$3,643	$3,777	$3,925	$4,088	$4,267	$4,464	$4,687
		F&E Total	**$4,232**	**$4,425**	**$4,638**	**$4,872**	**$5,130**	**$5,643**	**$6,207**
OPS Totals		Non-recurring	$253	$278	$306	$336	$369	$406	$447
		Recurring	$12,045	$13,085	$14,228	$15,486	$16,512	$18,163	$19,979
		OPS Total	**$12,298**	**$13,363**	**$14,534**	**$15,822**	**$16,881**	**$18,569**	**$20,426**

DMN user requirements are identified in the individual Fuchsia Book chapters. To prevent double counting of DMN user requirements, only the operational enhancement costs, as identified in the following table will be used to formulate the leased telecommunications OPS budget submission.

			FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY06
DMN Operational Enhancement Costs									
Cost Profile: AOP Costs to Sustain Operational Improvements									
Non-recurring Costs									
F&E Non-recurring Costs			**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring Costs			**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Costs									
F&E Recurring Costs			**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs			**$1,650**	**$1,650**	**$1,650**	**$1,650**	**$1,650**	**$1,650**	**$1,650**
			SUMMARY						
F&E Totals		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Totals		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		OPS Total	**$1,650**	**$1,650**	**$1,650**	**$1,650**	**$1,650**	**$1,650**	**$1,650**

Notes:

1. Projected program costs will decrease with service transition to FTI. FTI operations will increase by a commensurate amount.

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CHAPTER 2-08 - SUMMARY SHEET

FAA TELECOMMUNICATIONS SATELLITE (FAATSAT) SYSTEM

Program/Project Identifiers:

Project Number(s):	CIP C-15
Related Program(s):	CIPs A-11, C-14, C-17, C-20, F-02, F-05, W-01
New/Replacement/Upgrade?	New
Responsible Organization:	AOP-400
Program Mgr./Project Lead:	Mike Sullivan, AOP-400, (202) 493 5956
Fuchsia Book POC:	Terry Makinen, (202) 314-5935

Assigned Codes:

PDC(s):	UK ,VK, DE
PDC Description:	FAATSAT Test Circuits (OT&E); FAA Telecommunications Satellite Equipment; FAATSAT Transportable Earth Station (ES-T) Circuits.
Service Code:	SAT

Cost Estimates *:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$369	$0	$0	$0	$0	$0	$0
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$369**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$683	$16	$16	$16	$16	$16	$16
OPS Recurring	$15,594	$14,407	$13,700	$15,088	$15,236	$15,482	$15,503
Total OPS	**$16,277**	**$14,423**	**$13,716**	**$15,104**	**$15,252**	**$15,498**	**$15,519**

* Cost data provided by the Program Office.

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CIP Category:
Communications

2-08.0 FAA TELECOMMUNICATIONS SATELLITE SYSTEM

2-08.1 PROGRAM OVERVIEW

The FAA Telecommunications Satellite (FAATSAT) System is a leased service that consolidates existing operational satellite services, as well as future requirements, into a single program. Satellite service is provided in the Continental United States (CONUS) for some of Weather and Radar Processor (WARP) [formerly Meteorologist Weather Processor (MWP)] broadcast data circuits, and a small number of en route radar data circuits and Air-To-Ground (A/G) voice circuits. Major goals of the FAATSAT program are to avoid the costs and inefficiencies resulting from separate satellite communications circuit leases, increase availability through redundant diverse telecommunications circuits, and to reduce the proliferation of satellite antennas at FAA facilities. The FAATSAT contract, a requirement contract, was awarded to MCI in June 1996 for a period of five years with five one-year options.

The NAS requires high telecommunications service availability and can tolerate no single points of failure for critical services. The FAATSAT program augments FAA terrestrial telecommunications in satisfying NAS requirements. In some applications, where no diverse terrestrial paths are available between major facilities and remote sites, FAATSAT provides the required services at a competitive cost.

The Alaskan NAS Interfacility Communications System (ANICS) telecommunications satellite requirements are discussed in a separate Fuchsia Book chapter.

2-08.1.1 Purpose of the FAA Telecommunications Satellite System

The FAATSAT System is a NAS project that accomplishes the FAA goals of modernizing interfacility communications and improving flight safety and air traffic control operational needs by providing primary or secondary transmission means for appropriate telecommunications users. FAATSAT provides diversity for critical circuits where terrestrial means are not available, nor cost-effective, and provides the primary transmission means for non-critical circuits where practical and cost-effective. FAATSAT also can be used to achieve required overall service availability for selected unreliable circuits.

A satellite system acquisition plan and communications architecture have been established to facilitate satellite services acquisition. FAATSAT provides the following leased services and capabilities:

- Diverse routing for selected critical communications circuits, such as en route radar and A/G voice circuits,
- Primary transmission means for selected NAS projects,
- Primary or alternate transmission paths for selected NAS telecommunications requirements where satellite communication is necessary or cost-effective.

Plans and budgets of emerging programs must reflect the current and anticipated needs for satellite services.

The FAA Telecommunications Satellite and Advanced Technology Program Office of the Telecommunications Network Planning and Engineering Division, AOP-400, is responsible for the FAATSAT System.

2-08.1.2 References

2-08.1.2.1 Aviation System Capital Investment Plan, Project No. C-15, FAA Telecommunications Satellite (FAATSAT) System, January 1999

2-08.1.2.2 FAATSAT Request for Proposal (RFP), October 5, 1993, as amended.

2-08.1.2.3 FAATSAT Contract between Defense Information Technology Contracting Office (DITCO) and MCI, June 1996.

2-08.1.2.4 FAATSAT Functional Specification, FAA-E-2893, September 1994, as amended.

2-08.1.2.5 FAATSAT Operational Requirements Document, June 1995.

2-08.2 SYSTEM DESCRIPTION

The FAATSAT System is comprised of satellite ground equipment, referred to as Earth Stations (ESs) of various sizes, and leased satellite transponder capacity. The FAATSAT Program Office will install ES-Hubs at ARTCCs and other major FAA facilities, and ES-Remotes at selected FAA facilities such as en route radar and remote A/G radio sites. The FAATSAT vendor will provide a Network Management Center (NMC) which will provide the FAA, at its central maintenance control facility and at each ARTCC, a System Management Terminal (SMT) to provide operational and maintenance status of the FAATSAT System.

2-08.2.1 Components

The components of the FAATSAT System include ES-Hubs, ES-Remotes, ES-Transportables, space segment (satellite transponders) for FAATSAT telecommunications circuits, and a System Management Center (SMC). A Transportable Earth Station (ES-T) is available for contingency applications. The components of the FAATSAT System are represented in Figure 2-08-1.

The communications capacity requirements vary from facility to facility, however the capacity of the earth station ranges from 1.544 Mbps to 16 Mbps. ES-Remotes range from one 64 kbps channel to 1.544 Mbps; and ES-Transportables shall have a maximum capacity of 1.544 Mbps.

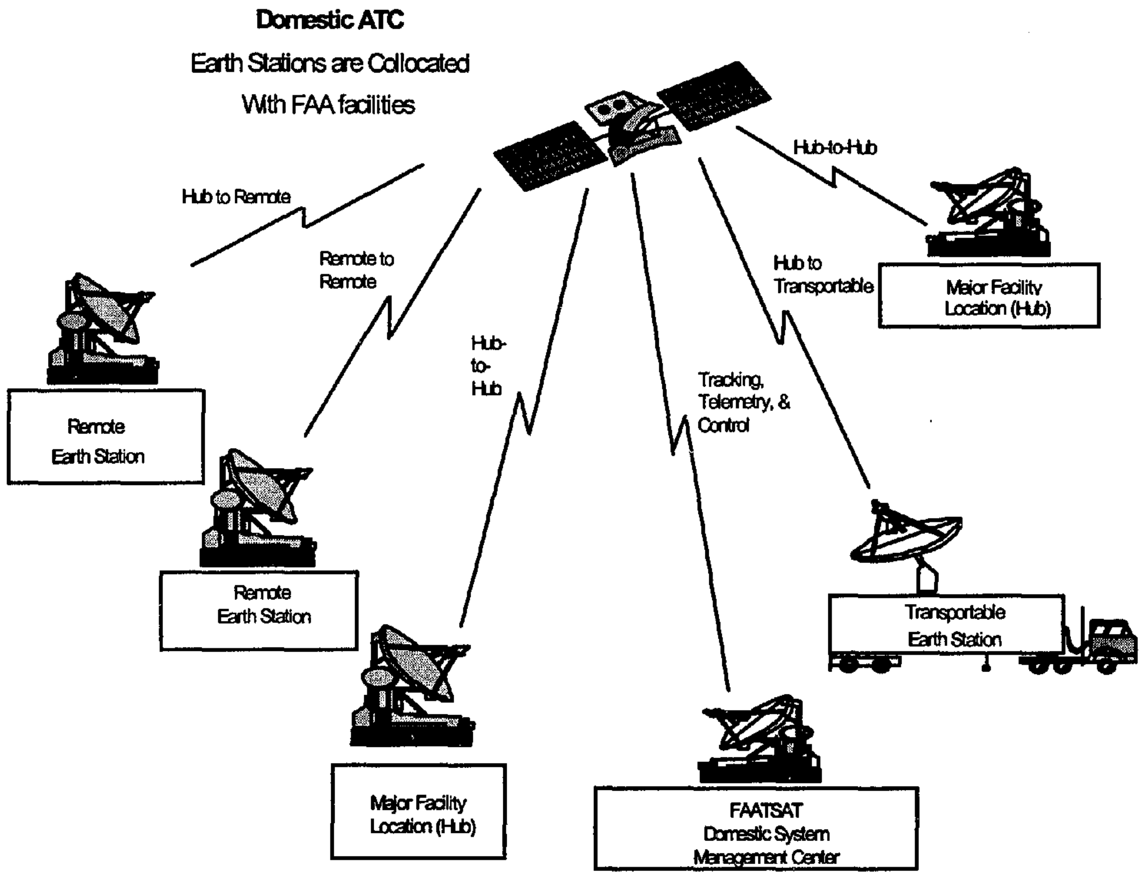

Figure 2-08-1. FAATSAT System Architecture

2-08.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

2-08.3.1 Telecommunications Interfaces

Telecommunications interfaces from the vendor's multiplex equipment to the antenna assembly are the vendor's responsibility.

The FAATSAT telecommunications interfaces are identified in the referenced Functional Specifications. FAATSAT interfaces include a Weather and Radar Processor (WARP) uplink site at the Jacksonville ARTTC for broadcast of WARP data to other ARTCCs. ARTCCs interface to en route radar data and Air/Ground voice as well as voice and data circuits at AFSS . Specific facility types and the interfaces required are identified in Table 2-08-1. Table 2-08-1, FAATSAT System Interface Requirements Summary, provides identification of the Interface Control Documentation (ICD), the protocol, transmission, and hardware.

FAATSAT provides a diverse route for designated FAA systems. Fault sensing and automatic switching will be provided by the Radio Control Equipment (RCE) for voice circuits and through the use of the Data Multiplexing Network (DMN) terminal equipment for data circuits. In the event of a satellite failure, affected circuits will be routed to an alternate satellite by the FAATSAT system vendor.

Table 2-08-1 FAATSAT System Interface Requirements Summary

		INTERFACES				
SUBSYSTEM INTERFACE		WARP	AFSS	ARSR	ATCT	ARTCC
INTERFACE CONTROL DOCUMENTATION		NAS IR 25159414 Oct 95 (Draft)	TBD	FAA-E-2763b para 3.5.13(h)	TBD	
PROTOCOL REQUIREMENTS	Network Layer					
	Data Link Layer					
	Physical Layer	EIA-530		RS-232-C		
	Special Formats/ Codes			Common Digitizer (CD-2)		
TRANSMISSION REQUIREMENTS	No. Channels	2	As Required	1		TBD
	Speed (kbps)	512/768	64	56		Various
	Simplex Half/Full Duplex	FD	FD	FD		FD
	Service	Broadcast & Point-to-point	Point-to-Point	Point-to-point	Point-to-point	Broadcast Point-to-point
HARDWARE REQUIREMENTS	Modem			Codex, Clocking Req'd		
	Cable/ Miscellaneous					

		INTERFACES				
SUBSYSTEM INTERFACE		RCAG	RCO/RTR	TRACON	VOR	CTAS
INTERFACE CONTROL DOCUMENTATION		Bellcore TR-NPL-000335 Rev 2 Nov 87	Bellcore TR-NPL-000335 Rev 2 Nov 87	TBD	Modified ANS X3.66	TBD
PROTOCOL REQUIREMENTS	Network Layer					
	Data Link Layer					
	Physical Layer	RS-232-C				
	Special Formats/ Codes	Data over voice				
TRANSMISSION REQUIREMENTS	No. Channels	1 VG-6 per radio				
	Speed (kbps)	VG			VG/FSK	
	Simplex Half/Full Duplex	FD			FD Data over voice	
	Service	Point-to-point			Point-to-point	
HARDWARE REQUIREMENTS	Modem	DSRCE				
	Cable/ Miscellaneous					

Table 2-08-1. FAATSAT System Interface Requirements Summary (Concluded)

SUBSYSTEM INTERFACE		ATCSCC	TRACON	CERAP	BUEC	ITWS
INTERFACE CONTROL DOCUMENTATION		See WARP	TBD	TBD	Bellcore TR-NPL-000335 Rev 2 Nov 87	
PROTOCOL REQUIREMENTS	Network Layer					TBD
	Data Link Layer					TBD
	Physical Layer					TBD
	Special Formats/ Codes				Can not be used w/ ACK	TBD
TRANSMISSION REQUIREMENTS	No. Channels					TBD
	Speed (kbps)					
	Simplex Half/Full Duplex					
	Service					TBD
HARDWARE REQUIREMENTS	Modem					
	Cable/ Miscellaneous					

2-08.4 ACQUISITION ISSUES

2-08.4.1 Project Schedule and Status

The integrated network architecture provides for satellite services, while a phased system implementation assures orderly FAATSAT System growth and meets anticipated user schedules. The estimated earth station installation schedule is given in Table 2-08-2.

Table 2-08-2. FAATSAT Earth Station Installation Schedule

Site Installation	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06	Total
ARTCCs and Other Major Facilities	22	0	0	0	0	0	0	0	**22**
Remote Sites	85	2	0	0	0	0	0	0	**87**
Transportable	1	0	0	0	0	0	0	0	**1**
Portables	0	0	0	0	0	0	0	0	**0**
Circuits	184	2	0	0	0	0	0	0	**186**

2-08.4.2 Planned Telecommunications Strategies

2-08.4.2.1 Planned Method & Cost

A FAATSAT System will be implemented for needed services. FAATSAT System goals include:

- Satisfying technical and operational requirements.
- Providing telecommunications services that cannot be practically implemented by terrestrial means.
- Supplementing terrestrial services that cannot meet availability requirements or providing an alternate path for critical services.
- Replacing terrestrial services to realize cost savings.

Table 2-08-3. Cost Summary - FAATSAT

CIP # C-15 All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
1. Earth Stations								
Earth Station Remotes Added		2	0	0	0	0	0	0
Total Earth Stations								
ES-Hub	22	22	22	22	22	22	22	22
ES-Remote	85	87	87	87	87	87	87	87
ES-Transportable	1	1	1	1	1	1	1	1
ES-Portable	0	0	0	0	0	0	0	0
Non-recurring Earth Station Costs								
F&E Non-recurring Costs		**$369**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring Costs		**$16**	**$16**	**$16**	**$16**	**$16**	**$16**	**$16**
Recurring Earth Station Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$13,617**	**$12,713**	**$11,926**	**$13,331**	**$13,459**	**$13,687**	**$13,687**
2. Space Segment								
Channels Added		2	0	0	0	0	0	0
Total Channels	184	186	186	186	186	186	186	186
Non-recurring Channel Costs								
F&E Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring Costs		**$6**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$968**	**$944**	**$1,025**	**$1,007**	**$1,026**	**$1,046**	**$1,066**
3. Program Management and Engineering								
Recurring Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$1,010**	**$750**	**$750**	**$750**	**$750**	**$750**	**$750**
4. Network Upgrades								
F&E Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring Costs		**$661**	**$200**	**$200**	**$200**	**$200**	**$200**	**$200**

SUMMARY

		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
F&E Totals	Non-recurring	$369	$0	$0	$0	$0	$0	$0
	Recurring	$0	$0	$0	$0	$0	$0	$0
	F&E Total	**$369**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Totals	Non-recurring	$683	$16	$16	$16	$16	$16	$16
	Recurring	$15,594	$14,407	$13,700	$15,088	$15,236	$15,482	$15,503
	OPS Total	**$16,277**	**$14,423**	**$13,716**	**$15,104**	**$15,252**	**$15,498**	**$15,519**

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CHAPTER 2-09 - SUMMARY SHEET

FAA-OWNED MICROWAVE SYSTEMS (FOMS)

Program/Project Identifiers:

Project Number(s):	CIP C-12
Related Program(s):	CIP C-18, F-02, M-15
New/Replacement/Upgrade?	Replacement/Upgrade
Responsible Organization:	TIPT
Program Mgr./Project Lead:	Tom Loftus, AOP-400/TIPT, (202) 493-5952
Fuchsia Book POC:	Joe Coury, (202) 863-7353

Assigned Codes:

PDC(s):	VR, VS, VT
PDC Description:	RCL Equipment; Low Density RCL Equipment; TML Equipment
Service Code:	RCL, TML

Cost Estimates*:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$7,800	$4,000	$1,000	$750	$500	$100	$100
OPS Recurring	$4,896	$5,356	$4,976	$5,416	$5,876	$6,336	$6,436
Total OPS	**$12,696**	**$9,356**	**$5,976**	**$6,166**	**$6,376**	**$6,436**	**$6,536**

* Cost data provided by the Program Office.

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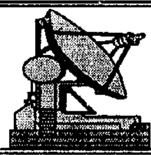
CIP Category: Communications



2-09.0 FAA-OWNED MICROWAVE SYSTEMS

2-09.1 FAA-OWNED MICROWAVE SYSTEMS (FOMS) OVERVIEW

The management, planning and engineering of all nationally fielded microwave systems owned by the FAA are under the auspices of the FOMS Program Office. These systems include the Radio Communications Link (RCL), the Low Density Radio Communications Link (LDRCL), the Radar Microwave Link (RML) and the Television Microwave Link (TML). These systems are outlined in the paragraphs below. Program funding is summarized in Table 2-09-4.

2-09.2 Radio Communications Link (RCL)
2-09.3 Low Density Radio Communications Link (LDRCL)
2-09.4 Radar Communications Link (RML)
2-09.5 Television Microwave Link (TML)

2-09.2 RADIO COMMUNICATIONS LINK (RCL) OVERVIEW

The Radio Communications Link (RCL) is the telecommunications transmission system that replaced and expanded the Radar Microwave Link (RML) system, creating an interconnected national RCL backbone network. The RCL is a primary means of achieving communications diversity for critical National Airspace System (NAS) services.

The RCL backbone is complemented by the Low Density RCL (LDRCL) system (described in Section 2-09.3) which provides short-haul user access links between FAA facilities. The RCL and LDRCL are part of the Interfacility Communications Systems element of the NAS.

2-09.2.1 Purpose of the Radio Communications Link

The RCL network is a reliable (.9998 availability), cost-effective transmission system designed to provide the FAA with high-capacity communications routes. It is a hybrid system, a combination of analog and digital technologies, capable of carrying voice and data services used for NAS requirements, including diverse and alternate communications paths. The RCL is managed by the FAA-Owned Microwave Systems Program Office in the Telecommunications Integrated Product Team (TIPT).

2-09.2.2 References

2-09.2.2.1 National Airspace System Plan, April 1985; Chapter V, "Interfacility Communication Systems," Project 3.

2-09.2.2.2 Radio Communications Link Specification, FAA-E-2749a, April 1985.

2-09.2.2.3 Radio Communications Link Implementation Plan, Order 6331.

2-09.2.2.4 RCL Cost Savings, MITRE, Memo No: W45-M-0010, January 1986.

2-09.2.2.5 Utilization of Telecommunications Resources, Action Notice, March 6, 1989.

2-09.2.2.6 National Airspace System Communications Network Design, October 1985.

2-09.2.2.7 FAA Capital Investment Plan, Project No. C-12, January 1999.

2-09.2.3 System Description

The RCL is a high-capacity microwave network composed of nodes located at the 20 CONUS ARTCCs (plus three non-ARTCC facilities at Spring Branch (LA), and Bozeman, and Billings (MT), intermediate repeater sites and terminals. The RCL network consists of a series of systems, each system normally providing connectivity between an ARTCC and an Air Route Surveillance Radar (ARSR). Each RCL system consists of two terminals and a variable number of repeater sites. Together, these systems form the RCL backbone network. The RCL terminals are located at the nodes and at ARSR sites. In most cases, the remote ARSR site provides connectivity to two ARTCCs, with a connection between the two systems, resulting in an end-to-end ARTCC-ARTCC backbone system. At some remote locations, the RCL is used as a spur, providing connectivity from an ARSR site to the backbone. The RCL network topology was designed to capture current and future high-capacity communication routes with access locations selected to maximize leased communications cost savings/avoidance. During the transition from RML to RCL, some existing RML systems were reengineered to include facilities having large numbers of telecommunication requirements.

2-09.2.3.1 RCL Network Components

The RCL network consists of nodes, terminals, repeaters and network management systems. All terminals allow user access to the RCL. Only selected repeater sites, called Drop-and-Insert Point (DIP) sites are configured for user access. The DIP sites have been selected to allow voice grade "tail circuits" to other remote NAS facilities, reducing the overall cost of leased service. Tail circuits can be either leased or provided by an owned LDRCL system. For those locations where a DIP is collocated with a NAS facility, the FAA provides the connectivity to the RCL.

Circuit Routing Units (CRUs), located at nodes, provide connectivity between RCL systems to form the FAA owned segment of the NAS Interfacility Communication System (NICS) network.

2-09.2.3.1.1 Systems

Each system has been designed to one of the following configurations:

1. 360 Voice Frequency (VF) (analog) channels and 3 T-1 (72 DS-0 digital channels);
2. 240 Voice Frequency (VF) (analog) channels and 4 T-1 (96 DS-0 digital channels);
3. 180 Voice Frequency (VF) (analog) channels and 5 T-1 (120 DS-0 digital channels).

2-09.2.3.1.2 Nodes

Nodes are located at all CONUS ARTCCs, Spring Branch, Bozeman and Billings, configured to one of the listed system configurations. Digital service is available between nodes while voice grade circuits are available between any combination of nodes, terminals or DIP sites. Figure 2-09-1 shows the RCL system nodes and backbone systems.

2-09.2.3.2 Non-ARTCC Terminals

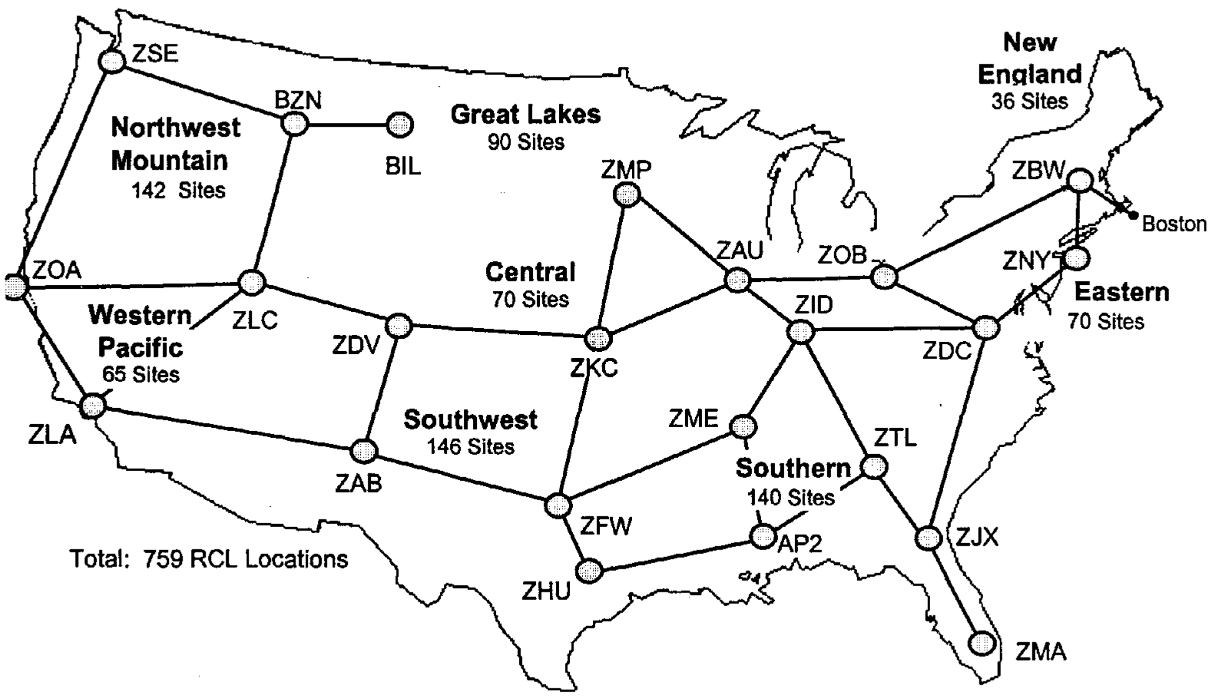
Each non-ARTCC (ARSR) terminal is capable of being configured to terminate up to 60 VF channels.

2-09.2.3.3 Repeater (Drop-and-Insert Point) sites

Although all repeater sites are capable of being configured as DIPs, only repeater sites collocated with NAS facilities or those sites determined to provide least-cost end-to-end connectivity via tail circuits to non-collocated NAS facilities have been designated DIPs. The DIPs are configurable to as many as 60 VF channels.

2-09.2.3.4 Automated Network Monitoring System (ANMS)

Each node is equipped with an ANMS capable of monitoring and detecting failures for up to eight RCL systems.



LEGEND		
Central Region (CE)	Southwest Region (SW)	Eastern Region (EA)
ZKC - Kansas City	ZAB - Albuquerque	ZDC - Washington, DC
Northwest Mountain Region (NM)	ZFW - Fort Worth	ZNY - New York
BIL - Billings	ZHU - Houston	Great Lakes Region (GL)
BZN - Bozeman	Southern Region (SO)	ZAU - Chicago
ZDV - Denver	AP2 - Spring Branch	ZID - Indianapolis
ZLC - Salt Lake City	ZJX - Jacksonville	ZMP - Minneapolis
ZSE - Seattle	ZMA - Miami	ZOB - Cleveland
New England Region (NE)	ZME - Memphis	Western Pacific (WP)
ZBW - Boston	ZTL - Atlanta	ZLA - Los Angeles
		ZOA - Oakland

Figure 2-09-1. Radio Communications Link

2-09.2.4 Telecommunications Interface

2-09.2.4.1 RCL Interfaces to NAS Facilities

At the ARTCC nodes, the RCL provides analog and digital interfaces through the Master DEMARC system. At all other locations, the interface will be through the facility demarcation system. The interface will have the same appearance to NAS facilities as a leased telecommunications channel. Table 2-09-1 provides a summary of the RCL interfaces.

Any NAS facility not collocated with an RCL site may access the system using a leased tail circuit. In locations where there is no telephone company access to the RCL site, (such as a repeater site located in a remote area), access to the RCL may be provided by the FAA (i.e., low-density radio communications link).

Table 2-09-1. RCL Interface Requirements Summary

System Interface		RCL-Analog	RCL-Digital
INTERFACE CONTROL DOCUMENTATION			
PROTOCOL REQUIREMENTS	Network Layer	N/A	N/A
	Data Link Layer	N/A	N/A
	Physical Layer	0/0 TLP	100 ohm, 1.544 Mbps D4/ESF DS-1, 135 ohms 56 kbps RTZ bipolar V.35/RS-422 64 kbps X N
	Special Formats/ Codes	N/A	N/A
TRANSMISSION REQUIREMENTS	No. Channels		
	Speed (kbps)		
	Simplex Half/Full Duplex	4W 600 Ohm Termination Transmission Level –13dBm0	4W Termination
	Service		
HARDWARE REQUIREMENTS	Modem	N/A	N/A
	Cable/ Miscellaneous	N/A	N/A

2-09.2.4.2 Diversity Implementation

To prevent fading or hardware failure from causing an RCL system failure, the RCL has been designed with two types of diversity, frequency and space. Frequency diversity uses two sets of transmitters and receivers, each pair using a different frequency but sharing a common antenna. At the ARTCC nodes, the switching between frequencies is accomplished at the baseband (BB) level, performed between the BB interface and the multiplexing equipment. An optional space diversity scheme, based on the use of one frequency, two transmitters, two receivers, and two antennas is also available.

2-09.3 LOW DENSITY RADIO COMMUNICATIONS LINK (LDRCL) OVERVIEW

The Low Density Radio Communications Link (LDRCL) satisfies short-haul, low-density communication requirements. It provides user access (tail circuits) to an RCL site or connectivity between two operational facilities.

2-09.3.1 Purpose of the Low Density Radio Communications Link

The LDRCL microwave communications system offers a cost-effective alternative to leased communications, designed to satisfy low capacity connectivity requirements between facilities where the primary path is unreliable or unavailable, or to provide diversity for critical NAS operational service. Use of an LDRCL will satisfy voice and data telecommunications requirements between connected facilities.

2-09.3.2 References

2-09.3.2.1 National Airspace System Plan, April 1985; Chapter V, "Interfacility Communication Systems," Project 3.

2-09.3.2.2 Utilization of Telecommunications Resources, Action Notice, March 6, 1989.

2-09.3.2.3 National Airspace System Communications Network Design, October 1985.

2-09.3.2.4 Low Density Radio Communications Link Specification, FAA-E-2853A, September 10, 1992.

2-09.3.2.5 Low Density Radio Communications Link Implementation Plan, Order 6540.8.

2-09.3.2.6 Capital Investment Plan (CIP) Project Number C-12 Expansion/Reconfiguration of Low Density Radio Communications Link (LDRCL), January 1999

2-09.3.3 System Description

The LDRCL is used to provide point-to-point communications between FAA facilities. Representative examples of how LDRCL establishes this connectivity are provided in Figure 2-09-2.

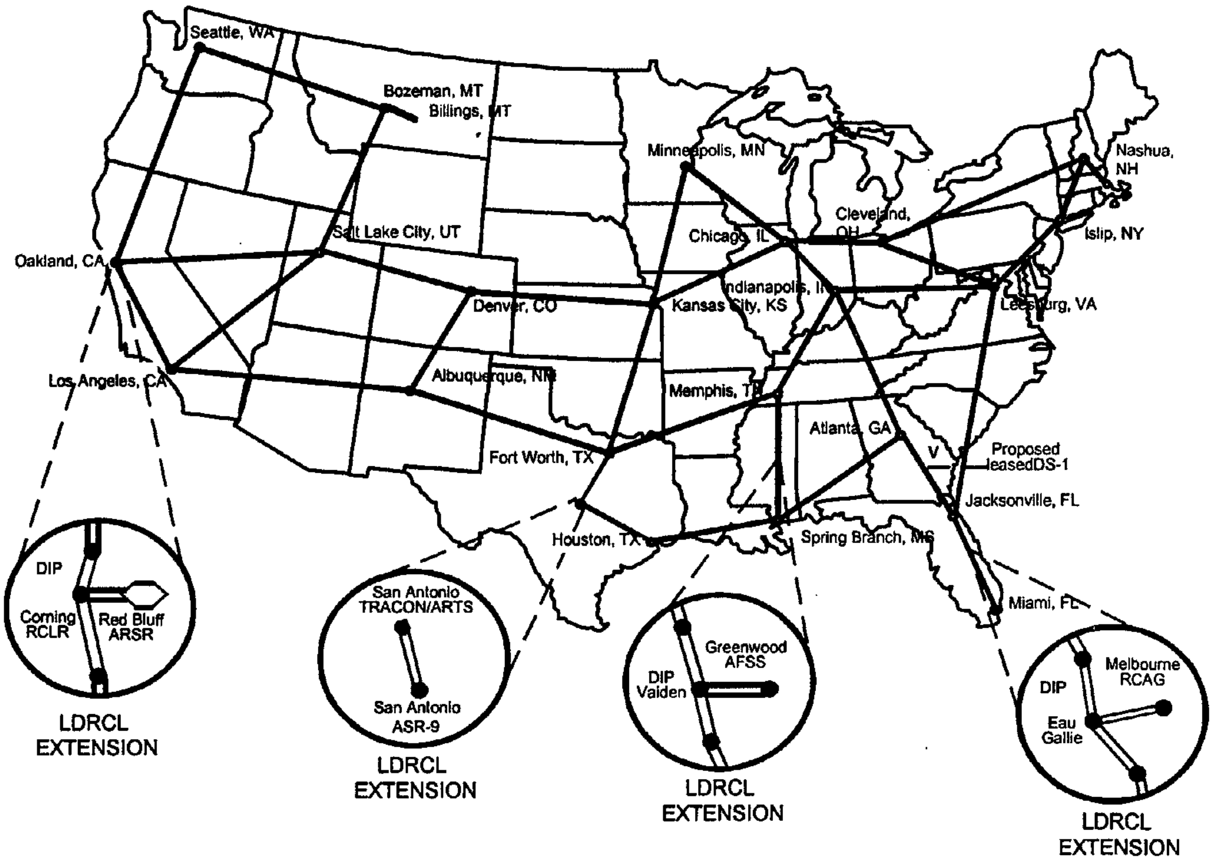


Figure 2-09-2. Low Density Radio Communications Link Map (Representative)

The LDRCL system allows the FAA to satisfy new NAS requirements, to replace existing leased circuits where economically and operationally advantageous, to provide diversity for critical and essential air traffic services, and provide connectivity where leased service is not available. In the past, the LDRCL project was divided into two phases:

- Phase I. Provided 33 systems which completed the RML Major Systems Acquisition (MSA) commitment to replace existing obsolete microwave transmission equipment.
- Phase II. Addresses new communications requirements, replace leased circuits where the primary transmission path is unreliable or unavailable, provides a diverse path for critical services where required, or offers a cost-effective alternative to leased communications.

For Phase II, a business case is prepared to compare the costs of various alternatives to determine the most cost-effective solution to satisfy the requirement.

2-09.3.3.1 System Components

Four different microwave systems were included in the LDRCL program. The 8 GHz system with state-of-the-art radios, switch mode rectifiers, and a year 2000 compliant network monitoring system is the primary system being deployed to satisfy LDRCL requirements. All microwave systems require line-of-site between antennas.

2-09.3.3.1.1 Ultra High Frequency (UHF) System

An analog UHF (932-945 MHz) system satisfies point-to-point applications with paths up to 60 miles.

2-09.3.3.1.2 1.8 GHz System

The 1.8 GHz digital system is available for paths up to 45 miles. The system is designed with a capacity of eight DS-1 channels (192 voice channels). As a result of the Omnibus Reconciliation Act of 1993, the government lost that portion of microwave spectrum that included the 1.8 GHz configuration. However, some 1.8 GHz systems will remain in-use at selected locations for some time.

2-09.3.3.1.3 23 GHz System

The 23 GHz digital system can only satisfy short-range applications since rain attenuation limits reliable transmission to less than 10 miles. The 23 GHz system has a maximum capacity of eight DS-1 channels (192 voice channels).

2-09.3.3.1.4 8 GHz System

The 8 GHz system can be used to replace 1.8 GHz systems or to satisfy higher capacity requirements. The 8 GHz system can support paths up to 40 miles with a capacity of 16 DS-1 channels (384 voice channels).

2-09.3.3.1.5 Monitoring/Sensing System

Each LDRCL system will be equipped with monitoring/sensing equipment to monitor the status of the system. Since each microwave system terminates at either an RCL or manned site, the status information provided by the monitoring/sensing system will be made available in one of two ways. For a system terminating at an RCL site, the monitoring/sensing equipment shall interface with the RCL Automated Network Monitoring System (ANMS) located at the appropriate ARTCC (node). For systems terminating at a manned site, the monitoring/sensing equipment provides status information to a monitoring system at the manned site.

2-09.3.4 Telecommunications Interface

2-09.3.4.1 LDRCL Interfaces to NAS Facilities

The LDRCL provides analog and digital interfaces through the facility demarcation system. The interface will have the same appearance to NAS facilities as a leased telecommunications channel. Table 2-09-2 provides a summary of the LDRCL interfaces.

Any NAS facility not collocated with an LDRCL terminal may access the system via a leased tail circuit.

Table 2-09-2. LDRCL Interface Requirements Summary

System Interface		LDRCL-Digital
Interface Control Documentation		
PROTOCOL REQUIREMENTS	Network Layer	
	Data Link Layer	
	Physical Layer	100 ohm, 1.544 Mbps, D4/ESF DS-1, 135 ohms 56 Kbps RTZ bipolar V.35/RS-422 64 kbps X N
	Special Formats/ Codes	-20dBm0 signaling tone
TRANSMISSION REQUIREMENTS	No. Channels	
	Speed (kbps)	
	Simplex Half/Full Duplex	4W Termination Transmission Level -13dBm0
	Service	
HARDWARE REQUIREMENTS	Modem	
	Cable/ Miscellaneous	

2-09.3.4.2 LDRCL Interfaces to NAS Facilities

The 900 MHz system provides an analog interface and the 1.8 GHz, 8 GHz, and 23 GHz systems provide a digital interface through the facility demarcation system. Each interface will have the same appearance to NAS facilities as a leased telecommunications channel.

2-09.3.4.3 Local Interfaces

There are no local or other telecommunications interfaces for LDRCL.

2-09.4 RADAR MICROWAVE LINK (RML) OVERVIEW

The Radar Microwave Link (RML) was the precursor to the current RCL system. Although most RML systems were converted to RCL, some point-to-point systems continue to operate in the NAS. These systems are at the end of their life cycle and are being replaced and decommissioned.

2-09.4.1 Purpose of the Radar Microwave Link

The RML was/is an analog broadband microwave transmission system designed to provide analog en route surveillance video from ARSRs to ARTCCs.

2-09.4.2 System Description

Each RML system requires a transmitter, receiver and dish antenna at each end of the system. Most systems included intermediate repeater sites to increase the useable distance.

2-09.4.3 RML Functional Components Interface Requirements

No interface data is available for RML systems.

2-09.4.4 Telecommunications Interface

The RML is a general transmission medium capable of providing voice and data connectivity between any pair of terminals in the system. Principal terminal-to-terminal routes connect ARSRs to ARTCCs.

2-09.4.5 RML Interfaces

The RML operates with the following requirements:

- Protocol Requirements. N/A.
- Transmission Requirements. RML operates in the 7125 to 8400 MHz band.
- Hardware Requirements. All user access to the RML is via 4-wire connection.

2-09.5 TELEVISION MICROWAVE LINK (TML) OVERVIEW

The Television Microwave Link (TML) transmits Bright Radar Indicator Terminal Equipment (BRITE)/Digital BRITE (DBRITE) radar display information from a TRACON to a satellite ATCT. The TML is the one way transmission media that links the output of the BRITE camera or DBRITE digital scan converter to the BRITE/DBRITE indicator located at the ATCT.

2-09.5.1 Purpose of the Television Microwave Link

The TML is the transport used to provide BRITE/DBRITE radar data, available at TRACONs, to satellite ATCTs. The TML is a cost-effective media to transmit video over a short distance.

2-09.5.2 System Description

Each TML consists of a transmitter (TMLT) and a dish antenna at the TRACON and a receiver (TMLI) and dish antenna at the satellite ATCT. Some systems require active or passive intermediate repeaters (TMLR).

2-09.5.3 TML Functional Component Interface Requirements

The TML interfaces with a BRITE camera or DBRITE digital scan converter at a TRACON and a BRITE/DBRITE indicator at an ATCT.

2-09.5.4 Telecommunications Interface

At the TRACON, the BRITE camera or DBRITE digital scan converter provides the video input to the TML. At the ATCT, the output of the TML provides video to the DBRITE/BRITE display. Figure 2-09-3 illustrates the TML telecommunications interfaces.

2-09.5.4.1 TML Interfaces

2-09.5.4.1.1 TRACON to TMLT

The BRITE/ DBRITE video is transmitted from the TRACON to the TML transmitter.

- Protocol Requirements. N/A
- Transmission Requirements. Video from the transmitter at the TRACON is received at a receiver at a satellite ATCT. Transmitted video is a combination of the ARTS alphanumeric, pre-trigger, radar video, and beacon video radio frequency modulated composite signal.
- Hardware Requirements. Hardware used in the TML system includes a transmitter at the TRACON, a receiver at the ATCT and an antenna at each location. Some systems require active or passive intermediate repeaters.

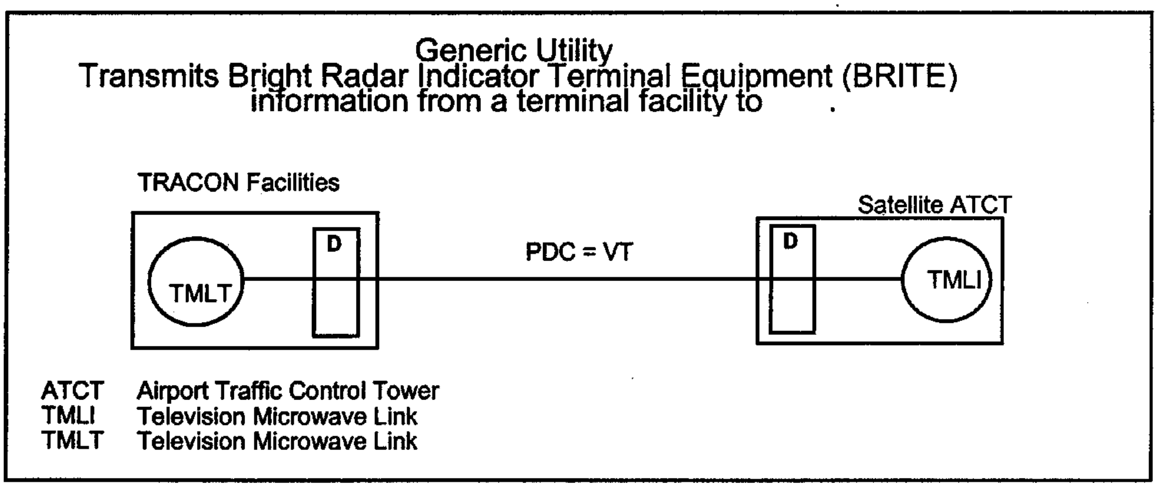


Figure 2-09-3. Television Microwave Link (TML)

2-09.6 MICROWAVE ACQUISITION ISSUES

2-09.6.1 Project Schedule and Status

RCL installations associated with the backbone system were completed in December 1992. All RCL systems are commissioned. For the remaining RML systems, there is no definitive schedule for decommissioning or replacement. LDRCL installations began in November of 1992 and are estimated to end by December 2001. LDRCL segment/system implementation schedules are important to planned and potential users of LDRCL transmission and will be included in subsequent editions of this publication. The LDRCL installation schedule is provided in Table 2-09-3.

Table 2-09-3. LDRCL System Installation Schedule

	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
Installations (Systems)	124	10	4	00	00	00	00	00

2-09.6.2 Telecommunications Strategies

RCL implementation was designed to supplement the NAS Interfacilities Communications System by providing diversity and remote access as well as accommodate new and expanded telecommunications requirements.

To maximize the economies inherent in the use of this FAA owned and operated system, there is an ongoing effort to identify existing and emerging requirements that can be satisfied by use of the RCL. The exact value of the cost avoidance will depend on the actual number of circuits added to the RCL each year.

2-09.6.3 Telecommunications Costs

Table 2-09-4 provides a summary of the program budget to manage all nationally fielded FAA-owned microwave systems. For the RCL, this includes the cost of hardware upgrades and other enhancements that are required to improve RCL availability, maintainability and quality of service. This budget, which reflects an increase to the OPS base, includes RCL decommissioning planning and preparation efforts. The transition and decommissioning of the RCL is not reflected and must be funded as a distinct program. For LDRCL, the budget includes OPS funds for the acquisition and installation of new systems to fulfill operational requirements. For RML and TML, the budget includes funds for service transition, decommissioning and program management.

The FOMS budget includes funds to manage these national assets and transition services as systems reach the end of their life cycle. The FOMS program budget is divided into three main functional areas, RCL, LDRCL and RML/TML. The OPS funding for the RCL system includes system maintenance and minor upgrades necessary to maintain reliable high quality operation of the RCL network for the remainder of its life cycle. The OPS funding for the LDRCL system includes the procurement and installation of LDRCL systems that replace or augment existing microwave systems. The OPS funding for the RML/TML systems is mainly for upgrades necessary to maintain RML/TML system operations until these systems are decommissioned and replaced by alternate telecommunications systems. The overall FOMS budget reflects a "tapering-off" in FY02 through FY04 as these systems are replaced and service placed on other systems. Funding is in accordance with FAA Order 2500.8A.

Table 2-09-4. Cost Summary - FAA-Owned Microwave Systems

CIP # None	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
Microwave Systems Program Operations Budget									
	Cost Profile: Funding required to improve system reliability, maintainability and quality of service. The projections reflect increases to the OPS base.								
1. RCL									
	Cost Profile: Includes circuit cutovers, maintainability, system improvements, program management, resource management and decommissioning activities. Recurring funding indicates annual program management costs.								
	Non-recurring Costs								
	F&E Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Non-recurring Costs		**$1,300**	**$1,300**	**$1,000**	**$750**	**$500**	**$100**	**$100**
	Recurring Costs								
	F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$1,000**	**$1,100**	**$1,120**	**$1,300**	**$1,400**	**$1,500**	**$1,600**
2. LDRCL									
	Cost Profile: Procurement and installation of LDRCL systems (both F&E and OPS requirements). Recurring funding reflects annual O&M costs.								
	Systems Added		10	4	0	0	0	0	0
	Total Systems	124	134	138	138	138	138	138	138
	Non-recurring Costs								
	F&E Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Non-recurring Costs		**$6,000**	**$2,400**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring Costs								
	F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$3,396**	**$3,756**	**$3,856**	**$4,116**	**$4,476**	**$4,836**	**$4,836**
3. RML and TML									
	Cost Profile: Upgrades to mid-life systems, decommissioning of antiquated systems, program management and emergent support requirements. Recurring funding reflects program management costs.								
	Non-recurring Costs								
	F&E Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Non-recurring Costs		**$500**	**$300**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring Costs								
	F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$500**	**$500**	**$0**	**$0**	**$0**	**$0**	**$0**
			SUMMARY						
	F&E Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Totals	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Totals	Non-recurring	$7,800	$4,000	$1,000	$750	$500	$100	$100
		Recurring	$4,896	$5,356	$4,976	$5,416	$5,876	$6,336	$6,436
		OPS Totals	**$12,696**	**$9,356**	**$5,976**	**$6,166**	**$6,376**	**$6,436**	**$6,536**

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CHAPTER 2-10 - SUMMARY SHEET

FAA TELECOMMUNICATIONS INFRASTRUCTURE (FTI)

Program/Project Identifiers:

Project Number(s):	C-26
Related Program(s):	LINCS, HAWAII LINCS, FAATSAT, FTS2001, ADTN2000, RCL, LDRCL, DMN, NADIN, AND ANICS
New/Replacement/Upgrade?	Upgrade/Replacement
Responsible Organization:	TIPT
Program Mgr./Project Lead:	Dave Joyce, AOP-500, (202) 493-5933
Fuchsia Book POC:	Michelle Brune, AOP-500, (202) 493-5941

Assigned Codes:

PDC(s):	There will be no specific PDCs for FTI - PDCs are determined by the programs using FTI
PDC Description:	
Service Code:	

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$6,068	$29,153	$38,691	$51,466	$52,233	$25,097	$1,100
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$6,068**	**$29,153**	**$38,691**	**$51,466**	**$52,233**	**$25,097**	**$1,100**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$0	$8,525	$16,200	$0	$0	$0	$0
Total OPS	**$0**	**$8,525**	**$16,200**	**$0**	**$0**	**$0**	**$0**

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CIP Category:
Communications

2-10.0 FAA TELECOMMUNUNICATIONS INFRASTRUCTURE (FTI)

2-10.1 PROGRAM OVERVIEW

The FAA Telecommunications Infrastructure (FTI) Program (previously referred to as the FAA Integrated Communications System for the 21st Century-FICS-21) is intended to provide reliable, manageable, efficient and cost-effective telecommunications services while maintaining the high degree of safety and security of the FAA's airway management missions. FTI services will replace most FAA owned and leased telecommunications systems/services and consolidate their functions under a single contract. The FTI contract will provide services that will meet current and future telecommunications requirements while reducing the unit cost for telecommunications. FTI will provide a telecommunications architecture that is consistent with the FAA and AF Strategic Plans as well as the NAS Architecture. The FAA's Service Delivery Point (SDP)-to-SDP service performance monitoring and management requirements will also be supported by FTI. FTI's contract performance measurement approach will support the requirements of the Government Performance and Results Act (GPRA).

The consolidation of existing services and systems under one contract will be accompanied by a significant change in business practices. Because the FTI contract will require that the vendor provide services vice circuits, the processes required to order, monitor, bill, and reconcile bills need to be upgraded to those that are commonly found in industry. It is predicted that the changes in business practices will result in improved efficiencies and cost savings in the management of the FAA's telecommunications systems and services. Overall, based on the investment analysis, the cost avoidance of the FTI program over the first ten years of its life cycle is estimated at $609M.

The FTI program is in the solution implementation stage of the Acquisition Management System (AMS). Mission Need Statement (MNS) 322 was approved by the Joint Resources Council (JRC) on May 6, 1998. The formal Investment Analysis, completed by ASD in May 1999, resulted in an approval to proceed on July 13, 1999. An FTI Product Team to plan and manage the project was established within the Telecommunications Integrated Product Team (TIPT).

Extensive discussions have been held with industry representatives regarding technical requirements, funding options, and acquisition alternatives. Efforts have been initiated to develop and document the administrative, technical, performance, security, management, and operational requirements of the FTI program. Other efforts are underway to define transition and implementation issues, develop a concept of operations, and determine the impact of FTI on the FAA user community.

2-10.1.1 Purpose of FAA Telecommunications Infrastructure

FTI is a NAS Program that provides an integrated telecommunications network for most FAA telecommunications resources. It is consistent with the NAS Architecture in that it supports interfacility, intrafacility and mobile communications requirements. FTI will satisfy both FAA mission support and NAS operational telecommunications requirements. Geographically, FTI will provide service in the Continental U.S., Alaska, Hawaii, southern Pacific, Caribbean, and Gulf of Mexico, and other international locations. FTI will pursue an acquisition strategy that takes maximum advantage of competition, performance-based contracting, economies of scale, and technology refresh. The administration of the FTI project is assigned to the TIPT.

2-10.1.2 References

2-10.1.2.1 Mission Need Statement for the FAA Communications Infrastructure, Number 322, May 6, 1998.

2-10.1.2.2 FAA Strategic Plan, 1997.

2-10.1.2.3 NAS Architecture, Version 3.0.

2-10.1.2.4 Airways Facilities Strategic Plan, 1997.

2-10.1.2.5 Telecommunications Strategic Plan, January 1997.

2-10.1.2.6 JRC Record of Decision, Telecommunications Infrastructure, May 1998.

2-10.1.2.7 FAA Aviation System Capital Investment Plan (CIP) C-26, January 1999.

2-10.1.2.8 FAA Telecommunications Infrastructure Investment Analysis Report, July 13, 1999.

2-10.1.2.9 Acquisition Program Baseline for FAA Telecommunications Infrastructure, July 13, 1999.

2-10.2 SYSTEM DESCRIPTION

FTI will consolidate and replace telecommunications systems/services as they reach the end of their contract or service lives. FTI will initially focus on replacing LINCS, ADTN-2000, Bandwidth Manager, and DMN. Other systems will be incrementally replaced based on individual business case decisions. The total scope of the program could eventually replace the functions performed by the following systems:

- Agency Data Telecommunications Network 2000 (ADTN-2000)
- Bandwidth Manager (BWM)
- Data Multiplexing Network Phase III (DMN)
- FAA Telecommunications Satellite System (FAATSAT)
- Hawaiian LINCS
- Leased Interfacility NAS Communications System (LINCS)
- Low Density RCL (LDRCL)
- National Airspace Data Interchange Network (NADIN)
- Radio Communications Link (RCL)

The FTI network will consist of vendor owned transmitting, switching, multiplexing and network management components with specific components are to be recommended by the vendor. Figure 2-10-1 illustrates the proposed FTI services as well as the programs that will be replaced. Program "replacement" will occur when the User's telecommunication service ceases being provided by an existing service and is provided by FTI.

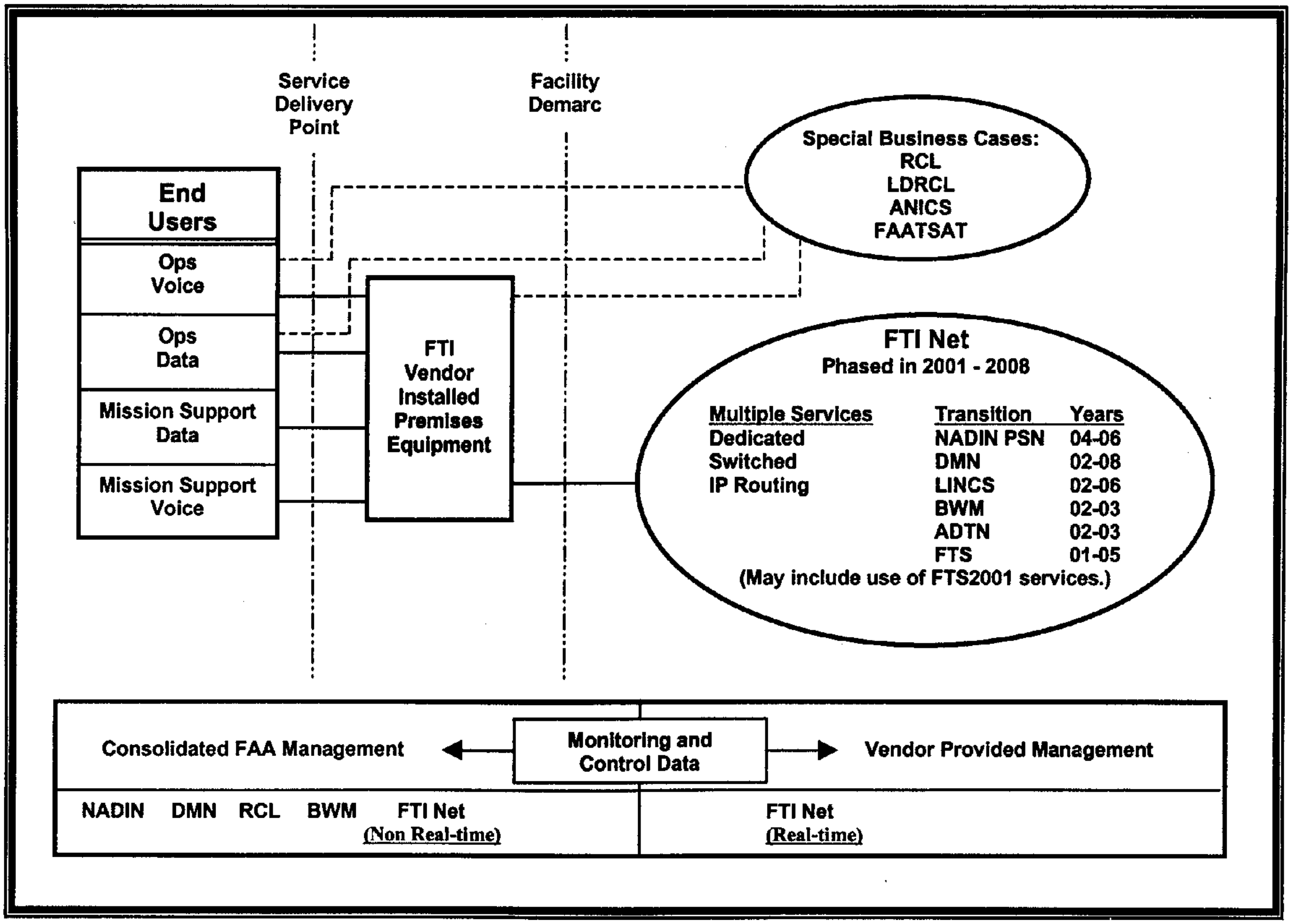

Figure 2-10-1. FAA Telecommunications Services and Programs

FTI may make use of the capabilities provided by the FTS-2001 and other applicable GSA contracts on a business case basis. An analysis is ongoing to determine the cost effectiveness of transitioning directly from FTS2000 to the FTI without first transitioning to FTS-2001. Current and continuous information on FTI as it moves forward may be obtained from the Internet at www.faa.gov/ats/af/tipt/fti.

2-10.3 ACQUISITION ISSUES

Figure 2-10-2 illustrates the FTI Acquisition Schedule. Table 2-10-1 identifies the estimated cost to transition to the FTI architecture. Updates to this cost projection will be made after the FTI contract has been award.

The projection of F&E funded non-recurring costs include site surveys, site prep, prototyping and test beds, OT&E sites (if required), infrastructure replacement, establishment of Network Control Centers, and circuit cut over. The F&E funded recurring costs cover the period of parallel operations, i.e., existing and FTI services. When existing services are terminated, the recurring cost of the FTI will be covered by the existing OPS Base.

The OPS funded recurring costs shown in FY03 and FY04 correspond to the recurring costs to support circuit requirements that were previously satisfied by FAA-owned communications assets.

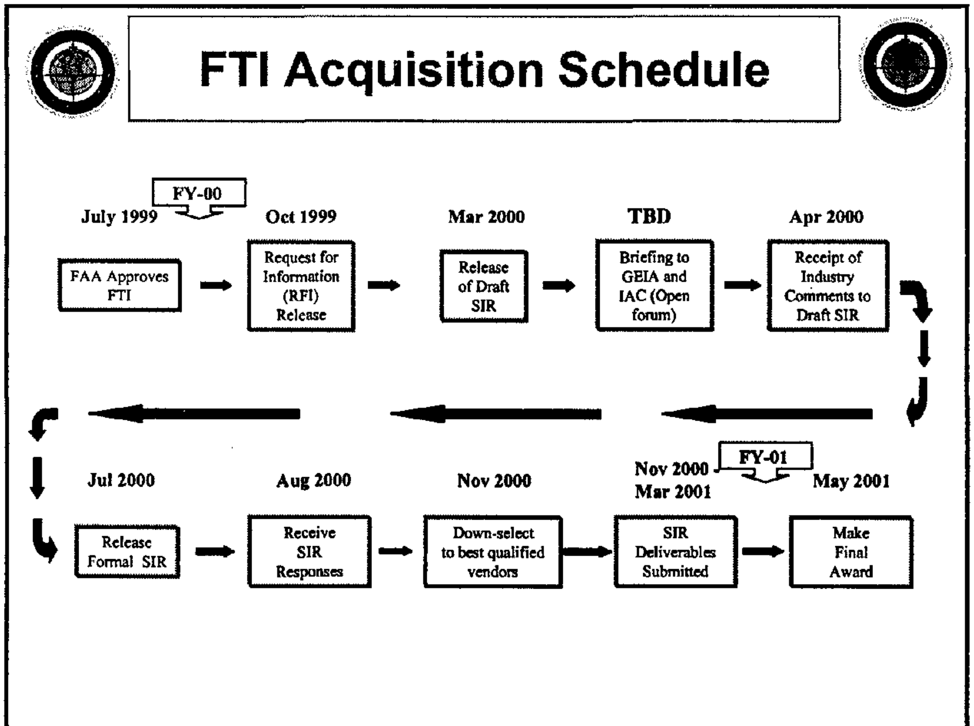

Figure 2-10-2. FTI Acquisition Schedule

Table 2-10-1 Cost Summary – FTI

CIP # C-26	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
FAA Telecommunications Infrastructure (All Costs F&E Funded)									
1. Source Selection			$956	$319	$0	$0	$0	$0	$0
2. Network Design & Engineering			$2,475	$3,576	$1,720	$1,439	$1,326	$453	$200
3. Site Surveys			$0	$971	$1,761	$1,900	$1,352	$218	$0
4. Transition Planning			$1,948	$2,893	$4,357	$4,912	$4,139	$1,912	$100
5. Site Prep			$0	$1,582	$5,225	$3,839	$1,868	$1,807	$0
6. Test & Evaluation			$689	$1,288	$413	$426	$438	$0	$0
7. Site Activations (Orders)			$0	$18,524	$15,746	$22,298	$25,048	$7,271	$0
8. Installation & Checkout			$0	$0	$6,146	$9,269	$10,002	$7,995	$200
9. Service Initiation			$0	$0	$2,101	$5,451	$6,230	$3,614	$0
10. Disposition of Existing Assets			$0	$0	$1,222	$1,932	$1,830	$1,827	$600
FAA Telecommunications Infrastructure (All Costs OPS Funded)									
1. Transition Planning & Support			$0	$8,525	$16,200	$0	$0	$0	$0

SUMMARY

		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
F&E Totals	Non-recurring	$6,068	$29,153	$38,691	$51,466	$52,233	$25,097	$1,100
	Recurring	$0	$0	$0	$0	$0	$0	$0
	F&E Total	**$6,068**	**$29,153**	**$38,691**	**$51,466**	**$52,233**	**$25,097**	**$1,100**
OPS Totals*	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$0	$8,525	$16,200	$0	$0	$0	$0
	OPS Total	**$0**	**$8,525**	**$16,200**	**$0**	**$0**	**$0**	**$0**

Notes:

1. Costs shown above are for planning purposes only. On July 13, 1999, JRC approval was received. The F&E funding has been baselined.
2. *F&E Funded recurring costs cover a period of parallel operations. When the existing services are terminated, it is assumed that the recurring cost of the replacement capability will be covered by the existing OPS Base and an increase of $8.5M in FY01 and $8.3M in FY02.
3. Total OPS Funded costs are not shown in the table because the recurring costs of FTI are projected to be within the TIPT's base funding level.

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CHAPTER 2-11 - SUMMARY SHEET

FEDERAL TECHNOLOGY SERVICE – FTS2000/2001

Program/Project Identifiers:

Project Number(s):	BIIP-982010
Related Program(s):	
New/Replacement/Upgrade?	New
Responsible Organization:	AOP-500
Program Mgr./Project Lead:	Dan Potes, AOP-400, 493-5957 - FTS Program Manager Daniel Vilardo, AOP-500, 493-5936 - FTS2001 Transition Manager
Fuchsia Book POC:	Frankie Brooks, AOP-400, 554-1680

Assigned Codes:

PDC:	There are no specific PDCs for FTS - PDCs are determined by the programs using FTS
PDC Description:	n/a
Service Code:	n/a

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$459	$230	$0	$0	$0	$0	$0
Total F&E	**$459**	**$230**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$3,000	$0	$0	$0	$0	$0	$0
OPS Recurring	$15,287	$16,211	$17,203	$18,062	$18,966	$19,918	$20,911
Total OPS	**$18,287**	**$16,211**	**$17,203**	**$18,062**	**$18,966**	**$19,918**	**$20,911**

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CIP Category: Communications

2-11.0 FEDERAL TECHNOLOGY SERVICE - FTS2000/2001

2-11.1 PROGRAM OVERVIEW

The Federal Technology Service (FTS) provides government users with voice, data, and video services provided by multiple carriers under multiple contracts managed by the General Services Administration (GSA). AT&T is the FTS2000 vendor providing administrative (and limited NAS) telecommunications services to the FAA.

The FTS2000 Integrated Custom Network includes the inter-city voice network, consolidated local telephone service, the Federal Secure Telephone System (FSTS), and other networks for the exclusive or common use of Federal agencies. The nationwide, switched telephone network is the most used service. It provides toll service and switched voice and data (to 1536 kbps) service between government offices (on-net), from government offices to non-government telephones (virtual on-net), and non-government off-net to government using an FTS2000 government calling card.

To meet the FAA requirements for increased bandwidth, FTS2000 services are available using multiple access methods, from a single 56/64 kbps channel to T-1 (1.544Mbps, either channelized and non-channelized). T-3, ISDN, and SDIS technology are also available to meet growing FAA demands.

GSA awarded two FTS2000 replacement contracts, to MCIWorldcom and Sprint in January 1999. The FAA selected MCIWorldcom as its FTS2001 vendor and plans to transition from FTS2000 (AT&T) to FTS2001 (MCIWorldcom) during Fiscal Years 2000 and 2001.

2-11.1.1 Purpose of the FTS2000 / FTS2001 Telecommunications Network

AT&T provides administrative and NAS support as well as limited NAS telecommunications services to the FAA and is responsible for provisioning, implementation, billing, maintenance, and training. The MCIWorldcom FTS2001 system will provide the administrative and NAS support as well as limited NAS telecommunications services for the FAA. FTS2001 allows multiple vendors to provide telecommunications services.

Program Management of the FTS2000/2001 program resides in AOP-400.

2-11.1.2 References

2-11.1.2.1 309-292-200 - FTS2000 - Integrated Customer Network Reference Guide - Source: AT&T.

2-11.1.2.2 TR-NPL-000335 - Source: Bellcore.

2-11.1.2.3 TR-NPL-000275 - Source: Bellcore: Notes on the BOC Intra-Lata Network, 1986.

2-11.1.2.4 ITU V.711 - Source: National Technical Information Service.

2-11.1.2.5 AT&T Technical Publication 62411.

2-11.1.2.6 AT&T Technical Publications 43801.

2-11.1.2.7 EIA-449 – Source: Electronic Industries Association.

2-11.1.2.8 ITU V.35 – Source: National Technical Information Service.

2-11.1.2.9 EIA-170A – Source: Electronic Industries Association.

2-11.1.2.10 EIA-232 – Source: Electronic Industries Association.

2-11.1.2.11 ANSI EIA-250-1976 - Source: American National Standards Institute.

2-11.1.2.12 ANSI-T1.502-1976 - Source: American National Standards Institute.

2-11.1.2.13 ANSI-T1.502.1988 - Source: American National Standards Institute.

2-11.1.2.14 AT&T Practices 365-170-119 - Source: AT&T.

2-11.1.2.15 ITU G.721 - Source: National Technical Information Service.

2-11.1.2.16 ITU I.411, I.420, I.430, I.440, I.450, I.451 - Source: National Technical Service.

2-11.1.2.17 AT&T Technical Publications 41449 and 41459 (ISDN).

2-11.1.2.18 Request for Proposal number TQC-SS-97-2001, The FTS2001 Procurement - Source: General Services Administration (GSA).

2-11.2 SYSTEM DESCRIPTION

The FTS2000 Integrated Custom Network includes an inter-city voice network, consolidated local telephone service, the Federal Secure Telephone System (FSTS), and other networks for the exclusive or common use of Federal agencies. The nationwide, commercial, switched telephone network is the most used service, providing long distance and switched voice and data (to 1.536 Mbps, channelized and non-channelized) services between government offices both on-net (dedicated access) and off-net (VON and non-government locations). Additional long distance services and intra-Lata switched voice service were added as FTS2000 services.

FTS2000 services are available using multiple access methods to meet the FAA requirement for increased bandwidth. T-3 and Switched Digital Integrated Service (SDIS) and Integrated Switched Digital Network (ISDN) technology is also available to meet growing FAA demands.

FTS2001 services will be similar to FTS2000 but will offer an expanded set of telecommunications services, including wireless communications, Internet networking, fiber-optic and satellite based telecommunications. These expanded services will allow technology refresh to encourage making new technology available for the mandatory and optional offered services. The FTS2001 contract will also allow the unbundling of the transport and access to permit the FAA to acquire either at the most advantageous pricing available.

2-11.2.1 FTS2000 Components

2-11.2.1.1 Principal Components

FTS2000 users select services to Service Delivery Points (SDPs) that are part of an integrated network. A SDP is the combined physical and service interface between the network and the FAA's premise equipment, off-premise switching and transmission equipment, and other facilities. SDPs, used for billing purposes, are the monitoring points at which monthly volume discounts are calculated. FTS2001 users will select services to SDPs in a similar fashion, however, the FTS2001 services can be unbundled to split the access and transport segments of an end to end telecommunications services.

The architecture of the FTS2000 Integrated Custom Network consists of four basic elements: service nodes, network access, distributed intelligence, and transport.

2-11.2.1.2 Functional Component Interface Requirements

2-11.2.1.2.1 Service Nodes

A service node contains components engineered to provide efficient access to FTS2000 services. The components include: 5 Electronic Switching System (ESS) Switch, 1 Packet Switched Service (PSS) Packet Switch, and Digital Access and Cross-Connect System (DACS). The 5 ESS provides circuit-switching of both Switched Voice and Switched Data Service. The DACS provides integrated access to the various switching vehicles and digital transmission channels.

2-11.2.1.2.2 Network Access

Network access provides connectivity between a SDP and a service node. The initial segment of access, between the FAA location and a FTS2000 access facility is provided by the Local Exchange Company (LEC). The use of dedicated facilities assures separation of FTS2000 access lines from the public network, except where based on low volume usage, virtual on-net may be more economical. The final segment of the access network is an AT&T circuit from the access facility to a FTS2000 node. Where it is technically feasible, FTS2000 trunks may terminate directly to the FAA-provided telephone switch or instrument.

2-11.2.1.2.3 Distributed Intelligence

The distributed intelligence element of the FTS2000 network consists of Network Control Points (NCPs), No. 2 signal transfer points (#2STPs), and signaling links. The NCPs share call-processing functions with the 5ESS Switches to handle peak user demands. The #2STPs are elements of the AT&T common channel signaling network, used to provide International Telecommunications Union (ITU) Circuit Switched Service 7 (CCS7) signaling that provides the network with Integrated Services Digital Network (ISDN) capabilities.

2-11.2.1.2.4 Transport

Transport facilities, using the existing AT&T fiber optic network, have extensive routing diversity to ensure that component failures will not significantly impact service availability. The fiber network has a closed-loop design that provides physical routing diversity between nodes.

2-11.2.1.2.5 FTS2001 Contract

This contract will replace the FTS2000 Integrated Custom Network with similar service offerings or enhanced services offerings. The FTS2001 contract includes:

(i) Circuit Switched Service (CSS), in which communications resources are shared among many users through the use of one or more circuit switching devices:
    (1) Switched Voice Service (SVS)
    (2) Circuit Switched Data Service (CSDS)
    (3) Toll Free Service (including 800, 888, 877, and other Service Access Codes [SAC])
    (4) 900 Service (including other equivalent SAC services as they develop)

(ii) Switched Data Service (SDS), in which communications resources are shared among many users through the use of a packet/cell/frame switching device:
    (1) Packet Switched Service (PSS)
    (2) Frame Relay Service (FRS)
    (3) Internet Protocol Internetworking Service (IPS)
    (4) Asynchronous Transfer Mode Service (ATMS)

(iii) Dedicated Transmission Service (DTS), in which communications circuits are allocated to one user or a group of users

(iv) Video teleconference System (VTS), which is a Value Added Service (VAS)

2-11.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

The interface specifications for customer equipment are service specific. D4 Channel Banks, CSUs/DSUs, modems, and Terminal Interface Units, (TIU), provide the standard 4-wire connectivity through designated FAA demarcation (DEMARC) points for FTS2000 services. Other interface options such as RS232, V.34 and V.35 are available and dependent on FAA requirements. Table 2-11-1 contains a Service Type Interface Summary. FTS2001 will provide direct compatibility to FTS2000 with additional capabilities, as they become available.

Table 2-11-1. Service Type Interface Summary

Service Type	Physical Interface	Transmission Speed	Transmission Interface	Signaling Interface Options	Reference
Switched Voice Service					
Analog	D4 Channel Bank	Up to 4.8 kbps	2-wire/4-wire Impedance: 600/900 ohms	Loop Start Ground Start E&M (Types I/II) DX	TR-NPL-000335 EIA/TIA-464-A TR-NPL-000275
Digital	CSU		2-wire/4-wire Impedance: 600/900 ohms	Loop Start Ground Start E&M (Types I/II) DX	
Switched Data Service	TIU	56 kbps 64 kbps available with ISDN access			
Packet Switched Service		300 bps to 56 kbps			
Dial Up Analog	D4 Channel Bank	300, 1200, 2400, 4800, 9600 bps asynchronous bi-synchronous	2-wire/4-wire Impedance: 600/900 ohms	Loop Start Ground Start E&M (Types I/II) DX	TR-NPL-000335 TR-NPL-000275
Dedicated Analog	Modem	4.8 kbps, 9.6 kbps	4-wire Impedance: 600 ohms	No Signaling Required.	TR-NPL-00035
Dedicated Digital Interface	DSU	full duplex, synchronous, digital data at 9.6 kbps and 56 kbps			
Enhanced PSS	DSU	56 kbps to 1526 kbps PVC 4 kbps to 1024 kbps			

Table 2-11-1. Service Type Interface Summary (Continued)

Service Type	Physical Interface	Transmission Speed	Transmission Interface	Signaling Interface Options	Reference
Video Transmission Services					Compression Labs, Inc
CVTS: Video In/Out	Codec	1-volt p-p 100/40 IRE	75 ohms unbalanced	NTSC Video Signal	EIA-170A BNC Connector
Audio In/Out		+12 dBm Maximum sine wave; Echo Return Loss (ERL) >50dB; Line Level 0.0dBm tone	600 ohms balanced		XLR Connector
Low Speed Port		Asynchronous			EIA-232
High Speed Port		Synchronous 9.6, 19.2, 56 64 and 112 kbps			EIA-449
Room Controller Ports	Diplexer	Asynchronous 1.2, 2.4, 4.8, 9.6 kbps			EIA-232
Wideband VTS: Transmit/Receive Video In/Out		50 Hz to 15 kHz 1-volt p-p 100/40 IRE	75 ohms unbalanced	NTSC Video Signal	ANSI EIA-2508-1976 ANSI T1.502-1988 EIA-170A MBC Connector
Audio In/Out	BMAC	+4 dBm 1kHz tone nominal +18 dBm max sine wave	600 ohms balanced		XLR Connector
Receive Only Video Out		1-volt p-p 100/40 IRE	75 ohms unbalanced	NTSC Video Signal	ANSI EIA-2508-1976 ANSI T1.502-1988 EIA-170A BNC Connector
Audio Out		0dBm 1kHz tone nominal +12 dBm max. sine wave	600 ohms balanced		Spade lug terminal block

Table 2-11-1. Service Type Interface Summary (Continued)

Service Type	Physical Interface	Transmission Speeds	Transmission Interface	Signaling Interface Options	Reference
Dedicated Transmission Service					TR-NPL-000335 AT&T 365-170-119 TR-NPL-000275
Dedicated Analog Interface	D4 Channel Bank	up to 9.6 kbps	2-wire/4-wire 600/900 ohms	Private Line Auto Ring down Loop Start Ground Start E&M DX	
Dedicated T1 Interface	CSU				ESF T-1 ITU V.711 AT&T Tech Pub. 62411 and 43801 RJ45F Telco Modular Connector ITU V.35 EIA-449 EIA-530
Dedicated Digital Interface	DSU	full-duplex, synchronous at 9.6 kbps and 56 kbps 64 kbps			EIA-449 ITU V.35 EIA-232
Unchannelized T45	CSU/CSU-DSU DS-3/DSX	44.736 Mbps 28 DSIs			AT&T Tech. Pub. TR 62415 M-Frame - ANSI T1.107 75 ohm TNC - ANSI T1.40 C-Bit Parity - ANSI T1.107a B3ZS - CB119
Switched Digital Integrated Service					
T1 Facility Type 1 pulse code modulation	CSU	1.544 Mbps			ESF T-1 ITU V.711 AT&T Tech. Pub. 62411 and 43801 RF45F Telco Modular Connector
T1 Facility Type 2 low bit rate pulse code modulation	Low Bit Rate Multiplexer	1.544 Mbps			ITU G.721
ISDN PRI	CSU	23 B-channels (64 kbps) 1 D-channel (64 kbps)		D-Channel	ITU - I.411, I.420, I.430, I.440, I.450 and I.451 AT&T Tech. Pub. 41459

2-11.3.1 Telecommunications Interfaces

2-11.3.1.1 FAA facilities to FTS2000 switching center.

FTS service is accessible via local TELCO central office trunk lines or direct trunk line connection to the FTS2000 switched voice network.

2-11.3.1.1.1 Protocol Requirements. N/A.

2-11.3.1.1.2 Transmission Requirements.

Voice grade analog and digital, full duplex circuits are available.

2-11.3.1.1.3 Hardware Requirements.

Hardware consists of PABX switches, DSU/CSU, Keysets, or dedicated telephone instruments.

2-11.3.1.2 FAA facilities to FTS2001 switching centers.

FTS service will be accessible via local TELCO central office trunk lines or direct trunk line connection to the FTS2001 switched voice network.

2-11.3.1.2.1 Protocol Requirements. N/A.

2-11.3.1.2.2 Transmission Requirements.

Voice grade analog or digital, full duplex circuits are generally used.

2-11.3.1.2.3 Hardware Requirements.

Hardware consists of PABX switches, DSU/CSU, Keysets, or dedicated telephone instruments.

2-11.4 ACQUISITION ISSUES

2-11.4.1 Program Schedule and Status

FAA requirements for FTS2000 services will continue under the new FTS2001 contract. The FTS2000 contract expired on December 7,1998. The Contract was extended for one year with two six-month option periods to accommodate the transition to the FTS2001 contract and replacement network. The FAA will transition to the FTS2001 contract during Fiscal Years 2000 and 2001. The bulk of the service and circuit transitions will occur during FY 2000. FTS2001 provides direct compatibility to FTS2000 services and hardware without additional cost to the government. However, the transition to FTS2001 will impose additional costs associated with transition. These costs include short periods of dual service and Service Initiation Charges (SIC) along with supporting the new provider's installations. In most cases, GSA will fund SIC charges associated with transition.

2-11.4.2 Planned Telecommunications Strategies

The FTS2001 contract includes all services necessary to satisfy the Government's worldwide administrative telecommunications requirements. The FTS2001 contract will offer switched voice, switched data, and dedicated transmission as core services. Core and new optional services, i.e., wireless, satellite, and other value added services are shown in Table 2-11-2.

Table 2-11-2. FTS2001 Services

CORE FTS2001 SERVICES	NEW - OPTIONAL FTS2001 SERVICES
-- Circuit Switched Services	**-- Wireless Services**
Switched voice	Cellular voice
Circuit switched data	Wireless digital packet data
Toll-free service	One-way paging
900 service	**-- Satellite Services**
-- Switched Data Services	Mobile satellite
Packet switched	Fixed satellite
Frame relay	**-- Value Added Services**
Internet protocol, internetworking	X.400-based messaging
Asynchronous transfer mode	SMTP-based messaging
-- Dedicated Transmission Services	Electronic commerce
	Video teleconferencing
	Federal relay

2-11.4.3 Telecommunications Costs

Funding for those programs using FTS2000/2001 for transport is included in the appropriate chapters.

The cost for funding the transition from FTS2000 to FTS2001 includes regional support for circuit transition. Additional costs are included to upgrade the existing FTS2000 Operations, Administration & Management (OA&M) support infrastructure to incorporate new FTS2001 requirements and to maintain the existing support during the transition. Table 2-11-3 includes the cost of the FTS2001 transition.

Table 2-11-3 Cost Data – FTS 2000/2001

CIP # None	All costs in 000's	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
1. National Projects - DITCO 9721 Acct.									
Dedicated Circuit and Switched Service Costs									
Recurring F&E Funded Costs									
	NSTB		$46	$23	$0	$0	$0	$0	$0
	CDM		$40	$20	$0	$0	$0	$0	$0
	OASIS		$58	$29	$0	$0	$0	$0	$0
	DSR		$168	$84	$0	$0	$0	$0	$0
	WAAS		$147	$74	$0	$0	$0	$0	$0
Total F&E Recurring Costs for National Projects			**$459**	**$230**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring OPS Funded Costs									
	CDM		$0	$20	$44	$46	$49	$51	$53
	DSR		$162	$193	$203	$213	$223	$235	$246
	EVCS		$41	$43	$45	$47	$50	$52	$55
	ISDN		$332	$349	$366	$384	$404	$424	$445
	NSTB		$387	$406	$478	$502	$527	$553	$581
	OASIS		$121	$156	$164	$172	$181	$190	$199
	FAAHQ		$1,487	$1,561	$1,639	$1,721	$1,807	$1,898	$1,993
	WAAS		$0	$74	$185	$194	$204	$214	$225
	MAP		$632	$664	$697	$732	$768	$807	$847
Total OPS Recurring Costs for National Projects			**$3,162**	**$3,466**	**$3,821**	**$4,011**	**$4,213**	**$4,424**	**$4,644**
2. Headquarters, Regions, Tech Center, and Aeronautical Center - DITCO 9721 Acct.									
Dedicated Circuit and Switched Service Costs									
Recurring OPS Funded Costs (See Note 2)									
	Headquarters		$9	$10	$11	$11	$12	$13	$13
	Alaska		$369	$388	$407	$427	$449	$471	$495
	Central		$451	$485	$509	$534	$561	$589	$619
	Eastern		$1,168	$1,227	$1,288	$1,353	$1,420	$1,492	$1,566
	Southwest		$1,145	$1,203	$1,263	$1,326	$1,392	$1,462	$1,535
	Northwest Mountain		$739	$776	$815	$856	$899	$944	$991
	Great Lakes		$1,380	$1,449	$1,521	$1,597	$1,677	$1,761	$1,849
	Western Pacific		$946	$994	$1,044	$1,096	$1,150	$1,208	$1,268
	New England		$566	$594	$624	$655	$688	$722	$758
	Southern		$1,615	$1,695	$1,780	$1,869	$1,963	$2,061	$2,164
	FAA Technical Center		$272	$286	$300	$315	$331	$348	$365
	FAA Aeronautical Center		$701	$736	$773	$812	$852	$895	$940
Total Recurring Costs HQ/Regions			**$9,361**	**$9,843**	**$10,335**	**$10,851**	**$11,394**	**$11,966**	**$12,563**
3. Headquarters, Regions, Tech Center, and Aeronautical Center - Vendor Direct 6905 Acct.									
Dedicated Circuit and Switched Service Costs									
Recurring OPS Fund Costs			**$2,764**	**$2,902**	**$3,047**	**$3,200**	**$3,360**	**$3,528**	**$3,704**

Table 2-11-3 Cost Data – FTS 2000/2001 (concluded)

All costs in 000's	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
4. Transition to FTS20001								
Regional Site Planning Costs								
Non-recurring OPS Funded Costs								
Contract support		$0	$0	$0	$0	$0	$0	$0
Installation/Cutover Plan Support		$0	$0	$0	$0	$0	$0	$0
FTS2001 Workshop		$0	$0	$0	$0	$0	$0	$0
Circuit Tracking Tool		$0	$0	$0	$0	$0	$0	$0
Total Regional Planning Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Circuit Transition Costs								
FAA Field Support/Overtime		$100	$0	$0	$0	$0	$0	$0
GSA Consolidated Switch		$100	$0	$0	$0	$0	$0	$0
FAA Contractor Labor		$1,600	$0	$0	$0	$0	$0	$0
FAA Contractor Travel		$150	$0	$0	$0	$0	$0	$0
Inside Wiring		$500	$0	$0	$0	$0	$0	$0
FAA Travel		$150	$0	$0	$0	$0	$0	$0
Terminal Equipment		$400	$0	$0	$0	$0	$0	$0
Total Circuit Transition Costs		**$3,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Total OA&M Upgrades		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Total Non-recurring Costs for FTS2001 Transition		**$3,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

SUMMARY

		FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$459	$230	$0	$0	$0	$0	$0
	F&E Total	**$459**	**$230**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Totals	Non-recurring	$3,000	$0	$0	$0	$0	$0	$0
	Recurring	$15,287	$16,211	$17,203	$18,062	$18,966	$19,918	$20,911
	OPS Total	**$18,287**	**$16,211**	**$17,203**	**$18,062**	**$18,966**	**$19,918**	**$20,911**

Notes:

1. All costs provided by the FTS2000 Program Office.
2. FTS costs for Regional Distance Learning and WXBRIEF programs funding are included.
3. The transition from FTS2000 to FTS2001 began in FY98 and will take 3 years.
4. The cost of any required terminating equipment is included in the service costs under the FTS2000 contract.
5. The cost of services under FTS2001 is expected to be similar to the costs under FTS2000 for comparable services.
6. Regional Site Surveys cost have been funded by FY98 budget.

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CHAPTER 2-12 - SUMMARY SHEET

GULF OF MEXICO PROGRAM- COMMUNICATION NAVIGATION SURVEILLANCE

Program/Project Identifiers:

Project Number(s):	CIP, C-22
Related Program(s):	CIPs, C-15, M-15, N-11, S-02
New/Replacement/Upgrade?	New
Responsible Organization:	AND-520
Program Mgr./Project Lead:	Dean Resch AND520, (202) 493-4711
Fuchsia Book POC:	same

Assigned Codes:

PDC(s):	CZ, VL
PDC Description:	Terrestrial Circuits for Gulf of Mexico Buoy Communications System; Gulf of Mexico Buoy Communications System Services (VERN & SAT).
Service Code:	ECOM

Cost Estimates *:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$2,650	$1,000	$900	$800	$0	$0	$0
F&E Recurring	$1,638	$1,413	$1,050	$1,000	$0	$0	$0
Total F&E	**$4,288**	**$2,413**	**$1,950**	**$1,800**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$0	$0	$571	$493	$2,054	$2,021	$2,021
Total OPS	**$0**	**$0**	**$571**	**$493**	**$2,054**	**$2,021**	**$2,021**

* Cost data provided by the Program Office.

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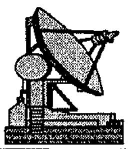
CIP Category: Communications		**2-12.0 GULF OF MEXICO PROGRAM – COMMUNICATION NAVIGATION SURVEILLANCE**

2-12.1 PROGRAM OVERVIEW

The Gulf of Mexico Program (GOMEX) will provide "domestic-like" air traffic services to aircraft flying in U. S. controlled airspace within the Gulf of Mexico at altitudes above 18,000 feet. This is necessary to accommodate increasing levels of flight activity in the Gulf of Mexico resulting from natural growth and the enactment of the North American Free Trade Agreement (NAFTA). The implementation of flight service improvements under GOMEX will improve safety and reduce the operating costs of Gulf airspace users.

In order for the FAA to accomplish this mission, the following capabilities are needed: direct Air Traffic Control (ATC) voice communications between Houston Air Route Traffic Control Center (ARTCC) controllers and pilots of aircraft flying within the Gulf of Mexico Flight Information Region (FIR); automation of the exchange of ATC messages with Mexico; improved Gulf of Mexico navigational capability; and surveillance capability for aircraft in Gulf airspace.

The mission need statement for communications, automation, navigation and surveillance capabilities within the Gulf was approved at Key Decision Point (KDP) #1, Identification of Mission Need, on March 9, 1992. Concurrently, the VHF communications upgrades were approved at KDP #4, Production. The navigation improvements have been completed, with automation and surveillance improvements currently being executed outside the Gulf of Mexico Program. Therefore, GOMEX is now solely a communications improvement program.

The initial attempt to meet the GOMEX-CNS communications requirement with the Buoy Communications System (BCS) failed when the contract for that development effort was terminated due to technical and schedule problems. The Gulf of Mexico Program has been restructured to consist of two separate projects, the Buoy Communications System (BCS) and VHF Extended Range Network (VERN), to meet the Gulf communication requirement. The restructured GOMEX was approved for execution by Joint Resource Council actions on August 20, 1997 and September 15, 1997.

2-12.1.1 Purpose of the VHF Extended Range Network and Buoy Communications System

The Gulf of Mexico FIR is currently designated as oceanic airspace by the International Civil Aviation Organization (ICAO) and the FAA. This designation requires the use of separation standards that provide greater distances between aircraft than domestic flight separation standards. The implementation of an upgraded VHF voice communications system to provide direct pilot to controller communications for aircraft transiting the Gulf FIR is the first step required in achieving domestic flight separation standards. This capability will, in turn, result in economy of operation for users of Gulf airspace and enhance safety.

The purpose of the VERN and the BCS is to provide for the relay of VHF voice communications in areas of the FIR where existing land-based systems provide either no coverage or unreliable coverage. The concepts of VERN and BCS are different for providing the needed coverage, but the combination of these two projects will enable the Gulf communications requirement to be met.

2-12.1.2 References

FAA Aviation System Capital Investment Plan (CIP) C-22, January 1999.

2-12.2 SYSTEM DESCRIPTION

The VHF Extended Range Network is a communications service which consists of four Gulf area coastal stations and provides direct tie-in to the Houston ARTCC to relay conventional VHF voice transmissions between pilot and air traffic controller. Each coastal station employs high transmitter power and high gain antennas to provide communications coverage into specific high traffic areas of the FIR. Each station is connected via telco to the Houston ARTCC and employs the use of Radio Control Equipment (RCE) identical to that used in FAA Radio Communication Outlet (RCO) facilities. To ensure proper operation, the contractor, on a regular basis, performs remote performance monitoring and control of each station.

The Buoy Communications System will, in its final configuration, consist of a network of two or three communications buoys, which will relay conventional VHF voice transmissions between pilot and air traffic controller via a satellite communications channel. A Remote Maintenance Monitoring and Control (RMMC) console will be located at the Houston ARTCC to enable FAA personnel to troubleshoot and effect equipment control. Figure 2-12-1 shows the configuration.

The buoy platforms are surplus from the U. S. Coast Guard (USCG) and will be refurbished by the National Data Buoy Center (NDBC), an element of the Department of Commerce. The NDBC provides operations and maintenance support for meteorological buoys belonging to the National Oceanic and Atmospheric Administration (NOAA) and the National Weather Service. Under an Interagency Agreement with the FAA, the NDBC is providing the complete power system for each buoy, buoy refurbishment services, and buoy maintenance service.

Under the restructured Gulf of Mexico Program, the NDBC will provide the communications system, which they will integrate into a buoy platform for test and evaluation prior to FAA's decision regarding procurement of the system for deployment. The system will consist, in part, of redundant VHF radio systems and commercial L-band satellite communications systems to provide the communications relay function.

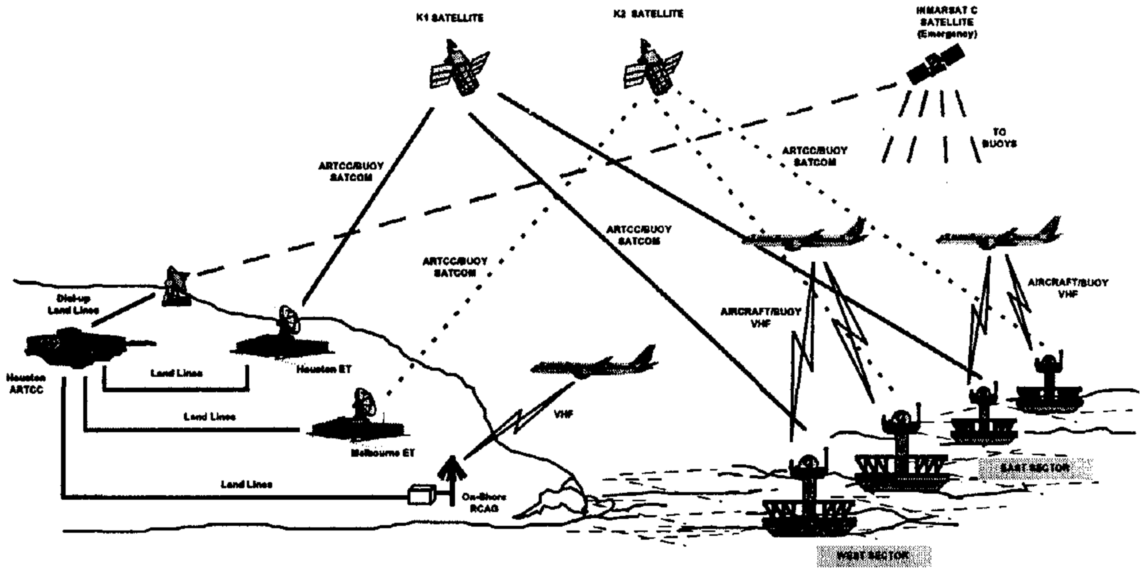


Figure 2-12-1. BCS Production Configuration

2-12.2.1 Program/System Components

2-12.2.1.1 VERN Principal Components

The VERN leased service consists of high power VHF transmitters, VHF receivers, high-gain antennas, and RCE, with appropriate mounting hardware and monitoring equipment at each remote station. The monitoring equipment provides data for the contractor monitoring and repair capability.

At the Houston ARTCC, the system consists of rack mounted RCE. These are interconnected with a dedicated voice channel with a dial-up capability used as a back up.

2-12.2.1.2 BCS Principal Components

A BCS remote site contains VHF radios, antennas, RCE, and mounting and switching equipment for VHF communications. In addition, each remote site contains RMMC equipment, power conditioning, and satellite communications. All of this is mounted on each buoy.

At the Houston ARTCC, the system consists of satellite communications equipment for receiving the voice communications from the aircraft and RMMC equipment for maintaining the buoy equipment.

2-12.2.1.3 Satellite Communications Service

Each buoy system will include redundant satellite communications equipment utilizing a commercial system such as American Mobile Satellite Communications Service. Each buoy will require a dedicated channel for the voice communications information and will share another channel with other buoys for transfer of remote maintenance monitoring information. A dial-up capability will be provided in the event the dedicated voice channel becomes unavailable.

2-12.2.1.4 Hardware Requirements

All communications hardware for BCS is being provided by the National Data Buoy Center. All hardware required for the VERN service is being provided by ARINC.

2-12.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

2-12.3.1 Telecommunications Interfaces

For the BCS and VERN, the interface of voice audio and radio control signals (push-to-talk and push-to-talk confirm) at the Houston ARTCC Voice Switching Communications System (VSCS) is accomplished through a design that uses the CSTI Radio Control Equipment (RCE).

Table 2-12-1. GOMEX-CNS Interface Requirements Summary

SUBSYSTEM INTERFACE		GOMEX To VSCS
INTERFACE CONTROL DOCUMENTATION		NAS-IC-42014000
	Type Interface:	Local Interface
PROTOCOL REQUIREMENTS	Network Layer	None
	Data Link Layer	None
	Physical Layer	None
	Special Formats/ Codes	None
TRANSMISSION REQUIREMENTS	No. Channels	6
	Speed (kbps)	9.6 kbps
	Simplex Half/Full Duplex	FD Synchronous
	Service	Pt. to pt.
	Restoration Time	Essential
HARDWARE REQUIREMENTS	Modem	None
	Data Bridge	
	Clock	
	A/B Switch	
	DSC	
	Cable/ Miscellaneous	None

The VERN interfaces at the Houston ARTCC using standard RCE equipment provided by the contractor. The interface of the BCS at the Houston ARTCC will be accomplished through a design that will emulate the standard RCE. These are standard digital interfaces and will not require any unique hardware or software.

2-12.3.2 Diversity Requirements

2-12.3.2.1 VHF Diversity

The coverage area of four VHF Extended Range coastal stations overlap slightly in areas within the FIR providing some diversity at critical air route intersections. In addition, the BCS coverage will overlap significantly with the coastal station coverage and provide additional diversity.

2-12.3.2.2 SATCOM Diversity

Redundant SATCOM equipment will be provided aboard the buoys for both voice and data satellite channels and will be available on a dial-up basis. In the event of a satellite outage, a redundant satellite channel will be made available on an immediate basis and will automatically be switched into the network making the service transparent to the BCS.

2-12.3.2.3 Terrestrial Landline Diversity

The VERN coastal stations and the satellite earth stations will utilize redundant telephone lines to continue service in the event of loss of the primary circuit.

2-12.4 ACQUISITION ISSUES

2-12.4.1 Project Schedules and Status

The VERN contract was awarded October 21, 1997. The contract provides for purchase of three years of communications services following fabrication and test of the coastal stations.

An Interagency Agreement (IA) will be used for the pre-production and production phases of the BCS effort.

2-12.4.1.1 Pre-production Phase - BCS

Award of an Interagency Agreement to NDBC for the pre-production phase occurred on November 21, 1997. Under the IA, NDBC will build two systems. One will be integrated in a buoy vessel and the other in a test trailer. Extensive testing, both dockside and at sea will be conducted. Additional testing by FAA will be conducted to establish the VHF coverage area and system survivability in the Gulf environment. During the pre-production phase, a minimal amount of maintenance, logistic support, and training documentation will be developed in the event the effort is not successful.

2-12.4.1.2 Production Phase - BCS

At the conclusion of the pre-production evaluation, the FAA will decide whether to continue into production and deployment. If the decision is to deploy BCS, the FAA may award a follow-on Interagency Agreement to NDBC for up to five buoy systems (deployed buoys plus spare systems). Development of all required logistic support, maintenance, and training documentation will be done in this phase prior to deployment of the operational buoys.

2-12.4.2 Planned Telecommunications Strategies

Under VERN, all telco requirements are provided by the service. Table 2-12-2 shows the site installation schedule for GOMEX, while Table 2-12-3 shows the interface implementation schedule for VERN and BCS.

Table 2-12-2. GOMEX-CNS Site Installation Schedule.

Installation	Region	Prior Yrs	FY00	FY01	FY02	FY03	FY04	FY05	FY06
Remote Sites	Southern Mexico Buoy	4	0	0	0	0	0	0	0
Control Sites	Southwest	3	0	0	0	0	0	0	0
	TOTAL	**7**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Table 2-12-3. GOMEX-CNS Interface Implementation Schedule

From	To	Diversity Req'mt	System/Rate/ Miles	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
VERN	ARTCC	Yes	9.6 kbps/ Dial Back Up	4	0	0	0	0	0	0	0
BCS	ARTCC	Yes	LINCS/Multipoint/ 9.6 kbps/2500	3	0	0	0	0	0	0	0

2-12.4.3 Associated Telecommunications Cost Projections

Table 2-12-4 provides F&E costs and estimated projections for Operations costs for BCS. Funding, as appropriate, will be in accordance with FAA Order 2500.8A.

The VERN Operations costs are included in Table 2-12-4, although they are not purely telecommunications costs.

Table 2-12-4. Cost Summary – GOMEX-CNS

CIP# G-22 All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
1. Buoy Communications System (BCS)								
Cost Profile: OPS Maintenance Costs are for the National Data Buoy Center (NDBC)								
Channel Costs								
Leased Communications								
F&E Recurring Costs		$300	$500	$700	$700	$0	$0	$0
OPS Recurring Costs		$0	$0	$0	$0	$700	$700	$700
Hardware Costs								
System Development								
F&E Non-Recurring Costs		$2,650	$1,000	$900	$800	$0	$0	$0
Maintenance								
OPS Recurring Costs		$0	$0	$0	$0	$850	$750	$750
2. Program Support								
FAAHQ		$200	$200	$200	$200	$0	$0	$0
FAATC		$675	$250	$150	$100	$0	$0	$0
F&E Recurring Costs		$875	$450	$350	$300	$0	$0	$0
3. VHF Extended Range (VERN)								
Channel Costs								
Leased Communications								
F&E Recurring Costs		$463	$463	$0	$0	$0	$0	$0
OPS Recurring Costs		$0	$0	$571	$493	$504	$571	$571
SUMMARY								
F&E Totals	Non-recurring	$2,650	$1,000	$900	$800	$0	$0	$0
	Recurring	$1,638	$1,413	$1,050	$1,000	$0	$0	$0
	F&E Total	**$4,288**	**$2,413**	**$1,950**	**$1,800**	**$0**	**$0**	**$0**
OPS Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$0	$0	$571	$493	$2,054	$2,021	$2,021
	OPS Total	**$0**	**$0**	**$571**	**$493**	**$2,054**	**$2,021**	**$2,021**

* All Costs Provided by the Program Office.

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CHAPTER 2-13 - SUMMARY SHEET

LEASED INTERFACILITY NAS COMMUNICATIONS (LINCS)

Program/Project Identifiers:

Project Number(s):	BIIP-991019
Related Program(s):	
New/Replacement/Upgrade?	Replacement
Responsible Organization:	AOP-500
Program Mgr./Project Lead:	Mike Sullivan, AOP-400, (202) 493-5956
Fuchsia Book POC:	Terry Makinen, (202) 314-5935

Assigned Codes:

PDC(s):	IN, UY, VX
PDC Description:	LINCS Training; LINCS Support Assets; Hi-Capacity Multiplexing, Cross-Connect and Support Equipment.
Service Code:	TRNG, MNTC, HCAP

Cost Estimates *:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$2,986	$3,070	$2,150	$1,000	$445	$445	$75
OPS Recurring	$72,860	$74,070	$79,713	$83,530	$73,746	$30,699	$16,349
Total OPS	**$75,846**	**$77,140**	**$81,863**	**$84,530**	**$74,191**	**$31,144**	**$16,424**

*Cost data provided by the Program Office.

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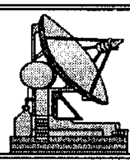
CIP Category: Communications 	2-13.0 LEASED INTERFACILITY NAS COMMUNICATIONS

2-13.1 PROGRAM OVERVIEW

The Leased Interfacility National Airspace System (NAS) Communications System (LINCS) is an interfacility communications system that conforms to the FAA's goal for standardization of telecommunications resources and to the FAA's Strategic Telecommunications Plan. The LINCS contract satisfied requirements for the following: (1) recompetition of circuits, (2) elimination of single point failures with improved access, and (3) improved technical performance. The LINCS system is expandable on a requirement basis as well as providing new channel types as industry standards mature and as FAA requirement change.

LINCS has improved inter-facility communications performance and will continue to improve service availability and prevent many "catastrophic" failures. LINCS reduces leased telecommunications costs by taking advantage of competition, economies of scale, and opportunities for high-speed multiplexing. The LINCS network will continue to support Air Traffic critical telecommunications requirements and will be the baseline for any future telecommunications infrastructure.

2-13.1.1 Purpose of the Leased Interfacility NAS Communications System

The LINCS contract provides transmission channels and leased premise equipment to satisfy FAA operational and limited administrative telecommunications requirements.

The LINCS program management resides in the Telecommunications Leased Communications Programs Division, AOP-500.

2-13.1.2 References

2-13.1.2.1 FAA Strategic Telecommunications Plan.

2-13.1.2.2 LINCS Project Implementation Plan.

2-13.1.2.3 LINCS Functional Specification.

2-13.1.2.4 LINCS Statement of Work.

2-13.1.2.5 Telecommunications Industry Interface Standards.

2-13.1.2.6 American National Standards Institute Publications:

- ANSI T1.102-1987, Digital Hierarchy - Formats Specification.
- ANSI T1.403-1989, Carrier-to-Customer Installation - DS1 Metal Interface Specification.
- ANSI T1.404-1989, Carrier-to-Customer Installation - DS3 Metal Interface Specification.

2-13.1.2.7 AT&T Publications:

- Pub. 43801, AT&T Technical Reference Digital Channel Bank Requirements and Objectives, November 1982.
- TR 54075, Subrate Data Multiplexing - A Service of DATAPHONE (1) Digital Service, November 1988.
- Pub. 62310, Digital Data System Channel Interface Specification, November 1987.

2-13.1.2.8 Bellcore Publications:

- TR-EOP 000063, Network Equipment-Building System (NEBS) Generic Equipment Requirements, Issue 3, March 1988.
- TR-NPL-000157, Secondary Channel in the Digital Data System Channel Interface Requirements, Issue 2, April 1986.
- TA-TSY-000342, High-Capacity Digital Special Access Service Transmission Parameter Limits and Interface Combinations, Issue 1, March 1990.
- TA-NPS-000436, Bellcore Technical Advisory Digital Synchronization Network Plan, Issue 1, November 1986.
- TR-NPL-000335, Bellcore Data Communication Technical Reference Voice Grade Special Access Service; Transmission Parameter Limits and Interface Combinations, Revision 2, 1987.

2-13.1.2.9 LINCS Contract (DCA200-92-D-0021).

2-13.2 SYSTEM DESCRIPTION

LINCS provides transmission channels of various industry-standard types between any specified end points, used to satisfy all FAA operational and some administrative telecommunications requirement. Compared to commercial networks, LINCS provides higher reliability and availability, improved maintainability, and is extremely robust. LINCS consists of a backbone network of nodes interconnected by paths, together with local access lines that connect remote End User Locations (EULs) to the backbone. The LINCS backbone has physical and electrical diversity, path redundancy and state-of-the-art digital connectivity, reducing catastrophic backbone failures. Figure 2-13-1 illustrates the LINCS conceptual network structure.

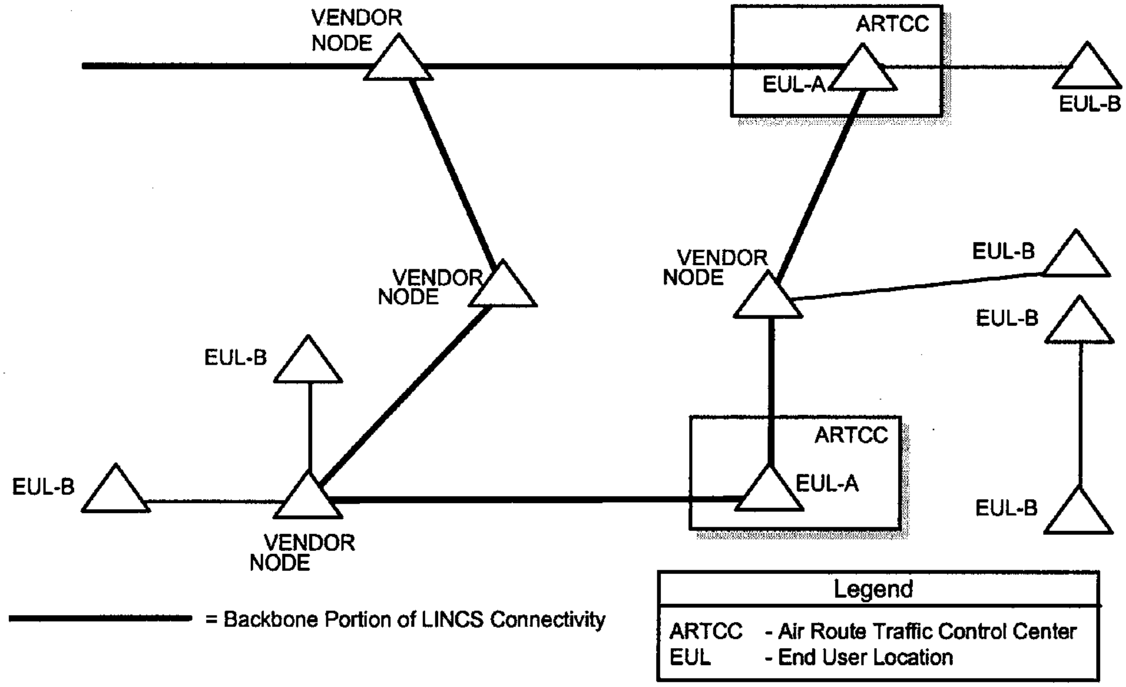


Figure 2-13-1. LINCS Conceptual Network Structure

2-13.2.1 LINCS Functional Components

2-13.2.1.1 End User Location (EUL)

An EUL is a facility at which a leased transmission channel terminates, delivered to a specific demarcation point within the facility. Each EUL is designated either a Type A (EUL-A) or Type B (EUL-B), depending on criticality. Some critical locations, such as RCAG and ASR sites, do not warrant the expense of the implementation of an EUL-A configuration but have a justified requirement beyond the capabilities of an EUL-B configuration. These locations, which require additional LINCS diversity, redundancy, or switching capabilities (FAA provided), are known as EUL-B+ locations.

2-13.2.1.2 End User Location - Type A Locations

Stringent requirements apply to services delivered to EUL-As, all of which will be interconnected by digital channels. EUL-As are generally characterized by one or more of the following conditions: large numbers of channels terminated, important operational services supported, diverse redundant communications, and quick restoral (less than 30 seconds) of failed communications.

The EUL-A facilities are ARTCC's, most AFSSs, and major TRACONs (Level 4 and 5). Other nodes may be established to enhance the robustness of the network. EUL-B facilities may be converted to EUL-As as dictated by air traffic requirements.

2-13.2.1.3 End User Location -Type B Locations

All non-EUL-A type locations are designated as EUL-B locations and characterized by one or more of the following conditions: small numbers of channels terminated, less important operational services supported, no diverse communications requirements, and moderate restoral of failed communications. Approximately 4,700 facilities are EUL-B site. These EUL-Bs facilities include non-FAA locations, including National Weather Service (NWS) and military facilities where FAA-provided circuits terminate.

2-13.2.2 Functional Component Interface Requirements

LINCS is a backbone network that must meet the telecommunications requirements of FAA interfacility services. The LINCS contract provides a network that has high reliability, availability, maintainability, and robustness. LINCS also provides a highly accurate time source (STRATUM 1), the ability to display the real-time status of LINCS channels (at ARTCC's), full period end-to-end channel monitoring, RAPID switching of backbone channels, and quick restoration of failed off-backbone channels.

2-13.2.2.1 Performance Requirements

Each node in the LINCS network connects to at least two other nodes using high capacity digital paths with automatic route switching. At least one of these paths must be a non-radio path. Clear channel voice-grade channels are "highly conditioned", dedicated, full period, and full duplex with a maximum channel delay of 50 milliseconds. The required LINCS channel 12-month average availability is in Table 2-13-1.

Table 2-13-1. Average Channel Availability Over the Most Recent 12-Month Period

From Facility	To Facility	
	EUL-A	EUL-B
EUL-A	0.99999	0.998
EUL-B	0.998	0.998

2-13.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

LINCS provides 4-wire connectivity at FAA demarcation (DEMARC) points for all types of channels except DS-3 and DDC. The voice-grade channel interface at the DEMARC (both transmit and receive) is a Zero Transmission Level Point (0 TLP). The maximum transmitted signal level at the DEMARC cannot exceed -13 dBm as averaged over any 3-second interval. Figure 2-13-2 illustrates the access options for Type VG channels delivered in a digital format.

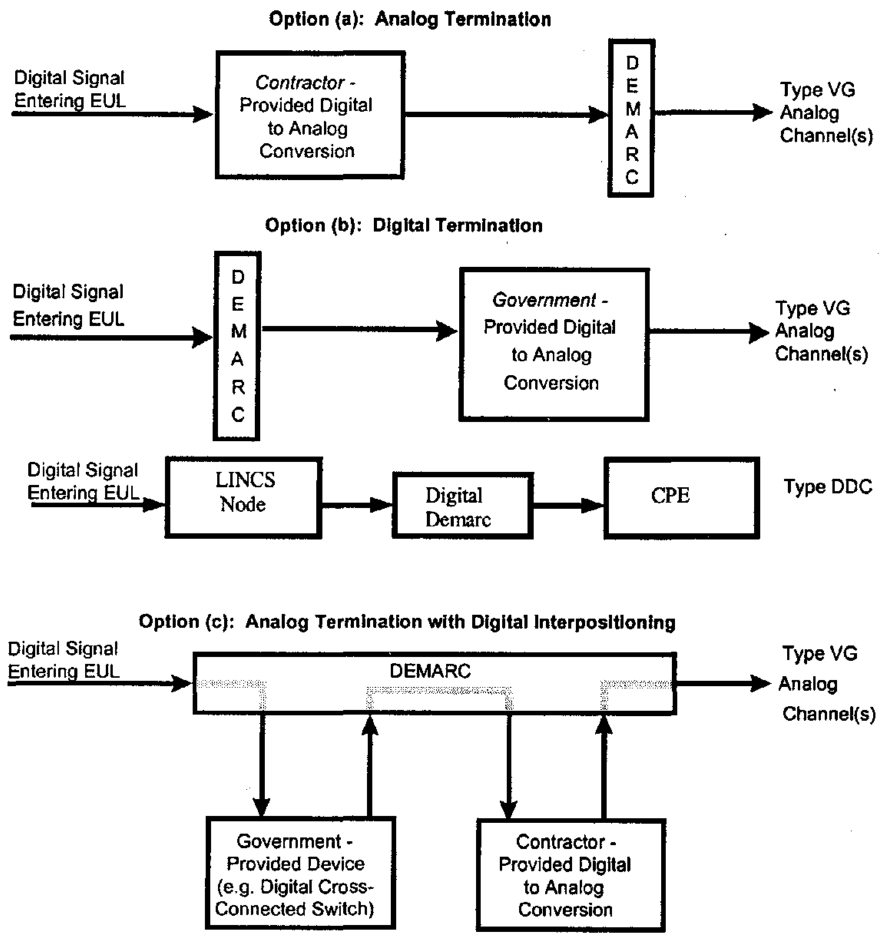


Figure 2-13-2.. LINCS Access Options for Type VG and DDC Channels in a Digital Format

LINCS will interface with FAA-owned systems in accordance with industry standards identified in Table 2-13-2.

2-13.4 ACQUISITION ISSUES

2-13.4.1 Project Schedule and Status

In 1992, the FAA awarded two LINCS contracts, one for the 48 contiguous states and one for Hawaii. Numerous stringent requirements are contained in each contract. Installation of the LINCS infrastructure is complete and all pre-LINCS critical circuits were transitioned to the LINCS network by mid FY96. Within CONUS, 130 vendor and 171 FAA (at EUL-A sites) nodes are operational; however, additional nodes may be required to support new programs such as the Wide Area Augmentation System (WAAS).

Table 2-13-2. Industry Standards

	SERVICE	SPECIFICATION
A.	Type VG (Voice Grade) 1) VG-6 2) VG-8	Bellcore TR-NPL-000335 Rev. 2 of November 1987 AT&T Pub. 43801
B.	Type DDS (Digital Data Service) 1) DDS-2.4 (2400 bps) 2) DDS-4.8 (4800 bps) 3) DDS-9.6 (9600 bps) 4) DDS-19.2 (19.2 kbps) 5) DDS-56 (56 kbps) 6) DDS-64 (64 kbps)	AT&T Pub. 62310 AT&T TR 54075 Bellcore TR-NPL-999157
C	Type DDC (Direct Digital Connectivity) 1) DDC-1/232 (2.4 Kbps - 19.2 Kbps) 2) DDC-1/530A (2.4 Kbps - 1.536 Mbps) 3) DDC-1/V.35 (2.4 Kbps - 1.536 Mbps) 4) DDC-2/232 (2.4 Kbps - 19.2 Kbps) 5) DDC-2/530A (2.4 Kbps - 1.536 Mbps) 6) DDC-2/V.35 (2.4 Kbps - 1.536 Mbps) 7) DDC-3/232 (2.4 Kbps - 19.2 Kbps) 8) DDC-3/530A (2.4 Kbps - 1.536 Mbps) 9) DDC-3/V.35 (2.4 Kbps - 1.536 Mbps)	ANSI/EIA/TIA-232C ANSI/EIA/TIA 422A ANSI/EIA/TIA-530A-1992 CCITT REC V.11 CCITT REC V.24 CCITT REC V.35 CCITT REC V.54
D.	Type F (Fractional DS-1, Channelized Format) 1) F-64 (1 DS-O Channel) 2) F-128 (2 DS-O Channels) 3) F-256 (4 DS-O Channels) 4) F-384 (6 DS-O Channels) 5) F-512 (8 DS-O Channels) 6) F-768 (12 DS-O Channels)	ANSI TI.107-1988
E.	Type FB (Fractional DS-1, Bulk Format) 1) FB-64 2) FB-128 3) FB-256 4) FB-384 5) FB-512 6) FB-768	ANSI TI.107-1988

Table 2-13-2. Industry Standards (Continued)

	SERVICE	SPECIFICATION
F	Type DS-1 (1.544 Mbps, Channelized Format)	ANSI T1.403-1989
G	Type DS-1B (1.544 Mbps, Bulk Format)	ANSI T1.107-1988 ANSI T1.403-1989
H.	Type DS-3 (44.736 Mbps)	ANSI T1.107-1988 ANSI T1.404-1989 Bellcore TA-TSY-000342
I.	Synchronization	Bellcore TA-NPS-000436

The Site Installation Schedule, shown in Table 2-13-3, provides the quantities of FAA nodes required for implementation in FY99 through FY05.

Table 2-13-3. LINCS Site Installation Schedule

Site Installation	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
FAA LINCS Nodes (InterNet, MetroNet, IntraNet)	171	0	0	0	0	0	0	0

Any EUL-A establishment and/or relocation required to support new programs/projects must be funded by the program office generating the requirement. All applicable existing circuits were transitioned to LINCS by the end of 2nd Quarter of FY96. Any additional channels will be funded by the program/project having the requirement.

The LINCS contracts provide the ability to upgrade performance as technology matures. It is expected that technology will be available to improve certain aspects of LINCS performance such as improved monitoring of circuits serving EUL-B sites.

2-13.4.2 Planned Telecommunications Strategies

The FAA will not lease LINCS channels if FTS2000/FTS2001 or FAA-owned transmission resources can satisfy operational requirements at a lower cost. FAA-owned resources include the Radio Communications Link (RCL), Low Density RCL (LDRCL), or cable.

A new LINCS direct digital interface for data rates between 2.4 kbps and 1.544 Mbps eliminated the need for FAA provided interface hardware (CSU/DSU). This new service, Direct Digital Connectivity (DDC) is available for existing as well as new FAA applications such as the Wide Area Augmentation Service (WAAS), Operations and Supportability Implementation System (OASIS), and the Enhanced Traffic Management System (ETMS).

2-13.4.3 Telecommunications Costs

Table 2-13-4 provides cost summaries of projected budget requirements for FY00 through FY06. The program office generating a requirement for a new channel, a new EUL-A or the relocation of an existing EUL-A is responsible for providing funding for the requirement. Costs for new requirements are in the applicable chapter.

The LINCS contract ends in March 2002. A bridge contract (nte 3 years) may be required to allow time for an orderly transition from LINCS to the replacement FTI network. The costs shown in FY03 through FY06 represent projections of the annual recurring costs based on the existing LINCS contract. Actual costs will depend on rates negotiated with the MCIWorldcom.

Table 2-13-4. Cost Summary - LINCS

CIP # None	All costs in 000's	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
1. LINCS Nodes									
	Cost Profile: Annual Recurring Costs								
	Upgraded Locations Added		0	0	0	0	0	0	0
	Total Upgraded Locations	171	171	171	171	171	171	171	171
	OPS Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$72,750**	**$73,950**	**$79,648**	**$83,530**	**$73,746**	**$30,699**	**$16,349**
2. Power Enhancements									
	Cost Profile: Regional Overtime, Inside Wiring, Power Panels, Testing								
	Upgraded Locations Added		20	0	0	0	0	0	0
	Total Upgraded Locations	132	152	152	152	152	152	152	152
	OPS Non-recurring Costs		**$711**	**$75**	**$75**	**$75**	**$75**	**$75**	**$75**
	OPS Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
3. Network Enhancements									
	Cost Profile: Diversity/Redundancy								
	Upgraded Locations Added		2	2	1	0	0	0	0
	Total Upgraded Locations	21	23	25	26	26	26	26	26
	OPS Non-recurring Costs		**$1,100**	**$1,200**	**$650**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$110**	**$120**	**$65**	**$0**	**$0**	**$0**	**$0**
4. Engineering Services									
a.	**Cost Profile: Y2K, Testing, Engineering, and Transition Support**								
	Number of hours of service @ $185/hr		5000	7000	5000	5000	2000	2000	0
	OPS Non-recurring Costs		**$925**	**$1,295**	**$925**	**$925**	**$370**	**$370**	**$0**
	OPS Recurring Costs - N/A		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
b.	**Cost Profile: Security Planning**								
	OPS Non-recurring Costs		**$250**	**$500**	**$500**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs - N/A		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	SUMMARY								
	F&E Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Totals	Non-recurring	$2,986	$3,070	$2,150	$1,000	$445	$445	$75
		Recurring	$72,860	$74,070	$79,713	$83,530	$73,746	$30,699	$16,349
		OPS Total	**$75,846**	**$77,140**	**$81,863**	**$84,530**	**$74,191**	**$31,144**	**$16,424**

Notes:

1. Projected program costs will decrease with service transition to FTI. FTI operations costs will increase by a commensurate amount.

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CHAPTER 2-14 - SUMMARY SHEET

NATIONAL AIRSPACE DATA INTERCHANGE NETWORK (NADIN)

Program/Project Identifiers:

Project Number(s):	BIIP-991020
Related Program(s):	See Table 2-14-1
New/Replacement/Upgrade?	Upgrading additional backbone trunks to T1; Implementing Frame Relay services; Testing and installing Network Analysis and Reporting System (NARS); Relocating the node in Hawaii; & installing nodes at San Juan, PR & at the Herndon, VA Air Traffic Control System Command Center (ATCSCC).
Responsible Organization:	AOP-400
Program Mgr./Project Lead:	Tom Loftus, AOP-400, (202) 493-5952
Fuchsia Book POC:	Hai Tran/Howard Harrell, (202)314-5986/(202)314-5914 – ITT/AOP

Assigned Codes:

PDC(s):	UA, UC, VC
PDC Description:	NADIN 1A Data Circuits, NADIN II Data Circuits; NADIN II Equipment
Service Code:	NAMS, NDNB

Cost Estimates*:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$3,115	$3,136	$3,248	$3,271	$3,294	$3,319	$3,345
Total OPS	**$3,115**	**$3,136**	**$3,248**	**$3,271**	**$3,294**	**$3,319**	**$3,345**

*Cost data provided by the program office.

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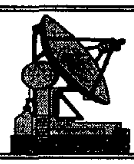
**CIP Category:
Communications**



2-14.0 NATIONAL AIRSPACE DATA INTERCHANGE NETWORK (NADIN)

2-14.1 PROGRAM OVERVIEW

2-14.1.1 Purpose of National Airspace Data Interchange Network

The National Airspace Data Interchange Network (NADIN) is part of the data-switching sub-element of the NAS communications element. It currently provides high-speed, data communications between other subsystems in the NAS, including those identified in Section 2-14.2. The NADIN Packet Switched Network (PSN), which was commissioned on March 31, 1995, employs the International Telecommunications Union-Telecommunication Standardization Sector (ITU-T, formerly CCITT Recommendation) X.25 protocol and operates twenty-four (24) hours a day, by seven (7) days a week. Telecommunications Services Division, AOP-400, is responsible for the NADIN PSN.

2-14.1.2 References

2-14.1.2.1 Budget Increase Issue Paper (BIIP) 991020

2-14.1.2.2 FAA Aviation System Capital Investment Plan (CIP) 35-07, January 1995.

2-14.1.2.3 NAS Level I Design Document (NAS-DD-1000), June 1989, pp. VI 8-10.

2-14.1.2.4 NADIN Packet Switched Network Functional Specification, FAA-E-2770d, May 1994.

2-14.1.2.5 NADIN Packet Switched Network Architectural Analysis, FR.3049.03.01, May 23, 1985.

2-14.1.2.6 NADIN PSN Traffic Analysis, WM.3049.03.14, May 15, 1985.

2-14.1.2.7 NADIN Support of the Weather Modernization Program, WM.3049.01.07, February 5, 1985.

2-14.1.2.8 Topological Analysis of NADIN PSN Backbone, CONTEL WM.3049.03.40, October 23, 1985.

2-14.1.2.9 ITU-T X.25, Interface Between Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE) for Terminals Operating in the Packet Mode on Public Data Networks, Geneva: 1976; as amended at Geneva, 1984.

2-14.1.2.10 NAS-SS-1000, Volume IV, Paragraph 3.2.1.3.2, January 1988.

2-14.1.2.11 National Airspace System Communications Network Design, October 1985.

2-14.1.2.12 National Airspace System Plan, June 1988; Chapter V-32, Interfacility Communications Systems, Project 7.

2-14.1.2.13 National Airspace Data Interchange Network, Packet Switched Network, X.25 Packet Mode Users, Interface Control Document (NAS-IC-43020001), April 4, 1996.

2-14.1.2.14 Analysis of NADIN PSN network Performance, August 1996.

2-14.2 SYSTEM DESCRIPTION

The NADIN PSN is an independent X.25 packet switched network that augments and functions in parallel with the NADIN Message Switching Network (MSN, or NADIN 1, sometimes incorrectly referred to as NADIN 1A). Collectively, both networks are known as NADIN. The NADIN PSN is a highly robust data communications network composed of packet switching nodes connected by high-speed digital backbone trunks and controlled from a central facility, the National Network Control Center (NNCC). There are two of these control centers which act as mutual back-up, redundant systems: one in the Atlanta, GA, area, and the other in Salt Lake City, UT. The two major functions performed by the NNCC are network management and control. However, normal day-to-day operation of the NADIN PSN requires no manual (operator) intervention by the NNCCs or others; it is fully automatic.

The NADIN PSN provides end-to-end connectivity between users and host computers nationwide. NADIN PSN uses commercially leased circuits, primarily Leased Interfacility NAS Communications System (LINCS), as the transmission media to connect the operational NADIN PSN packet switching nodes in the Continental United States (CONUS). Network services include interactive host-to-host, host-to-terminal, terminal-to-host, and terminal-to-terminal data transfer. The packet switching nodes are multi-processor devices with automatic redundancy. Alternate routing is provided to all node sites, with each node having a minimum of two backbone trunks.

The NADIN PSN maintains two NNCCs manned 24 hours per day, 7 days per week. Either NNCC can be designated the master NNCC and perform all NNCC functions. The other NNCC functions as the backup NNCC and can assume the master NNCC role when required.

The NADIN PSN interfaces with the NADIN MSN concentrators via an X.25 interface at every ARTCC, with protocol conversion taking place on the NADIN MSN side of the interface. Identical interface and conversion also occurs between the NADIN PSN switch/node and its corresponding NADIN MSN switch at the Atlanta and Salt Lake City NNCCs. The NADIN MSN, although still using mostly low-speed legacy protocols, satisfies certain mandatory requirements for flight plan messaging prescribed by the International Civil Aviation Organization (ICAO). These requirements include Store-and-Forward, Message Priority, and Alternate Routing capabilities.

Current and anticipated NADIN PSN subscribers/customers are shown in Table 2-14-1.

Table 2-14-1 NADIN Current and Prospective Customers

1. Advanced Technologies & Oceanic Procedures (ATOP) contract
2. Aeronautical Data Link/Controller Pilot Data Link Control (ADL/CPDLC)
3. Aeronautical Fixed Telecommunications Network (AFTN) [This is the existing International network for interchange/distribution of aircraft movements/flight plans, weather, & NOTAM services; NADIN MSN is the FAA interface to AFTN.]
4. AFTN/MET terminals [FAA-developed program, using Commercial Off-the-Shelf (COTS) microcomputer platform and communications interface, for weather and flight-plan processing at remote sites.]
5. Aeronautical Information System (AIS)
6. Aeronautical, Radio Inc. (ARINC)
7. Aeronautical Telecommunication Network (ATN)
8. Air Force, Army, Coast Guard, Navy, other Department of Defense (DoD)
9. Airlines/Commercial
10. Air Traffic Interfacility Communications System (AIDC)
11. Atmospheric Systems Corporation (ASC)
12. Automated Unicom (Commercial name = SUPERUNICOM®)
13. AWOS Data Acquisition System (ADAS)
14. Aviation Weather Processor (AWP)
15. Capstone Program (Micro-EARTS at Anchorage, initially)
16. Controller Pilot Data Link Communications (CPDLC)
17. Department of Justice (DOJ)
18. Direct User Access Terminal Service (DUATS)
19. Dynamic Ocean Tracking System (DOTS+)
20. Enhanced Traffic Management System (ETMS)
21. Executive Jet Aviation (NetJets.com)
22. Federal Express (FedEx)
23. Free Flight Phase I
24. Foreign Civil Aviation Authorities (CAAs)
25. Hawaii Pacific Systems Management Office (SMO) & Maintenance Control Center (MCC)
26. Honolulu CERAP
27. Host and Oceanic Computer System Replacement (HOCSR)
28. Host Interface Device/National Airspace System Local Area Network (HID/NAS LAN)
29. Integrated Terminal Weather System (ITWS)
30. Jeppesen-Sanderson (formerly Jeppesen-DataPlan)
31. Joint Typhoon Warning Center (JTWC)
32. Kavouras
33. LANE Corporation's Passport® system connection for Headquarters Command Center
34. Liat Airlines (Antigua, West Indies)
35. Maintenance Processor Subsystem (MPS)
36. Mejoras al Enlace de Voz del ATS (MEVA)
37. Micro-En Route Automated Radar Terminal; System (M-EARTS)
38. Multi-Sector/Oceanic Data Link (MS-ODL)
39. NADIN MSN Circuits between Concentrators and Message Switches
40. NADIN MSN Subscribers
41. National Severe Storms Forecast Center/Kansas City (NSSFC)
42. Oceanic Data Link (ODL)
43. Operational and Supportability Implementation System (OASIS)
44. Operational Data Management System (ODMS)
45. Remote Maintenance Monitoring System (RMMS)
46. SCSI

47. Series One Replacement (S1R)
48. SkySource
49. Societe Internationale de Telecommunications Aeronautiques (SITA)
50. Special Use Airspace Management System (SAMS)
51. Standard Terminal Automation Replacement System/Enhanced System Capability (STARS/ESC-2)
52. Telecommunications Remote Maintenance and Monitoring (TRMM)
53. Terminal Weather Information for Pilots (TWIP)
54. Tinker AFB/KAWN
55. Tower Automation Platform/Surface Movement Advisor (TAP/SMA)
56. Tower Data Link Service (TDLS)
57. Tower Doppler Weather Radar (TDWR)
58. Treasury
59. Unisys Corporation/Weather Services Group
60. United States NOTAM System Replacement (USNSR)
61. Universal Weather & Aviation (univ-wea.com)
62. User Request Evaluation Tool (URET)
63. Virginia Department of Aviation
64. VOLMET Automation System (VAS)
65. Weather and Radar Processor (WARP)
66. Weather Message Switching Center Replacement (WMSCR)
67. Weather Systems Processor (WSP)
68. WSI Corporation

2-14.2.1 NADIN Program/System Components

2-14.2.1.1 Packet Switching

The NADIN PSN uses packet switching technology, transparent to the user, that includes: adaptive, dynamic routing of data packets, error-free data transmission, data transmission acknowledgement, data transmission priority levels, network congestion control, and call redirection.

2-14.2.1.2 Network Access

The NADIN PSN provides subscriber access to network services for ITU-TSS X.25 users. Non-X.25 users are currently supported via the software gateway function provided at the interfaces between the MSN and PSN.

2-14.2.1.3 Service Control

The NADIN PSN controls user access to the network, determines service requirements, and establishes authorized connections.

2-14.2.1.4 Data Transfer

The NADIN PSN provides fast reliable, properly ordered and error-free transmission of subscriber data packets over a backbone network.

2-14.2.1.5 Gateway

The NADIN PSN provides gateway access to the NADIN MSN switch at each ARTCC and at the NNCCs located in Atlanta and Salt Lake City. NADIN PSN also maintains gateway access at the Washington and Oakland ARTCCs for TDLS, TWIP, TDWR and DOTS data destined for users served by the ARINC Packet Network (APN). There is also a gateway function between the FAA and the National Weather Service (NWS), based on a Memorandum of Agreement (MOA) between the two agencies.

These gateways eliminate incompatible elements in protocols, formats, and addresses used by the PSN and MSN networks. They also perform service control and network control functions. Gateway capabilities with other Government agencies and commercial service providers are being planned.

2-14.2.1.6 End-to-End Message Assurance

The NADIN PSN provides end-to-end assurance of data delivery between X.25 network users.

2-14.2.1.7 Network Recovery

The NADIN PSN provides control of the logical composition and connectivity of the network so that node or link failures are transparent to network users. The network node access availability is 99.99970%.

2-14.2.1.8 Performance Requirements

Each NADIN PSN packet node has a theoretical throughput processing capability of 615 kbps (mean) in Normal Mode, and 1230 kbps (mean) when operating in the Degraded Mode.

Normal Mode operation allows for the failure of one packet node or one backbone connection between a pair of packet nodes. Degraded Mode may be caused by multiple failures in the transmission links or packet nodes. Network Degraded Mode requirements are established to meet the increased traffic loads experienced on any given node when one or more nodes or trunks have failed.

Note: Prospective NADIN PSN users are encouraged to contact the NADIN Program Office (AOP-400) at 202-493-5952 regarding specific performance requirements which may impact their system.

2-14.2.1.9 Bit Error Rate

The NADIN PSN Specification, FAA-E-2770d, requires that end-to-end, undetected bit error rate will not exceed 10^{-12} (One in a trillion, 10 to the minus 12^{th}, or 0.000000000001). This capability was satisfied by the analysis method during the performance portion of COTS testing at the original contractor's (Harris Corporation) factory and during Operational Test and Evaluation (OT&E) on site at one of the original key sites.

2-14.2.1.10 Diversity Requirements

Prior analysis suggested that, at a minimum, the following diversity requirements should be implemented.

1. Each packet switching node be connected to at least two other packet switching nodes via separate backbone trunks; and

2. Diversity between a packet switching node and a user is dependent on the criticality of the service being carried over the user interface. For those users that are not collocated with their associated packet switching node where a modem or CSU/DSU is used, diversity will typically be accomplished using a dial backup line dedicated to that user and the packet switching node.

All of the operational NADIN PSN nodes are currently connected to at least two other nodes via high-speed (56 kbps) leased lines. Some nodes, as for example the Salt Lake and Atlanta NNCC nodes, have considerably more diversity, up to five or six links.

2-14.2.2 Components

The NADIN PSN topology includes 25 interconnected operational packet switching nodes. These nodes, or switches, are Hughes Network Systems (HNS) STRATEGY™ 9000 Series Network Exchanges. The nodes are located at the 20 Continental United States (CONUS) Air Route Traffic Control Centers (ARTCCs), the Anchorage ARTCC, the Honolulu Combined Center Radar Approach Control (CERAP), the Guam CERAP, and the two (2) National Network Control Centers located in Atlanta and Salt Lake City. The Guam node is not currently operational.

Nodes located at the NNCCs in Atlanta and Salt Lake City also contain these additional components:

- Network Control Centers (NCCs) to monitor, control, and service the network.
- NADIN MSN/PSN Gateways to facilitate data intercommunications between the two (2) NADIN networks and their users.

In addition to the operational network facilities, the NADIN PSN provides separate, non-operational, network support systems at the FAA William J. Hughes Technical Center (former FAA Technical Center) and the FAA Academy. The Technical Center performs limited User Certification Testing of all prospective NADIN PSN users and maintains the NADIN PSN configuration database. The Aeronautical Center supports training.

NADIN PSN internodal circuits (backbones) may use a combination of government-owned transmission equipment that may be provided by the FAA Owned Microwave Systems (FOMS) and/or Bandwidth Manager (BWM) or leased channels.

2-14.2.2.1 Functional Component interface Requirements

The NADIN PSN functional/physical interfaces are illustrated in Figures 2-14-1 through 2-14-3. Figure 2-14-1 shows interfaces for collocated and remote, or non-collocated subscribers to NADIN PSN at centers. (CERAP configuration would be similar to that at an ARTCC). Figure 2-14-2 is a depiction of center-to-center, or backbone-link interface. Figure 2-14-3 depicts the connections from the PSN node at NNCC to the MSN switch, to MSN Concentrators, and between the two NNCC switch locations, via the FAA-developed software gateway function. NWS, ARINC and other special NADIN x.25 gateway interfaces are not depicted in this chapter.

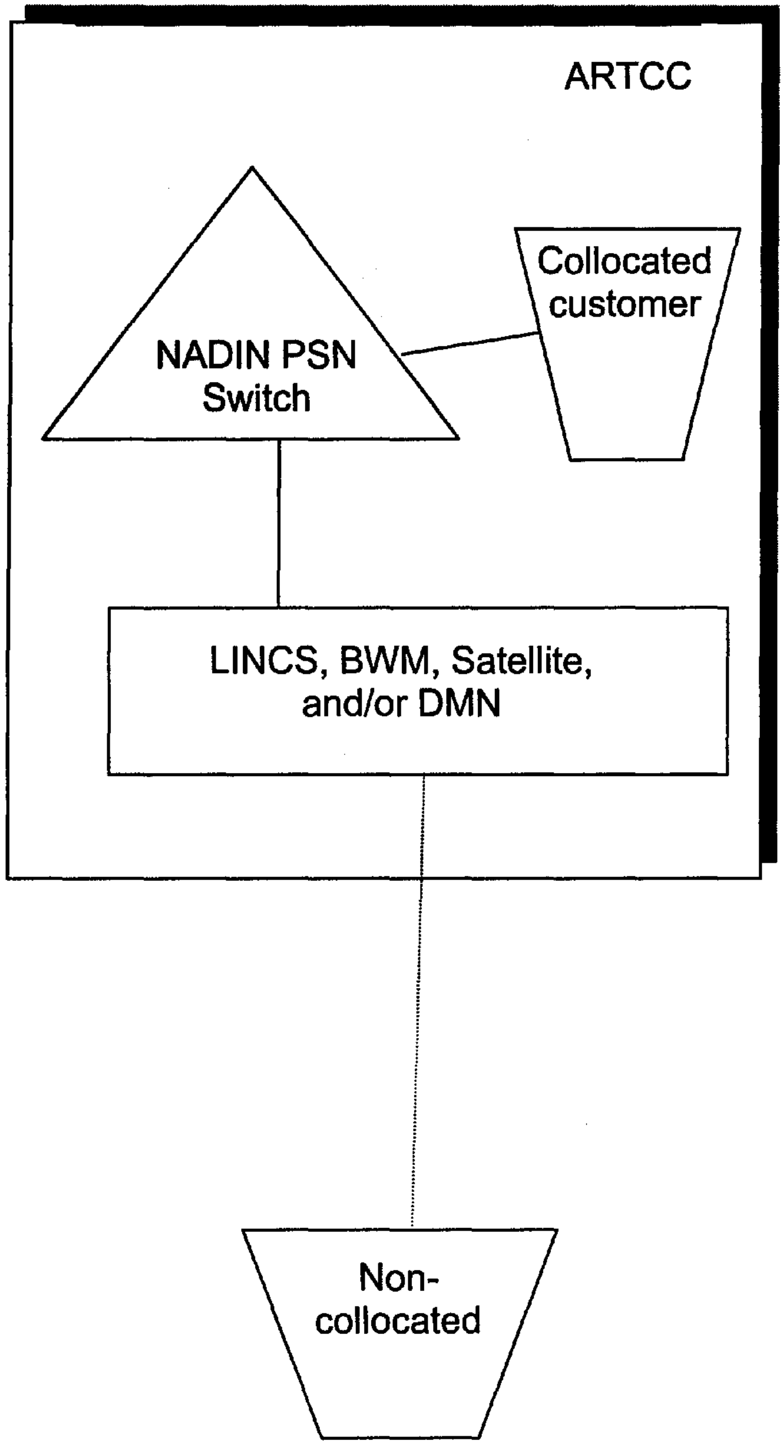


Figure 2-14-1. Collocated and Remote Interfaces

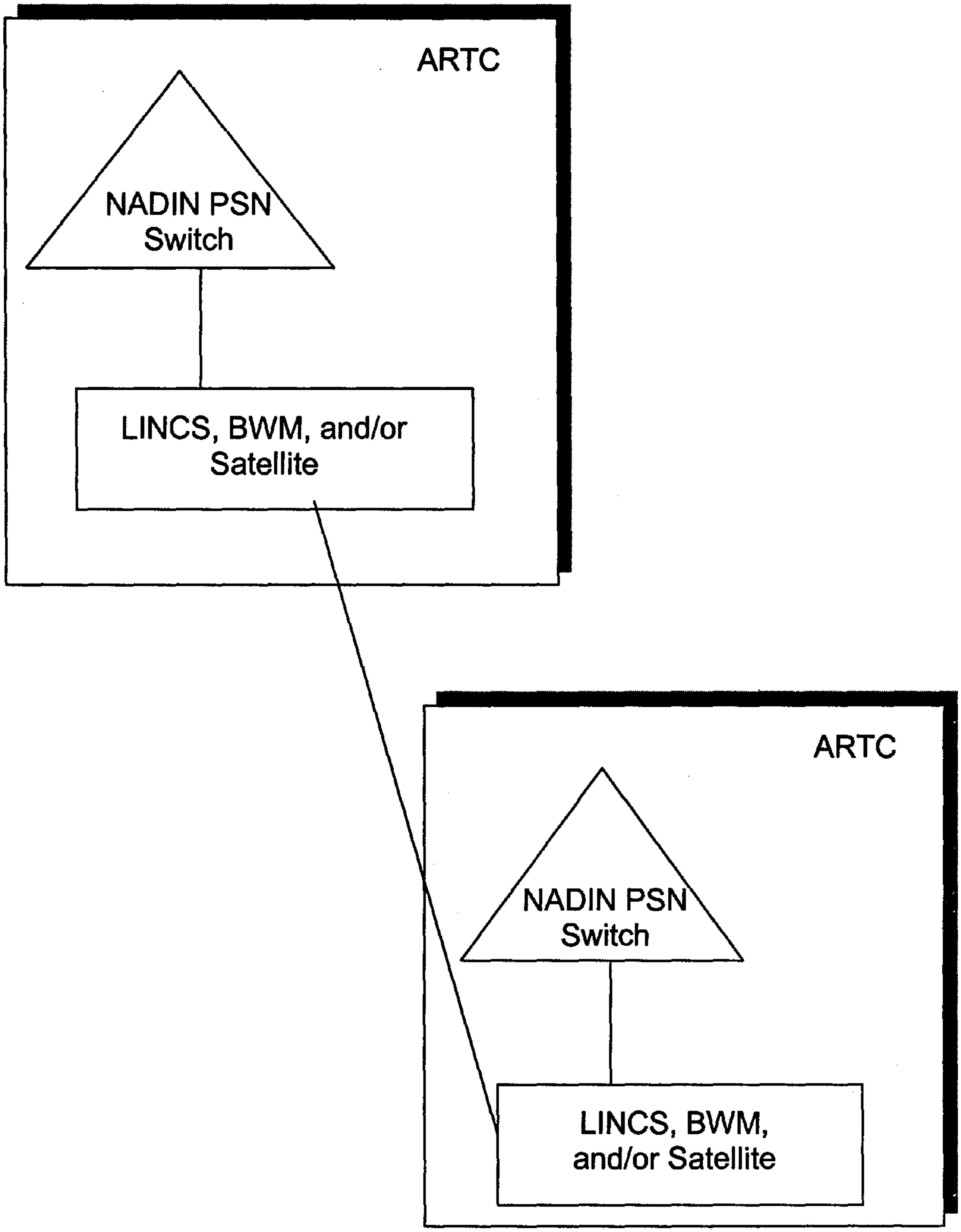


Figure 2-14-2. Backbone Interface

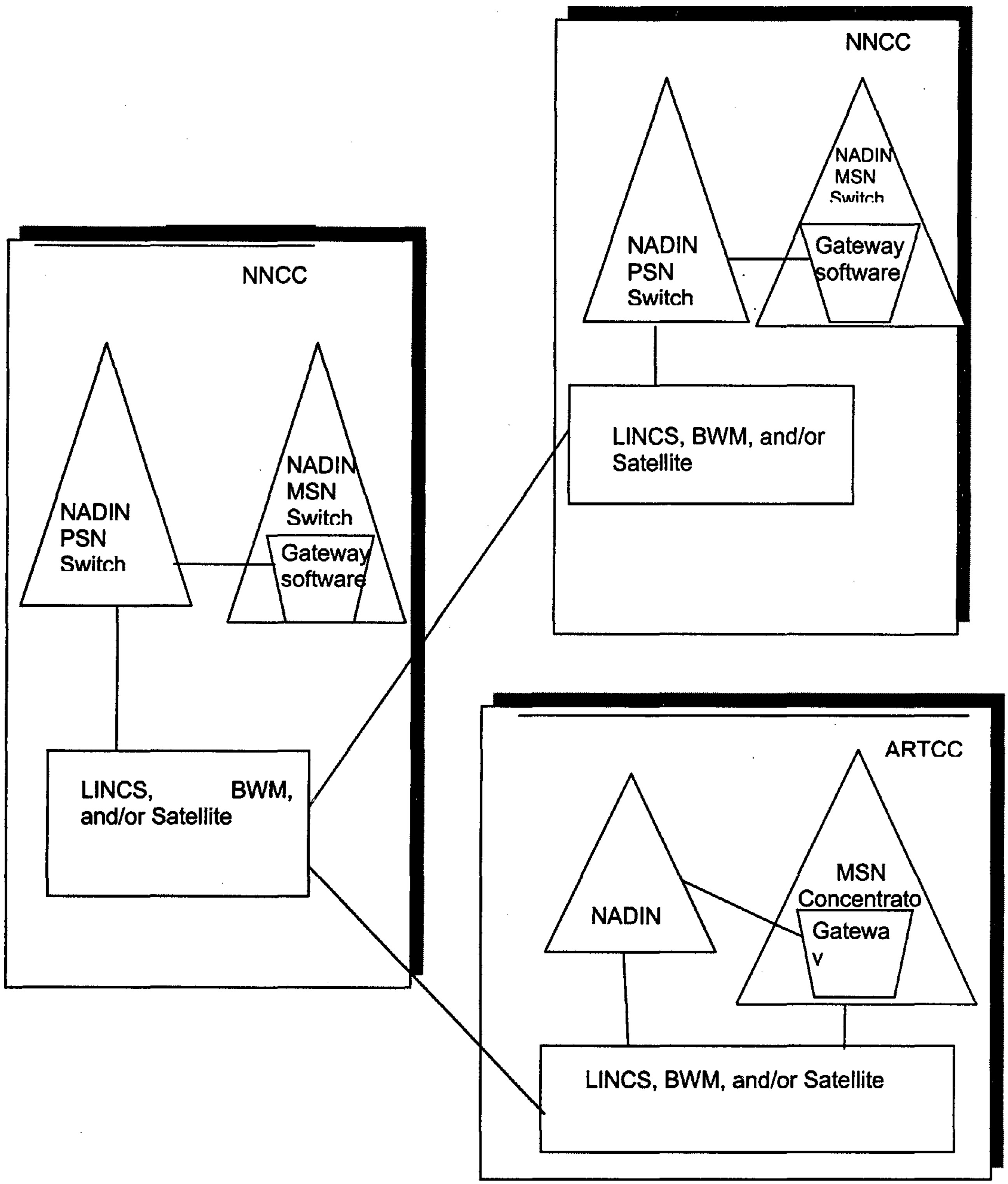


Figure 2-14-3. MSN/PSN Gateway Functional Interfaces

2-14.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

In order to meet specified performance requirements, the NADIN PSN backbone network must be at least doubly connected (i.e., every NADIN PSN node must be connected to at least two other NADIN PSN g nodes).

The backbone topology configuration consists of 38 separate high-speed (56 Kbps) trunks. This configuration assumes one high-speed data channel for each required link. Figure 2-14-4 shows the NADIN PSN topology as of December 1999. Descriptions of the required interfaces are provided in the paragraphs that follow. Protocol, transmission and hardware requirements are summarized for each interface.

2-14.3.1 Telecommunications Interfaces

2-14.3.1.1 Packet Switching Node to Packet Switching Node

This interface supports high-speed traffic passing from one node to another.

2-14.3.1.1.1 Protocol Requirements

The protocol used on node-to-node backbone trunks is a modified, proprietary version of ITU-T (CCITT) X.75. The Frame Relay technology insertion modifies this to a proprietary protocol, which is in effect standard Frame Relay without the 'overhead'. The vendor calls this "Frame Transparent" backbone.

2-14.3.1.1.2 Transmission Requirements

For this interface, 56/64 Kbps MCI LINCS (or equivalent) data channels will, for the short term, meet all existing and documented NADIN PSN transmission requirements, including traffic, service performance, and special (e.g., alternate routing) requirements. Significant increases in backbone and user channel bandwidth, including T-1, are required to support users such as the Weather and Radar Processor (WARP), Integrated Terminal Weather System (ITWS), and User Request Evaluation Tool (URET) programs. The backbone circuits are being upgraded to T-1 and will be available in the 3rd quarter of FY 2000. Backbone circuits will operate full-duplex. Those backbone circuits currently operating over satellite have implemented Modulo 128 sequence numbering to provide high link-level utilization to minimize satellite delay.

NADIN PSN Topology

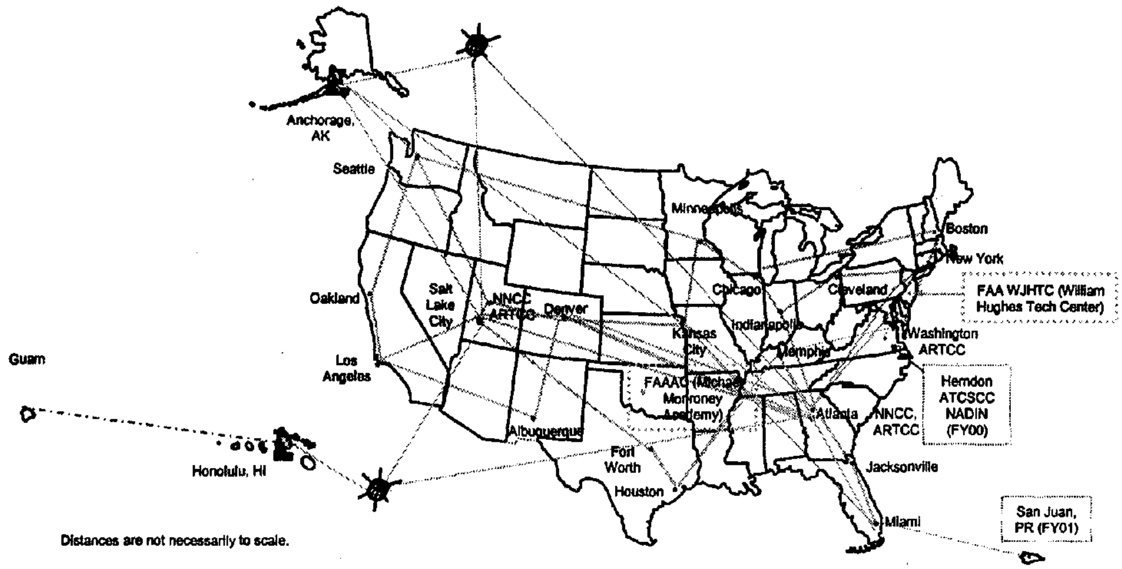


Figure 2-14-4. NADIN PSN - December 1999

2-14.3.1.1.3 Hardware Requirements

NADIN PSN hardware includes all necessary cabling and switching equipment required for internal PSN connectivity.

2-14.3.1.2 Packet Switching Node to Subscriber (User)

Subscriber telecommunications requirements are discussed under each of the individual subscriber project/system descriptions found elsewhere in this publication.

2-14.3.1.2.1 Protocol Requirements

Protocols are as defined in the NADIN PSN X.25 Packet Mode Users Interface Control Document (ICD) (NAS-IC-43020001), dated 4 April 1996.

Specifically, conformance and interoperability of the user interface with the PSN shall comply with FAA-STD-047 and FAA-STD-048, and the 3rd party interface testing shall comply with ISO 8882-2 and ISO 8882-3. Users are required to document and certify this compliance when submitting their initial service request. Interface requirements are depicted in Table 2-14-2.

Table 2-14-2. NADIN PSN Interface Requirements Summary

SUBSYSTEM INTERFACE		PSN NODE TO PSN NODE	PSN TO SUBSCRIBER
INTERFACE CONTROL DOCUMENTATION			
PROTOCOL REQUIREMENTS	Network Layer	X.25	X.25
	Data Link Layer	Proprietary, modified X.75	X.25/HDLC
	Physical Layer	EIA/TIA-530 or V.35	EIA-232-C/D, EIA/TIA-530-A
	Special Formats/ Codes		
TRANSMISSION REQUIREMENTS	No. Channels	35	100 s
	Speed (Kbps)	56/64K or 1.3 / 1.5M	1200 bps to 1.5 Mbps (T-1)
	Simplex Half/Full Duplex	FD	FD
	Service		
HARDWARE REQUIREMENTS	Modem	GFE	Data Multiplexing Network or user-supplied
	Cable/ Miscellaneous	Standard cabling	Standard or custom cables/ connectors

2-14.3.1.2.2 Transmission Requirements

Transmission requirements are as defined in the applicable subscriber ICD appendix. NADIN PSN user interface always acts as the logical Data Circuit-terminating Equipment (DCE) and provides the clock. User access speeds offered are from 2400 bps to 1.544 Mbps (T-1) limited by available bandwidth of the backbone transport service, its overhead, and existing load on adjacent ports connecting to the same backbone(s). Users requiring access speed greater than 64 kbps are reviewed on a case by case basis.

2-14.3.1.2.3 Hardware Requirements

Electrical and mechanical characteristics (Physical Layer Interface) allow subscribers to connect to NADIN PSN using an Electronic Industry Association /Telecommunications Industry Association (EIA/TIA) 232-C/D/E for low-speed/short distance (line speeds less than 20 Kbps) or EIA/TIA-530 physical interface for higher speeds and longer distances (line speeds greater than 20 Kbps). Termination may use local cable, modems, or Direct Digital Connection (DDC) operating over dedicated telco channels. For security reasons, remote users are not authorized dial access to the NADIN PSN.

2-14.3.2 Local Interfaces

The NADIN PSN allows multiple, collocated [e.g., intra-ARTCC] subscribers with no other telecommunications requirements. There are no backbone link requirements involved in the NADIN PSN to NADIN MSN (PSN-to-MSN) gateway interface.

2-14.3.2.1 Packet Switching Node to NNCC

This interface is provided via the NADIN PSN packet switching nodes at Atlanta and Salt Lake City NNCC.

2-14.3.2.2 Packet Switching Node to Subscriber (User)

Subscriber connections on a local basis are discussed under each of the individual subscriber project/descriptions found elsewhere in this publication.

2-14.3.2.3 Packet Switching Node to MSN Gateway

An interface is established at each ARTCC and the Atlanta and Salt Lake City NNCCs.

2-14.3.2.3.1 Protocol Requirements

The Packet Switching Node (PSN) Gateway to MSN is an implementation of "Gateway Services" as defined in ITU-T (CCITT) X.25 1984, in accordance with NAS-IC-43020001, as amended. This gateway is protocol only and stores no information while in transit from the NADIN Message Switch to users or NADIN Concentrators.

2-14.3.2.3.2 Transmission Requirements

This interface operates over multiple 9600 bps full-duplex links. An alternate path is provided by using two gateways (one at each NNCC), each routinely handling approximately one half of the traffic load, with the capability to support the entire MSN/PSN traffic load. While alphanumeric information is normally exchanged, binary information can be contained in the text of messages.

2-14.3.2.3.3 Hardware Requirements

This interface is implemented by a direct cable connection, which will be provided by the NADIN PSN project. Electrical characteristics of the MSN are EIA-232-C/D. Limited distance modems or active converters are required at some locations. Synchronization is provided by the PSN end of the interface if it is a direct cable.

2-14.4 ACQUISITION ISSUES

2-14.4.1 Project Schedule and Status

The NADIN PSN contract was awarded in July 1989. NADIN PSN became operational on 31 March 1995, except for the MSN-PSN Gateway interfaces which were fully completed and operational in September 1995. A major backbone upgrade is planned in FY00 to support increasing user traffic. The upgrade, which will be driven by the requirements and schedules of those users requiring significantly greater data throughputs, will increase the data rates of all backbone trunks to T-1. Additionally, two (2) new NADIN PSN nodes and/or mini-nodes are planned: the CERAP at San Juan, Puerto Rico; and the Air Traffic Control System Command Center (ATCSCC) in Herndon, VA.

As part of the FAA effort to modernize the National Airspace System (NAS), the MSN concentrators located in each of the ARTCCs are scheduled to be shut off and decommissioned starting in the September 2000 timeframe. As part of this effort, all MSN users must be disconnected and migrated on to the PSN. The first phase of this migration, removal of the WMSCR rehost circuits, has been completed. The second phase impacts current MSN users including, but not limited to, International Civil Aviation Organization (ICAO) groups, air carriers, aviation service providers, and others. Most of these subscribers use NADIN MSN to acquire Service A (weather) and/or Service B (flight movement) products.

Table 2-14-3 shows the current Site Installation Schedule for NADIN PSN nodes, including the projected backbone upgrade.

Table 2-14-3. Site Installation Schedule

Site Installation	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
5-Node Test Network	5	0	0	0	0	0	0	0
Remaining Nodes	23	0	0	0	0	0	0	0
PSN/MSN Gateways (24 sites)	24	0	0	0	0	0	0	0
Guam mini-node	1	1	0	0	0	0	0	0
Puerto Rico node	0	1	0	0	0	0	0	0
ATCSCC node	0	1	0	0	0	0	0	0
Migration of users from NADIN MSN	0	0	0	0	0	0	0	0
Upgrade Trunks/Nodes to T1 (22 sites)	8	9	18	0	0	0	0	0
Upgrade Nodes to Frame Relay	0	24	0	0	0	0	0	0

2-14.4.2 Telecommunications Strategy

In April 1999, the NADIN PSN received new system software (Release 6.4) from the vendor that brings the NADIN PSN into compliance with the FAA's Year 2000 Initiative. In addition, the functional enhancements of this new software release include, but are not limited to: XSC Cluster support to provide for high speed Frame Transparent Backbones; high speed X.25 and Frame Relay user access; increased NCP Access Link Logical Channels; and X.25 Datascope. During FY00, a Frame Relay Service availability will be announced. Documentation on this service offering will be made available through the NADIN Program office. Backbone trunk lines are provided by the FAA. FAA circuits are leased or may be provided by FAAOMW, BWM, ANICS, FAATSAT, or other FAA owned or leased services.

The NADIN PSN backbone network topology is shown in Table 2-14-4.

Table 2-14-4 NADIN PSN Backbone

FROM	TO	BANDWIDTH	Quantity
Atlanta NNCC	Salt Lake City NNCC	56 Kbps	2
Atlanta NNCC	Salt Lake City NNCC	1.544 Mbps	2 (a)
Atlanta NNCC	Anchorage ARTCC	56 Kbps	1
Atlanta NNCC	Boston ARTCC	56 Kbps	1
Atlanta NNCC	WJHTC	56 Kbps	2
Atlanta NNCC	WJHTC	1.544 Mbps	1
Atlanta NNCC	Washington ARTCC	56 Kbps	1
Atlanta NNCC	Washington ARTCC	1.544 Mbps	1 (b)
Atlanta NNCC	Honolulu CERAP	56 Kbps	1 (c)
Atlanta NNCC	Indianapolis ARTCC	56 Kbps	1
Atlanta NNCC	Jacksonville ARTCC	56 Kbps	1
Atlanta NNCC	Jacksonville ARTCC	1.544 Mbps	1 (a)
Atlanta NNCC	New York ARTCC	56 Kbps	1
Atlanta NNCC	Atlanta ARTCC	56 Kbps	1 (d)
Salt Lake City NNCC	Anchorage ARTCC	56 Kbps	1 (c)
Salt Lake City NNCC	WJHTC	56 Kbps	1
Salt Lake City NNCC	WJHTC	1.544 Mbps	1 (a)
Salt Lake City NNCC	Denver ARTCC	56 Kbps	1
Salt Lake City NNCC	Denver ARTCC	1.544 Mbps	1 (b)
Salt Lake City NNCC	Fort Worth ARTCC	56 Kbps	1
Salt Lake City NNCC	Honolulu CERAP	56 Kbps	1
Salt Lake City NNCC	Salt Lake City ARTCC	56 Kbps	1 (d)
Salt Lake City NNCC	Seattle ARTCC	56 Kbps	1
Salt Lake City NNCC	Seattle ARTCC	1.544 Mbps	1 (a)
Albuquerque ARTCC	Denver ARTCC	56 Kbps	1
Albuquerque ARTCC	Los Angeles ARTCC	56 Kbps	1
Chicago ARTCC	Indianapolis ARTCC	56 Kbps	1
Chicago ARTCC	Minneapolis ARTCC	56 Kbps	1
Boston ARTCC	Chicago ARTCC	56 Kbps	1
Denver ARTCC	Kansas City ARTCC	56 Kbps	1
Fort Worth ARTCC	Houston ARTCC	56 Kbps	1
Houston ARTCC	Memphis ARTCC	56 Kbps	1
Jacksonville ARTCC	Miami ARTCC	56 Kbps	1
Kansas City ARTCC	Memphis ARTCC	56 Kbps	1
Kansas City ARTCC	Minneapolis ARTCC	56 Kbps	1
Los Angeles ARTCC	Salt Lake City ARTCC	56 Kbps	1
Los Angeles ARTCC	Oakland ARTCC	56 Kbps	1
Salt Lake City ARTCC	Atlanta ARTCC	56 Kbps	1
Memphis ARTCC	Miami ARTCC	56 Kbps	1
Memphis ARTCC	Atlanta ARTCC	56 Kbps	1
New York ARTCC	Washington ARTCC	56 Kbps	1
Oakland ARTCC	Seattle ARTCC	56 Kbps	1
Cleveland ARTCC	Indianapolis ARTCC	56 Kbps	1
Cleveland ARTCC	New York ARTCC	56 Kbps	1
Seattle ARTCC	Minneapolis ARTCC	56 Kbps	1
Guam CERAP	Honolulu CERAP	56 Kbps	1

(a) For testing in WARP Virtual Private Network (VPN)
(b) Aeronautical Information System (AIS)

(c) Via commercial satellite services
(d) Via local FAA-owned cable

2-14.4.3 Telecommunications Cost

The estimated costs related to the NADIN PSN for fiscal years 2000 through 2006 are summarized in Table 2-14-5. As noted earlier, the backbone of the NADIN PSN is currently undergoing an upgrade to support the requirements of new programs such as WARP. The non-recurring costs associated with the upgraded backbone trunks and high speed cluster cards will be funded by the WARP Program. In addition, the WARP Program will be responsible for a portion of the recurring charges in the first two years of each t-1 link, as a function of their usage.

Table 2-14-5 identifies the costs associated with contract maintenance, test support, and program management and engineering. These items have been included to reflect more accurately all costs related to the operation and maintenance of the NADIN PSN. As a result, the OPS funded recurring costs are higher than previous projections.

User telecommunication interfaces to the individual nodes are currently covered by the embedded base, using the Leased Interfacility NAS Communications System (LINCS) or via the Data Multiplexing Network (DMN). Local interfaces will be via high-speed in-house cabling arrangements. Table 2-14-5 also includes the costs associated with upgrading to T-1 trunks. Funding will be in accordance with FAA Order 2500.8A.

Table 2-14-5. Cost Summary - NADIN PSN

CIP # None	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
NADIN Backbone Trunks									
Channel Costs									
	Cost Profile: LINCS DDS-56k Circuits between ARTCCs								
	Channels Added	60	0	0	0	0	0	0	0
	F&E Funded Channels		0	0	0	0	0	0	0
	OPS Funded Channels		60	60	60	60	60	60	60
	Non-recurring Channel Costs								
	F&E Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring Channel Costs								
	F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$1,784**	**$1,784**	**$1,873**	**$1,873**	**$1,873**	**$1,873**	**$1,873**
Hardware Costs									
Contract Maintenance on NADIN Switches (Includes SW Maintenance)									
	Recurring Maintenance Costs								
	OPS Recurring Costs		**$500**	**$500**	**$500**	**$500**	**$500**	**$500**	**$500**
	FAA Technical Center Test Support								
	Non-recurring Costs								
	F&E Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring Costs								
	F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$300**	**$300**	**$300**	**$300**	**$300**	**$300**	**$300**
Program Management and Engineering (PM&E)									
TIPT Program Management and Engineering Support									
	Non-recurring Costs								
	F&E Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring Costs								
	F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$531**	**$552**	**$574**	**$597**	**$621**	**$646**	**$672**
			SUMMARY						
	F&E Totals	Non-Recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Totals	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Totals	Non-Recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$3,115	$3,136	$3,248	$3,271	$3,294	$3,319	$3,345
		OPS Totals	**$3,115**	**$3,136**	**$3,248**	**$3,271**	**$3,294**	**$3,319**	**$3,345**

Notes:

1. New circuit costs funded by the WARP program are itemized separately on the next page.
2. Costs to upgrade NADIN PSN backbone nodes not funded by the WARP program are funded by the NADIN program.
3. OPS costs for node upgrades funded by the NADIN program.

Table 2-14-5. Cost Summary - NADIN PSN (concluded)

Circuits Identified as Requirements in the WARP Chapter, Shown Here for Information Only

CIP # None	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
Channel Costs									
Upgrade of NADIN Backbone Trunks									
	Cost Profile: LINCS DDC T-1 Circuits, Inside Wiring, and Digital Patch Panels								
	Trunks Upgraded (by WARP Program)		10	21	0	0	0	0	0
	Total Trunks Upgraded	6	16	37	37	37	37	37	37
	F&E Funded Channels		14	31	21	0	0	0	0
	OPS Funded Channels		2	6	16	37	37	37	37
	F&E Non-recurring Channel Costs		**$126**	**$190**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring Channel Costs								
	F&E Recurring Costs		**$856**	**$2,991**	**$2,242**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$1,160**	**$1,160**	**$2,117**	**$4,359**	**$4,359**	**$4,359**	**$4,359**

CHAPTER 2-15 - SUMMARY SHEET

NEXT GENERATION AIR-TO-GROUND (NEXCOM)

Program/Project Identifiers:

Project Number(s):	CIP C-21
Related Program(s):	CIPs C-01, C-04, C-06, C-09, C-10, C-20, M-15, R,E&Ds 031-110, 031-130
New/Replacement/Upgrade?	New
Responsible Organization:	AND-360
Program Mgr./Project Lead:	Mike Shveda, AND-360, 267-8898
Fuchsia Book POC:	same

Assigned Codes:

PDC(s):	CA, CB, CC, CE, CH, CJ, CK, CT, CU, CV, CW, CY, FD
PDC Description:	air/ground circuits
Service Code:	ECOM, EFAS, FCOM, TCOM

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$6	$0	$0	$0	$0	$300	$0
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$6**	**$0**	**$0**	**$0**	**$0**	**$300**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$0	$0	$0	$0	$0	$0	$0
Total OPS	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

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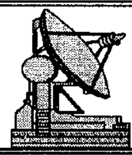
CIP Category: Communications



2-15.0 NEXT GENERATION AIR-TO-GROUND (NEXCOM)

2-15.1 PROGRAM OVERVIEW

2-15.1.1 Purpose of NEXCOM

NEXCOM is a multi-year Facilities and Equipment (F&E) program that will alleviate the spectrum problem, provide for future growth, reduce maintenance costs, increase security/channel control, and support data link for air traffic control communications.

2-15.1.2 References

2-15.1.2.1 FAA Capital Investment Plan (CIP) Project No. C-21, January 1999.

2-15.1.2.2 Publications of the Radio Technical Commission for Aeronautics (RTCA) Special Committee, (SC) 172 (RTCA DO-224 and RTCA DO-225).

2-15.1.2.3 Publications of the International Civil Aviation Organization (ICAO) Aeronautical Mobile Communications Panel (AMCP).

2-15.1.2.4 Draft Standards and Recommended Practices (SARPS) for the future digital radio system have been developed and are being submitted to AMCP for approval, March 2000.

2-15.1.2.5 Acquisition Program Baseline, May 5, 1998.

2-15.1.2.6 Investment Analysis Report, May 5, 1998.

2-15.1.2.7 Requirement Document, May 4, 1998.

2-15.1.2.8 Transition Report, May 5, 1998.

2-15.1.2.9 JRC Decision Report, May 5, 1998.

2-15.2 SYSTEM DESCRIPTION

The NEXCOM air/ground communications program will replace existing amplitude-modulation (AM), VHF voice radios with data-capable, multimode (AM-compatible) digital radios. The transition period to the new system will begin in the year 2002 and likely run for more than ten years. The key change, with respect to leased telecommunications resource utilization effected by the program, is in the networking of radios, as described in the following paragraphs.

The present air/ground network uses an early 1950s-era design. As air traffic demand has grown, air/ground (A/G) communications capacity expanded within the originally allocated spectrum by halving the bandwidth of each air/ground channel. Functionally, the current A/G radio system has remained essentially unchanged from the original design. There is a need to again expand system capacity. A fundamental redesign of the system, with an opportunity to make substantial improvements in the system, will introduce modern technology. Among the benefits of upgrading the A/G network are reduced pilot and controller workloads, improved reliability of A/G communications, and greatly improved efficiency in the use of A/G communications resources.

Figure 2-15-1 illustrates a portion of the present A/G network. Air Traffic Control (ATC) facilities have a dedicated set of radio sites and circuits used for A/G communications. ATC facilities include Air Route Traffic Control Centers (ARTCCs), responsible for control of aircraft en route between airports, and Airport Traffic Control Tower/Terminal Radar Approach Control facilities (ATCT/TRACON), responsible for control of aircraft in terminal areas. Each radio is assigned to a frequency, and the frequency is assigned to a controller. The key architectural characteristic of the present configuration is that resources are dedicated on a per communications channel basis.

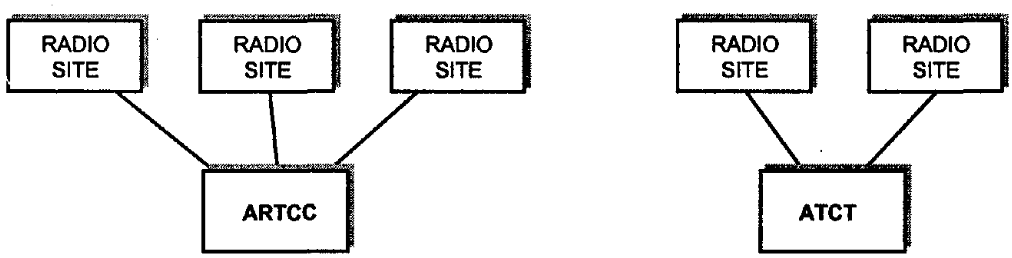


Figure 2-15-1. Present Air/Ground Network

Figure 2-15-2 illustrates at a high level alternative architecture proposed for the future A/G system ground network, in which digital transmission facilities will be used for voice and data. The components of the system shown include: the new digital VHF and analog UHF radios and the Radio Interface Unit (RIU) at remote radio sites and the Ground Network Interface (GNI) at the control site for independent handling of the voice and data circuits supported by the VHF Digital Link (VDL) Time Division Multiple Access (TDMA) mode radio.

2-15.2.1 System Components

The system has three basic components: the GNI, RIU, and the radios connected over existing terrestrial communications facilities.

2-15.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

2-15.3.1 Functional Requirements

Specific needs documented in the Mission Need Statement (MNS) include the following:

- Provide Air Traffic (AT) controllers the capability to accommodate the growing number of sectors and services using the available limited radio frequency (RF) spectrum.
- Reduce logistical costs (supplies, maintenance, training, etc.) i.e., replace expensive to maintain VHF and UHF radios that are of the 1940s technology and have exceeded their life expectancy by 10 years.
- Provide new data link communications capability to all classes of users.
- Reduce A/G RF interference and provide security mechanisms to identify unauthorized users (e.g., "phantom controllers").

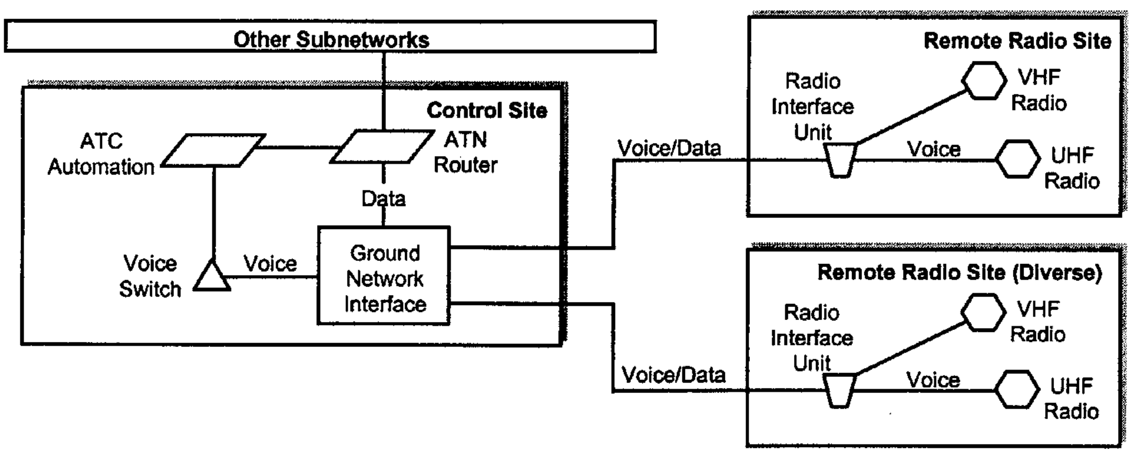
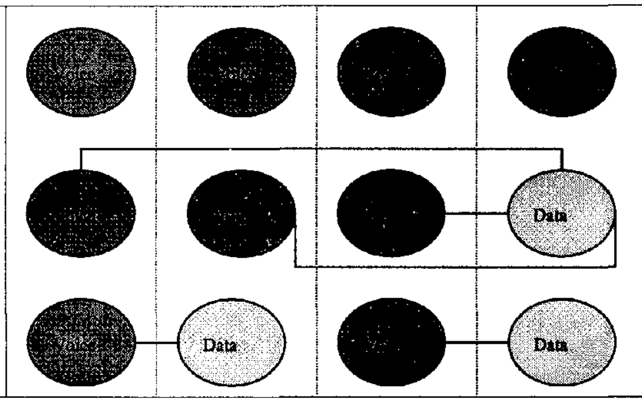


Figure 2-15-2. A Proposed Future Air/Ground Network

2-15.3.2 Performance Requirements

Performance Requirements can be seen in Table 2-15-1.

Table 2-15-1. Performance Requirements



System Configuration	User Groups Supported	Service
4V	4	Dedicated Voice only
3V1D	3	Dedicated voice with Data Sharing
2V2D	2	Dedicated Voice and Data

2-15.3.3 Functional/Physical Requirements

The primary voice interfaces will include current and future voice switch systems, e.g., Voice Switching and Control System (VSCS), Enhanced Terminal Voice Switch (ETVS), Rapid Deployment Voice Switch (RDVS), Small Terminal Voice Switch (STVS) and Integrated Communication Switching System (ICSS). The data link will interface, at a minimum, to the NAS ATN router system. The NEXCOM system will support pilot/controller voice or data communications.

2-15.3.4 Interface Requirements

The interfaces of the future VHF system, summarized in Table 2-15-2, have not yet been established.

Table 2-15-2. Future VHF System Interface Requirements Summary

SUBSYSTEM INTERFACE		Control Facility to Radio Sites
INTERFACE CONTROL DOCUMENTATION		TBD
PROTOCOL REQUIREMENTS	Network Layer	Draft Standards
	Data Link Layer	Draft Standards
	Physical Layer	Draft Standards
	Special Formats/Codes	Draft Standards
TRANSMISSION REQUIREMENTS	No. Channels	TBD
	Speed (kbps)	TBD
	Simplex Half/Full Duplex	Half Duplex
	Service	Voice and Data
HARDWARE REQUIREMENTS	Modem	TBD
	Cable/Miscellaneous	TBD

2-15.3.5 Local Interfaces

The NEXCOM interfaces have not been established.

2-15.4 ACQUISITION ISSUES

2-15.4.1 Program Schedule and Status

Table 2-15-3 is the NEXCOM Segment 1 acquisition schedule.

Table 2-15-3. Acquisition Schedule

Event	Event Completion Date
Segment One Radio Procurement	
JRC Investment Decision	05/98
APB Approval	05/98
Acquisition Strategy Approved	08/99
Integrated Program Plan Approved	02/00
System Specification Approval	04/00
Screening Information Request Released	10/00
Contract Award	12/01
Initiate In-Service Review Decision	02/03
Initial Operational Capability (IOC) Analog Voice	05/03
First Commissioning (Analog Voice)	06/03
Initial Operational Capability (IOC) Digital Voice	01/07
Site Implementation Complete	08/09
Full Operational Capability (FOC) Analog Voice	10/09
Full Operational Capability (FOC) Digital Voice	09/10
Last Commissioning (Digital Voice)	10/10

2-15.4.2 Planned Telecommunications Strategies

In the long term, the NEXCOM system should reduce leased telecommunications costs related to A/G communications through a reduction in the number of leased channels by multiplexing multiple radio channels on a single leased digital channel.

All voice channels from ATC to remote A/G sites will require full period, full-duplex, diverse routing. Diverse routing is to be implemented to avoid single point of failure. Each diverse route shall be physically different from the primary route and not share any common facilities with the primary route. Fully diverse routing is required to meet the currently documented availability requirements in the SR-1000.

2-15.4.3 Telecommunications Costs

The planned connectivity may reduce the overall number of leased channels. Until implementation of NEXCOM, the A/G connectivity will use existing circuits.

The diversity costs and savings of the NEXCOM system have not yet been determined. However, the anticipated cost of implemented diversity may be ameliorated by the technical and architectural approaches mentioned in 2-15.4.2 (benefits resulting from opportunities to apply multiplexing techniques).

After the architecture and system interfaces of the NEXCOM system are identified, site and interface implementation schedules will be developed to calculate the funding requirement and included in a future edition of the Fuchsia Book. Appropriate funding will be in accordance with FAA Order 2500.8A. The costs presented in the summary are from the CIP.

Table 2-15-4 Cost Summary - NEXCOM

CIP # C-21	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
Control Site <---> Remote Radio Site									
1. Segment I									
	Cost Profile: 1 VG Circuit per Frequency per Site								
Channel Costs			*N/A - NEXCOM Will Use Existing Analog Lines*						
2. Segment II									
	Cost Profile: 1 Digital Circuit (64 kbps) per Site								
Channel Costs									
	Total Channels	0	0	0	0	0	0	0	0
	F&E Non-recurring Costs (see Note 1)		**$0**	**$0**	**$0**	**$0**	**$0**	**$300**	**$0**
	Recurring Circuit Costs								
	F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

SUMMARY

		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
F&E Totals	Non-Recurring	$0	$0	$0	$0	$0	$300	$0
	Recurring	$0	$0	$0	$0	$0	$0	$0
	F&E Totals	**$0**	**$0**	**$0**	**$0**	**$0**	**$300**	**$0**
OPS Totals	Non-Recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$0	$0	$0	$0	$0	$0	$0
	OPS Totals	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

Note:

1. FY05 Non-recurring cost is for the testing of various proposed Nexcom sites.

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CHAPTER 2-16 - SUMMARY SHEET

NAS RECOVERY COMMUNICATIONS (RCOM)

Program/Project Identifiers:

Project Number(s):	CIP C-18
Related Program(s):	CIPs F-08, M-03, M-15, M-21, M-27
New/Replacement/Upgrade?	New/Replacement
Responsible Organization:	AND-360
Program Mgr./Project Lead:	Mike Shveda, AND 360, (202) 267 8898
Fuchsia Book POC:	Dave Kuraner, AND-360, (202) 493-4817

Assigned Codes:

PDC(s):	IL
PDC Description:	FM Network-Circuit Terminating at Regional AF Repeater Link Equipment
Service Code:	NRCS

Cost Estimates *:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$4,400	$4,650	$4,300	$4,000	$3,000	$5100	$5200
F&E Recurring	$45	$10	$10	$10	$10	$10	$10
Total F&E	**$4,445**	**$4,660**	**$4,310**	**$4,010**	**$3,010**	**$10**	**$10**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$1,664	$1,771	$1,771	$1,796	$1,796	$1,796	$1,796
Total OPS	**$1,664**	**$1,771**	**$1,771**	**$1,796**	**$1,796**	**$1,796**	**$1,796**

*Cost data provided by the Program Office.

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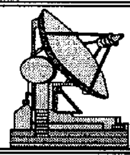
CIP Category:
Communications



2-16.0 NAS RECOVERY COMMUNICATIONS (RCOM)

2-16.1 PROGRAM OVERVIEW

2-16.1.1 Purpose of NAS Recovery Communications

The NAS Recovery Communications (RCOM), the FAA's emergency communications system contains both long-range and short-range components. The long-range component is a tri-level communications system consisting of a priority telephone service (Government Emergency Telephone Service), satellite telephone network (American Mobile Satellite Corporation) and high frequency/single side-band (HF/SSB) radio network. The purpose of the long-range component is to conduct inter- and intra-agency command and control communications during national emergencies.

The short-range component (usually referred to as RCOM II) is a VHF/FM land mobile radio network. During a local, regional or national emergency or crisis, the VHF/FM radio network is used by airway facilities technicians, civil aviation security agents, air traffic supervisors, emergency operations staff and management, and flight standards personnel field personnel for command and control activities.

The short-range component also provides day-to-day command and control communications support during normal FAA operations. Such communications are between System Maintenance Offices and maintenance technicians, or to support flight-check aircraft, crash site investigation teams, aviation security, and other agencies

Other components of RCOM include AUTODIN equipment, an ANS, secure fax/secure telephone equipment, and three Contingency Support Teams (CST), one of which is now contained in a Mobile Communications Van (MCV). All of these other components of RCOM except ANS are complete.

2-16.1.2 Background

The HF/SSB radio system and VHF/FM regional network were procured under the National Radio Communications System (NARACS) contract in 1983 and 1986 to meet requirements established in presidential orders, national security decision directives and other national level documents. These systems satisfy FAA obligations established in a number of Memoranda of Agreements and Understandings between the FAA and other Government agencies.

The RCOM product team is AND-360. The RCOM sponsor is ADA-20 (Emergency Operations Staff).

2-16.1.3 References

2-16.1.3.1 FAA Capital Investment Plan (CIP) Project C-18, January 1999, establishes the RCOM program authorization.

2-16.1.3.2 Mission need for the RCOM program is described in the Updated RCOM Mission Need Statement, 1993.

2-16.1.3.3 The RCOM Operational Requirements Document was completed in 1997.

2-16.2 SYSTEM DESCRIPTION

The long-range communications portion of RCOM consists of the following components at major FAA facilities (ARTCCs, ROs, CERAPs, FAATC, FAAHQ and FAAAC): Government Emergency Telephone Service (GETS), satellite telephones (fixed and portable) and HF/SSB radios. This tri-level architecture insures that at least one transmission means is available no matter what contingency exists for communications within the FAA and between the FAA and external government and military organizations. The GETS priority telephone service is RCOM's "first line of defense". GETS is used when normal telephone service is disrupted. The satellite telephones are used if GETS service is not available. The HF/SSB network is the "last line of defense" for RCOM, used when other means are not available. There are HF radio systems at all ARTCCs, ROs, CERAPs, FAAHQ, FAATC and the ARCTR.

The short-range communications portion of RCOM is the "regional network", a nationwide network of hand-held and mobile radios, fixed repeaters and base stations that connect field users to personnel located at FAA facilities. Some repeaters are stand-alone units, while others connect to the Radio Communications Link (RCL) and/or the public telephone system, enabling FAA users to make telephone calls to personnel at facilities around the country. Selected radios have voice privacy (DES-Data Encryption Standard) capability.

The regional network currently consists of approximately 4000 NARACS portable (hand-held) and mobile (vehicle-mounted) VHF/FM radios, along with about 700 fixed VHF/FM repeaters and 400 base stations. Regional personnel also use other types of portable radios, as well as cellular telephones, when NARACS radios are not available. In FY97, the RCOM plan to purchase replacement VHF/FM (12.5 kHz channel spaced) radio equipment was delayed when funds were reprogrammed to higher priority programs.

Contingency Support Team (CST) equipment packages are located at the two National Emergency Operations Facilities (NEOFs) and the Mobile Communications Van (MCV), deployed by Emergency Operations staff to support air crash investigations and other emergencies worldwide. Each CST package consists of a portable HF/SSB radio, a number of portable VHF/FM radios, a portable VHF/FM repeater, a digital camera and a portable INMARSAT satellite telephone.

The ANS is a computer-based communication system installed at 12 FAA locations. The ANS will automatically call and provide information to appropriate personnel during an emergency.

Figure 2-16-1 illustrates the GETS/Satellite Telephone/HF Radio tri-level architecture. Figure 2-16-2 illustrates the VHF/FM regional network architecture.

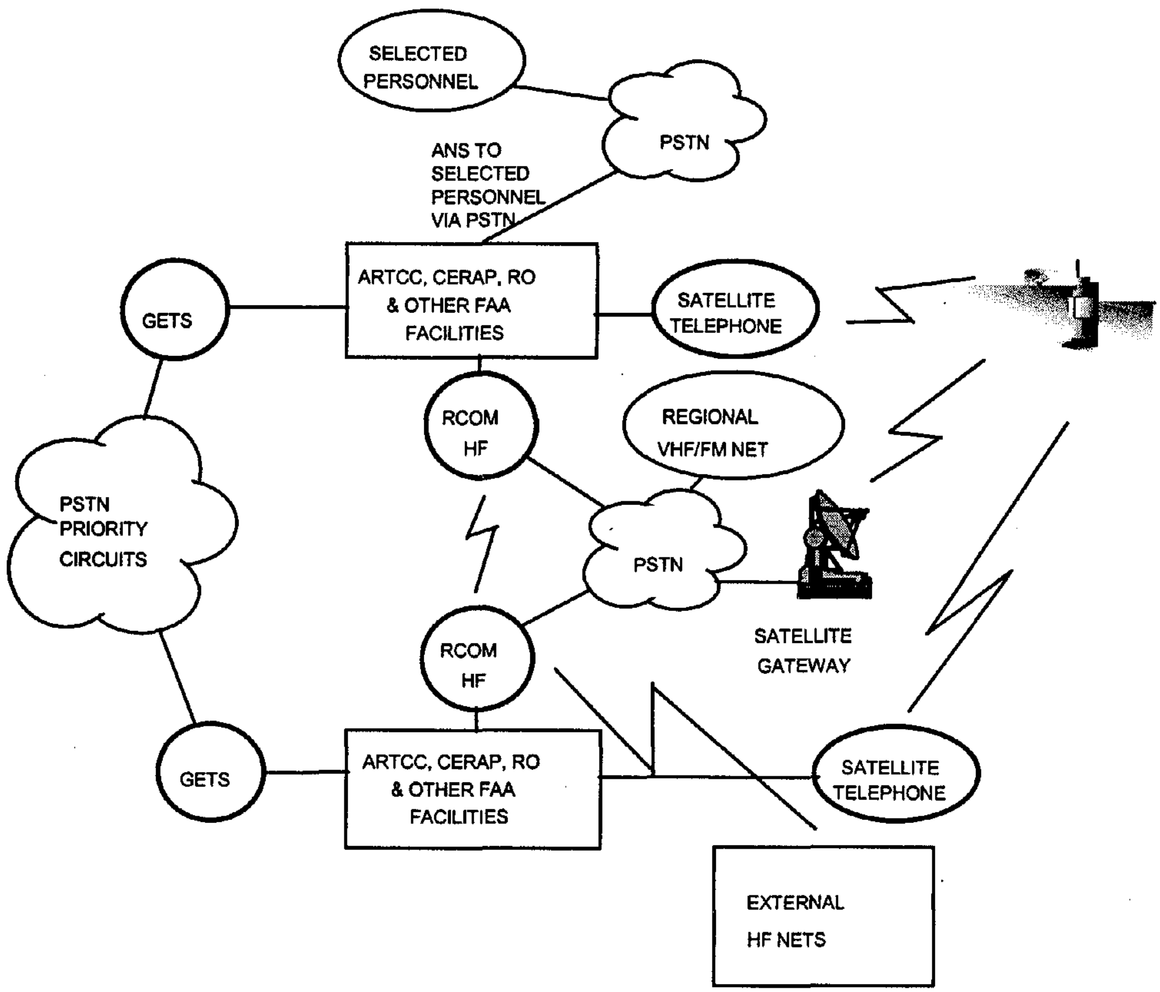


Figure 2-16-1. RCOM/GETS Tri-level Network Architecture

The Defense Message System (DSM) (replacement for the Automatic Digital Interface Network [AUTODIN]) is the principal long-haul record communications network within the Defense Communications System providing secure data transmissions through a system of government owned and leased automatic switching facilities. The DSM handles command and control, operations, intelligence, logistic, diplomatic and administrative data traffic. All users are billed for the cost of leased circuits, plus a monthly subscriber fee for DSM access.

The FAA has DSM service at the FAA Headquarters, Regions, Air Route Traffic Control Centers (ARTCCs), the Air Traffic Control Systems Command Center (ATCSCC), the National Emergency Operations Facility (NEOF), and the alternate command center.

2-16.2.1 RCOM System Components

2-16.2.1.1 Principal Components

The following paragraphs contain the principal RCOM components, locations and descriptions.

2-16.2.1.1.1 HF/SSB Radio at ARTCCs, CERAPs, ROs, FAAHQ, WJHTC, and ARCTR

Using the NARACS contract, the current HF/SSB radio systems were procured in 1983 and installed at major FAA facilities. The HF/SSB radio equipment consists of a console, radio/amplifier and antenna. The HF/SSB radio is normally used for voice communications only; however, data may be transmitted if required. A voice privacy capability is provided. Many of the HF/SSB radio systems are being upgraded to conform to the federal standard for HF/SSB radio operation (FED-STD-1045) and to improve operational performance. The remaining NARACS HF radios will be retained, but stripped of their computer based consoles and upgraded to conform to FED-STD-1045. Additional communications capabilities (GETS priority telephone service and satellite telephone) have been provided to major FAA facilities to create a tri-level architecture for emergency communications.

2-16.2.1.1.2 GETS located at ARTCCs, CERAPs, ROs, FAAHQ, FAAAC and WJHTC

The GETS service provides FAA management personnel at major FAA facilities with priority telephone service during periods when the public telephone system becomes overloaded during emergency/crisis situations. This service is the "first line of defense" for FAA long-range command and control communications.

2-16.2.1.1.3 Satellite Telephones Located at ARTCCs, CERAPs, ROs, FAAHQ, FAAAC and WJHTC

Approximately 100 portable and fixed American Mobile Satellite Corporation (AMSC) single voice channel satellite telephones are being installed at major FAA facilities for long-range command and control communications when the public telephone system and GETS are not usable. All ARTCCs will have 2 fixed satellite telephones and 1 portable satellite telephone. CERAPs, ROs, FAAHQ, FAAAC and FAATC will each have 1 fixed satellite telephone and 1 portable satellite telephone.

2-16.2.1.1.4 Contingency Support Team (CST) Located at NEOFs (2) and MCV

Contingency Support Team (CST) equipment packages are located at the two National Emergency Operations Facilities (NEOFs) and the Mobile Communications Van (MCV), deployed by Emergency Operations staff to support air crash investigations and other emergencies worldwide. Each CST package consists of a portable HF/SSB radio, a number of portable VHF/FM radios, a portable VHF/FM repeater, a digital camera and a portable INMARSAT satellite telephone. The CST packages located at NEOFs are vehicle and aircraft transportable. The MCV is aircraft transportable.

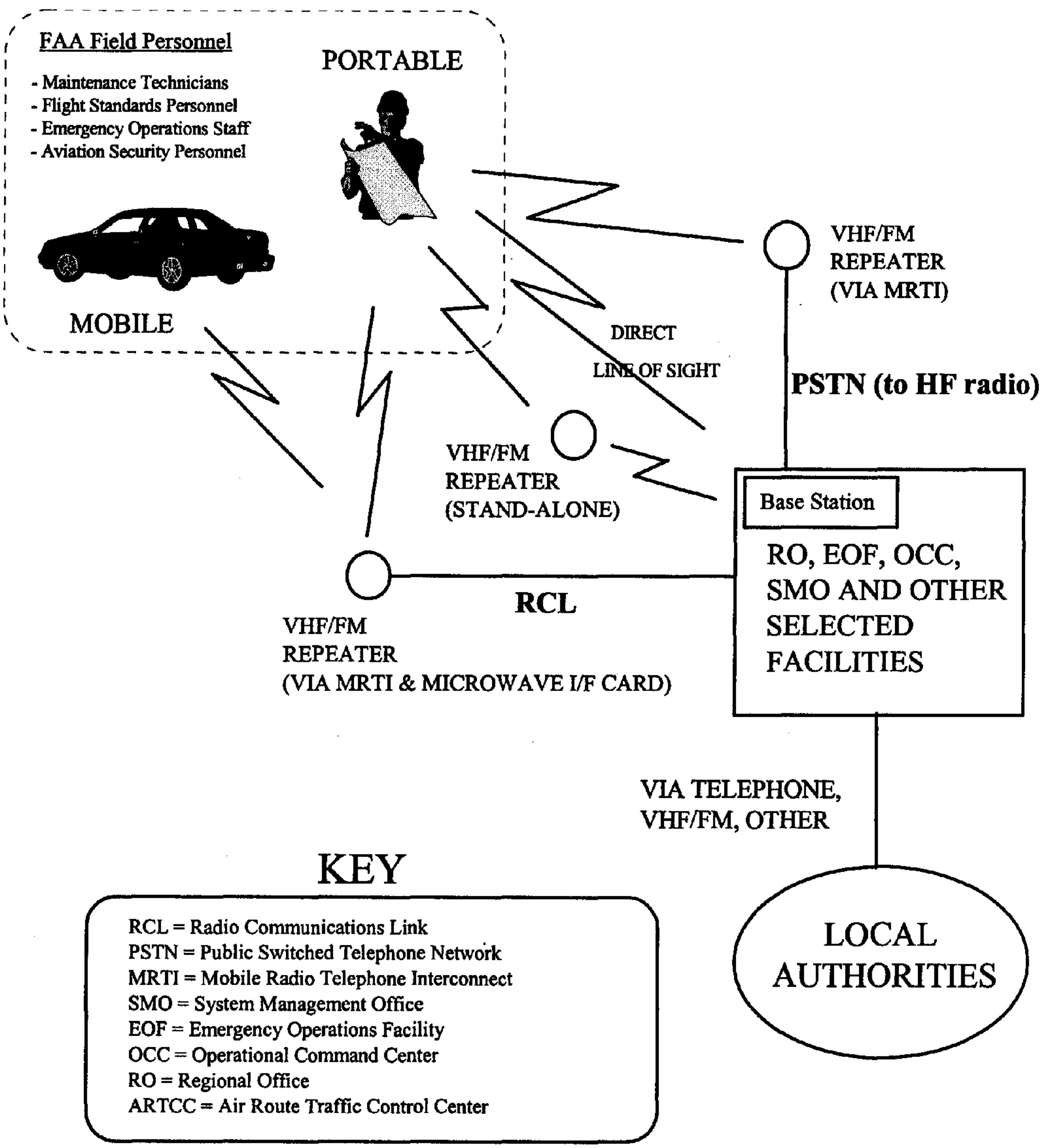


Figure 2-16-2. VHF/FM Regional Network Architecture

2-16.2.1.1.5 VHF/FM Radios Located at ROs, ARTCCs and Maintenance Hubs

The regional networks consist of NARACS VHF/FM (25 kHz), some other types of VHF/FM radios and a large number of cellular telephones. These radios and cellular telephones are used by various FAA organizations--air traffic, airway facilities, civil aviation security, emergency communications staff, and flight standards. The RCOM II program will replace all existing VHF/FM radios and cellular phones with conventional analog narrowband (12.5 kHz) VHF/FM radios, base stations and repeaters, capable of

12.5 kHz or 25 kHz operation. Some new radios will include Data Encryption Standard (DES) voice privacy capability; the remaining will operate in clear voice only. Radio and infrastructure equipment replacement, which began in early FY1997, will continue until approximately FY2004.

2-16.2.1.1.6 VHF/FM Base Stations Located at Selected Regional Facilities (400)

Approximately 400 existing 25 kHz VHF/FM base stations must be replaced with 12.5 kHz equipment prior to January 1, 2005. Base stations are used as dispatcher stations for regional users at selected FAA facilities, controlled via a remote controller/keyboard.

2-16.2.1.1.7 Fixed VHF/FM Repeaters Located at Remote Locations (700)

Approximately 700 existing 25 kHz VHF/FM base stations must be replaced with 12.5 kHz equipment prior to January 1, 2005. Many of these new repeaters will be connected to the RCL and/or the public telephone system to extend the coverage of the regional network coverage.

2-16.2.1.1.8 Portable VHF/FM Repeaters Located at Selected Facilities (3)

Portable VHF/FM repeaters will be located at selected FAA facilities and used during emergencies to establish command and control communications. Portable repeaters may be used to create a private network for a group of users, temporarily replacing a non-operational repeater or extending the coverage of the regional network.

2-16.2.1.1.9 Automatic Digital Interface Network (AUTODIN)

The AUTODIN network, now referred to as AUTODIN Dial-In, was reconfigured at all FAA AUTODIN sites to temporarily solve DMS transition issues. The AUTODIN Dial-In configuration implemented consists of a Message Distribution Terminal (MDT) and a STU III secure phone/modem. The AUTODIN Dial-In interfaces through direct dial data lines into the Pentagon Telecommunications Service Center's (PTSC) AUTODIN system. The PTSC system converts DMS messages to AUTODIN format for users who have not yet transitioned to DMS.

2-16.2.1.1.10 Defense Message System (DMS)

The Defense Message System will use a backbone architecture with dedicated user workstations, capable of encryption/decryption using FORTEZZA technology that will employ essentially a high-assurance e-mail system for organizational messaging.

2-16.2.1.1.11 ANS Located at All EOFs, FAAHQ, WJHTC and ARCTR

The ANS, a hardware and software system installed at twelve locations, automatically notifies appropriate personnel (FAA provided checklist) of an emergency. In addition to hardware and software costs, there are recurring leased telephone line costs.

2-16.2.1.1.12 Mobile Communications Van (MCV)

A Mobile Communications Van (MCV) is a temporary communications command center used during air crash investigations and other crises. The MCV contains a portable HF radio, a number of hand-held VHF/FM radios, portable VHF/FM repeater, satellite telephone, and a digital camera.

2-16.2.1.2 Functional Component Internal Interface Requirements

2-16.2.1.2.1 VHF/FM Network to RCL (via repeater)

This interface is physically located at the VHF/FM repeater and requires a phone patch as well as microwave interface card(s) to access the RCL. This interface allows a hand-held or mobile radio user to call FAA facilities via the RCL.

Refer to Figure 2-16-2 for the VHF/FM network to RCL interface and the VHF/FM network to Public Switched Telephone Network (PSTN) interface.

2-16.2.1.2.2 VHF/FM Network to HF/SSB Network (via PSTN)

The PSTN connects the HF/SSB radio network to the VHF/FM regional network through a phone patch located at selected HF/SSB radio consoles. Refer to Figure 2-16-1 for the VHF/FM network to HF/SSB network interface.

2-16.2.1.3 Functional Component External Interface Requirements

2-16.2.1.3.1 RCOM HF/SSB Network to External HF/SSB Network(s)

The interface is illustrated in Figure 2-16-1.

2-16.2.1.3.2 Regional Network to Local Authorities

This interface is illustrated in Figure 2-16-2.

2-16.2.1.3.3 ANS to Selected Personnel (via Public Switched Telephone System)

The interface is illustrated in Figure 2-16-1.

2-16.2.1.3.4 VHF/FM Network to PSTN (via repeater)

This interface is physically located at selected VHF/FM repeaters via a phone patch that allows the user to make telephone calls through the PSTN using a hand-held or mobile VHF/FM radio.

2-16.2.1.3.5 HF/SSB Radio to PSTN

This interface allows emergency operations staff or other designated FAA personnel to operate an HF radio remotely by dialing the telephone number of the HF radio console using the PSTN. Refer to Figure 2-16-1 for the HF/SSB Radio to PSTN interface.

2-16.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

2-16.3.1 Telecommunications Interfaces

2-16.3.1.1 VHF/FM Network to RCL

This is a 2-wire to 4-wire E & M (Ear and Mouth) signaling interface. The RCL interface requirements are contained in FAA standard, FAA-E-2749a, FAA Specification, Radio Communications Link (RCL). The link between the VHF/FM radio user and the telephone is Push-to-Talk (PTT) (half-duplex) voice only.

2-16.3.1.2 VHF/FM Network to HF/SSB Network (via PSTN)

The VHF/FM network to HF/SSB network interface is actually a combination of two separate interfaces:

- VHF/FM network to PSTN
- The PSTN to HF/SSB network, i.e., there is no direct RF (radio frequency) interface between the regional network and the HF radio network.

2-16.3.1.3 HF/SSB Radio Network to PSTN

The HF/SSB radio connects to the local PBX. The HF/SSB radio interface to the PSTN is RS-496.

2-16.3.1.4 VHF/FM Network to Local Authorities

The FAA must be able to communicate with local police and firefighters during local emergencies. The appropriate regional personnel may use the PSTN, VHF/FM radio or other means (e.g., satellite telephone) available, for contacting local authorities.

2-16.3.1.5 FAA to Other Government Agencies (HF Net to External HF Net)

During a national emergency, the FAA will coordinate with external Government agencies and other organizations via RCOM HF/SSB radio and the HF/SSB radio provided by the external organization(s).

2-16.3.1.6 VHF/FM Network to PSTN

This interface is physically accomplished at selected VHF/FM repeaters using a phone patch.

2-16.3.1.7 ANS to PSTN

The ANS connects to the PSTN via dedicated leased lines.

2-16.3.1.8 Connectivity Requirements

An estimated 200 of the 700 new fixed VHF/FM repeaters will connect to the PSTN and/or RCL.

All HF/SSB radios connect to the regional network via the local PBX. RCL and public telephone system circuits terminate at the PBX. Telephone calls are from either the field or a FAA facility. The HF/SSB network operates PTT (half-duplex).

2-16.3.1.9 AUTODIN Interfaces

AUTODIN service uses the PSTN with STU-III secure phones/modems to access the PTSC AUTODIN system to support the FAA command and control structure to pass classified messages. Message Distribution Terminals (MDTs) and STU-III secure phones/modems are located at selected FAA facilities for receipt and transmission of secure messages.

2-16.3.2 Traffic Characteristics

Most messages in the RCOM network are voice except for the data transmitted via the HF/SSB system and the AUTODIN system. Although actual use of GETS, satellite telephone and HF/SSB radio is expected to be extremely low, the HF/SSB system and the satellite telephone equipment are periodically tested to ensure availability during emergencies.

The VHF/FM network is used for day-to-day activities, primarily by Airway Facilities maintenance technicians.

The AUTODIN/DMS network is used daily to handle operations, intelligence, logistics, diplomatic and administrative data. During emergencies, the volume of data transmitted by the network will increase significantly.

There are no significant propagation or transmission delays for any of the RCOM transmission media. The satellite telephone links have a one-way, end-to-end propagation delay of about 0.25 seconds. The RCOM long-range system provides high "service availability" through redundancy of the tri-level communications architecture, i.e., GETS, satellite telephone and HF radio, and through the networking of the HF radios.

Table 2-16-1. RCOM Interface Requirements Summary

SUBSYSTEM INTERFACE	VHF/FM NET to HF NET	VHF/FM NET to RCL	VHF/FM NET To PSTN	HF NET To EXTERNAL HF	HF NET To PSTN
INTERFACE CONTROL DOCUMENTATION	None	FAA-E-2749a & NAS-IR-61004403	None	None	None
PROTOCOL REQUIREMENTS	TBS	2-WIRE to 4-WIRE E&M	2-WIRE to 4-WIRE E&M	FED-STD-1045	TBS
TRANSMISSION REQUIREMENTS	1 VX CH HALF DUX	1 VX CH HALF DUX	1 VX CH HALF DUX	1 VX CH HALF DUX	1 VX CH HALF DUX
HARDWARE REQUIREMENTS	Via PBX	Phone patch + Microwave Interface Card	Phone patch	None	Via PBX

2-16.4 ACQUISITION ISSUES

The existing NARACS VHF/FM system, which has been in operation since 1986, will continue to be used for regional field personnel. During the next 3 or 4 years, this network of hand-held and mobile radios, base stations and repeaters must be replaced gradually with new VHF/FM equipment. The RCOM II strategy is to replace the hand-held mobile radios, base stations, and repeaters, meanwhile operating the network using new radios and the NARACS base stations and repeaters. The VHF/FM network, including new radios, will be operated using 25 kHz channels until such time as all base stations and repeaters have been replaced with 12.5 kHz channel equipment. All new VHF/FM equipment will be capable of 12.5 or 25 kHz channel operation.

The procurement of new VHF/FM equipment started in early FY97 and will continue through FY04.

summarizes the RCOM site installation schedule, while Table 2-16-3 summarizes the RCOM interface implementation schedule. The paragraphs that follow discuss the status of RCOM initiatives.

Initial transition from the AUTODIN network to the Defense Message System started before December 31, 1999, and must be completed by December 31, 2001, when all AUTODIN Switching Centers will be closed. Effective December 31, 1999, any FAA site using the AUTODIN secure messaging system was/is being transferred to an AUTODIN Transition Hub and charged a significant monthly fee. The FAA's interim solution (for two years) was to reconfigure 38 AUTODIN sites to direct dial into the PTSC's AUTODIN system, giving the FAA time to address and implement a permanent DMS configuration.

2-16.4.1 Program Schedule and Status

2-16.4.1.1 HF/SSB Network

A HF/SSB network upgrade allows compliance with the federal standard for HF/SSB radio operation (FED-STD-1045) and provides improved operational capabilities. The modernization of the long-range portion of RCOM will to continue into 2000, due to the time required to produce and install the various systems involved. This modernization includes GETS capability, satellite telephones and upgraded HF/SSB radio systems.

Table 2-16-2. RCOM Site Installation Schedule

Installation	Prior Yrs	FY99	FY00	FY01	FY02	FY03	FY04	FY05
HF Upgrade Kit Site Installations	10	5	2	1	0	0	0	0
HF NARACS/ALE Installations	4	6	9	2	0	0	0	0
ANS Site Installations	12	0	0	0	0	0	0	0
AMSC Satcom Site Installations	32	0	0	0	0	0	0	0
VHF/FM Repeater/Base Station Installations	0	0	0	100	400	300	300	0
AUTODIN Site Installations	38	0	0	0	0	0	0	0
CST Site Installations	3	0	0	0	0	0	0	0

Table 2-16-3. RCOM Interface Implementation Schedule

FROM	TO	Diversity Req'mt	System/ Rate/ Miles	Prior Years	FY99	FY00	FY01	FY02	FY03	FY04	FY05
VHF/FM Net	RCL	No		200	0	0	0	0	0	0	0
VHF/FM Net	HF Net	No		10	4	4	4	0	0	0	0
VHF/FM Net	**PTN**	**No**		**200**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
HF Net	**PTN**	**No**		**8**	**4**	**4**	**4**	**0**	**0**	**0**	**0**
HF Net	**External HF**	**No**		**50**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
ANS	**PTN**	**No**		**12**	**6**	**0**	**0**	**0**	**0**	**0**	**0**
VHF/FM Net	Local Authorities	No		32	0	0	0	0	0	0	0

2-16.4.1.2 VHF/FM Network

The VHF/FM network must be replaced with new equipment that complies with the National Telecommunications and Information Administration (NTIA) mandate that by January 1,2005, all VHF/FM equipment is capable of narrowband (12.5 kHz) operation. The existing regional network operates wideband (25 kHz). To meet NTIA mandates and to ensure interoperability and standardization of regional VHF/FM networks, system engineering, testing and initial procurement of VHF/FM equipment must take place in FY00. The VHF/FM network replacement (RCOM II) will be the primary RCOM initiative in the future.

The replacement of the existing VHF/FM network began in 1997 and is scheduled for completion by FY04. Approximately 1100 radios, 6 fixed repeaters, 3 portable repeaters and 8 base stations were procured for the Southern Region in FY97. Award of a contract for additional 3000-4000 radios, 700 fixed repeaters, 50 portable repeaters, and 400 base stations is scheduled for late 2000.

2-16.4.1.3 AUTODIN Network

There will be recurring charges for AUTODIN circuits and subscriber fees for connection to AUTODIN Switching Centers until the transition to the Defense Message System is complete. The transition to DMS may include monthly recurring charges.

2-16.4.1.4 Automated Notification System

The ANS is implemented. There are recurring costs for telecommunications lines.

2-16.4.1.5 Secure Telephone/Secure Fax Network

The Secure Telephone/Secure Fax Network is complete. There are approximately 400 secure telephones and approximately 23 secure faxes.

2-16.4.2 Planned Telecommunications Strategies

2-16.4.2.1 Leased Services

The RCOM leased services include the American Mobile Satellite Corporation (AMSC) and International Maritime Satellite (INMARSAT) satellite services (usage costs only), ANS leased telephone lines, and GETS priority telephone service. Annual recurring costs for AMSC, INMARSAT and GETS are expected to remain low. In addition, there are recurring leased line costs for connection to the public switched telephone network at about 200 repeater sites.

2-16.4.2.2 FAA-Owned Telecommunications Assets

The RCL (with collocated VHF/FM repeaters) will be used to relay voice messages between FAA users and selected FAA facilities.

2-16.4.2.3 Diversity Requirements

The RCOM system is designed with diversity of transmission media and paths, e.g., GETS, satellite telephone and HF radio (in addition to normal telephone service).

2-16.4.3 Telecommunications Costs

2-16.4.3.1 Satellite Communications

The FAA owns approximately 105 fixed and portable AMSC terminals located at selected major FAA facilities. The on-line cost is approximately $1.50 per minute for each terminal; however, except for routine, weekly operational checks, the satellite telephones are not expected to be used frequently since GETS is the first line of defense in emergencies.

The FAA also owns approximately 10 portable INMARSAT satellite terminals that are deployed by FAA emergency operations staff (ADA-20) during crisis situations. Although INMARSAT satellite on-line costs are $6/minute, annual costs for usage are expected to be small.

2-16.4.3.2 Government Emergency Telecommunications Service (GETS)

The GETS priority telephone service is used when the PSTN is disrupted. Primary recurring costs are related to regular, but infrequent, exercising of the GETS capability.

2-16.4.3.3 HF/SSB Radio

None (FAA-owned).

2-16.4.3.4 ANS

There is equipment maintenance and leased line monthly recurring costs at all 12 ANS locations. The estimated total recurring cost for ANS for 2 years is $58K.

2-16.4.3.5 VHF/FM Network

There are telecommunications costs for the approximately 200 VHF/FM repeaters connected to the PSTN via phone patch. These costs are estimated to be about $50 per repeater per month.

2-16.4.4 Summary of Telecommunications Costs

The Cost Summary in Table 2-16-4 provides RCOM projected F&E and OPS costs for the period FY00 through FY06 in accordance with FAA Order 2500.8A.

Table 2-16-4. Cost Summary – RCOM

CIP # C-18 All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
Emergency Inter-ATC Facilities Communications								
1. Regional Network								
Costs to Procure Radios, Base Stations, and Repeaters								
Non-recurring Costs								
F&E Non-recurring Costs		$3,000	$3,000	$3,000	$3,000	$3,000	$0	$0
OPS Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
Recurring Costs								
F&E Recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Recurring Costs		$0	$0	$0	$0	$0	$0	$0
Installation Costs								
Non-recurring Costs								
F&E Non-recurring Costs		$500	$250	$0	$0	$0	$0	$0
OPS Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
Recurring Costs								
F&E Recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Recurring Costs		$0	$0	$0	$0	$0	$0	$0
Logistics Costs								
Non-recurring Costs								
F&E Non-recurring Costs		$500	$1,000	$1,000	$1,000	$0	$0	$0
OPS Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
Recurring Costs								
F&E Recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Recurring Costs		$0	$0	$0	$0	$0	$0	$0
Maintenance Costs (see Note 1)								
Non-recurring Costs								
F&E Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
Recurring Costs								
F&E Recurring Costs		$25	$0	$0	$0	$0	$0	$0
OPS Recurring Costs		$0	$50	$50	$75	$75	$75	$75
Leased Line Costs (see Note 2)								
Non-recurring Costs								
F&E Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
Recurring Costs								
F&E Recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Recurring Costs		$120	$120	$120	$120	$120	$120	$120
Program Support Costs								
Non-recurring Costs								
F&E Non-recurring Costs		$300	$300	$300	$0	$0	$0	$0
OPS Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
Recurring Costs								
F&E Recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Recurring Costs		$0	$0	$0	$0	$0	$0	$0

Table 2-16-4. Cost Summary – RCOM (Continued)

CIP # C-18 — All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
2. HF/SSB Network								
NARACS Radios (ARTCCs)								
Hardware Costs (Add ALE-1045)								
Non-recurring Costs								
F&E Non-recurring Costs		$100	$100	$0	$0	$0	$0	$0
OPS Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
Recurring Costs								
F&E Recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Recurring Costs		$0	$0	$0	$0	$0	$0	$0
3. Mobile Communications Van								
(1 Unit) Special Modified Version - No Warranty								
Non-recurring Costs								
F&E Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
Recurring Costs								
F&E Recurring Costs		$10	$0	$0	$0	$0	$0	$0
OPS Recurring Costs		$0	$10	$10	$10	$10	$10	$10
4A. Satellite Service (AMSC)								
Non-recurring Costs								
F&E Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
Recurring Costs								
F&E Recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Recurring Costs		$100	$100	$100	$100	$100	$100	$100
4B. Satellite Service (INMARSAT)								
Non-recurring Costs								
F&E Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
Recurring Costs								
F&E Recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Recurring Costs		$10	$10	$10	$10	$10	$10	$10
5. AUTODIN								
H/W Plus S/W Maintenance								
Non-recurring Costs								
F&E Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
Recurring Costs								
F&E Recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Recurring Costs		$150	$150	$150	$150	$150	$150	$150
Leased Line Costs								
Non-recurring Costs								
F&E Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
Recurring Costs								
F&E Recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Recurring Costs		$1,225	$1,225	$1,225	$1,225	$1,225	$1,225	$1,225

Table 2-16-4. Cost Summary - RCOM (Continued)

CIP # C-18 All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
6. Secure Telephones (STU-III) (see Note 3)								
Non-recurring Costs								
F&E Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
Recurring Costs								
F&E Recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Recurring Costs		$20	$20	$20	$20	$20	$20	$20
7. Secure Fax Machines - 50 Units								
Non-recurring Costs								
F&E Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
Recurring Costs								
F&E Recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Recurring Costs		$10	$10	$10	$10	$10	$10	$10
8. Automated Notification System								
Leased Line Costs								
Non-recurring Costs								
F&E Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
Recurring Costs								
F&E Recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Recurring Costs		$29	$29	$29	$29	$29	$29	$29
Software Maintenance								
Non-recurring Costs								
F&E Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
Recurring Costs								
F&E Recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Recurring Costs		$0	$32	$32	$32	$32	$32	$32
Hardware Maintenance								
Non-recurring Costs								
F&E Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
Recurring Costs								
F&E Recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Recurring Costs		$0	$15	$15	$15	$15	$15	$15

Table 2-16-4. Cost Summary - RCOM (Concluded)

CIP # C-18	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
			SUMMARY						
	F&E Totals	Non-recurring	$4,400	$4,650	$4,300	$4,000	$3,000	$0	$0
	(see Note 4)	Recurring	$45	$10	$10	$10	$10	$10	$10
		F&E Total	**$4,445**	**$4,660**	**$4,310**	**$4,010**	**$3,010**	**$10**	**$10**
	OPS Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	(see Note 4)	Recurring	$1,664	$1,771	$1,771	$1,796	$1,796	$1,796	$1,796
		OPS Total	**$1,664**	**$1,771**	**$1,771**	**$1,796**	**$1,796**	**$1,796**	**$1,796**

Notes:

1. There is a 1 year warranty period for maintenance costs after which AND-340 provides funding for 1 year until OPS funding begins. Radios will be procured first, followed in later years by base stations and repeaters. Annual recurring costs will increase as additional equipment is procured.
2. Leased line costs are associated with approximately 200 fixed repeaters. Existing lines for NARACS repeaters will be used for new repeaters; estimated average recurring costs are $50/month per repeater.
3. There are 407 secure telephone units total, 297 of which are covered by a maintenance contract through FY00 and OPS funding begins in FY01 for them. OPS funding for the remaining 110 units begin in FY99.
4. All RCOM system costs have been provided by AND-340 and ADA-20.

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CHAPTER 2-17 - SUMMARY SHEET

TOWER DATA LINK SERVICES (TDLS) SYSTEM

Program/Project Identifiers:

Project Number(s):	CIP C-20
Related Program(s):	CIPs A-01, A-02, A-04, A-06, A-10, A-11, A-12, C-14, C-15, C-21, M-15, N-12, S-02, W-04, R,E&Ds 021-190, 022-110, 022-150, 031-110, 031-120, 031-130, 032-110, 041-110, 042-110,
New/Replacement/Upgrade?	Upgrade
Responsible Organization:	AND-370
Program Mgr./Project Lead:	Sonja Whitson, AND-370, (202) 493-4716
Fuchsia Book POC:	Doris Rinkus, AND-370, (202) 493-4706

Assigned Codes:

PDC(s):	NS
PDC Description:	Pre-depart. Clearance, Flight Data, and Digital ATIS Data Transmission
Service Code:	ARIN

Cost Estimates *:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$19	$19	$14	$10	$0	$0	$0
Total OPS	**$19**	**$19**	**$14**	**$10**	**$0**	**$0**	**$0**

*Cost data provided by the Program Office.

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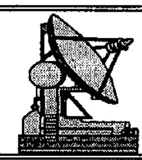
CIP Category: Communications



2-17.0 TOWER DATA LINK SERVICES SYSTEM

2-17.1 PROGRAM OVERVIEW

2-17.1.1 Purpose of the Tower Data Link Services System

The Tower Data Link Services (TDLS) system is a computer system that provides a platform for computer-aided performance of Air Traffic Control Tower (ATCT) functions and provides information to aircraft via data link. The TDLS interfaces with local weather data and flight data and provides services that include Pre-Departure Clearance (PDC), Digital Automatic Terminal Information Service (D-ATIS), and Flight Data Input/Output (FDIO) Replacement Alphanumeric Keyboard (CRT/RANK) emulation.

The Aeronautical Data Link Product Team, AND-370, is responsible for the TDLS project.

2-17.1.2 References

FAA Aviation System Capital Investment Plan (CIP), Project No. C20.04, Aeronautical Data Link – Tower Data Link Service, February 2000.

2-17.2 SYSTEM DESCRIPTION

The Tower Data Link Services (TDLS) system provides a number of services through specialized applications hosted in a UNIX Window environment on a redundant computer platform. All TDLS systems include the FDIO CRT/RANK emulation, the Pre-Departure Clearance application, and D-ATIS with Automatic Voice Generation (AVG). These applications may be run concurrently in separate windows on a single monitor or on separate monitor/workstations.

The FDIO CRT/RANK emulation replaces FDIO components in the tower cab. This application allows the TDLS terminal to emulate the FDIO keyboard and display used by controllers to display flight strips and general information messages. The consolidation of FDIO functions into TDLS reduces the number of ATCT I/O devices and eases space constraints in the tower cab.

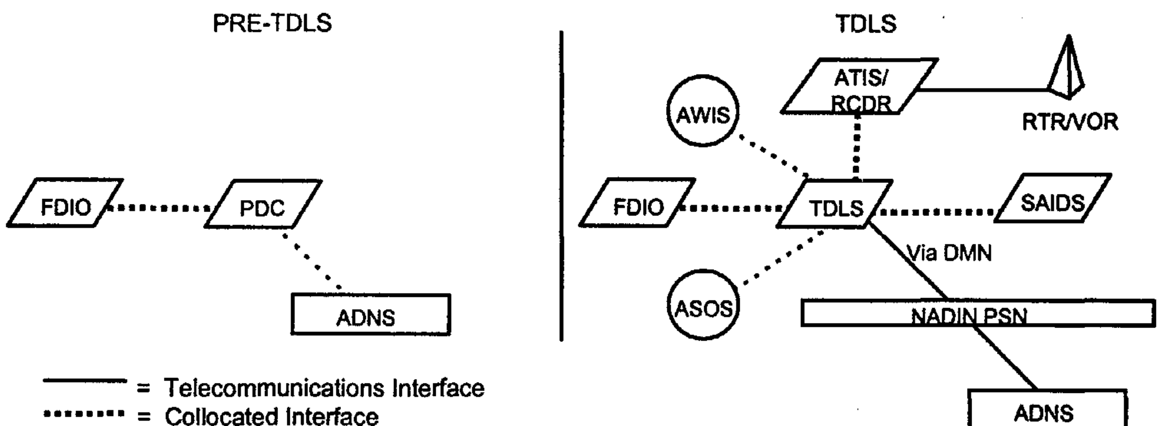
The present PDC application enables the tower to provide Pre-Departure Clearance service. PDC assists the ATCT Clearance Delivery (CD) Specialist in generating and relaying departure clearances to flight crews. TDLS taps the flight plan information, delivered to the ATCT via the FDIO system. The PDC application allows the CD Specialist to use information contained in the departure flight strip and add local operating instructions to compose a clearance. The clearance is then transmitted in text form to user computers and then to the flight crew via Aeronautical Radio Inc. (ARINC) Communications Addressing and Reporting System (ACARS) data link or gate printers. This replaces the voice transmission of clearance information, thus reducing frequency congestion and human-induced delay and inaccuracy in clearance delivery.

Automatic Terminal Information Service (ATIS) is a recorded message that conveys information essential for aircraft operating in the terminal area. ATIS is prepared in ATCTs and broadcast continuous data over VHF channels. The existing ATIS requires controllers to frequently rerecord broadcasts to reflect changes in weather or airport conditions. Aircrews, who must listen to ATIS broadcasts prior to approach and departure, may spend considerable time transcribing the lengthy and sometimes difficult-to-understand recordings. The Digital ATIS application running on TDLS allows the controller to add local instructions to weather data and to generate the ATIS text message. AVG automatically produces spoken broadcasts using a synthesized voice to "read' the message and transmit over the existing VHF air/ground channels. The text messages are made available to flight crews through data link. The Digital ATIS application on TDLS makes the generation of ATIS broadcasts simpler, easier to update, and less time consuming for the controller, while conveying information in a consistent and intelligible manner.

There are no diversity requirements for this program.

2-17.2.1 Program/System Components

The TDLS appears as a single component from a telecommunications viewpoint, as shown in Figure 2-17-1.



ABBREVIATIONS			
ADNS	- ARINC Data Network Service	NADIN PSN	National Airspace Data Interchange Network Packet Switch Network
ASOS	- Automated Surface Observing System	RCDR -	Recorder
ATIS	- Automated Terminal Information System	RTR	- Remote Transmitter/Receiver
AWIS	- Airport Weather Information System	SAIDS	- System Atlanta Information Display System
DMN	- Data Multiplex Network	TDLS	- Tower Data Link Services System
FDIO	- Flight Data Input/Output	VOR	- VHF Omnidirectional Range
PDC	- Pre-Departure Clearance		

Figure 2-17-1. Tower Data Link Services Interfaces

2-17.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

2-17.3.1 Functional Requirements

The first 30 operational PDC ATCTs used dedicated communications links between each ATCT and the ARINC Data Network Service (ADNS). Dial circuits at each ATCT allow access for diagnostic purposes.

TDLS was deployed at 58 ATCTs (the first 30 PDC ATCTs and an additional 28 ATCTs) using a commercial-off-the-shelf (COTS) X.25 capability that replaced dedicated communications circuits at the first 30 PDC ATCTs. Dial circuits at all 58 ATCTs allow access for diagnostic purposes.

The data communications path from TDLS to ADNS user hosts uses X.25 from TDLS to the ADNS PSN, via the NADIN PSN. The connection from each TDLS ATCT to the nearest NADIN PSN node uses DMN or other appropriate FAA owned or leased channels.

2-17.3.2 Traffic Requirements

Each PDC and ATIS message sent to the user hosts requires an acknowledgment to confirm receipt of the message. This receipt must be received within two minutes after the original message is transmitted.

2-17.3.3 Connectivity Requirements

2-17.3.3.1 TDLS to ARINC Data Network Service (ADNS) Users

This interface provides connectivity between the ATCT and flight crews via systems connected to ADNS. This interface handles low transport rate data with non-periodic transactions. TDLS, interfaced to the ADNS, distributes messages to user computers or the Digital ATIS Server, for eventual data link to flight crews. TDLS transmits PDC and ATIS in this manner. The initial PDC configuration employed leased circuits to connect the ATCTs to the ADNS network. The TDLS configuration uses DMN to connect ATCTs to NADIN PSN, and the NADIN PSN to the ADNS network through an X.25 gateway facility. The protocol, transmission, and hardware requirements related to this interface are summarized in Table 2-17-1.

2-17.3.4 Telecommunications Interfaces

2-17.3.4.1 Tower Data Link Services System to Weather Data Sources

Each TDLS can interface directly with a variety of collocated weather data terminals. Typically, the ATCTs have only one or two weather data services. Normally, TDLS interfaces to one weather data station, however, depending on the particular ATCT, TDLS may receive weather information from ASOS, AWIS, or SAIDS. The connectivity may use FAA-owned cable or leased circuits, depending on local conditions.

Table 2-17-1. Tower Data Link Services System Interface Requirements Summary

SUBSYSTEM INTERFACE		ATCT to NADIN PSN Via (DMN)	NADIN PSN to ARINC (Via DMN)
INTERFACE CONTROL DOCUMENTATION		EIA-530	EIA-530
PROTOCOL REQUIREMENTS	Network Layer	X.25	X.25
	Data Link Layer	X.25	X.25
	Physical Layer	X.25	X.25
	Special Formats/ Codes		
TRANSMISSION REQUIREMENTS	No. Channels	57	2
	Speed (kbps)	2.4	19.2
	Simplex Half/Full Duplex	FD	FD
	Service	Subscriber	Gateway
Hardware Requirements	Modem	GFE	GFE
	Data Bridge		
	Clock		
	A/B Switch		
	DSC		
	Cable/Miscellaneous	GFE	GFE

2-17.3.4.2 Tower Data Link Services System to Automatic Terminal Information Service (ATIS) Transmitter

The TDLS generates synthesized speech for use as the ATIS broadcast. The D-ATIS application sends the ATIS Voice Text Message (AVTM) to the Voice Synthesis Unit (VSU) which sends the voice message to the VHF transmission facility using FAA cable. Transmission uses existing air/ground radios.

2-17.3.4.3 Tower Data Link Services System to Flight Data Input/Output (FDIO)

The FDIO to PDC interface provides the TDLS with flight data for use in preparing PDCs. The connectivity includes a "Y" cable inserted into the data lines that drive the control tower flight strip printers without affecting FDIO operation. The interface to the FDIO system for FDIO CRT/RANK emulation provides the TDLS with bi-directional I/O necessary to use and control the FDIO services. FAA cable provides the connectivity.

2-17.4 ACQUISITION ISSUES

The TDLS system is operational, there are no acquisition issues. However, there is a need for a "technical refresh" of the existing equipment and a replacement TDLS system sometime in the next six years or so.

There is a degree of uncertainty in this program. The TDLS was developed and installed as an interim system, pending implementation of the Tower Control Computer Complex (TCCC) portion of the Advanced Automation System. With the cancellation of the TCCC program, TDLS become an end-state system. The issues are twofold:

- The TDLS system is hosted on obsolete IBM-486 processor hardware, and replacement systems are for the most part already unavailable.
- The contractor maintenance arrangement was established because the TDLS system was to be an interim, short-term solution.

It is necessary to conduct a "technical refresh" of the IBM-486 hardware and supporting peripherals. In the FY03 to FY04 timeframe, the existing TDLS system should be replaced with a new architecture using a state-of-the-art system. Air Traffic requirements for a system to replace the TDLS are being identified.

2-17.4.1 Program Schedule and Status

Fifty-eight systems are installed at 57 airport locations. TDLS implements the PDC, FDIO CRT/RANK Emulation, and Digital ATIS with Automatic Voice Generation applications at the existing 58 ATCTs. The installation schedule is in Table 2-17-2, with the implementation schedules for the associated TDLS interfaces shown in Table 2-17-3 and Table 2-17-4.

Table 2-17-2. Tower Data Link Services System Site Installation Schedule

Site Installation	Region	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
TDLS	Central	2	0	0	0	0	0	0	TBD
	Eastern	9	0	1	1	0	0	0	TBD
	Great Lakes	8	0	0	0	0	0	0	TBD
	New England	2	0	0	0	0	0	0	TBD
	Northwest Mountain	4	0	0	0	0	0	0	TBD
	Southern	13	0	0	0	0	0	0	TBD
	Southwest	9	0	0	0	1	0	0	TBD
	Western Pacific	11	0	0	0	0	0	0	TBD
	TDLS Total	**58**	**0**	**1**	**1**	**1**	**0**	**0**	**0**

Table 2-17-3. Tower Data Link Services Telecommunications Interface Implementation Schedule

From	To	Diversity Req'mt	System/Rate/Miles	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY0 6
TDLS	NADIN PSN	No	DMN Ports ATCT/ARTCC (Note 1)	57	0	1	1	1	TBD	TBD	TBD

Note 1. PM has confirmed that sufficient existing capability exists to meet this requirement.

Table 2-17-4. Tower Data Link Services Local Interface Implementation Schedule

From	To	Diversity Req'mt	System/Rate/ Miles	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
FDIO	TDLS	No	Passive Local Tap	57	0	1	1	1	TBD	TBD	TBD
TDLS	ATIS Transmitter	No	Local Tap	57	0	1	1	1	TBD	TBD	TBD
TDLS	AWIS	No	Passive Local Tap	10	0	0	0	0	TBD	TBD	TBD
TDLS	SAIDS	No	Passive Local Tap	10	0	0	0	0	TBD	TBD	TBD
TDLS	ASOS	No	Passive Local Tap	35	0	1	1	1	TBD	TBD	TBD
PDC	ADNS	No	Direct Connect	30	0	0	0	0	0	0	0

2-17.4.2 Planned Telecommunications Strategies

There are no diversity requirements for this program. Replacing the dedicated circuits between each ATCT and the ADNS with the lower cost NADIN PSN saves the annual recurring costs of the dedicated circuits.

2-17.4.3 Telecommunications Cost

Table 2-17-5 provides a summary of the estimated telecommunications cost for the TDLS system. Per FAA Order 2500.8A, leased telecommunications costs (non-recurring and recurring) for the year of activation and one year following are shown in the table as being funded under Facilities and Equipment (F&E) account.

Table 2-17-5. Cost Summary – TDLS

CIP # C20.0 4 All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
TDLS <---> ADNS								
a. Dedicated Access via DMN and NADIN								
Channel Costs								
Channels Added		0	1	1	1	0	0	0
Total Channels	57	57	58	59	60	60	60	60
Recurring Channel Costs			*N/A - Placed on Existing DMN Lines*					
			No Charge Back for NADIN Usage					
b. Dial Back-up Service								
Switched Service Costs								
Cost Profile: Dial-up Lines via Local PSTN								
Dial Lines Added		0	1	1	0	0	0	0
Total Dial Lines	57	57	57	43	30	0	0	0
F&E Funded Dial Lines		0	0	0	0	0	0	0
OPS Funded Dial Lines		57	57	43	30	0	0	0
F&E Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Switched Service Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$19**	**$19**	**$19**	**$19**	**$0**	**$0**	**$0**

SUMMARY

		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
F&E Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$0	$0	$0	$0	$0	$0	$0
	F&E Total	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$19	$19	$14	$10	$0	$0	$0
	OPS Total	**$19**	**$19**	**$14**	**$10**	**$0**	**$0**	**$0**

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CHAPTER 2-18 - SUMMARY SHEET

TERMINAL VOICE SWITCH REPLACEMENT (TVSR) PROGRAM

Program/Project Identifiers:

Project Number(s):	CIP C-05
Related Program(s):	CIPs A-02, C-04, C-23, F-01, F-02, F-03, F-14, F-18, F-23, M-03, M-22
New/Replacement/Upgrade?	Replacement
Responsible Organization:	AND-320
Program Mgr./Project Lead:	Jim Little, AND-320, (202) 493-4651
Fuchsia Book POC:	Kent Cheung, (202) 554-4530 ext.118

Assigned Codes:

PDC(s):	EY
PDC Description:	Interphone Key Equipment (TVSR)
Service Code:	TSYS

Cost Estimates *:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$10	$11	$5	$5	$8	$8	$7
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$10**	**$11**	**$5**	**$5**	**$8**	**$8**	**$7**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$0	$6	$7	$7	$9	$7	$7
Total OPS	**$0**	**$6**	**$7**	**$7**	**$9**	**$7**	**$7**

*Cost data provided by the Program Office

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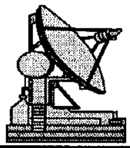
CIP Category: Communications 	**2-18.0 TERMINAL VOICE SWITCH REPLACEMENT PROGRAM**

2-18.1 PROGRAM OVERVIEW

2-18.1.1 Purpose of the Program/System

The Terminal Voice Switch Replacement (TVSR) program provides modern voice switching equipment to support airport traffic control operations in Airport Traffic Control Towers (ATCT) and Terminal Radar Approach Control (TRACON) facilities. The on-going Small Tower Voice Switch (STVS), Rapid Deployment Voice Switch I (RDVS), RDVS II, RDVS IIA and the Enhanced Terminal Voice Switch (ETVS) procurements provide replacements for the aging electromechanical voice switches and Integrated Communications Switching Systems (ICSS).

The TVSR voice switching systems can be augmented by an Operational Support Telephone System (OSTS) and Voice Switch By-Pass (VSBP) system. The OSTS is provided in cases where the existing capability to access the public switched telephone network (PSTN) is displaced by the replacement of the electromechanical switch. The VSBP provides air traffic controllers with emergency access to air/ground (A/G) radio transmitters and receivers during a catastrophic failure of the facility's voice switch system.

The TVSR is managed by the AND-320 Voice Switching and Recording Integrated Product Team.

2-18.1.2 References

2-18.1.2.1 FAA Aviation System Capital Investment Plan (CIP) Project C-05, Voice Switches, January 1999.

2-18.1.2.2 Enhanced Terminal Voice Switch (ETVS) Specification, FAA-E-2894.

2-18.1.2.3 Voice Switch/PABX, ICD #42009404.

2-18.1.2.4 Voice Switch/Recording Equipment, ICD #42004205.

2-18.1.2.5 TCS & ICSS To Existing ICSS Trunks, ICD #42028403.

2-18.1.2.6 STVS Specification, FAA-E-2974.

2-18.1.2.7 ERMS Specification.

2-18.1.2.8 Maintenance Processor Subsystems to RMS and RM Subsystem Concentrators, NAS-MD-790.

2-18.2 SYSTEM DESCRIPTION

2-18.2.1 Program/System Components

The AND-320 integrated TVSR product line illustrated in Figure 2-18-1 provides intra-facility and inter-facility connectivity via Ground-to-Ground (G/G) circuits and air-to-ground radios. It also provides for air traffic controller voice communications to other air traffic controllers, other terminal and enroute facilities, and aircraft flight crewmembers in accomplishing terminal environment operational air traffic control.

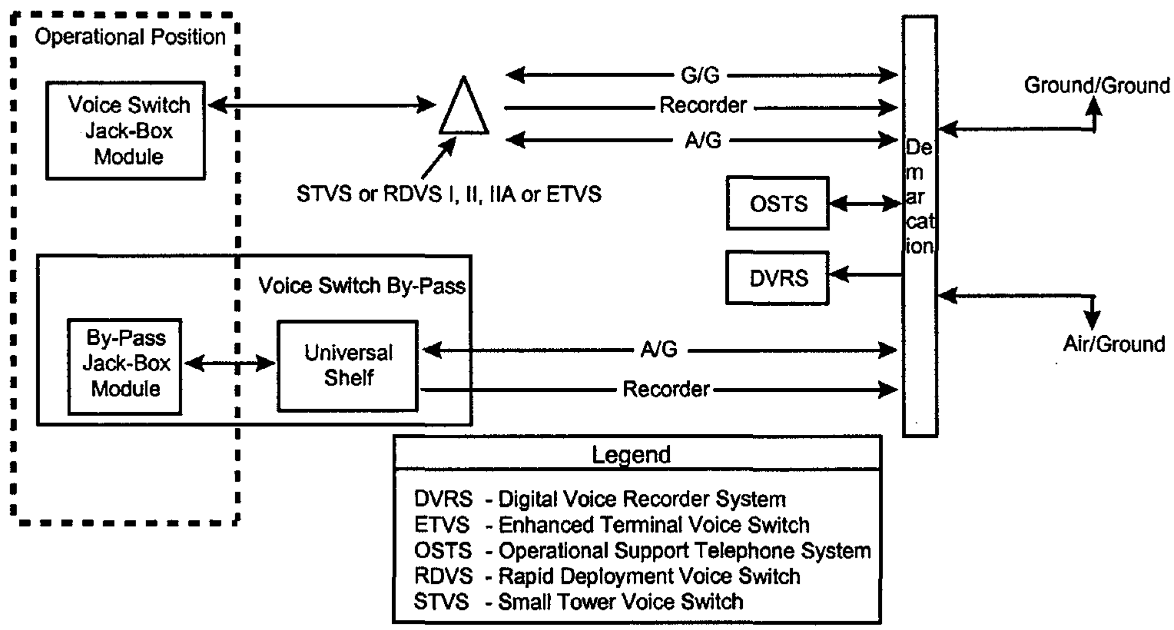


Figure 2-18-1. Terminal Voice Switch Replacement (TVSR) Product Line

2-18.2.2 Principal Components

The TVSR program's principal voice switch components include the STVS, the RDVS and the ETVS systems.

2-18.2.2.1 Small Tower Voice Switch

The STVS project procures integrated A/G and G/G voice switching systems for Visual Flight Rules (VFR) ATCTs. A Basic STVS voice switch supports up to four positions at Level 1 and Level 2 ATCTs. Each operational position provides access to at least six A/G frequencies. Up to three Basic STVS can be interconnected (i.e., a Multi-link STVS) to support up to a maximum of 12 positions at one facility.

2-18.2.2.2 Rapid Deployment Voice Switch

The RDVS, RDVS II, and RDVS IIA projects procure ATCT and TRACON voice switches to meet urgent schedule requirements until ETVS voice switches are available under the ETVS project.

The Litton RDVS I, RDVS II, and RDVS IIA contracts procure integrated digital voice switching systems that provide non-blocking voice communications between the air traffic control operator positions, radio channels, and interphone land lines. The Litton RDVS is available in Small Baseline System (Model 3080-C) and Litton RDVS II Large Baseline System (Model 3080-E) configurations. A Litton RDVS Small Baseline System configuration can range from 1 to 64 positions. The Litton Large Baseline System provides support to the Small Baseline System and can range from 1 to 144 positions

Enhancements are identified as Litton RDVS IIA (Model 3080-F) and Litton (Model 3080-H). The RDVS IIA (Model 3080 F and Model 3080 H) enhancements baseline introduces the Touch Entry Display (TED) features and the faster processor chip set/hardware that provides faster access speed capability for up to 144 air traffic controller positions, respectively. The RDVS IIA contract can be used to procure up to 50 Large Baseline Systems.

The Denro RDVS I and RDVS II contracts provided Denro Model 400 integrated communications switching systems that provide non-blocking voice communications between the air traffic controller positions, A/G radio channels, and interfacility interphone lines. These systems are configured to support up to 80 positions. All the DENRO RDVS I and II voice switches have been installled.

2-18.2.2.3 Enhanced Terminal Voice Switch

The ETVS contract is used to procure Denro Model 400D integrated communications switching systems that provide non-blocking voice communications between the air traffic control operator positions, A/G radio channels, and interfacility interphone circuits. The ETVS is a modular, expandable system design capable of supporting up to 150 positions. Both push-button and Touch Entry Display (TED) position equipment complements are available. ETVS features include the capability for supervisory recording of incoming and outgoing calls at any operational position, display of maintenance alarms, and an audible alarm for unmonitored positions. ETVS Pre-Planned Product Improvements (P3I) include a management information system, a communications traffic data and event collection and reporting system, and remote maintenance monitoring subsystem. ETVS provides digital network interfaces including Leased Interfacility NAS Communications System (LINCS) and P3Is for T-1s and Integrated Services Digital Network (ISDN).

2-18.2.2.4 TVSR Voice Switch Equipment Deployed To ATCT and TRACON Facilities

The TVSR voice switch equipment deployed to ATCT and TRACON facilities consists of up to four major components:

- Operational position equipment that includes devices such as push buttons and Touch Entry Displays (TED) that provide human interface to the voice switch system,

- A supervisory position that incorporates an interactive terminal to reconfigure the operational characteristics of the systems,

- The voice switching equipment in one or more standard racks that contains the electronics of the voice switch and provides both intra-facility and inter-facility connectivity,

- A maintenance position or workstation that allows the maintenance technician to perform system diagnostics and troubleshooting.

A TVSR system can be augmented with a Commercial-Off-the-Shelf (COTS) modular and expandable OSTS. The OSTS provides up to 24 stations and access to 64 circuits at locations where a facility's capability to access the PSTN is displaced with the replacement of the electromechanical switch. This requirement is determined on a site-by-site basis and is not expected to involve any new circuit requirements.

The VSBP provides air traffic controllers with emergency access to A/G radio transmitters and receivers in the event of a catastrophic failure of the facility voice switch system. The VSBP is totally independent of the facility voice switch system and provides direct connectivity between the controller and the A/G radio equipment for the primary frequency(s) assigned to the operational position. VSBP activation is initiated by the controller (i.e., energized by insertion of the controller's headset/microphone into the VSBP By-Pass jack); there is no automatic VSBP activation. The VSBP provides a push-to-talk (PTT) signal compatible with the PTT requirements of the primary radio interface, whether in the local or remote mode. Manual reassignment and connection of radios to positions is made via patch panel. The VSBP provides an interface compatible with the facility's legal voice recorder. The total number of VSBP systems to be deployed to FAA sites is 250.

2-18.2.3 Functional Component Interface Requirements

The TVSR functional telecommunications interfaces are illustrated in Figure 2-18-2. The voice switch provides positive indication of connectivity and routes voice traffic through ground circuits to other ground facilities and through radio circuits to aircraft.

TVSR equipment provides voice connectivity for A/G communications through direct interfaces with radio equipment or through tone control equipment for remote radios. The voice switch equipment has the capability to access main or standby radios and includes PTT.

TVSR equipment also provides voice connectivity between controller positions within the same facility (intercom) and other air traffic control facilities (interphone). The TVSR equipment interfaces to FAA owned and leased commercial circuits to establish inter-facility communications. TVSR equipment provides an interphone interface to a local OSTS or Administrative Telephone System.

Specific functional requirements illustrated in Figure 2-18-2 is contained in the STVS Specification, RDVS contracts, RDVS II contracts, the ETVS Specification, and OSTS contract.

2-18.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

2-18.3.1 Local Interfaces

2-18.3.1.1 TVSR Local Interfaces

All TVSR components illustrated in Figure 2-18-1 are collocated and interconnected via house wiring. TVSR internal interfaces include position equipment to switching equipment, switching equipment to interface equipment, switching equipment to OSTS, and switching equipment to Legal Recorders. Specific internal interface requirements illustrated in Figure 2-18-2 is contained in the STVS Specification, RDVS contracts, RDVS II contracts, the ETVS Specification, and OSTS contract.

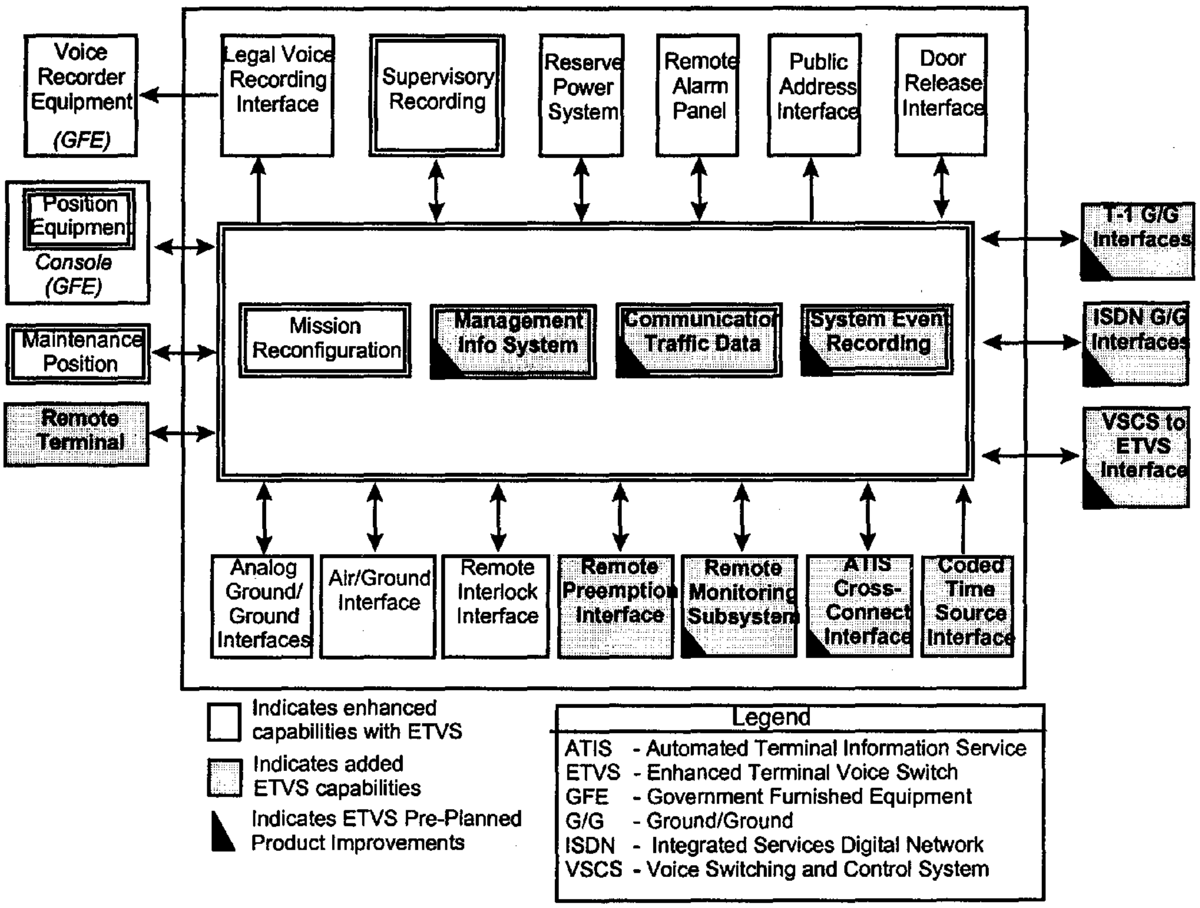


Figure 2-18-2. Terminal Voice Switch Replacement System Architecture & Interfaces

2-18.3.2 Telecommunications Interfaces

2-18.3.2.1 TVSR to Other Air Traffic Control (ATC) Facilities (ARTCC, TRACON, ATCT)

Figure 2-18-2 illustrates the fact that TVSR voice switch equipment provides the capability for analog and digital external interfaces connectivity to other ATC facilities.

2-18.3.2.1.1 Interface Requirements

TVSR voice switch equipment interfaces to G/G trunks and circuits that can be characterized as full-period, dedicated lines in two-point and multi-point configurations. TVSR can operate with a variety of 2-wire and 4-wire incoming signaling and outgoing signaling analog circuit interface types. These are identified by FAA designation as Types 3, 4, 5, 4/5, 6, 7, 8, and 9 circuits.

The incoming services supported include 20 Hertz (Hz) ring; loop start; voice; loop + dial; ground + dial; E-lead; Selective Signaling (SS) dial; SS dial or voice; E-lead; tone-on-idle; tone-on-active; tone-on-idle/dial; and E-lead + dial.

The outgoing services supported include loop start; ground start; loop + dial; ground + dial; voice; 20 Hz automatic; 20 Hz manual; 20 Hz ring; M-lead + dial; SS dial; SS dial + voice; M-lead; tone-on-idle; tone-on-active; tone on idle + dial; and M-lead + dial.

The RDVS Large Baseline system also provides connectivity to the T-1 digital service. The ETVS P3I will provide connectivity to T-1 and ISDN carrier services.

Detailed incoming and outgoing signaling specifications for each of the above incoming and outgoing services are provided in the STVS Specification, RDVS contracts, RDVS II contracts, and the ETVS Specification referenced in Section 2-18.1.2.

2-18.3.2.1.2 Connectivity Requirements

TVSR equipment includes a complete hardware system with all necessary circuit interfaces. An intermediate distribution frame also may be required to provide the interface between the voice switch equipment and the circuits. This information is provided in the respective installation documentation.

The STVS with 4 positions can support a maximum combination of 12 radio and telephone interfaces. A Multi-link STVS configuration consisting of 3 interconnected STVS with a maximum of 12 positions can support a maximum combination of 36 radio and telephone interfaces. A RDVS Denro Model 400 with a maximum of 80 positions can support a maximum of 96 A/G interfaces and 96 G/G interfaces. A Litton RDVS Small Baseline System configured with 48 positions can support a maximum combination of 312 A/G and G/G interfaces. A RDVS Litton Large Baseline System configured with 136 positions can support a maximum combination of 312 A/G and G/G interfaces. A Denro ETVS can be configured with a maximum of 150 positions, with a maximum of 200 A/G interfaces and 200 G/G interfaces.

2-18.3.2.1.3 Traffic Characteristics

Traffic characteristics vary from site to site and are dependent on the configuration of the voice switch, i.e., the number of positions, the number of A/G interfaces and G/G interfaces. As noted earlier, TVSR voice switch equipment interfaces to G/G PSTN trunks and full-period dedicated circuits in two-point and multi-point configurations. Without actual usage data, a guide to estimate a site's traffic characteristics, based on the voice switch configuration, can be determined from the ETVS communications test load specified in Table 2-18-3 in Reference 2-18.1.2.2 (repeated below as Table 2-18-1).

Table 2-18-1. ETVS Communications Test Load

Event Type	Average No. of Events per Hour	Average Holding Time per Event
A/G transmission	300 PTTs x no. of positions	3 seconds
A/G reception	300 squelch breaks x no. of receivers	3 seconds
IC Calls	10 x no. of positions	20 seconds
Non-IC calls placed	10 x no. of positions	1 minute
Non-IC calls received	10 x no. of circuit interfaces	1 minute

2-18.3.2.2 TVSR to Administrative Telephone System (ATS) (Voice)

The TVSR voice switch equipment provides interfaces to ATS equipment to furnish connectivity to place and receive calls inside a facility and to place and receive outside calls. This interface consists of dial-up voice access to the public switched telephone network (PSTN), Federal Telecommunications System (FTS), and Defense Switched Network (DSN).

The TVSR equipment interfaces support Pulse and Dual-Tone Multi-Frequency (DTMF) dialing. Connectivity and traffic characteristics for this interface are as described in Sections 2-18.3.2.1.2. and 2-18.3.2.1.3.

2-18.3.2.3 TVSR Interface to FAA Radios

TVSR voice switch equipment provides A/G interfaces for both local and remote radio equipment. This interface may be direct connections for local radios or through radio equipment for remote radios. Variation by site can be expected and complete details are specified by the government at the time of order.

2-18.3.2.3.1 Interface Requirements

TVSR voice switch equipment furnishes an audio signal to each radio transmitter comprising the radio frequency interface (i.e., main transmitter and standby transmitter) as specified by the government at time of order and as selected by the operator. TVSR voice switch equipment also accepts an audio signal from each radio receiver comprising the radio frequency interface (i.e., main receiver and standby receiver) as specified by the government at time of order and as selected by the operator. Control signals supported by TVSR voice switch equipment include PTT control; Main/Standby Transmitter selection;

Main/Standby Receiver selection; and Receiver squelch break. Connectivity and traffic characteristics for this interface are as described in Sections 2-18.3.2.1.2 and 2-18.3.2.1.3.

2-18.3.2.4 TVSR to Remote Maintenance Monitoring System (RMMS)

Specific TVSR RMMS interface requirements are contained in the STVS Specification, RDVS contracts, and the ETVS Specification, as appropriate.

2-18.3.2.4.1 Interface Requirements.

The STVS equipment has contact closures that can be connected through the Environmental Remote Monitoring Subsystems (ERMS) to provide remote monitoring. Requirements for STVS should be described as a part of the ERMS. The RDVS is not required to interface to RMMS. The ETVS Specification includes an option to design and deliver an RMMS interface in accordance with FAA-MD-790 and FAA-MD-793. Protocol, transmission, and hardware requirements associated with the ETVS RMMS interface will be added when the option is exercised. For connectivity requirements, refer to discussions in Sections 2-18.3.2.4 and 2-18.3.2.4.1.

2-18.4 ACQUISITION ISSUES

2-18.4.1 Program Schedule and Status

The STVS contract was awarded on October 30, 1992. Deliveries of the STVS began in December 1993. The Litton RDVS contract was awarded on July 1, 1993 and the Denro RDVS contract was awarded on September 16, 1993. Delivery of Litton and Denro systems began in February 1994 and January 1994, respectively. The Litton and Denro RDVS II contracts were awarded in January 1995. Deliveries began on both contracts in May 1995. The Litton RDVS IIA contract was awarded December 20, 1996, and deliveries began in August 1997. The ETVS contract was awarded July 26, 1995. Deliveries of ETVS production systems began in May 1998.

The projected delivery schedule includes: 243 STVS systems (including 68 DoD systems); 3 Litton RDVS systems; Denro RDVS systems; 3 Litton RDVS II systems (10 basic plus 3 options),; 51 RDVS IIA systems; 26 Denro RDVS II systems (10 basic plus 3 options); and 406 ETVS systems (including approximately 240 DoD systems). Planned delivery by fiscal year is shown in Table 2-18-2. Because the FAA does not fund DoD requirements, the switch replacement numbers contained in Table 2-18-2 will exceed those contained in Table 2-18-3.

Table 2-18-2. FAA and DoD Delivery Schedule

Switch Type	Prior Yrs	FY00	FY01	FY02	FY03	FY04	FY05	FY06
DENRO RDVS I	6	0	0	0	0	0	0	0
Litton RDVS I	13	0	0	0	0	0	0	0
RDVS II	12	0	0	0	0	0	0	0
RDVS IIA	27	20	7	0	0	0	0	0
ETVS	31	68	67	48	61	54	13	11
Multiple STVS	21	0	0	0	0	0	0	0
STVS	154	0	0	0	0	0	0	0
	264	**88**	**74**	**48**	**61**	**54**	**13**	**11**

2-18.4.2 Planned Telecommunications Strategies

TVSR is a communications switch replacement project that does not generate new transmission requirements, only leased ICSS system and maintenance costs were initially addressed. The following planned implementation strategy now reflects changes for purchasing the systems and leasing the support until 2000.

When the TVSR switch replaces a leased electromechanical switch, region must request removal of the leased switch. In most instances, removal would be accomplished under the AT&T lease and maintenance contract, administered by Telecommunications Leased Communications Programs Division, AOP-500.

2-18.4.3 Telecommunications Costs

Table 2-18-3 provides a summary of the estimated costs based on the quantity of voice switches the program office is authorized to purchase each fiscal year. However, the quantities differ from the delivery schedule figures contained in Table 2-18-2 because of the distinction between the order date (when funds are required) and the actual delivery date. Also, the quantities contained in Table 2-18-2 include DoD as well as FAA funded switches, whereas the quantities in Table 2-18-3 correspond to the number of switches funded exclusively by the FAA.

The recurring costs in Table 2-18-3 represent contract maintenance costs for the installed switches. Since the switches are replacing units that are already in the OPS domain, it is assumed that contract maintenance costs for the new switches will be OPS funded.

No channel costs are identified in the cost summary table because the FAA employs a "hot" cutover approach when bringing the replacement switch on-line. In addition, the replacement of the switch does not change the channel requirements at a site.

Table 2-18-3. Cost Summary - TVSR

CIP # C-05	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
TVSR <---> PSDN, FTS, DSN									
	Cost Profile: Installation of New Voice Switches to Replace Outdated Equipment								
	Replacements required		18	20	10	10	26	26	17
	Total Replacements	294	312	332	342	352	378	404	421
	Non-recurring Hardware Costs								
	F&E Non-recurring Costs		**$10**	**$11**	**$5**	**$5**	**$8**	**$8**	**$7**
	OPS Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring Hardware Costs								
	F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$0**	**$6**	**$7**	**$7**	**$9**	**$7**	**$7**
			SUMMARY						
	F&E Totals	Non-recurring	$10	$11	$5	$5	$8	$8	$7
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Totals	**$10**	**$11**	**$5**	**$5**	**$8**	**$8**	**$7**
	OPS Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$6	$7	$7	$9	$7	$7
		OPS Totals	**$0**	**$6**	**$7**	**$7**	**$9**	**$7**	**$7**

Cost data provided by the Program Office.

CHAPTER 2-19 - SUMMARY SHEET

UNITED STATES INTERNATIONAL TELECOMMUNICATIONS SYSTEMS (USITS)

Program/Project Identifiers:

Project Number(s):	BIIP-991023
Related Program(s):	
New/Replacement/Upgrade?	Multiple new projects and system upgrades
Responsible Organization:	AOP
Program Mgr./Project Lead:	Dulce Roses, AOP-600, (202) 493-5916
Fuchsia Book POC:	Don Rickerson, ITT, (202) 863-7323

Assigned Codes:

PDC(s):	AG, AH, BK, CS, NF
PDC Description:	MEVA-Western Caribbean Satellite Equipment and Services; MEVA-Eastern Caribbean Satellite Equipment and Services; AFTN Circuits; ARINC Air to Ground Voice; ARINC DOTS and Automatic Dependent Surveillance
Service Code:	SAT, AFTN, ARIN

Cost Estimates*:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	$0
OPS Non-recurring	$800	$550	$500	$500	$0	$0	**$0**
OPS Recurring	$2,561	$3,022	$3,039	$3,039	$2,939	$2,939	$2,939
Total OPS	**$3,361**	**$3,572**	**$3,539**	**$3,539**	**$2,939**	**$2,939**	**$2,939**

*Cost data provided by the Program Office.

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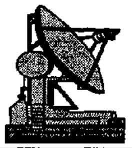
**CIP Category:
Communications**



2-19.0 UNITED STATES INTERNATIONAL TELECOMMUNICATIONS SYSTEMS PROGRAM

2-19.1 OVERVIEW

The International Civil Aviation Organization (ICAO) provides the worldwide framework for coordinating global activities in support of aviation. Within the United States, the FAA International Telecommunications System (ITS) Program performs the overall management and funding for circuits, facilities and services required to meet ICAO and bilateral treaty obligations.

Two broad categories of international aeronautical telecommunications are of primary interest to the FAA. The first category is the Aeronautical Fixed Services (AFS), comprised of the Aeronautical Fixed Telecommunications Network (AFTN) and ATS Direct Speech that support data and voice services between ATC facilities and authorities, and the World Area Forecast System (WAFS) that supports satellite broadcast of meteorological data for approximately two-thirds of the world. In the future, the Aeronautical Telecommunications Network (ATN) will displace the AFTN and support a variety of new data exchange requirements between ATC and aircraft based automated end-systems.

The second category is the Aeronautical Mobile Services (AMS), which consist of all facilities used for Air-to-Ground communications and the frequencies assigned to them. The circuit cost for the terrestrial portion of this service is included in other chapters/programs.

The FAA provides the circuits necessary to support both AFS and AMS capabilities. The FAA is only responsible for the AFS circuit to the mid-point or designated border crossing point.

This chapter of the Fuchsia Book, with the exception of WAFS which is included in the Weather Section, addresses programs being implemented to meet obligations incurred under the ICAO framework.

2-19.1.1 Purpose of the United States ITS Programs

ITS program supports telecommunications obligations incurred by the FAA as a signatory to the ICAO Convention on International Civil Aviation. ITS program promotes flight safety improvement and international cooperation in achieving overall efficiencies in the aviation industry and provides international assistance. In accordance with ICAO rules for programs implemented under its agreements, the individual ICAO member states negotiate and manage the implementation of the agreed telecommunications programs and provide the necessary funding support as specified in the respective agreements.

2-19.1.2 References

2-19.1.2.1 Bi-lateral and Multi-lateral agreements with member ICAO states. Copies available through the manager, Telecommunications Support and International Communications Division, AOP-600.

2-19.1.2.2 International Standards, Recommended Practices and Procedures for Air Traffic Services, Aeronautical Telecommunications, Annex 10 to the convention on International Civil Aviation.

2-19.1.2.3 ICAO Regional Air Navigation Plans.

2-19.2 DESCRIPTION OF UNITED STATES ITS PROGRAMS

The United States International Program (USIP) provides the planning, engineering, procurement and implementation of multiple individual projects to meet the treaty obligations. From the telecommunications perspective, these are stand-alone projects, contributing to the overall communications infrastructure serving international flight operations. The agreements with the foreign facility at the distant end determine the performance requirements for the components, systems, sub-systems, circuits, etc. that comprise each project.

The United States International Programs/Projects discussed in this chapter are as follows:

Section 2-19.2.1	Alaska/Russia Far East Program
Section 2-19.2.2	Lisbon/New York/Gander Project
Section 2-19.2.3	United States/Japan Telecommunications Project
Section 2-19.2.4	AFTN to X.25 Upgrade Project
Section 2-19.2.5	Mejoras al Enlace de Voz del ATS (MEVA)
Section 2-19.2.6	East Caribbean Digital Network Project
Section 2-19.2.7	PSS1 QSig Protocol Trials with Eurocontrol/Canada
Section 2-19.2.8	Aeronautical Telecommunications Network (ATN) Implementation

2-19.2.1 ALASKA/RUSSIA FAR EAST PROGRAM

2-19.2.1.1 Overview

The Alaska/Russia Far East Program establishes direct operational aeronautical fixed services (AFS) communications between the Anchorage Air Route Traffic Control Center (ARTCC) and Russian Air Traffic Control Centers located at Petropavlovsk-Kamchatski, Anadyr, Magadan, and Mys Schmidta.

2-19.2.1.2 Purpose

The purpose of this project is to provide the capability to use air traffic routes in the North Pacific (NOPAC) operational area that would not otherwise be available to international carriers. The program enhances safety and brings significant economies to air operations.

2-19.2.1.3 Telecommunications Strategy

The required telecommunications connectivity will be provided by direct satellite communications links with switching capabilities for voice and data services.

2-19.2.1.4 Acquisition and Costs

The current schedule is summarized in Table 2-19-1.

Table 2-19-1. Alaska/Russia Far East Program Interface Implementation Schedule

Interface	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
US FAC to Russian FAC	2	0	0	0	0	0	0	0

The terminal equipment and transmission media for the Alaska/Russia Far East Program will be leased from an U.S. carrier (AT&T). All costs for the Program are borne by the United States. A summary of the leased service cost estimate is provided in Table 2-19-7.

2-19.2.2 LISBON/NEW YORK/GANDER UPGRADE PROGRAM

2-19.2.2.1 Overview

The Lisbon/New York/Gander Telecommunications Project addresses several current telecommunications circuit infrastructure concern. The primary concern deals with the inability to establish simultaneous communications between any two locations. When considering alternatives to correct this problem, the FAA design included the possible use of voice/data multiplexers and voice compression technology.

2-19.2.2.2 Purpose

This project will increase the circuit bandwidth capacity to allow higher data transmission rates; upgrade the telecommunications services to state-of-the-art technology, reduce the monthly recurring costs, and provide simultaneous voice communications.

2-19.2.2.3 Telecommunications Strategy

The upgrade included the installation of a 64 kbps circuit between New York and Lisbon, voice/data multiplexer equipment, and AFTN X.25 application software. This circuit will carry four voice channels, one 9.6 kbps AFTN data channel, and one channel available for future ATN use. Currently, the one voice circuit accessible to the three locations allows only one conversation at a time to take place. In addition, there are two costly low-speed data circuits carrying AFTN data between the NADIN MSN switch and Portugal. The upgrade will improve the entire operation.

2-19.2.2.4 Acquisition and Costs

The upgrade implementation is in accordance with bi-lateral agreements between Portugal and the FAA, using leased terminal equipment and transmission media. The current schedule is in Table 2-19-2 with leased service costs for the Lisbon/New York/Gander Project summarized in Table 2-19-7.

Table 2-19-2. Lisbon/New York/Gander Interface Implementation Schedule

Interface	Prior Years	2000	2001	2002	2003	2004	2005	2006
Portugal/New York/ Voice	1	1	0	0	0	0	0	0
Portugal/Gander Voice	1	0	0	0	0	0	0	0
US/Santa Maria Voice	1	0	0	0	0	0	0	0
Data Channels	1	0	1	0	0	0	0	0

Note: Circuit carries four voice and two data channels

2-19.2.3 UNITED STATES/JAPAN TELECOMMUNICATIONS PROJECT

2-19.2.3.1 Overview

The US to Japan Telecommunications Project addresses two separate upgrades to the existing telecommunications circuit infrastructure. The first of these involves an upgrade of the AFTN service to X.25, and the first use of multiplexing and voice compression technology to combine voice and data onto one 56 kbps circuit. The second upgrade involves the implementation of digital voice communications. Both upgrades are in accordance with bi-lateral agreements between the Japan Civil Aviation Bureau (JCAB) and the FAA.

2-19.2.3.2 Purpose

The purpose of this two-phase project is to increase the circuit bandwidth to provide higher data transmission rates, upgrade the analog telecommunications services to state-of-the-art technology, implement digital voice communications, reduce the monthly recurring costs, and provide independent operations between Tokyo and Oakland Center (ZOA) and Anchorage Center (ZAN).

2-19.2.3.3 Telecommunications Strategy

The FAA presently routes AFTN traffic through a 1.2 kbps data circuit to the NADIN MSN system and voice through two separate circuits to ZOA and ZAN. The first upgrade involves the installation of a 56Kbps circuit between Tokyo and the Oakland Center, voice/data multiplexer equipment, and AFTN X.25 application software. The operational circuit will carry three voice channels, one 9.6Kbps AFTN data channel, and one 9.6Kbps Oceanic AIDC data channel.

The second upgrade involves the installation of a 64 kbps circuit between the Oakland ARTCC and Tokyo to accommodate Private Selective Signaling (PSS-1) QSig digital voice protocol. The digital system will convert the analog-based voice communications to digital communications, allow additional voice transmission to the Asia/Pacific region, and establish a ground-to-ground network that will accommodate ATN.

2-19.2.3.4 Acquisition and Costs

The 56Kbps circuit between the Oakland and Tokyo became operational in November 1997 using leased terminal equipment and transmission media. The current schedules are summarized in Table 2-19-3 and Table 2-19-4.

Table 2-19-3. 56Kbps US/Japan Telecommunications Project Interface Implementation Schedule

Interface	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
ZAN/Tokyo Voice	1	0	0	0	0	0	0	0
ZOA/Tokyo Voice	1	0	0	0	0	0	0	0
ZOA/Naha Voice	1	0	0	0	0	0	0	0
Data Channels	2	0	0	0	0	0	0	0

Note: Circuit carries three voice and two data channels

Table 2-19-4. 64Kbps US/Japan Telecommunications Project Interface Implementation Schedule

Interface	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
ZAN/Tokyo Voice	1	0	0	0	0	0	0	0
ZOA/Tokyo Voice	1	0	0	0	0	0	0	0
ZOA/Naha Voice	1	0	0	0	0	0	0	0
Data Channels	2	1	0	0	0	0	0	0

Note: Circuit carries three voice and three data channels

A summary of the leased service costs for the United States/Japan Project is summarized in Table 2-19-7.

2-19.2.4 AFTN To X.25 Upgrade Project

2-19.2.4.1 Overview

The Aeronautical Fixed Telecommunications Network (AFTN) is used by international air traffic specialists to exchange weather messages, Notices to Airmen (NOTAM), and aircraft movement information as defined in Annex 10 to the Convention on International Air Transportation. This project will replace existing slow-speed, asynchronous communications with a more reliable state-of-the-art synchronous communications service to effect a more efficient transfer of aviation data.

The FAA presently routes AFTN traffic through the NADIN MSN system. It is composed of tributary and main routing stations and their connections with primary and alternate routing determined by static routing tables.

2-19.2.4.2 Purpose of the AFTN To X.25 Upgrade Project

The purpose of the AFTN to X.25 upgrade project is to improve the existing AFTN communications infrastructure, standardize the NADIN operation by using one common interface communications protocol for all international users, and replace all Speech Plus circuits and equipment. Subsequently, this project will facilitate the development of a ground-to-ground Aeronautical Telecommunications Network (ATN) digital network in accordance with ICAO ATN Panel Standards and Recommended Practices. AFTN upgrades are in accordance with bi-lateral agreements between the foreign communications center and the FAA.

2-19.2.4.3 Acquisition and Cost

The upgrade involves the replacement of terminal equipment at the user end and installation of AFTN X.25 application software as required by the GOSIP Conformance Tested Product Register and the AFTN/X.25 Interface Control Document (ICD. To eliminate the requirement for international circuits and to replace antiquated technology, the FAA proposes to use voice/data multiplexing equipment at locations having multiple voice and data circuits or locations where voice communications are carried by Speech Plus equipment. (Note: The FAA proposed the use of voice/data multiplexing technology for the US/Japan AFTN and the US/Portugal AFTN circuit upgrades.)

The number of international AFTN circuits scheduled for upgrade to X.25 protocol and the number of circuits on which the Speech Plus equipment is scheduled for removal are identified in Table 2-19-5. A list of these circuits is shown in Table 2-19-6.

Table 2-19-5. AFTN Circuit Upgrade Implementation Schedule

	Prior Yr.	FY00	FY01	FY02	FY03	FY04	FY05	FY06
AFTN	28	1	1	0	0	0	0	0
Speech Plus Equip	4	0	0	0	0	0	0	0

All costs for the AFTN to X.25 Upgrade Project are borne by the United States. A summary of the cost estimate is provided in Table 2-19-7.

Table 2-19-6. AFTN/Speech Plus Circuit Listing

Origination/Termination Point	Network	Remarks
SLC NADIN to NADI, Fiji ACC	AFTN	Operational 1/97
Miami ARTCC to Santo Domingo ACC	AFTN	Operational 3/97 (will be part of MEVA)
Oakland ARTCC to Tokyo ACC	AFTN	Operational 9/97
Miami ARTCC to Haiti ACC	AFTN	Operational 9/97 on MEVA
Honolulu CERAP to Majuro Micronesia	AFTN	Operational 9/97
Honolulu CERAP to Pohnpie Is. Micronesia	AFTN	Operational 9/97
Honolulu CERAP to Palau Micronesia	AFTN	Operational 9/97
Miami ARTCC to Lima ACC	AFTN	Operational 9/97
Miami ARTCC to Turks&Caicos	AFTN	Operational 10/97
Jamaica/Panama/Tegucigalpa	AFTN	Operational 11/98 - Possibly MEVA
NY ARTCC to Panama CERAP	AFTN	Operational 10/97 - Possibly MEVA
NY ARTCC to Bermuda ACC	AFTN	Operational 10/97
NY ARTCC to Santa Maria ACC	AFTN	Operational 12/97
NY ARTCC to Santa Maria ACC	AFTN	Operational 12/97
San Juan CERAP to Caracas ACC	AFTN	Operational 9/98
NY ARTCC to Trinidad ACC	AFTN	Operational 12/97 - Possibly MEVA
Ft Worth ARTCC to Mexico City ACC	AFTN	Operational 7/98
SLC NADIN to Sidney ACC	AFTN	Operational 9/98
Chicago ARTCC to Tonontin Airport (Honduras)	AFTN	Operational TBD
Miami ARTCC to Cuba ACC	AFTN	Operational 11/98 - MEVA
Miami ARTCC to Nassua ACC	AFTN	Operational 11/98
Miami ARTCC to Jamaica (Aerotel)	AFTN	Operational 11/98 - MEVA
San Juan CERAP to Curaco ACC	AFTN	Operational 6/98 on MEVA
Oakland ARTCC to Guam-Saipan AFB CERAP	AFTN	Operational 11/98
Atlanta to Brazil	AFTN	Operational 12/98
San Juan to St. Maarten	AFTN	Operational 12/98
WFSI DP I0239 AVR	Speech Plus	Voice from SJ to Santo Domingo. Speech Plus equipment should have been removed
WFSI DP L8290	Speech Plus	Voice portion on MEVA. Speech Plus should have been removed
WFSI DP L9188	Speech Plus	Still Speech Plus. Will become part of ECAR network
WFSI DP L1183 AVR	Speech Plus	San Juan St. Maarten to Caracas. Will become part of ECAR
WFSI DP L8460	Speech Plus	AFTN provided by L9188. Can be removed?
WFSI L8461	Multidrop Voice to all islands	Is this function still required? Could be removed?
WUII DP SJ001	Speech Plus	Still Speech Plus. Combine voice/AFTN with mux equipment

2-19.2.5 MEJORAS al ENLACE de VOZ del ATS (MEVA)

2-19.2.5.1 Overview

The MEVA program will provide modern voice and data circuit connectivity for Air Traffic Control communications between the United States and ICAO member countries of the Caribbean and Latin America Regions. (Note: The Spanish name of the program "Mejoras al Enlace de Voz del ATS" translates as Improvements to the Voice Network of the ATS.) Currently, 16 ICAO member countries have joined the MEVA program or expressed an interest in acquiring MEVA services. It is anticipated that interest and the number of MEVA participants will continue to rise as the capability is implemented.

2-19.2.5.2 Purpose

The purpose of the MEVA program is to improve air traffic control communications, thereby increasing the number of aircraft that can safely use the airspace of and among the participating members. Air traffic operations in the region have increased significantly, frequently greater than that over the Atlantic, and from an air traffic control operations perspective, have reached the saturation point.

MEVA will use point-to-point and demand assigned multiple access voice and data circuits to support FAA communications in the region, including AFTN. The system architecture includes the use of Very Small Antenna Terminal (VSAT) technology system, centered on a large central hub earth station antenna at the international gateway near Miami, Florida. A switched T-1 leased fiber optic channel (with a diverse/redundant route) provides the Miami ARTCC access to the MEVA network. Figure 2-19-1 contains an outline of the overall topology.

2-19.2.5.3 Network Architecture

The network architecture includes Demand Assigned Multiple Access (DAMA); Permanently Assigned Multiple Access (PAMA), as well as voice and data compression technologies. Most DAMA circuits and all PAMA circuits allow communication between air traffic controllers in any country within the network, simply by pressing a speed dial (AutoDial) key or button on a telephone at the controllers position.

All aircraft operating under "Instrument Flight Rules" must obtain "clearances" from air traffic controllers responsible for the airspace in which the aircraft operate. The voice calls placed by the controllers are used to provide these "clearances" (or refuse or change them) and to pass other types of messages.

The network architecture allows for 100% expansion at of network nodes by adding additional channel cards or modems after coordinating with the Network Management, Operations Control Facilities. This satisfies the need for the future addition of circuits between air traffic control facilities. The network is software driven; most network changes completed in a matter of seconds by technicians using software.

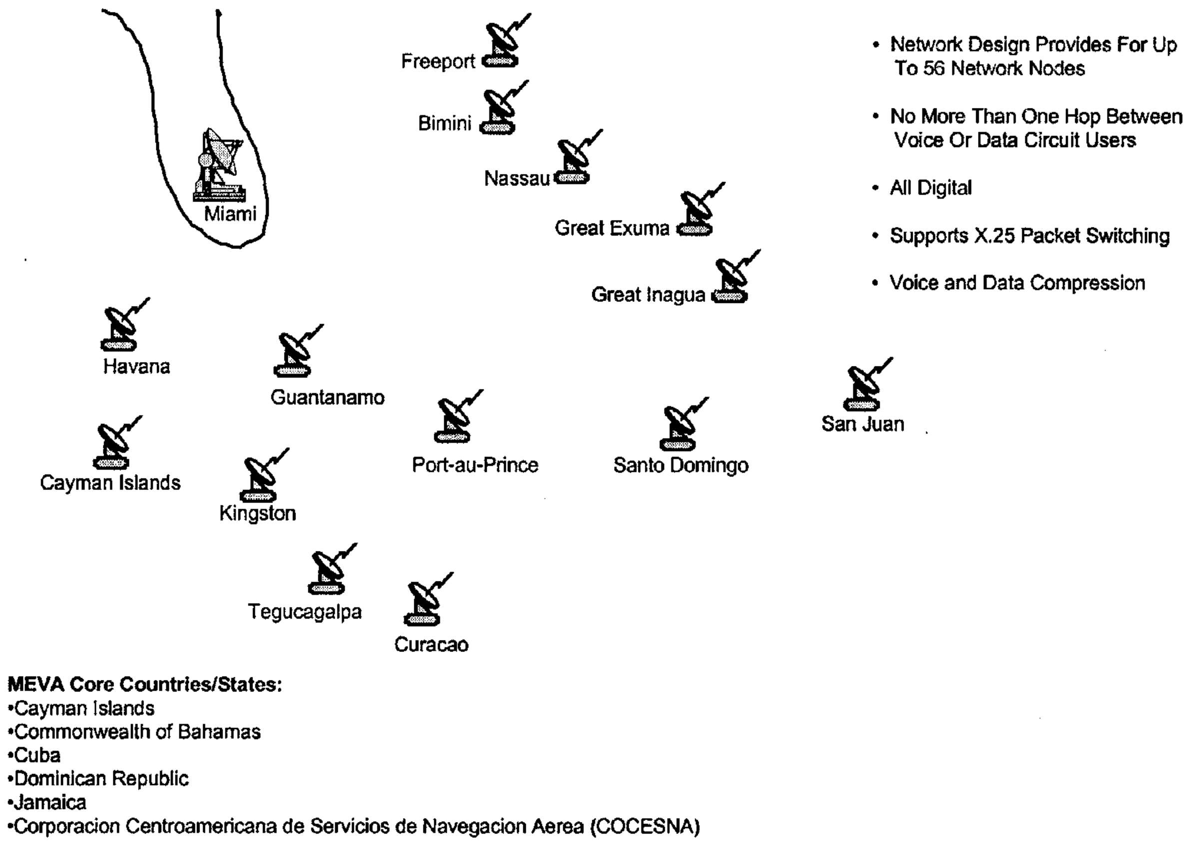


Figure 2-19-1. MEVA Primary Area of Interest

2-19.2.5.4 Network Management and Control

The Network Management, Operations and Control Facility (NMO&C) is a leased service provided by Satellite Communication Systems, Inc., which avoids the tremendously high cost of establishing and maintaining a separate facility. The NMO&C is located near Miami (Opa-Locka) and allows point-to-point voice and data circuits to be set up and taken down. It also provides complete network analysis on a real time basis so that the facility technicians often know about problems before users and can advise the users accordingly. This facility maintains the dial numbering plan and network connectivity data.

2-19.2.5.5 Acquisition and Cost

Costs for the Mejoras al Enlace de Voz del ATS (MEVA) are borne by the participating ICAO countries. The advanced technologies keep bandwidth management cost down and allow Satellite Communication Systems, Inc. to bill each participating country for its use of the bandwidth. For funding dedicated circuits (PAMA), the two users of the circuit each pay half of the cost. MEVA also contains switched services (DAMA), in which case the DAMA software provides a method for maintaining circuit usage statistics, enabling the vendor to charge for actual circuit usage. Satellite Communication Systems, Inc. bills each participating country directly. The DAMA service is a leased service, provided and maintained by the vendor, which avoids expenditure for hardware, software, and technical training. A summary of the implementation and recurring cost estimates, by fiscal year for the U.S. is provided in Table 2-19-7.

2-19.2.6 EAST CARIBBEAN (ECAR) DIGITAL NETWORK PROGRAM

2-19.2.6.1 Overview

The United States (US) and the Eastern Caribbean (ECAR) states, under the auspices of the International Civil Aviation Organization (ICAO), cooperate in the control of air traffic in the ECAR region. In order to provide modern voice and data circuit connectivity for FAA Air Traffic Control communications, the 15 ECAR member states have collectively embarked on a restructuring of the Aeronautical Fixed Service (AFS) via the ECAR Restructured Digital AFS Network developed by the Intercaribbean Aeronautical Communications LTD (IACL). The IACL system uses N.E.T. equipment that utilizes Integrated Services Digital Network (ISDN) technology not compatible with telecommunications systems currently used by the FAA.

2-19.2.6.2 Purpose

This project allows the FAA to develop and deploy an interface to accommodate the ISDN technology being implemented within the IACL network system design, while simultaneously improving FAA communications capabilities with the ECAR region. Testing the proposed interface at the William J. Hughes Technical Center (in accordance with an approved test plan) will use equipment that replicates the field hardware and operational conditions. The approved interface is to be located at the San Juan, Puerto Rico CERAP.

2-19.2.6.3 Interface Architecture

The Integrated Communications Switching System (ICSS) at the San Juan CERAP system must interface with the N.E.T. ISDN equipment at two major nodes of the ECAR Restructured Digital AFS network. The proposed FAA interface consists of a digital PABX that will translate the switched analog voice requirements of the ICSS, direct speech circuits and data circuits. The voice circuits will employ compression technology, and the data circuits will employ X.25. Making the FAA node identical to those specified by IACL, using common equipment provided by a single vendor simplified system maintenance and troubleshooting, which is of extreme importance for the safety of flight. The basic architecture shall provide an availability level of at least 99.7 percent over the last 12-month period that satisfies the requirement for current and expected telecommunications standards for air traffic control. Additionally, since the network is software driven, most network changes completed in a matter of seconds by technicians using software.

2-19.2.6.4 Schedule

Major milestones for the implementation of the ECAR interface design include:

- Installation and Acceptance in San Juan – TBD.

2-19.2.6.5 Acquisition and Cost

All costs for the ECAR Digital Network Implementation Project are borne by the participating ICAO members.

2-19.2.7 SUPPORT PSS-1/QSIG PROTOCOL TRIALS WITH EUROCONTROL

2-19.2.7.1 Overview

The United States (US) is collaborating with NAV Canada and Eurocontrol to establish guidelines for implementing a standardized Private Selective Signaling (PSS1) digital voice telecommunications network. The guidelines, once approved by the International Civil Aviation Organization (ICAO), will be submitted to the Air Navigation Commission (ANC) as Voice Telecommunications Network (VTN) Standards and Recommended Practices (SARPs). These SARPs will be used by ICAO member states worldwide to either implement or interface to digital voice networks.

2-19.2.7.2 Purpose

The purpose of this program is to establish a VTN Task Force consisting of FAA and International organizations that will collectively develop a standardized ground-to-ground digital voice telecommunications network infrastructure and transition guideline material. AOP-600 will support the activities of the Task Force, which consist of the following objectives:

- Develop a draft Voice Communications System (VCS) Technical Provision Document.
- Develop draft QSig SARPs.
- Develop a draft Transition Guideline Manual.
- Develop a draft generic Interface Control Document.
- Conduct PSS1 operational trials with Eurocontrol.

2-19.2.7.3 Telecommunications Strategy

The FAA currently uses analog voice switching technology for communications between ATS centers that requires one circuit for each voice connection. Digital technology provides improvements in voice quality and supports multiple communications channels within one wide bandwidth circuit. Using voice/data multiplexers and voice compression algorithms, one 64Kbps digital circuit can support a minimum of two ATS speech channels, one data channel, and one signaling channel. This reduces the circuit requirement between two ATS locations with an associated reduction in circuit cost.

2-19.2.7.4 Acquisition and Cost

The acquisition of equipment, installation, acceptance test, and operational trials occurred in 1999. A summary of the cost estimate for this effort is provided in Table 2-19-7.

2-19.2.8 Aeronautical Telecommunications Network (ATN) Implementation

2-19.2.8.1 Overview

The Aeronautical Telecommunications Network (ATN) is an evolving global data Internet. The working infrastructure developed by ICAO for this purpose is ATN. The ATN will be comprised of interconnecting computers with gateways or routers via real sub-networks. This allows the construction of a homogeneous virtual data network in an environment of administrative and technical diversity. Given the desire to interconnect an evolving and ever-wider variety of aircraft and ground-based computers to accomplish Air Traffic Management, it is clear the civil aviation community needs a global data Internet.

2-19.2.8.2 Purpose

The ATN design allows communications services among different user groups, i.e. Air Traffic Services (ATS), Aeronautical Operational Control, (AOC), Aeronautical Administrative Communications (AAC) and Aeronautical Passenger Communications (APC). The design provides for the incorporation of different air-ground sub-networks and different ground-ground sub-networks (e.g. AFS, AMCS), into a unified data transfer service. These two aspects are the basis for interoperability of the ATN and will provide a reliable data transfer service for all users. The design is such that new user communications services can be introduced in an evolutionary manner.

2-19.2.8.3 Telecommunications Strategy

The Replacement plan will include upgrading the AFTN Switching Centers in Atlanta and Salt Lake City. The ATN Fixed Service connectivity will include:

- Australia
- Canada
- Fiji
- Portugal
- The CAR/SAM Regions
- MEVA Sites

The major components of the network include the Automatic Message Handling System (AMHS) Gateway, Automatic Integrated Data Communications (AIDC) and ATN routers.

2-19.2.8.4 Telecommunications Costs

The acquisition of equipment, installation, acceptance testing and operational trials is tentatively scheduled for FY00. A summary of the cost estimates for the USITS program is in Table 2-19-7.

Table 2-19-7. Cost Summary - USITS

CIP None — All costs in 000's	Unit Cost	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
1. Alaska/Russia Far East Program									
Cost Profile: Leased Costs for terminal equipment and satellite links.									
Non-Recurring Costs									
Channels Added			0	0	0	0	0	0	0
Total Channels		2	2	2	2	2	2	2	2
Non-Recurring Costs									
F&E Costs			$0	$0	$0	$0	$0	$0	$0
OPS Costs			$0	$0	$0	$0	$0	$0	$0
Recurring Costs									
F&E Costs			$0	$0	$0	$0	$0	$0	$0
OPS Costs			$840	$840	$840	$840	$840	$840	$840
2. Portugal/New York/Gander Project									
Cost Profile: Leased costs for terminal equipment/satellite links for four voice and two data channels									
Non-Recurring Costs									
Channels Added			0	0	0	0	0	0	0
Total Channels		1	1	1	1	1	1	1	1
Non-Recurring Costs									
F&E Costs			$0	$0	$0	$0	$0	$0	$0
OPS Costs			$0	$0	$0	$0	$0	$0	$0
Recurring Costs									
F&E Costs			$0	$0	$0	$0	$0	$0	$0
OPS Costs			$100	$100	$100	$100	$100	$100	$100
3. United States/Japan Upgrade Project									
Cost Profile: Leased costs for terminal equipment/satellite links for three voice and three data channels									
Non-Recurring Costs									
Channels Added			0	0	0	0	0	0	0
Total Channels		2	2	2	2	2	2	2	2
Non-Recurring Costs									
F&E Costs			$0	$0	$0	$0	$0	$0	$0
OPS Costs			$0	$0	$0	$0	$0	$0	$0
Recurring Costs									
F&E Costs			$0	$0	$0	$0	$0	$0	$0
OPS Costs			$40	$40	$40	$40	$40	$40	$40
4. AFTN to X.25 Upgrade Project									
Cost Profile: Leased costs for upgraded X.25 capabilities.									
Non-Recurring Costs									
Channels Added			1	1	0	0	0	0	0
Total Channels		23	27	28	28	28	28	28	28
Non-Recurring Costs									
F&E Costs			$0	$0	$0	$0	$0	$0	$0
OPS Costs			$50	$50	$0	$0	$0	$0	$0
Recurring Costs									
F&E Costs			$0	$0	$0	$0	$0	$0	$0
OPS Costs			$93	$96	$96	$96	$96	$96	$96

Table 2-19-7. Cost Summary - USITS (Concluded)

CIP None	All costs in 000's	Unit Cost	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
5. Mejoras al Enlace de Voz del ATS (MEVA)										
Cost Profile: Leased costs for satellite terminals and links.										
Non-Recurring Costs										
	F&E Costs			$0	$0	$0	$0	$0	$0	$0
	OPS Costs			$0	$0	$0	$0	$0	$0	$0
Recurring Costs										
	F&E Costs			$0	$0	$0	$0	$0	$0	$0
	OPS Costs			$1.488	$1.846	$1.863	$1.863	$1.863	$1.863	$1.863
6. Digital Voice Telecommunications (PSS1/Qsig) Project										
Cost Profile: Acquisition of equipment, installation, acceptance testing, and operational trials.										
Non-Recurring Costs										
	F&E Costs			$0	$0	$0	$0	$0	$0	$0
	OPS Costs			$100	$0	$0	$0	$0	$0	$0
Recurring Costs										
	F&E Costs			$0	$0	$0	$0	$0	$0	$0
	OPS Costs			$0	$0	$0	$0	$0	$0	$0
7. Ground-Ground Aeronautical Telecommunications Network Project										
Cost Profile: Acquisition of equipment, installation, acceptance testing, and operational trials.										
Non-Recurring Costs										
	F&E Costs			$0	$0	$0	$0	$0	$0	$0
	OPS Costs			$600	$500	$500	$500	$0	$0	$0
Recurring Costs										
	F&E Costs			$0	$0	$0	$0	$0	$0	$0
	OPS Costs			$0	$100	$100	$100	$0	$0	$0
SUMMARY										
F&E Totals	Non-recurring			$0	$0	$0	$0	$0	$0	$0
	Recurring			$0	$0	$0	$0	$0	$0	$0
	F&E Total			**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Totals	Non-recurring			$800	$550	$500	$500	$0	$0	$0
	Recurring			$2.561	$3.022	$3.039	$3.039	$2.939	$2.939	$2.939
	OPS Total			**$3.361**	**$3.572**	**$3.539**	**$3.539**	**$2.939**	**$2.939**	**$2.939**

CHAPTER 2-20 - SUMMARY SHEET

VOICE TELECOMMUNICATIONS SWITCH (VTS)

Program/Project Identifiers:

Project Number(s):	BIIP - 991025
Related Program(s):	
New/Replacement/Upgrade?	Upgrade
Responsible Organization:	AOP-500
Program Mgr./Project Lead:	Doug Kay, AOP-500, (202) 493-5955
Fuchsia Book POC:	Bobbi Jones, (843) 571-3853

Assigned Codes:

PDC(s):	KT
PDC Description:	Voice Telecommunications System (VTS)
Service Code:	ADSY

Cost Estimates *:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$4,152	$580	$0	$355	$0	$375
OPS Recurring	$0	$931	$834	$853	$872	$892	$913
Total OPS	**$0**	**$5,084**	**$1,414**	**$853**	**$1,227**	**$892**	**$1,288**

*Cost data provided by the Program Office

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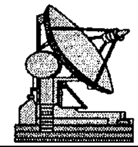
CIP Category:
Communications



2-20.0 TERMINAL VOICE SWITCH REPLACEMENT PROGRAM

2-20.1 PROGRAM OVERVIEW

2-20.1.1 Purpose of the Program/System

The Voice Telecommunication System (VTS) provides Private Branch Exchange (PBX) and Conference Bridge services at many FAA locations. These locations include a majority of the FAA Regional Offices, Air Route Traffic Control Center Operations (ARTCCs) selected large Terminal Radar Approach Control (TRACON) and other identified FAA locations. The VTS operation at the Herndon Va. Air Traffic Control System Control Center (ATCSCC) is discussed in a separate chapter addressing unique requirements at that location. In recent years, some of the original VTS sites have dropped out of the VTS Program and been replaced by others. By the end of FY2000, the VTS PBX's and/or the Allegro Conference Bridge systems will serve 33 locations. The VTS systems are either Meridian I Option 61, 71 or 81 models with the difference primarily in the maximum system capacity size. The operations, features, and hardware of all systems are identical and are driven by the software release residing on the PBX. The PBX is generally served via direct T1 connectivity to either the FTS or PSN network (normally a Bell Operating Company Service). No additional systems are planned for the last contract year ending September 2001. Recent activity includes the new Northern California TRACON in Sacramento, California, the new Atlanta Large TRACON in Peachtree, GA, and the relocation/upgrade of the Honolulu CERAP in Hawaii. Decisions are expected by June 2001 as to the ongoing support and disposition of the VTS contract.

2-20.1.2 References

There are no known Capital Investment Plan Project/Program numbers associated with the VTS. The VTS Contract DTFA01-91-D-00041 contain all Functional Specifications (FAA-P-2845), System Requirement Documents, System Specifications, Plans/Reports and Equipment configurations and descriptions for the various VTS systems.

2-20.2 SYSTEM DESCRIPTION

2-20.2.1 Program/System Components

The VTS was designed in 1991 to replace the administrative telecommunication needs at selected FAA locations, however it has seen modifications in order to meet backup operational requirements and remain competitive with other government services. Although designed to be an administrative PBX in nature, the VTS and the Conference Bridge systems have assumed a larger role in the backup to the National Airspace System (NAS) in provisioning for the Emergency Voice Telecommunications System (EVCS) and command and control functions over the conference bridge. Further VTS support of the NAS is provided by way of backup service to the Operational Voice Switching and Control System (VSCS). By end of FY2000 the project to consolidate the various FAA Maintenance Control Centers (MCCs) into three new strategically located Operational Control Centers (OCCs) will be well underway. The VTS systems at the Southern California TRACON (SCT) and the Atlanta ARTCC (ZTL) will be upgraded and expanded to accommodate the new operational centers. SCT will house the Pacific Operations Control Center (POCC) and the Atlantic Operations Control Center (AOCC) will be in Atlanta. The Mid-States Operations Control Center (MOCC) is located in Kansas City, which is not a VTS supported location. The OCCs will operate under a Call Center environment utilizing state-of-the-art software and communications applications. The AOCC, MOCC and POCC operate in support of the existing National Operation Control Center (NOCC) located at the Herndon, VA ATCSCC. Other programs have provided funds for the implementation/installation of the OCC project. The ongoing support will likely fall under the regional telecommunications budgets upon commissioning on October 1, 2000. This is yet another example of NAS support provided by the VTS. Details of the OCC operations are included in a separate chapter.

2-20.2.2 Principal Components

The VTS Program Manager (AOP-400) is responsible for the VTS system. The following paragraphs provide further detail in subsystems associated within the VTS. The overall functional system in which the VTS operates is depicted in the following block diagram. Remote monitoring by the service and maintenance provider guarantees the operation and prompt restoration during network interruptions.

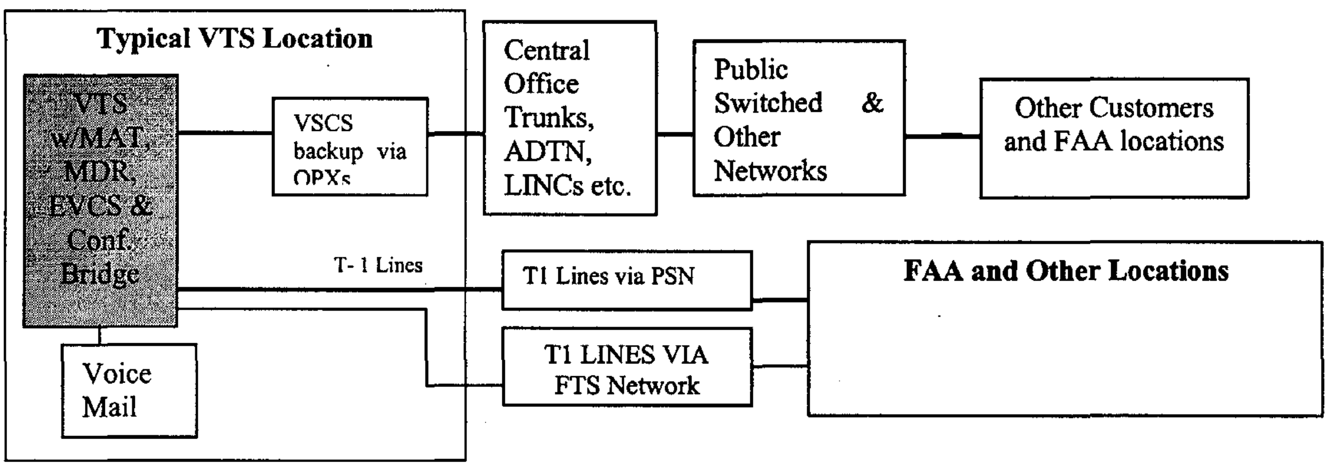


Figure 2-20-1. Voice Telecommunications Switch Block Diagram

The current maintenance and service provider is DynCorp Information Systems (previously known as GTE Information Systems) in Chantilly, VA. DynCorp maintains a testbed of all equipment serviced through out the VTS contract boundaries. The VTS telephone and conference bridge equipment, including all consoles, analog and digital telephone sets, is provided and maintained by DynCorp under annual maintenance agreements, renewable each fiscal year (October 1).

The VTS system components are described in the following paragraphs. Although the majority of VTS locations are leased-to-ownership services from the maintenance provider, there are some regions that have ownership of some PBX systems and associated equipment. All leased systems will become government property by contract term (September 30, 2001). A detailed list of FAA VTS locations is contained in the table further down in this section.

- Meridian 1, Option 61, 71, 81, 61C & 81C PBX systems – COTS, manufactured by Northern Telecom. Meridian Software, Release 21 & 24 and Northern Telecom MAT Software.
- Call Accounting System – COTS, manufactured by MDR Telemarketing Company Inc.
- Allegro Conference Bridge System – COTS, manufactured by ConferTech Systems.
- Interface to a government furnished (GFE) voice mail system.
- Emergency Voice Communications System (EVCS)

The Meridian SL1 PBX can accommodate both analog and digital telephone sets, tie lines/T1s/Central Office trunk terminations and is equipped to handle ISDN. The PBX utilizes least cost routing, with FTS the first choice out and managed via a MAT terminal with remote monitoring and diagnostics by DynCorp. The PBX configurations range from 300 to 1500 and are expandable. The majority of the PBX systems have direct FTS or PSN T1 terminations. The T1s provide the DID/DOD access, EVCS, DSN, tie line services and other connections to the telcom population. There are few direct Central Office trunks terminating in the VTS. The Allegro Conference Bridge system is supported by the VTS.

The MDR Call Accounting System provides call record detail as designed by the system administrator from the MDR Administrative Terminal in conjunction with the PBX MAT function. All equipment and software is COTS and is the most recent release.

The Allegro Conference Bridge systems range in size from 48 ports to 240 ports with the average being 72 ports. The Allegro systems are located in a majority of the FAA Regional Offices and other selected locations to provide administrative backup and Command and Control services in support of the NAS. System configurations and locations are detailed later in this chapter. Efforts have been ongoing to expand some of these systems up to 144 ports. As these systems are adjuncts to the VTS PBX, there are coordinated efforts to increase system configurations and/or network services connectivity to lesson the impact increased bridge traffic could have on the PBX system user population.

The voice mail systems are of various manufacturers but are supported by the VTS. Voice mail was not permitted under the VTS contract although regional agreements have been made with DynCorp to support these government owned systems under annual maintenance contracts.

The EVCS was installed under a presidential mandate as a result of a major airline crash and the lack of dedicated emergency telecommunications required for such events. The original EVCS was an internal FAA network of dedicated point to point channels, five hub locations, and a series of private line services known as the Electronic Tandem Network (ETN). EVCS provides support communications between FAA locations associated with the transport of air carriers and command and control functions of other major 'events'. The ETN network was changed in 1999 to utilization of more reliable FTS services and to reduce costs. EVCS makes use of dedicated channels within an FTS2000 (or FTS2001) T1 "pipe" to provide "dedicated outgoing service channels" for emergency outgoing call traffic management. The FTS network provides a more robust backbone for EVCS than previously configured, is less vulnerable to network failures, and provides diversified routes for traffic flow. In rare instances, a dedicated FTS central office telephone line, bypassing the PBX provides EVCS services. These exceptions will be addressed as upgraded FTS services are made available. All VTS locations have EVCS connectivity.

Table 2-20-1 provides the current list of VTS Program locations.

Table 2-20-1 - VTS Equipped Sites

Location / LID	Meridian PBX with MAT (option #)	Allegro Conference Bridge System	MDR Call Accounting System
LBK/RTS	61	Yes	Yes
AMI/OEX	No	Yes	No
AAL RO	No	Yes	No
RGC/AGL RO	71 (81C proposed)	Yes	Yes
RWA HQ - DC	No	Yes	No
RBN/ANE RO	61	Yes	Yes
RTA/ASO RO	71 (81C proposed)	Yes	Yes
ZTL ARTCC	61C (AOCC location)	Yes	Yes
A80 TRACON	81C	No	Yes
FTW/ASW RO	71 (81C proposed)	Yes	Yes
ZLC ARTCC	61	Yes	Yes
ZDV ARTCC	61	Yes	Yes
ANM RO	No	Yes	No
AWP RO	81 (81C proposed)	Yes	Yes
NCT	81C	No	Yes
ZHN ARTCC	61 (61C planned)	Planned	Yes
ZSE ARTCC	61	No	Yes
DVX TRACO	71 (81C proposed)	No	Yes
ZMA ARTCC	61	No	Yes
ZAU ARTCC	61	No	Yes
ZJX ARTCC	61	No	Yes
ZHU ARTCC	61	No	Yes
XDC (ATCSCC)	61 (61C proposed)	Yes	Yes
ZMP ARTCC	61	No	Yes
SCT TRACON	81C (POCC location)	No	Yes
ELG TRACON	61	No	Yes
ORD TOWER	61	No	Yes
ZOB ARTCC	61	No	Yes
ZME ARTCC	61	No	Yes
ZSU CERAP	61	No	Yes
ZOA ARTCC	61	No	yes
ZAN ARTCC	61	No	Yes

2-20.2.3 Functional Component Interface Requirements

There are a variety of communications networks that provide communications to the VTS. Dial connections are provided via the FTS and Public Network.

Meridian trunking interfaces are either analog or digital. The Digital T1 implements the DS1 physical and electrical level using the North American D3/D4 format and Extended Super Frame (ESF). The physical digital interface is 4 Wire, full duplex, twisted pair shielded, and 100 ohms nominal. Analog interface is available through Meridian 1 NT8D15 E&M trunk cards, 600 ohms (E&M, wink start, DTMF). ISDN PRI is identical to the DS1 interface.

Network interfaces via direct digital T1 are used to implement all trunk types (DID/DOD) and to interface to all required networks such as FTS. AUTOVON/DSN and EVCS will ride established T1 channels to either FTS or the PSN.

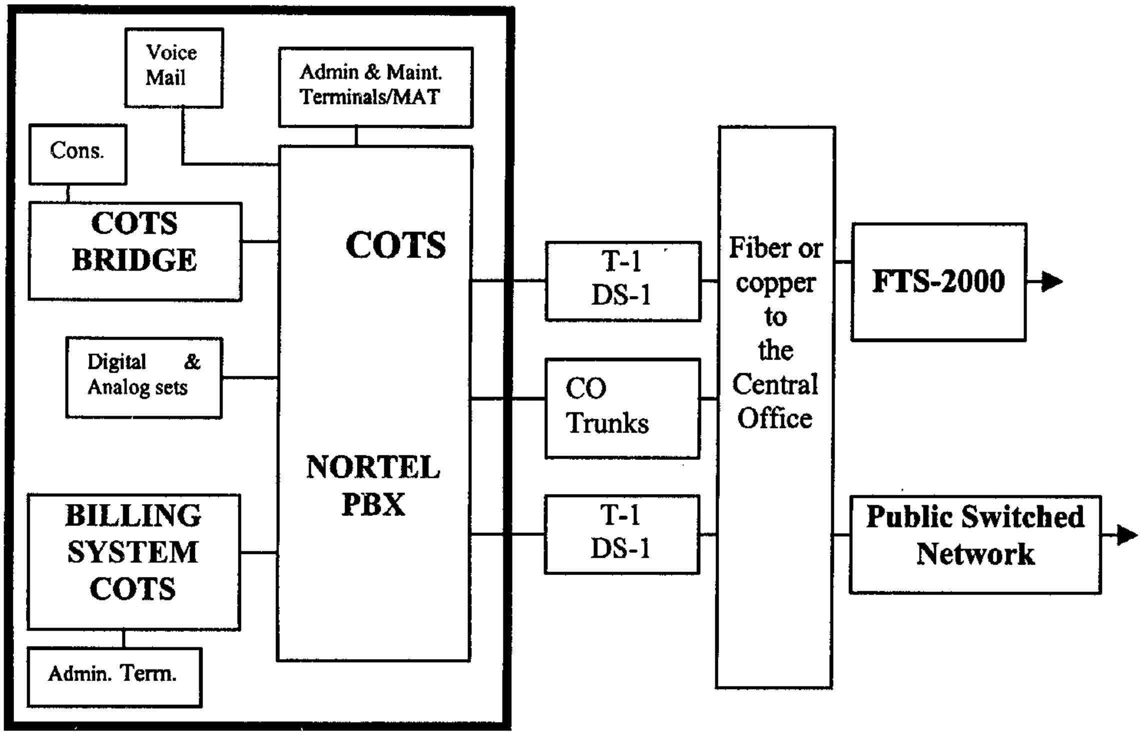


Figure 2-20-2. Voice Telecommunications Interfaces

2-20.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

2-20.3.1 Telecommunications Interfaces

Meridian 1 Interfaces are of the following types: Network Trunking or OPX Station Lines.

The Meridian external trunking interfaces are either analog or digital.

The Digital T1 implements the DS1 physical and electrical level using the North American D3/D4 format and Extended Super Frame (ESF).

a. The physical digital interface is 4 Wire, full duplex, twisted pair shielded
b. The electrical interface impedance is 100 ohms nominal.
c. The signaling interface can be set to meet most signaling types (Duplex 4 wire, Duplex 2 wire, E&M, DTMF, Pulse etc.)

Analog interface is available through Meridian 1 NT8D15 E&M trunk card.

a. The physical analog interface is the E&M trunk cards (25 pr. connectorized)
b. The electrical interface impedance is 600 ohms
c. The signaling interface parameters are E&M, Wink Start, DTMF

2-20.3.1.1 Traffic Characteristics

The traffic characteristics for both the internal VTS and the external lines, which support the VTS, are constant. The recommended ration to local T1 bridge connectivity should have equal network T1 connectivity so as to not impact the balance of the station user population of the VTS. Unlike operational services support to events such as weather or disruptions of NAS resources (e.g. host computers, radar's, etc), the VTS PBX traffic is relatively constant. Since the bridge shares the same network interfaces as the PBX, exceptions could occur during peak traffic loads on the conference during support of unusual events. The maintenance provider conducts traffic studies and recommendations on a quarterly basis.

2-20.3.2 Local Interfaces

DynCorp currently provides and supports all cabling between the equipment room frame, the wire closets, telephone set locations and the conference bridge consoles.

2-20.3.3 Diversity Requirements

2-20.3.3.1 Redundancy and Security

Redundancy: The VTS systems, unlike operational systems, have limited redundant capability. The Option 61, 71 or 81 PBX's are single core systems. The newer 61C and 81C are multi-core and provide some system redundancy. All are provisioned with battery backup.

Security: The security issues involving the VTS will be addressed at some later date under a nationwide security program review. The VTS program has many security procedures in place.

2-20.3.3.2 Diversity

The VTS is served via dial-up connections to the FTS and Public Switched Networks. These dial-up service lines terminate directly into the PBX and provide the Direct Inward (DID) and Direct Outward (DOD) services over dedicated T1 channels. Unlike operational systems, the VTS has single path access to the VTS. With few exceptions, the T1 carry all network access. Regional decisions and funding have dictated the number and types of Central Office lines, separate from the PBX that can be used in the case of T1 failures. The VTS has no connectivity to LINCS, RCL or ADTN as backup services.

2-20.4 ACQUISITION ISSUES

With the exception of contractual maintenance costs, site management fees, or FTS 2001 transition expenses, all VTS identified requests remain unfunded. FY-2001 and beyond requests have been identified and are listed below. VTS funds currently are provided under Operations (OPS) vs. Facility & Engineering (F&E) and are reviewed annually in the VTS Spend Plan document.

The upcoming acquisitions need to include:

- Upgrade of the original VTS PBX's to core systems
  - Will allow for increased T1 services, expanded system operations, current software applications.
  - Redundancy of two core systems not available today

- Platform for state-of-the-art technology, services and applications.
- At a minimum, upgrade the option 71 systems to 81C systems
- Upgrade of the Herndon ATCSCC 61 to a core system is discussed in another chapter.

- Increase of network side T1 services (Central Office side).
  - Meet expected increase in PBX call traffic as the VTS is called upon to further support operations.
  - Provide network services to match anticipated increase in conference bridge size/usage.

- Increase Conference Bridge services to 144 ports at identified locations
  - Will allow the regional locations the flexibility to meet the ever-increasing Conference Bridge usage requirement loads.
  - Provides additional backup to the VSCS other operational services

- Other miscellaneous requirements involved with facility rearrangements/reorganizations, address security/safety issues, and provide for new system users and applications. Increases in services of the VTS are for administrative use, NAS support services, and to supplement the VSCS telephone system. Such identified requirements include the Phonemaster replacement for MAT, Companion campus environment wireless system, additional spare parts, and Severe Weather Approach Plan (Operational SWAP) software. Buyout of the VTS leased equipment in FY2000 will result in additional savings and have been noted.

2-20.4.1 Program Schedule and Status

Table 2-20-2 - VTS Program Schedule and Estimated Costs

Forecast Expense	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
	FY-01 THROUGH FY-06 SHOWN IN THOUSANDS ($000)					
Hardware Costs						
1. Administrative Voice Switch / VTS						
Non-Recurring Program Costs	2,100.80					
Recurring Program Costs	606.40	624.20	643.00	662.20	682.10	702.50
Recurring Regional Costs	3,655.80	3,606.00	3,714.20	3,825.60	3,940.40	4,058.60
2. Other Hardware/Miscellaneous Services						
Non-Recurring Program Costs		2,800.00				
Recurring Regional Costs		87.00				
Other Telecommunications Related Costs						
1. Software Upgrades/Enhancements						
Non-Recurring Program Costs	2,151.60	580.00		355.00		375.00
Recurring Regional Costs		785.00	435.00	1,450.00	435.00	435.00
2. Training Expenses						
Non-Recurring Program Costs						
Non-Recurring Regional Training	200.00	100.00				
3. Contractor Support	200.00	200.00	200.00	200.00	200.00	200.00
4. Program Security Admin. & Validation	125.00	10.00	10.00	10.00	10.00	10.00
TOTAL	**9,039.60**	**8,792.20**	**5,002.20**	**6,502.80**	**5,267.50**	**5,781.10**

Note 1: Estimates above are not based on formally submitted requirement but rather identified upgrades/improvements.

Note 2: Regional Recurring Costs cover partial FTS usage and estimated maintenance. Program recurring costs include assumption that remote maintenance and/or some other HQ support will be ongoing. Program non-recurring costs include such items as Companion, T1 equipment, Spare parts, and lease buyouts. Further details available.

2-20.4.2 Planned Telecommunications Strategies

The VTS contract was signed in 1991 and will expire September 2001. The disposition is to be determined. Some growth is expected in telecommunications requirements for the VTS due to the anticipated NAS support requirements. Those have been identified above in section 2-20.4.1.

Each region is responsible for justification and provisioning of Telecommunication resources (FTS or Central Office trunking increases) and will be looked upon for support in ongoing efforts at the VTS locations.

Until determination is made on the disposition of an ongoing VTS maintenance/support contract after September 2001, the estimated maintenance costs shown above may be used for planning purposes.

2-20.4.3 Telecommunications Costs

Table 2-20-2 provides a summary of the estimated costs based on the quantity of voice switches the program office is authorized to purchase each fiscal year. However, the quantities differ from the delivery schedule figures contained in Table 2-18-2 because of the distinction between the order date (when funds are required) and the actual delivery date. Also, the quantities contained in Table 2-18-2 include DoD as well as FAA funded switches, whereas the quantities in Table 2-18-3 correspond to the number of switches funded exclusively by the FAA.

The recurring costs in Table 2-18-3 represent contract maintenance costs for the installed switches. Since the switches are replacing units that are already in the OPS domain, it is assumed that contract maintenance costs for the new switches will be OPS funded.

No channel costs are identified in the cost summary table because the FAA employs a "hot" cutover approach when bringing the replacement switch on-line. In addition, the replacement of the switch does not change the channel requirements at a site.

Table 2-20-3 - Cost Summary - VTS

CIP # None — All costs in 000's	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
Hardware Costs								
1. Administrative Voice Switch/VTS								
Non-Recurring Program Costs		$0	$2,001	$0	$0	$0	$0	$0
Recurring Program Costs		$0	$606	$624	$643	$662	$682	$703
Recurring Regional Costs		$0	$3,656	$3,606	$3,714	$3,826	$3,940	$4,059
2. Other Hardware/Miscellaneous Services								
Non-Recurring Program Costs		$0	$0	$2,800	$0	$0	$0	$0
Recurring Regional Costs		$0	$0	$87	$0	$0	$0	$0
Other Telecommunications Related Costs								
1. Software Upgrades/Enhancements								
Non-Recurring Program Costs		$0	$2,152	$580	$0	$355	$0	$375
Recurring Regional Costs		$0	$0	$785	$435	$1,450	$435	$435
2. Training Expenses								
Non-Recurring Program Costs		$0	$0	$0	$0	$0	$0	$0
Non-Recurring Regional Costs		$0	$200	$100	$0	$0	$0	$0
3. Contractor Support		$0	$200	$200	$200	$200	$200	$200
4. System Program Administration		$0	$125	$10	$10	$10	$10	$10

SUMMARY (Excluding Regional Costs)

		FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$0	$0	$0	$0	$0	$0	$0
	F&E Total	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Totals	Non-recurring	$0	$4,152	$580	$0	$355	$0	$375
	Recurring	$0	$931	$834	$853	$872	$892	$913
	OPS Total	**$0**	**$5,084**	**$1,414**	**$853**	**$1,227**	**$892**	**$1,288**

Notes:

1. The estimates provided above are not based on formally submitted requirements. Firm requirements will be developed upon disposition of the VTS ongoing contract administration and services. It has not been determined if a new nationwide contract for time/material or fixed price will be negotiated or rather each region allowed to act autonomously.
2. Costs in this chapter for VTS do not include voice costs for T1 usage, Public Switched Access cost, or other network interface monthly or fixed costs. Those are captured under other programs (i.e.: FTS2000/2001) or funded under Regional Telecommunication allocations.

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CHAPTER 3-01 - SUMMARY SHEET

DOD/FAA AIR TRAFFIC CONTROL FACILITY TRANSFER MODERNIZATION (ATCFTM)

Program/Project Identifiers:

Project Number(s):	CIP F-04
Related Program(s):	CIPs A-03, A-04, C-01, C-04, C-06, C-11, C-18, F-01, F-02, M-07, S-02, S-03, W-04,
New/Replacement/Upgrade?	New/Replacement/Upgrade
Responsible Organization:	ANS-400
Program Mgr./Project Lead:	Nancy Hurmence, ANS-400, (202) 267-3903
Fuchsia Book POC:	Nancy Hurmence (202) 267-3903

Assigned Codes:

PDC(s):	Since this program covers multiple facilities and the PDCs are facility dependent, PDCs are not listed
PDC Description:	n/a
Service Code:	n/a

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$4,806	$0	$0	$0	$0	$0	$0
F&E Recurring	$260	$4	$0	$0	$0	$0	$0
Total F&E	**$5,066**	**$4**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$481	$140	$0	$0	$0	$1	$1
OPS Recurring	$2,465	$1,595	$1,678	$1,455	$1,482	$1,511	$1,511
Total OPS	**$2,946**	**$1,735**	**$1,678**	**$1,455**	**$1,482**	**$1,512**	**$1,512**

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CIP Category: Facilities	3-01.0 DOD/FAA AIR TRAFFIC CONTROL FACILITY TRANSFER MODERNIZATION

3-01.1 PROGRAM OVERVIEW

Throughout the United States, selected military Air Traffic Control (ATC) facilities have provided ATC services for civilian and military air traffic. With the downsizing of the Department of Defense (DOD) and base realignment and closure actions, the FAA will assume ATC services for airspace controlled by several military ATC facilities. The closure actions require the evaluation of military airfields for possible civil reuse. The transferring of airspace jurisdiction and the potential reuse of military facilities for civil aviation requires the FAA to equip and upgrade facilities as necessary to assume ATC services.

3-01.1.1 Purpose

The purpose of this program is to transfer identified DOD ATC facilities and services into the FAA NAS, and provide facilities and equipment to facilitate transition of military airfields to civil airports, or realigns airspace previously controlled by the DOD.

3-01.1.2 References

FAA Aviation System Capital Investment Plan, Project F-04, January 1999.

3-01.2 SYSTEM DESCRIPTION

The overall approach for this project is to implement the necessary systems, software, implementation support, and maintenance support to replace existing DOD equipment or assume air traffic services. This project has two key components: base closures and facility transfers.

3-01.2.1 Base Closures

This project will provide necessary facilities and equipment to support known base closure impacts and mitigate impacts from future DOD base closures that provide needed aviation facilities/services. The FAA will provide services formerly provided to the NAS by DOD at bases identified for closure. DOD will provide supply support for facilities and equipment at these bases until they can be replaced by the FAA. This will require engineering resources to plan, design, and implement procurement strategies for a number of equipment types, assemblies, and sub-assemblies at DOD bases that cannot be supported by FAA's training and supply support center.

3-01.2.2 Facility Transfers

FAA will assume the approach control function from selected DOD facilities at areas where the mix of civilian and military traffic is primarily civilian. DOD will provide logistics support for these facilities and equipment until replaced by the FAA. This will require engineering resources to plan, design, and implement procurement strategies for a number of equipment types, assemblies, and sub-assemblies that cannot be supported by the FAA training and logistics centers.

3-01.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

Absorbing these DOD facilities into the FAA hierarchy to sustain the existing NAS infrastructure will result in a corresponding increase in telecommunications requirements related to providing the air traffic control services formerly provided by DOD.

3-01.4 ACQUISITION ISSUES

3-01.4.1 Program Schedule and Status

3-01.4.1.1 Facility Transfer

The Los Angeles Air Route Traffic Control Center absorbed the airspace previously controlled by Vandenberg Air Force Base, California, when the Air Force transferred jurisdiction to the FAA. In May 1999, the Daytona Beach TRACON absorbed the airspace previously controlled by the Patrick Air Force Base, FL.

Patrick AFB Airspace Transfer was successfully completed in June 1999. The military radar antenna rotation speed was found to be incompatible with the FAA ARTS system, causing significant delays in completing the radar/automation integration. Facility support at the Daytona Beach, FL ATCT (the primary control facility) is scheduled for completion by the end of FY 2000. The scheduled support includes replacing the existing TRACON and base building HVAC system and refurbishing a recently acquired National Weather Service Building for relocation of an Airway Facilities office.

Other scheduled transfer is:

Homestead Air Force Reserve Base - June 2000

3-01.4.1.2 Base Closures

The Southern California TRACON and Pacific Desert SMO assumed responsibility for the airspace and navigational aids controlled by El Toro Marine Air Station, California, in July 1999. The Honolulu CERAP and Hawaii-Pacific SMO assumed responsibility for the airspace and navigational aids controlled by the Naval Air Station Barbers Point, Hawaii, in July 1999. As of January 2000, the final scheduled base closure is McClellan Air Force Base (AFB), CA (including Camp Kohler), in October 2000.

FAA will have to secure, upgrade, and, in some cases, relocate some of the assets listed above to ensure critical communications connectivity regardless of the final decision regarding reuse of the installation.

FAA will be required to secure, upgrade, and, in some cases, relocate some military assets associated with base closures to ensure critical communications connectivity regardless of the final decision regarding reuse of the installation.

3-01.4.2 Telecommunications Costs

Table 3-01-1 summarizes the estimated annual telecommunications funding requirements of the ATCFTM program.

The estimates include regional telecommunications requirements for the following facilities: MCAS El Toro, Skaggs Island Naval Facility, NAS Barbers Point, NAS Agana and Patrick AFB (ASO).

Table 3-01-1. Cost Summary - ATCFTM

CIP # F-04	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
Telecommunications Costs									
Cost Profile: Annual Costs as Provided by the Regions and the Program Manager									
Non-recurring Costs									
	F&E Funded Costs		**$4,806**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Funded Costs		**$481**	**$140**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Costs									
	F&E Funded Costs		**$260**	**$4**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Funded Costs		**$2,465**	**$1,595**	**$1,429**	**$1,455**	**$1,482**	**$1,511**	**$1,511**
			SUMMARY						
F&E Totals		Non-recurring	$4,806	$0	$0	$0	$0	$0	$0
		Recurring	$260	$4	$0	$0	$0	$0	$0
		F&E Total	**$5,066**	**$4**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Totals		Non-recurring	$481	$140	$0	$0	$0	$1	$1
		Recurring	$2,465	$1,595	$1,429	$1,455	$1,482	$1,511	$1,511
		OPS Total	**$2,946**	**$1,735**	**$1,429**	**$1,455**	**$1,482**	**$1,512**	**$1,512**

<u>Notes:</u>

1. OPS cost data provided by the ATCFTM Program Office
2. Non-recurring F&E cost provided by the regions (ASO, AGL, and AWP)

CHAPTER 3-02 - SUMMARY SHEET

AIR TRAFFIC CONTROL SYSTEM COMMAND CENTER (ATCSCC)

Program/Project Identifiers:

Project Number(s):	BIIP-982003
Related Program(s):	A-05, A-08, A-10, C-15, M-07, W-04
New/Replacement/Upgrade?	New, Replacement and Upgraded systems will be installed
Responsible Organization:	ATO-200
Program Mgr./Project Lead:	Tim Grovac, ATO-200, (703) 904-4402
Fuchsia Book POC:	Tim Grovac, ATO-200, (703) 904-4402

Assigned Codes:

PDC(s):	IO, IA, IB, IC, IJ, HB, AA, BY, UF, US, VX, MM, UH, BC, MW, VK
PDC Description:	See 1999 Currant Book
Service Code:	ADTN, ADVO, CCCC, CFCS, DMN, HCAP, MISC, MNTC, NOTM, PBRF, SAT

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$773	$830	$15,460	$220	$270	$220	$220
OPS Recurring	$709	$783	$951	$867	$897	$948	$988
Total OPS	**$1,482**	**$1,613**	**$16,411**	**$1,087**	**$1,167**	**$1,168**	**$1,208**

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CIP Category:
Facilities

3-02.0 AIR TRAFFIC CONTROL SYSTEM COMMAND CENTER

3-02.1 AIR TRAFFFIC CONTROL SYSTEM COMMAND CENTER OVERVIEW

The David J. Hurley Air Traffic Control System Command Center (ATCSCC) is the highest authority for National Airspace System (NAS) Command and Control. It provides the national level focal point for monitoring the overall demand of the NAS and assessing the capability of the NAS to meet this demand.

3-02.1.1 Purpose of the Air Traffic Control System Command Center

The ATCSCC, located in Herndon, VA, provides a centralized facility wherein Traffic Management Specialists adjust traffic demands to meet system capacity when phenomena such as adverse weather, equipment outages, runway closures, or other significant events impact on an airport or area. The use of advanced automation tools, along with direct communication with ARTCCs, TRACONs, ATCTs, and airline representatives, allow personnel in the ATCSCC to manage the flow of air traffic on a national as well as a local level.

3-02.1.2 Air Traffic Control System Command Center Description

3-02.1.2.1 Components

The ATCSCC has many components that support the mission of balancing air traffic demand with system capacity. The following are examples:

- Central Flow Control Function (CFCF)
- CFCF- Operational Telephone System (OTS)
- Enhanced Traffic Management System (ETMS)
- Collaborative Decision Making (CDM) prototype
- Central Altitude Reservation Function (CARF)
- Air Traffic Services Cell (ATSC)
- Airport Reservation Office (ARO)
- Computerized Voice Reservation System (CVRS)
- Central Flow Weather Service Unit (CFWSU)
- Ocean Traffic Planning System (OTPS)
- National Maintenance Control Center (NMCC)
- Maintenance Processor Subsystem Executive Node (MPSEN)
- US Notice to Airmen (NOTAM) System ReHost (USNSR)
- Special Use Airspace Management System (SAMS)
- Aviation System Standards Consolidated Scheduling and Tracking Liaison Office (AVN)
- System Support Center (SSC)
- Flight System Management (FSM)
- Airspace Management Systems
    - Air Traffic Operational Network (OPSNET)
    - ATC System Management and Operations Research Lab

  - ATC System Management Training Facility
  - Administrative Staff Offices
  - FAA Telecommunications Satellite (FAATSAT)
  - Bandwidth Manager (BWM)
- Cable distribution system (EDS)
- Evans Consoles (Operations floor)

The ATCSCC is also receiving or is scheduled to receive new components that will provide improved mission support. The following are examples:

- Enhanced Traffic Management Computer Complex (ETMCC)
- National Operation Control Center (NOCC)
- US NOTAM System ReHost "Web Access for public aviation customers."
- Weather and Radar Processor (WARP)
- FAA Bulk Weather Telecommunications Gateway (FBWTG)
- National Airspace Data Interchange Network Packet Switched Network (NADIN PSN) Node

3-02.1.3 OPERATIONAL TELEPHONE SYSTEM (OTS) PROGRAM/SYSTEM OVERVIEW

The David J. Hurley Air Traffic Control System Command Center (ATCSCC) is the highest authority for the National Airspace System (NAS) Command and Control. The Operational Telephone System (OTS) provides the operational voice communications for Air Traffic and Contingency functions at the ATCSCC.

3-02.1.3.1 Purpose of Program/System

The Operational Telephone System (OTS) began operation at the ATCSCC in Herndon VA in the spring of 1994, concurrent with the opening of the ATCSCC. The OTS provides sophisticated conferencing capabilities for the purpose of managing Air Traffic flow in cooperation with Air Traffic Control Towers (ATCT), Terminal Radar Approach Control (TRACON), Air Route Traffic Control Centers (ARTCC), and the Airline Industry. In addition the OTS preset conference capability is used to initiate contingency restoration conferences to respond to emergencies and disruptions of NAS Resources.

The Operational Telephone System (OTS) is a sub-element of the Air Traffic Management system, which: coordinates and manages air traffic flow in cooperation with the airline industry, responds weather and other emergency situations. The FAA Administrator has designated the ATCSCC as the lead to resolve flight delay problems. The OTS is the principal voice system used by the Traffic Management Specialist to accomplish these responsibilities. The OTS provides voice communications for many critical functions which includes:

- Flow Control – At the national Level the ATCSCC provides the focal point for monitoring the overall demand of the National Airspace System and assesses the capability of the NAS to meet this demand. This centralized facility has Traffic Management Specialists who adjust traffic demands to meet system capacity when phenomena such as adverse weather, equipment outages, runway closures, or other significant events impact on an airport, national or international airspace. The use of advance automation tools, along with direct communication with ARTCCs, TRACONS, ATCTs, and airline representatives, allows personnel to manage the flow of air traffic on both the national and local levels. In addition to air traffic management, the OTS and its supporting telecommunications lines provide these services.

- Contingency Plan Implementation – The ATCSCC is responsible to support field facilities in the area of telecommunications during a catastrophic event to the NAS. Various conferences would be established to communicate and assign new areas of responsibilities.
- National Operations Control Center (NOCC)-The OTS provides Communications and Conferencing capabilities to increase effectiveness and efficiencies in managing NAS infrastructure.
- Notice To Airmen (NOTAM) – Disseminates information on unanticipated or temporary changes to components of or hazards in the NAS until the associated charts and related publications have been amended.

3-02.1.4 References

There are no known Capital Investment Plan Project/Program Number that establishes the program authorization, references to RE&D or NAS Architectural Plans. The Functional Specification (FAA-P-2851, Revision 3 dated 6/27/97), incorporated in Mod-24 of FAA Contract DTFA01-90-D-00035; provides System Requirement Documents and System Specifications.

3-02.2 PROGRAM/SYSTEM DESCRIPTION

3-02.2.1 Program/System Components

The OTS Program Manager (AOP-400) is responsible for the OTS system. The OTS is a closely connected group of subsystems located at the ATCSCC (defined in paragraph 3-02.1.3.1). The overall functional system in which the OTS operates is depicted in the following block diagram. OTS provides operational voice communication between the ATCSCC and various remote FAA and Airline locations. Dial lines are used to communicate with the airline industry and many FAA locations. Direct Access Ring-down lines (DA lines) are used to provide critical services between the ATCSCC and ARTCCs, TRACONS and Towers. Remote user terminations vary widely; DA lines are terminated in VSCS, ICSS, 4 wire instruments, etc. and dial lines are terminated in a variety of unknown PBX and key systems. DA (ring-down) lines utilize LINCS and RCL transmission systems. Dial lines utilize the FTS and Public Network Systems.

3-02.2.2 NAS System Components Utilized by the OTS

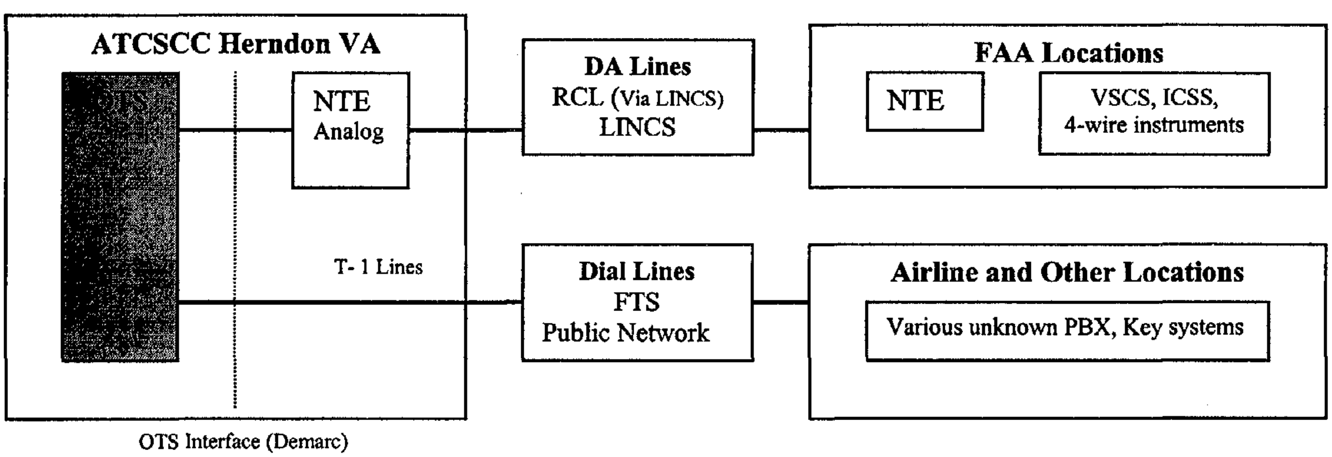

Figure 3-02-1. OTS Block Diagram

3-02.2.2.1 Principal Components

The OTS was installed at the ATCSCC (Herndon VA) in March of 1994. There are no other installations except for a testbed system located at the vendor's facility in Monroeville, PA. The initial plan was to install the testbed system at a relocation site but no such action has been undertaken.

OTS is a telecommunications Conference/Switching System that is leased from Compunetix Inc. It provides sophisticated conferencing capability for FAA applications including the Central Flow Control Service (CFCS), Contingency conferencing, etc. The OTS is comprised of the following five major elements:

- Contex 480 Conference Bridge - COTS, manufactured by Compunetix.
- Private Branch Exchange (PBX) NEAX 2400 MMG - COTS, manufactured by NEC.
  - ◊ NEAX 2400 PBX MAT
- System Control Computer (SCC) - Custom designed for FAA, fabricated by Compunetix.
  - ◊ SCO UNIX Software used in the SCC
  - ◊ SCC MAT Printer Terminal
- Digi Concentrator link from the SCC to the User Consoles.
- User Console - Custom designed for FAA, fabricated by Compunetix .

Contex 480
The Contex 480 is a digital non-blocking space division conference bridge, controlled by redundant processors. This unit performs OTS conferencing, functions for conferences of up to 480 parties. There are 14 T-1 communications links between the NEAX PBX and the CONTEX Bridge with echo cancellors installed.

NEAX 2400 MMG
The NEAX 2400 is a PBX which routes calls between the Contex 480 and user consoles, off-premise extensions, direct access lines, central office trunks, direct inward /outward dial trunks, TIE lines. A Maintenance Administration Terminal (MAT) is provided to support the PBX.

System Control Computer (SCC)
The SCC is comprised of redundant processors that house systems files (directories, conference configurations, etc.), provides for system maintenance and diagnostic activity, administrative access and administrative reports. The SCO UNIX operating system software is utilized on the processors and Compunetix custom application software is used to provide the SCC function.

Digi Data Concentrators
The SCC is connected to the User Consoles by Digi data concentrators. The data carried by this data link is used to provide user database information to the console user and drive various screen menus to set up conferences and telephone connections.

User Console
The user console provides a customized user telephone interface to the OTS system. From the user console, located on the operations floor, the Air Traffic Specialist can establish two party connections and/or multi-party connections i.e., preset, meet-me, and progressive conferences. The console also terminates VTS station lines, which are independent of any OTS involvement. These VTS station lines are used to back up the OTS should a disruption occur and for administrative use.

3-02.2.3 Functional Component Interface Requirements

The following sketch depicts the internal OTS interfaces defined in the preceding paragraph.

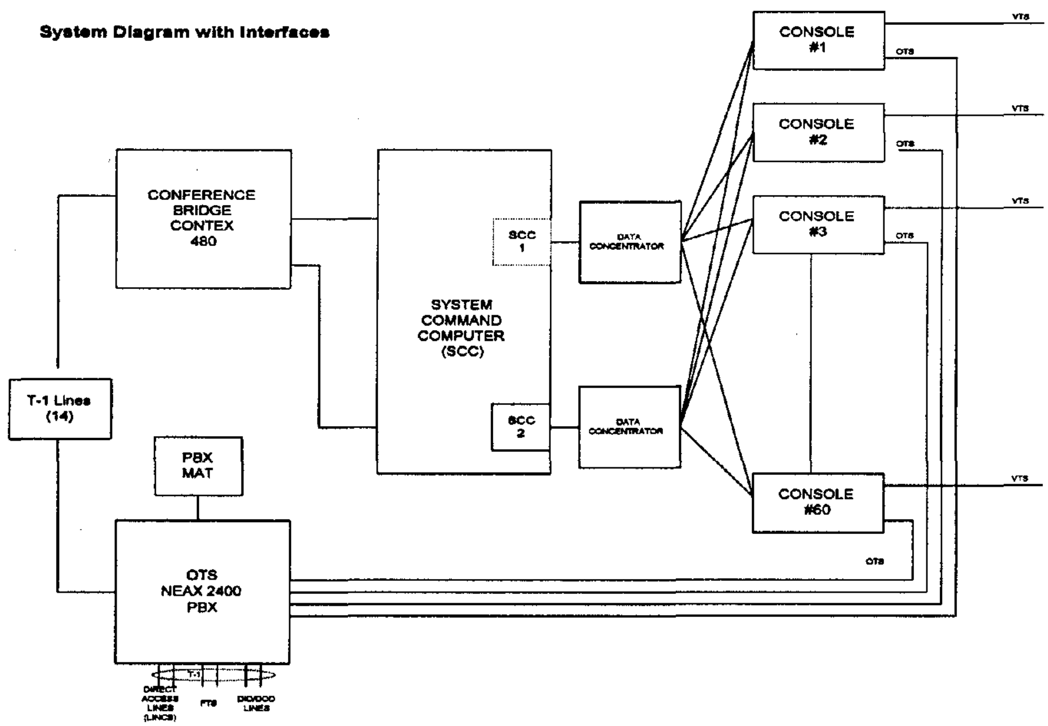

Figure 3-02-2 - OTS Interface Diagram

3-02.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

There are a variety of communications networks that provide communications to the OTS. Dial connections are provided via the FTS and Public Network. Direct Access (DA) / Ring-down lines are provided via the LINCS and RCL network. Since the RCL network does not have a service point at the ATCSCC, access to ZDC RCL is gained over LINCS T-1 lines.

3-02.3.1 Telecommunications Interfaces

Table 3-02-1 provides the telecommunications interfaces used by the OTS.

Table 3-02-1. OTS and Telecommunications Interface Information

Type Service	OTS Interface	DCC NTE / Signaling	Lines	Inter-facility Signaling
Direct Access (DA)Lines				
Primary Lines (4-wire lines)	E&M signaling Analog	Tellabs NTE (signaling tone on busy)	LINCS VG-8 lines	In-band tone
SWOP Lines (4-wire lines)	E&M signaling Analog	Tellabs NTE (signaling tone on busy) Bandwidth Mgr. 440 Tellabs Mux	Redundant lines LINCS T1 To ZDC Diverse RCL analog / Digital routes	In-band tone
FTS T-1 (dial lines)	T-1 interface	None	T-1	Integrated in T1
Public Network (dial lines)	T-1 interface	None	T-1	Integrated in T1
FTS T-1 to DOT PBX	T-1 Interface	None	T-1	Integrated in T1
LINCS T-1 to FAA 10A	Not Connected	440 Telabs Mux	T-1	None required
FAATSATS T-1	TBD			
FAATSATS DS0	TBD	Tellabs NTE (signaling tone on busy)		

3-02.3.1.1 Interface Requirements

See above

3-02.3.1.2 Connectivity Requirements

Not Required

3-02.3.1.3 Traffic Characteristics

The traffic characteristics for both the internal OTS and the external lines, which support the OTS, are event driven. Events such as weather, disruptions of NAS resources (e.g. host computers, radar's, etc) terrorist activity, etc. require the initiation of large multiple pre-set and meet-me conferences. While traffic studies provide a baseline, desktop scenarios must be conducted to define actual engineering criteria.

3-02.3.2 Local Interfaces

EDS provides cabling between the equipment room frame, the wire closets, and the consoles. Special floor modules are required at the Evans' consoles. These costs are not included in the telecommunication budget.

3-02.3.3 Diversity Requirements

3-02.3.3.1 OTS Internal Redundancy and Security

Redundancy: With the exception of the consoles all common elements of each subsystem utilize redundant / backup architecture.
Type of redundant / backup: There is a need to reevaluate the type of backup/standby architecture employed; i.e. **inactive standby** (database must be updated & active calls lost), **hot standby** (ready for immediate operation but active calls dropped during transfer) or continuous standby (transfer without dropping calls or service disruption).
Security: During the year (2000) we plan to begin the review of Physical, Remote Access, and Hardware/Software security of the OTS.

3-02.3.3.2 Diversity of Lines Serving the OTS Operation.

There are a variety of communications networks that provide communications to the OTS. Dial connections are provided via the FTS and Public Network. Direct Access (DA)/Ring-down lines are provided via the LINCS and RCL network. Since the RCL network does not have a service point at the ATCSCC, access to ZDC RCL is gained over LINCS T-1 lines.

Currently Bell Atlantic provides the Local Access to all of the above-defined networks. Two diverse fiber routes provide this Local Access; from the ATCSCC to two separate Central Offices (CO). For emergency, three copper-wire lines have been installed to connect to a Bell Atlantic CO, for access to the Public network. In addition a Satellite Phone is provided at the NOM's position on the Operations Floor for emergencies.

In order to provide additional access diversity, as well as vendor diversity, it is recommended that FAATSATS access be provided to the OTS. Currently a Satellite dish and basic terminal equipment is installed at the ATCSCC.

3-02.4 ACQUISITION ISSUES

3-02.4.1 The major immediate (2000-2001) acquisition needs include:

- Annual Contract Maintenance (Only funds through September 2000 were approved).
  - Extend existing Lease/Maintenance Contract from May 1 through Aug 31, 2000.
  - Implementations of a new 12-month contract to provide second level maintenance beginning Sept 1, 2000.

- Funding for Airways Facility Training.
  First level maintenance training is required for FAA's Airway Facility technicians. A sole source contract will be negotiated with Compunetix to provide second level maintenance, equipment repair and engineering support. The current OTS lease/purchase contract expires on 8/30/2000.
  - Documentation and test-lab training on all sub systems except the NEAX PBX
  - Class-room training on the NEAX PBX
  - Airways Facility training and travel funds.
  - System Administrator Documentation / Training for SCC MAT.

- Funding new Air Traffic requirements
  The following OTS features will play a major role in to supporting Administrator Garvey's initiative to reduce flight delays.
  - Recorded instructions for meet-me conferences, Improve service to Airlines & reduce Fight Delays (Caller ID, Call Queues, Queue Announcements, Call management info, etc.), Improved ring configuration, Minimum speaker volume, Recorded instructions for contingency pre-set conferences, Improved list display, onsite cutover coverage, etc.
  - ATCSCC Air Traffic operational floor rearrangement expected the summer of 2000
  - Meet legal requirements to record all Conferences.
  - Develop an improved OTS console prototype.
  - Other miscellaneous requirements

- FAA Travel expenses
- Travel costs to the Test Lab (PA) for AF and AT personnel to define new contract requirements and monitor feature development.
  - Level 1 AF Maintenance Cost.
    Technical and supervision staffing costs

- Testbed enhancement
  - Annual testbed improvements.
  - A testbed is necessary to fully load test the system as features and services are added.

- Funding for other FAA's initiatives.
  - Certification of each system's security.
  - Follow-on Y2K effort (Leap year, audits, document retention, etc.)
  - FTS Transition Costs

- Funding for telecommunications lines and improved diversity.
  Administrator Garvey's initiative to reduce flight delays will result in increased communications and the telecommunications lines to support them. Bell Atlantic currently provides all local access; it is proposed that limited FAATSATS access be utilized to provide local access other than through the Bell Atlantic facilities.
  - Additional FTS and Public Network T-1 lines.
  - FAATSATS lines to selected FAA facilities.
  - Network Terminating Equipment

- Network Terminating Equipment for DA Lines
  - Tellabs terminating and signaling equipment
  - Jack Panels (4-wire and DSX)
  - Voice Recorders and high impedance 2 to 4 Wire converters, amps, pads and 2 wire jack panels to access records at proper levels.

- AOP-400 Contractor Support
  Annual contractor support expense.

- Decisions must be made regarding the schedule and resources to extend the life of the OTS or replace it.
  Until that decision is made funding to extend the life of the OTS will be forecast. Currently $15million is forecast for the replacement of the OTS in 2002. Ref. Paragraph 3-02.4.1 for additional information. The following issues require review:
  - Expand OTS Console Capacity - 60 to 120 consoles
  - Upgrade/replace user consoles in 2001/2002 if funded prototype is feasible
  - Video Conferencing (Weather Units)
  - System and Software Configuration Reports (Software/Hardware)
  - A test-bed is need to support any new system
  - Requirements for a relocation site must be investigated.
  - Response time for maintenance call-out
  - User and technician training

3-02.4.2 OTS Life Cycle/Next Generation Issues

Currently the AOP-500 organization is responsible to determine Life Cycle Management and the projected cost and schedule of the Next Generation OTS. When system replacement is required it will be necessary to define what FAA organization will responsible for its procurement.

The following provides information that may be helpful in that forecast. The OTS contract was signed in 1990 and was installed at the ATCSCC's Central Flow Control Facility (CFCF) in March 1994, when the ATCSCC at Herndon begin operation. Prior to 1994 the CFCF function was based at 800 Independence in Washington DC. The OTS ten year Lease to Purchase contract will expire in August 2000 at which time FAA will own the OTS.

The primary driver for the funding sequence, over the next 6 years, is based on the schedule as to when the current OTS will be replaced with the next generation system.

As defined in Paragraph 3-02.2.1 there are 5 subsystems that comprise the OTS System. The current OTS architecture, technology, reliability, impact of needed features, etc. must be addressed in determining the next five-year acquisition strategy.

3-02.4.3 Other Planned Telecommunications Strategies

Some growth is expected in telecommunications requirements (LINCS, FTS, Public Network) due to the Administrator Garvey's initiative to reduce airline flight delays. Paragraph 3-02.3.1.3 (Traffic Characteristics) defines these needs.

Currently Bell Atlantic provides the Local Access to all of the above-defined networks. Two diverse fiber routes provide this Local Access; from the ATCSCC to two different Central Offices (CO). For emergency, three copper-wire lines have been installed to connected to a Bell Atlantic CO, for access to the Public network. In addition a Satellite Phone is provided at the NOM's position on the Operations Floor for emergencies.

Since all lines are provided over Bell Atlantic facilities except for the single Satellite Phone it will be recommended, in this Fuchsia Book forecast, that FAATSATS access be provided to the OTS. Currently a satellite dish and basic terminal equipment is installed at the ATCSCC.

Table 3-02-2 - Projected Line Needs

Line Type	Existing	FY00	FY01	FY02	FY03	FY04	FY05	FY06
DA Analog lines (19 ARTCCs via RCL, remaining are LINCS lines)	72	80	90	100	105	110	115	120
LINCS T-1s 2 - T-1s to ZDC 1 – T-1 to HDQ 10A	3	3	3	3	3	3	3	3
FTS T-1 to DOT PBX	1	1	1	1	1	1	1	1
FTS T-1s	3	4	5	5	6	6	6	6
Public Network T-1s	5	6	6	6	7	7	7	7
FAATSATS T-1s		1	1	1	2	2	2	2
FAATSATS (DS-0)	0	0	20	22	24	26	26	26

Table 3-02-3 Cost Summary - ATCSCC

CIP # F-02	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
Channel Costs									
Channel costs are detailed in regional submissions in the annual request for funding. A listing is shown on the next page for information purposes.									
Hardware Costs									
1. Operational Telecommunications System (OTS)									
Cost Profile: OTS Recurring Costs and OTS Replacement (see Note 2)									
Non-recurring Costs			**$0**	**$0**	**$15,000**	**$0**	**$0**	**$0**	**$0**
Recurring Costs			**$390**	**$550**	**$585**	**$620**	**$655**	**$690**	**$725**
2. OTS Features and Upgrades									
Cost Profile: Required and New/Improved Features and Services									
Non-recurring Costs			**$773**	**$800**	**$450**	**$200**	**$250**	**$200**	**$200**
Recurring Costs			**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Other Telecommunications Related Costs									
1. Testbed Enhancements (see Note 3)									
Non-recurring Costs			**$0**	**$30**	**$10**	**$20**	**$20**	**$20**	**$20**
Recurring Costs			**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
2. Training for FAA Personnel and Travel									
Non-recurring Costs			**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Costs			**$119**	**$28**	**$156**	**$32**	**$22**	**$33**	**$33**
3. Program Management and Engineering (PM&E)									
Non-recurring Costs			**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Costs			**$200**	**$205**	**$210**	**$215**	**$220**	**$225**	**$230**
Emergency Operations Facility									
An Emergency Operations Facility (EOF) able to assume ATCSCC operations during periods of unexpected disruption of regular ATCSCC operations is under consideration for development. It is expected that a decision regarding the EOF will be made in the near future. The cost impact of such facility has not been assessed at this point in time, because a complete package that identifies the minimum requirements is still under development. See note 3.									
				SUMMARY					
F&E Totals		Non-recurring	$0	$0	$15,000	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Totals		Non-recurring	$773	$830	$460	$220	$270	$220	$220
		Recurring	$709	$783	$951	$867	$897	$948	$988
		OPS Total	**$1,482**	**$1,613**	**$16,411**	**$1,087**	**$1,167**	**$1,168**	**$1,208**

Notes:

1. All costs shown as OPS Funded until determined otherwise.
2. The non-recurring cost in FY02 for the OTS correspond to its planned replacement.
3. The creation of the EOF will have significant impact over the future costs of the ATCSCC operations.

The following table shows requirements which are identified in regional submissions. They are repeated here for information only and are not included in ATCSCC program funding requirements.

Table 3-02-3 Cost Summary - ATCSCC (continued)

CIP # F-02 — All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
Channel Costs								
1. Leased Circuit Costs								
1a. ATCSCC <---> ARTCCs, TRACONS, & Towers								
Cost Profile: LINCS VG-8 Circuits								
Channels Added		10	10	10	5	5	5	5
Total Channels	57	67	77	87	92	97	102	107
F&E Funded Channels		0	0	0	0	0	0	0
OPS Funded Channels		67	77	87	92	97	102	107
OPS Non-recurring Channel Costs		**$40**	**$40**	**$42**	**$21**	**$21**	**$21**	**$21**
Recurring Channel Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$798**	**$917**	**$1,088**	**$1,151**	**$1,213**	**$1,276**	**$1,339**
1b. ATCSCC <---> ZDC & HDQ								
Cost Profile: LINCS T-1 Circuits								
Channels Added		0	0	0	0	0	0	0
Total Channels	3	3	3	3	3	3	3	3
F&E Funded Channels		0	0	0	0	0	0	0
OPS Funded Channels		3	3	3	3	3	3	3
OPS Non-recurring Channel Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$29**	**$29**	**$31**	**$31**	**$31**	**$31**	**$31**
1c. ATCSCC <---> Telco Central Office & DOT								
Cost Profile: FTS2000/2001 T-1 Circuits								
Channels Added		1	1	0	1	0	0	0
Total Channels	4	5	6	6	7	7	7	7
F&E Funded Channels		0	0	0	0	0	0	0
OPS Funded Channels		5	6	6	7	7	7	7
OPS Non-recurring Channel Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$41**	**$49**	**$49**	**$57**	**$57**	**$57**	**$57**
1d. ATCSCC <---> Telco Central Office								
Cost Profile: Local Exchange Carrier T-1 Circuits								
Channels Added		1	2	2	1	0	1	0
Total Channels	5	6	8	10	11	11	12	12
F&E Funded Channels		0	0	0	0	0	0	0
OPS Funded Channels		6	8	10	11	11	12	12
OPS Non-recurring Channel Costs		**$1**	**$2**	**$2**	**$1**	**$0**	**$1**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$12**	**$17**	**$21**	**$23**	**$23**	**$25**	**$25**

Table 3-02-3 Cost Summary - ATCSCC (concluded)

CIP # F-02 All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
1e. Cost Profile: FAATSAT T-1 Circuits								
Channels Added		0	1	0	1	0	0	0
Total Channels	0	0	1	1	2	2	2	2
F&E Funded Channels		0	0	0	0	0	0	0
OPS Funded Channels		0	1	1	2	2	2	2
OPS Non-recurring Channel Costs		**$0**	**$34**	**$0**	**$34**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$119**	**$117**	**$238**	**$243**	**$248**	**$260**
1f. Cost Profile: FAATSAT DDS-64 Circuits								
Channels Added		0	1	0	1	0	0	0
Total Channels	0	0	1	1	2	2	2	2
F&E Funded Channels		0	0	0	0	0	0	0
OPS Funded Channels		0	1	1	2	2	2	2
OPS Non-recurring Channel Costs		**$0**	**$10**	**$0**	**$10**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$5**	**$5**	**$10**	**$10**	**$10**	**$11**

TOTAL PROGRAM SUMMARY

(Includes Requirements Identified in Regional Submissions)

		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
F&E Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$0	$0	$0	$0	$0	$0	$0
	F&E Total	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Totals	Non-recurring	$814	$916	$15,504	$8,266	$291	$242	$241
	Recurring	$1,590	$1,919	$2,262	$2,377	$2,474	$2,595	$2,710
	OPS Total	**$2,404**	**$2,835**	**$17,766**	**$10,643**	**$2,765**	**$2,837**	**$2,951**

CHAPTER 3-03 - SUMMARY SHEET

COMPUTER-AIDED ENGINEERING GRAPHICS (CAEG)

Program/Project Identifiers:

Project Number(s):	CIP F-17
Related Program(s):	CIPs A-02, A-07, A-08, A-10, A-11, A-14, C-01, C-09, F-01, F-02, F-03, F-04, F-05, F-06, F-08, F-13, F-15, F-18, M-15, M-18, M-21, M-22, M-26, M-27, N-03, S-02,S-03, S-04, S-05
New/Replacement/Upgrade?	Upgrade
Responsible Organization:	ANS-110
Program Mgr./Project Lead:	Steve Kalabokes, ANS-110, (202) 267-7411
Fuchsia Book POC:	John Gellios, ANS-110 (202) 646-5436

Assigned Codes:

PDC(s):	HG
PDC Description:	Administrative Data Circuits for CAEG
Service Code:	ADDA

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$296	$0	$0	$0	$0	$0	$0
F&E Recurring	$310	$310	$0	$0	$0	$0	$0
Total F&E	**$606**	**$310**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$358	$358	$688	$688	$688	$688	$688
Total OPS	**$358**	**$358**	**$688**	**$688**	**$688**	**$688**	**$688**

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CIP Category: Facilities	3-03.0 COMPUTER-AIDED ENGINEERING GRAPHICS

3-03.1 PROGRAM OVERVIEW

3-03.1.1 Purpose of Computer-Aided Engineering Graphics

Computer-Aided Engineering Graphics (CAEG) provides services and automated computer-aided design/computer aided engineering (CAD/CAE) systems to facilitate site and installation planning for programs affecting air traffic safety, air traffic sector design, transition planning, and airport planning. CAEG servers are installed at all FAA Regions, connected via a wide area network. On January 20,1999, the CAEG Program Office (PO), in conjunction with AOP published a telecommunications study identifying current and future CAEG bandwidth requirements. The study concluded that the planned implementation of the Engineering Document Management System (EDMS) would have a significant increase in the data transmitted on the network.

The CAEG servers are installed at Regional Offices (ROs), Air Route Traffic Control Centers (ARTCCs), the William J. Hughes Technical Center (FAATC), the Mike Monroney Aeronautical Center (ARCTR), the Pittsburgh ATCT, and at several System Management Offices (SMOs).

The CAEG system is adept at all modeling tasks and is fully three-dimensional. It also excels at all mapping applications, including airspace, ground contours, and signal propagation and coverage. It uses database information to produce intelligent graphics.

This system enables engineers to generate designs and site plans using airport layouts, roads, highways, obstructions (man-made and natural), airspace information, antenna characteristics, and topographical data complemented by a vast suite of design and analytical software applications. Using a relational database, the CAEG can produce up-to-date analytical products by superimposing the various mapped data items against terrain and man-made obstructions. Examples include Airports Analysis such as Part 77 and Radar & RF Transmitter Coverage and Interference Analysis to develop safer, more efficient airports and air traffic patterns. Electrical and mechanical computer-aided design and drafting and the digitizing or scanning of existing libraries of paper drawings can also be accomplished.

Without this data/information in electronic format and quick access capability, engineers and technicians would manually seek, rework, and ensure data accuracy on a daily basis, which would lead to implementation delays and increased costs. It would be difficult to implement a common, standard database and maintain data accuracy without a convenient means to access and update data. The data is voluminous and would be extremely difficult to store effectively at all sites.

CAEG has the following analysis capabilities:

- Airport/airspace planning and analysis (under development)
- Coverage optimization analysis and coverage charting

- Civil, structural, architectural and electrical/electronic analysis for transition/construction planning, repair and space management
- Air traffic/flight service station mapping

The CAEG databases contain FAA's National Airspace System (NAS) data that can be divided into three groups: engineering drawings for new programs, engineering drawings for existing programs, and Airport Trust Fund obtained information. The NAS data is primarily engineering drawings of FAA facilities. The CAEG database contains approximately 300,000 files that have been converted from hard copy drawings. Approximately 2 million drawings remain in hard copy; 40% need to be converted to the electronic vector format. Using its Oracle RDBMS, the CAEG system can link information relating to equipment/material specifications directly to the drawings so that quick access to additional information is possible directly from the drawing.

The second group of data includes new program engineering drawings received by the FAA in electronic format. The third category of NAS data is electronic data obtained from the National Flight Data Center (NFDC), maps and grids of the United States from the US Geological Survey (USGS) and Defense Mapping Agency (DMA) and obstruction data (both man-made and natural) from the National Oceanographic and Atmospheric Agency (NOAA) The NFDC database includes Navigation Aids, ARTCC boundaries, Special Use Airspace, census, Digital Line, etc. The USGS and DMA databases include contouring, terrain and mapping data. This data is instrumental in performing radio coverage analysis, cartographic functions, and obstruction evaluations.

The last category of data is photogrammetrical data and Airport Layout Plans (ALPs) obtained from state agencies, consultants, and other sponsors and is funded through the Airport Trust Fund. This data provides an improved resolution of terrain information. The cartographic, obstruction evaluation and other unique FAA applications are in use at some sites and have been demonstrated in the New England Region. The cartographic capability is available at all regional and headquarters offices for use in developing appropriate maps.

There are plans to implement CAEG systems at each of the SMOs in the near term and at the Airport District Offices in the long term. At the ARTCCs, the CAEG system is used to develop the equipment installation plan, converting maps into digital format, and air traffic sector design and modification. At FAA Headquarters, it is used to develop the facility master plan to track projects added to each facility and the analysis of each facility's capacity for future growth. At the ARCTR, it is used to convert equipment drawings to electronic format and streamline procedures in the FAA Logistics Support Center. Other efforts include developing a three-dimensional computer model of new or modified FAA facilities to facilitate transition planning and simulate test scenarios. Access to the wide area network is needed to share engineering information, shorten the time needed for approval of any plan modifications and to accelerate the facilities site and installation planning.

3-03.1.2 References

FAA Aviation System Capital Investment Plan (CIP), No. F-17, January 1999.
ANS Telecommunications Study, January 20, 1999.

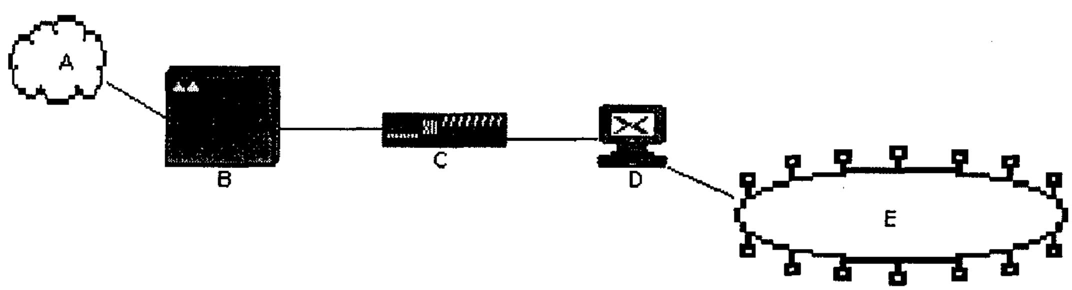
3-03.2 SYSTEM DESCRIPTION

3-03.2.1 Program/System Components

The CAEG system consists of approximately 275 Hewlett Packard/Apollo workstations, 11 Windows NT servers as well as peripherals located in all Regional Offices, the ARCTR, the WJHTC, AWA, all 20 ARTCCs, two of the three Combined En Route Radar Approach Control Facilities (CERAPs), three SMOs, three special project sites, and the nine Raytheon Technical Support Services Contract (TSSC). offices within proximity to the nine Regional Offices. Figure 3-03-1 shows the configuration. Plans are currently underway to add the Engineering Document Management System to the network. This system will add a considerable amount of traffic to the network. A joint CAEG PO/AOP study was conducted to estimate the expected traffic load. This study has been published and its estimates used for estimating future bandwidth requirements for the CAEG program.

TYPICAL CAEG NETWORK (RO, ARTCC & SMO)
IP NETWORK ADDRESS WWW.XXX.YYY.ZZZ
SUBNET MASK BBB.CCC.DDD.EEE

Description of schematic:
A. ADTN2000 WAN
B. Backbone Router
C. Ethernet Hub/Switch
D. Ethernet/Token Ring Gateway
E. Token Ring Network



Legend:

ADTN2000	Agency Data Telecommunications Network 2000
ARTCC	Air Route Traffic Control Center
CAEG	Computer Aided Engineering Graphics
SMO	System Management Office

Figure 3-03-1. CAEG Configuration

Local area network (LAN) bridges/routers will be required to link the CAEG LANs to the ADTN2000 network. The CAEG system consists of:

- Hewlett Packard 9000/425t and 9000/Raven workstations, Apollo DN-4500 Workstations, Windows NT Servers with RAID capability, DLT Tape Drives, 2.6 GB external Winchester

Drive and 50 gigabyte (GB) 8mm tape jukebox, 4mm DAT tape drive, and minitower 4GB mass storage;

- 7 Million Instruction Per Second (MIP) Motorola chip 68040, 22 MIP MC 68040, and 75 MIP MC 68044, PA-Reduced Instruction Set Computing C class chip, Intel Pentium II chips;

- Floppy or cartridge tape drive, up to a 4 GB Internal hard drive, CD Reader/Writers and zip drives;

- 19-inch, 256 color, 1,024 by 800 CRX monitor, or 1,280 by 1024 Hi-Resolution CRX monitor; and,

- Running HP-UX and Domain/OS with three operational environments (AEGIS, Berkeley UNIX, AT&T Sys5 Unix), Windows NT v4.0 and utilizing Auto-trol Technology software, Microstation SE/J and AutoCAD r14/2000.

Various COTS and FAA-custom applications software packages run on top of the Auto-trol software and provide added power for design, modeling and simulation features. An Oracle RDBMS is resident in the system and provides the ability to manage engineering information. Translators exist to convert existing drawings, including those in AutoCAD and Intergraph, to the CAEG system. Analysis can be run independent of the graphics. Peripherals include:

- 60 Mbyte ¼" and 180 Mbyte ½" magnetic tape drives;

- 800 Mbyte WORM disks, 650 Mbyte Read/Write CD-ROM, 100 Mbyte Zip drive for archiving;

- Summagraphics Microgrid II digitizers for inputting information;

- CALCOMP 5735 Electrostatic and 5912 Thermal plotters; E-size CALCOMP Draftmaster Thermal, E-size Hewlett Packard DesignJet 750c color and OCE 9400 monochrome production Plotters; and,

- HP 7596a Draftmaster Pen plotters; and Encapsulated Postscript compatible B-size plotters, QMS PS222, Lexmark, Oce and various A through D-size plotters.

3-03.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

In most cases, the CAEG system workstations are connected within each major site using an Apollo Token Ring Local Area Network (LAN) and at the desktop via an Ethernet connection. Interfacility connectivity uses the Agency Data Telecommunications Network 2000 (ADTN2000). Approximately every 56 days, 400 MB of NFDC bulk file data will be transferred from Headquarters to the nine Regional Offices. Additional network capability is needed between the CAEG sites to:

- support the transfer of bulk file engineering drawings between these sites
- interactive communications for engineering specifications and diagrams on a daily basis
- remote CAEG system administration
- interface to NFDC and USGS data at ARTCCs for database query and updates

Future plans (estimated FY01) include data access to/from the Engineering Center (location TBD) and if required, a videoconferencing capability. The implementation of the EDMS will add a considerable amount of traffic to the network, as indicated in the ANS/AOP Telecommunication Study.

3-03.3.1 Interface Requirements

3-03.3.1.1 CAEG LANs to ADTN2000

Access to the ADTN2000 is required through the CAEG LAN Cisco routers, Ethernet-based, for Internet Protocol (IP) traffic, and SPX/IPX traffic for system-to-system traffic at all sites. Table 3-03-1 summarizes the protocol, transmission and hardware requirements for this interface.

3-03.3.1.2 ARTCC Workstations to Regional Office CAEG LANs

Access to the ADTN2000 is required through the ARTCC's Cisco routers, which work with a wide variety of physical, data link and network protocols for IP traffic. The service is to be provided on the 56 Kbps dedicated service from the ARTCCs to the respective regional office pad. Table 3-03-1 summarizes the protocol, transmission and hardware requirements for this interface.

Table 3-03-1. CAEG Interface Requirements Summary

SUBSYSTEM INTERFACE		**CAEG LANs To ADTN2000**	**ARTCC WSs To Regional Offices**	**SMOs* to Regional Offices**
INTERFACE CONTROL DOCUMENTATION		TBD	TBD	TBD
PROTOCOL REQUIREMENTS	Network Layer	IP	IP	IP
	Data Link Layer	802.3, 802.2, Ethernet II		
	Physical Layer	Ethernet		
	Special Formats/Code			
TRANSMISSION REQUIREMENTS	No. Channels	11	23	26
	Speed (Kbps)	640-1540Kbps	640-1540Kbps	
	Simplex, Half/Full Duplex	FD	FD	FD
	Service Type	Point-to-Point Access circuit	Point-to-Point Access Circuit	Point-to-Point access circuit
HARDWARE REQUIREMENTS	Modem	N/A		N/A
	Data Bridge			
	Clock			
	A/B Switch			
	DSC			
	Cable/Misc.			

*Although there are 34 SMOs, some are collocated with existing serviced facilities.

3-03.3.1.3 SMO Workstations to Regional Office CAEG LANs

Same interface as Paragraph 3-03.3.1.2.

3-03.3.1.4 ADO Personal Computers to Regional Office CAEG LANs

TBD. Project is a future requirement.

3-03.3.2 Local Interfaces

As circuits are upgraded to T1 service or better, the existing LAN bridge/routers, modems, and cabling at the ARTCCs and SMOs will require upgrade.

3-03.4 ACQUISITION ISSUES

3-03.4.1 Program Schedule and Status

The CAEG uses ADTN for connectivity between CAEG sites. However, the ADTN will not be able to handle the increased bandwidth requirements of the planned implementation of the EDMS. This conclusion is supported by the ANS/AOP Telecommunications Study. A full implementation of the EDMS will necessitate dedicated point to point connectivity between CAEG sites.

The EDMS is scheduled for pilot implementation during FY00 at 4 regional sites. As EDMS is fully implemented during FY01 and FY02, increases in bandwidth will slow access times for any program using the ADTN2000. The CAEG Program is estimating 240 Users for FY00 and 1100 in FY01. As EDMS is implemented and its benefits realized, the CAEG PO estimates a conservative growth of 20% for FY02, 15% for FY03 and 10% for FY04 and FY005. The project schedule for the changeover of the circuits is reflected in Table 3-030-2

Table 3-03-2. Circuit Activation Schedule

CIRCUIT ACTIVATION	PRIOR YEAR	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
Alaska Region (AAL)[1]	3	0	0	0	0	0	0	0
Central Region (ACE)	2	2	0	0	0	0	0	0
Eastern Region (AEA)[2]	4	3	0	0	0	0	0	0
Great Lakes Region (AGL)[3]	7	1	0	0	0	0	0	0
New England Region (ANE)	2	1	0	0	0	0	0	0
Northwest Mountain Region (ANM)	4	1	0	0	0	0	0	0
Southern Region (ASO)	6	7	0	0	0	0	0	0
Southwest Region (ASW)	5	4	0	0	0	0	0	0
Western Pacific Region (AWP)	4	2	0	0	0	0	0	0
National Headquarters	Local	0	0	0	0	0	0	0
FAA Aeronautical Center	1	0	0	0	0	0	0	0
FAA Technical Center	1	0	0	0	0	0	0	0
Total	40	21	0	0	0	0	0	0

[1]Total includes the Northern Alaska Airway Facility Sector (NAAFS) in addition to the ARTCC
[2]Total includes the Liberty Center SMO in addition to the ARTCCs
[3]Total includes the Chicago SMO and the Superior SMO in addition to the ARTCCs

3-03.4.2 Planned Telecommunications Strategies

The CAEG uses the ADTN2000 network for connectivity. The ANS/AOP Telecommunications Study indicates that the current infrastructure will be inadequate to support the implementation of the EDMS. The EDMS will automate existing workflow, eliminate redundancies, provide economies of scale and efficiency in developing, locating and modifying site installation drawings. If the network is not upgraded, scheduling delays in the completion of NAS project implementation would occur, since FAA personnel would not have access to cartographic information to update maps and conduct various analyses. This would increase the workload and result in extensive travel to remote sites. A return to the slow and costly manual method of operations would be required in lieu of the development of applications for sector map coverage analysis and other applications listed previously.

3-03.4.3 Telecommunications Costs

The projected telecommunications costs associated with the CAEG Program are summarized in Table3-03-3. In accordance with FAA Order 2500.8A, the non-recurring charges for each circuit and equipment item and the associated recurring charges in the year of installation and the next full fiscal year are included in the F&E Funded totals. After the second year a particular item has been installed, the recurring charges become part of the OPS Funded costs.

In comparison to the 1998 Fuchsia Book, a greater number of channels are included in the cost summary and, when known, actual cost factors have been applied instead of averages. As a result, the projection of telecommunications costs has increased since last year. In addition, the data rate for the SMO-to-Regional Office connectivity has been increased from 56 kbps to 128 kbps to minimize latency when applications on centralized processors are accessed remotely from the SMOs.

Table 3-03-3. Cost Summary – Computer Aided Engineering Graphics

CIP # F-17 All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
1. ARTCC WSs <---> Regional Offices								
Channel Costs								
Cost Profile: 56 kbps Circuits from ARTCC WSs to Regional Offices (see Note 1)								
Channels Added (see Note 2)		0	0	0	0	0	0	0
Total Channels	39	39	39	39	39	39	39	39
F&E Funded Channels		0	0	0	0	0	0	0
OPS Funded Channels		39	39	39	39	39	39	39
F&E Non-recurring Channel Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$356**	**$356**	**$356**	**$356**	**$356**	**$356**	**$356**
Hardware Costs								
Cost Profile: CSU/DSUs Required on Both Ends of Each Channel (see Note 3)								
Hardware Units Added		0	0	0	0	0	0	0
Total Hardware Units	26	26	26	26	26	26	26	26
F&E Funded HW Units		0	0	0	0	0	0	0
OPS Funded HW Units		26	26	26	26	26	26	26
F&E Non-recurring HW Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Hardware Costs (see Note 2)								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$2**	**$2**	**$2**	**$2**	**$2**	**$2**	**$2**
2. SMOs <---> Regional Offices								
Channel Costs								
Cost Profile: 128 kbps Circuits from SMOs to Regional Offices (see Note 2)								
Channels Added		21	0	0	0	0	0	0
Total Channels	0	21	21	21	21	21	21	21
F&E Funded Channels		21	21	0	0	0	0	0
OPS Funded Channels		0	0	21	21	21	21	21
Non-recurring Channel Costs								
F&E Non-recurring Costs		**$244**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$308**	**$308**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$0**	**$308**	**$308**	**$308**	**$308**	**$308**
Hardware Costs								
Cost Profile: CSU/DSUs Required on Both Ends of Each Channel (see Note 2)								
Hardware Units Added		42	0	0	0	0	0	0
Total Hardware Units	0	42	42	42	42	42	42	42
F&E Funded HW Units		42	42	0	0	0	0	0
OPS Funded HW Units		0	0	42	42	42	42	42
F&E Non-recurring HW Costs		$52	$0	$0	$0	$0	$0	$0
Recurring Hardware Costs (see Note 2)								
F&E Recurring Costs		$1	$1	$0	$0	$0	$0	$0
OPS Recurring Costs		$0	$0	$1	$1	$1	$1	$1

Table 3-03-4. Cost Summary – Computer Aided Engineering Graphics (Continued)

CIP # [illegible]-17	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
			SUMMARY						
	F&E Totals	Non-recurring	$296	$0	$0	$0	$0	$0	$0
		Recurring	$310	$310	$0	$0	$0	$0	$0
		F&E Total	**$606**	**$310**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$358	$358	$668	$668	$668	$668	$668
		OPS Total	**$358**	**$358**	**$668**	**$668**	**$668**	**$668**	**$668**

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CHAPTER 3-04- SUMMARY SHEET

TRACON, ATLANTA (TR-ATL)

Program/Project Identifiers:

Project Number(s):	CIP- F-02
Related Program(s):	
New/Replacement/Upgrade?	new
Responsible Organization:	ANS
Program Mgr/Project Lead:	Kim Newman, ANS-220, (202) 267-3847 Wilbur Jarmon, ASO-IF (404) 305-5053
Fuchsia Book POC:	Bill Gregg, AOP-400, (202) 314-5984

Assigned Codes:

PDC(s):	
PDC Description:	
Service Code:	

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$4,509	$0	$0	$0	$0	$0	$0
F&E Recurring	$992	$1,161	$0	$0	$0	$0	$0
Total F&E	**$5,501**	**$1,161**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$1	$1	$666	$666	$666	$666	$666
Total OPS	**$1**	**$1**	**$666**	**$666**	**$666**	**$666**	**$666**

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CIP Category: Facilities

3-04.0 ATLANTA TRACON TELECOMMUNICATIONS PROGRAM

3-04.1 PROGRAM/SYSTEM OVERVIEW

The Atlanta Consolidated Terminal Radar Approach Control (TRACON) Interfacility Telecommunications Program (A80) provides the telecommunications required to support the relocation of the Atlanta (ATL) TRACON (Phase I) and its subsequent consolidation with the Columbus (CSG) TRACON and the Macon (WRB) Radar Approach Control (RAPCON) (Phase II) in a new TRACON (Location Identifier - A80) facility located at Peachtree City, Georgia.

3-04.1.1 Purpose of the Program/System

The A80 program is designed to satisfy the demands for terminal air traffic services in the North Georgia area well into the 21st century. This program includes the telecommunications required to meet the operational requirements of A80 with a planned transition to minimize interruption to air traffic operations. The program includes safeguards against catastrophic failures and satisfies the diversity requirements of FAA Order 6000.36A. The goals of the program include the development of a responsive, integrated network management environment, satisfying telecommunications reliability criteria, and promoting the use of state-of-the-art technologies for voice and data communications.

3-04.1.2 References

3-04.1.2.1 FAA Capital Investment Plan Project No. F-02 (Jan 1999).

3-04.1.2.2 Atlanta Metroplex Control Facility Staff Study (Nov 1994).

3-04.1.2.3 Operational Requirements Document (ORD) Atlanta MCF (Nov 1994).

3-04.1.2.4 Atlanta Large TRACON System Architecture Document (SAD) (Oct 1998).

3-04.1.2.5 NAS System Specification (NAS-SR-1000), SCN-1 to SCN-12 (May 1993).

3-04.1.2.6 NAS System Specification (NAS-SS-1000), SCN-1 to SCN-25 (Sep 1994).

3-04.1.2.7 FAA Order 6000.36A, NAS Communications Diversity (Nov 14, 1995).

3-04.1.2.8 Atlanta Large TRACON Interfacility Telecommunications Program Plan (TPP) (Dec 1997)

3-04.1.2.9 Atlanta Large TRACON Interfacility Telecommunications Program Planning Update (Sep 1998)

3-04.2 PROGRAM/SYSTEM DESCRIPTION

Airport expansion programs or expanded radar coverage prevent the existing Atlanta TRACON from meeting operational requirements. Within the Atlanta terminal area airspace, there is a natural operational linkage between the Atlanta and Columbus TRACONs, and the Macon RAPCON. Consolidation of these facilities will enhance operations in the Atlanta terminal area by optimizing airspace and procedures.

On March 13, 1995, the FAA approved site acquisition and construction of a facility sized to accommodate Atlanta and Columbus TRACONs and Macon RAPCON operations and support activities. Based on a review of detailed airspace and cost-benefit analyses, ATS-1 (on September 26, 1998) approved consolidation of the Macon RAPCON and Columbus TRACON into the Atlanta Consolidated TRACON (ACT) by July 2001.

3-04.2.1 Functional Interface Requirements

The ACT telecommunications program provides telecommunications connectivity in support of interfacility voice, data, and video services, as well as air-to-ground radio.

3-04.2.1.1 A80 Phase I

Functional connectivity for Atlanta TRACON activities will remain constant throughout the transition. The A80 TRACON will provide direct connectivity to all ATCTs and other user sites in the end-state. These functional requirements form the foundation for the functional telecommunications connectivity shown in Figure 3-04-1.

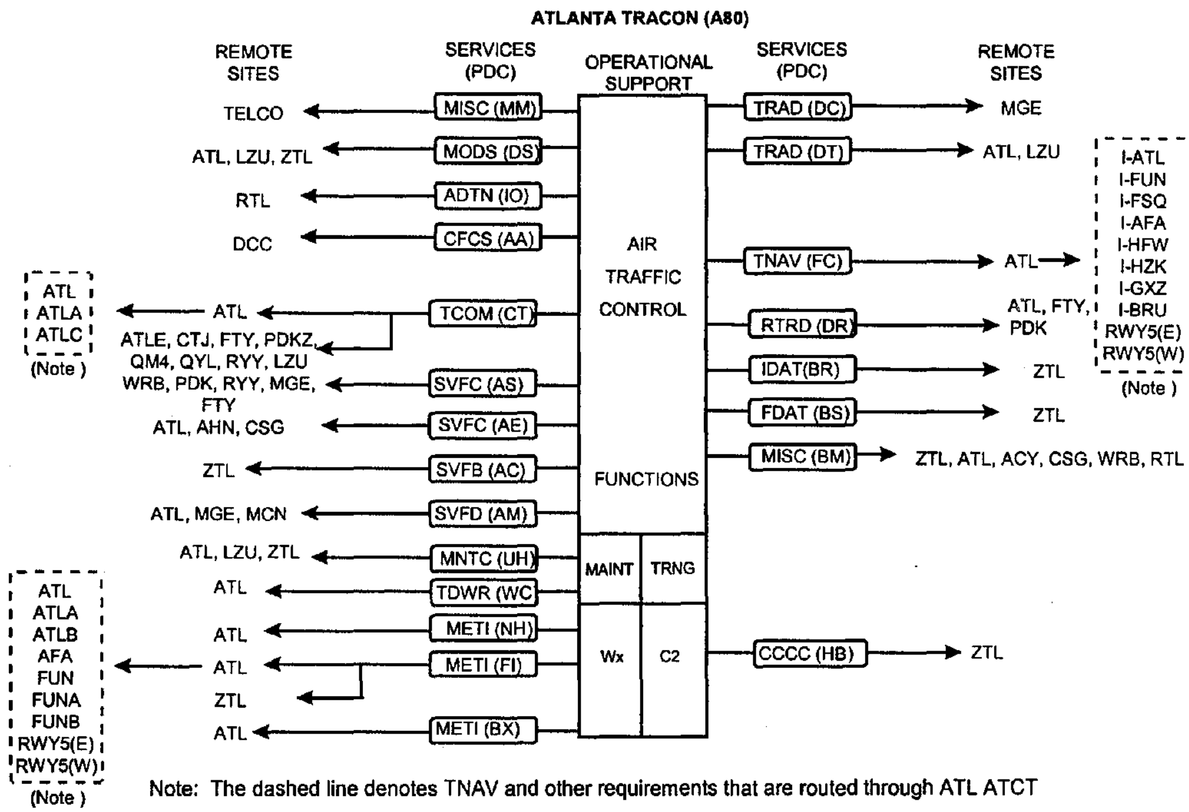
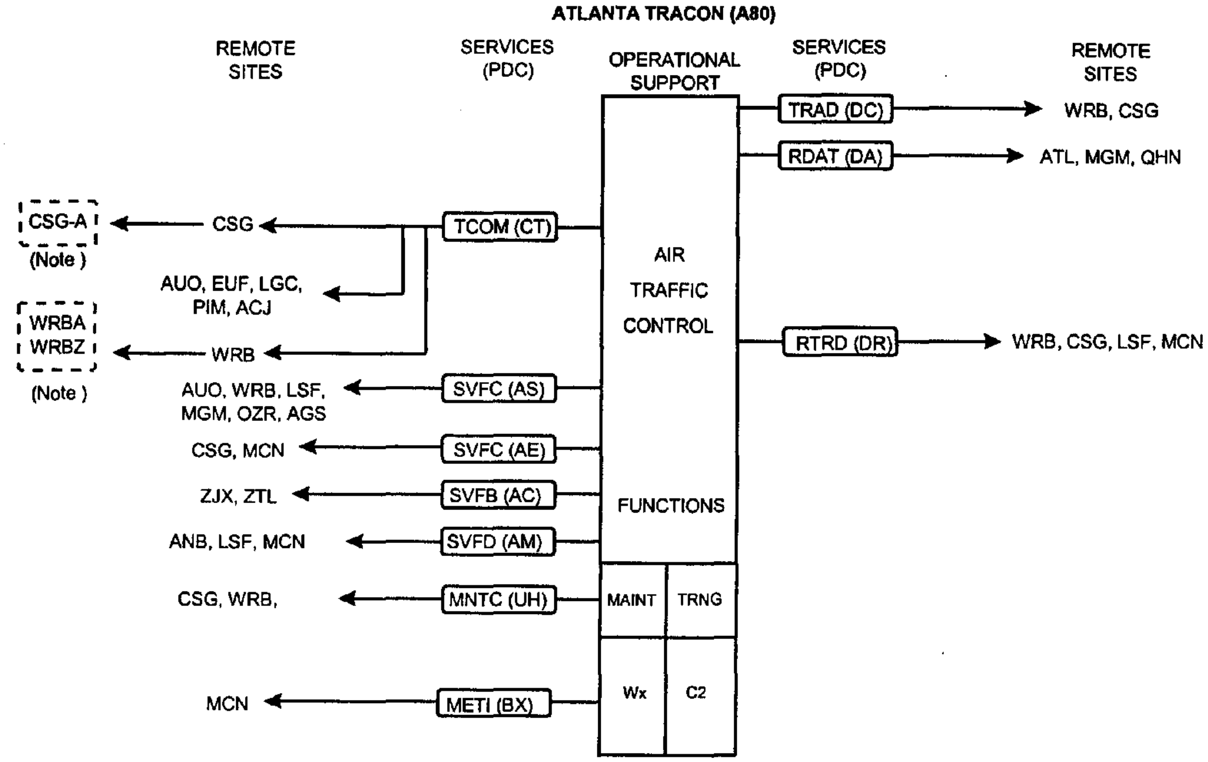


Figure 3-04-1. A80 Functional Connectivity Requirements (Phase I)

3-04.2.1.2 A80 Consolidation (Phase II)

Figure 3-04-2 depicts the telecommunications functional requirements added with the consolidation of the CSG TRACON and WRB RAPCON functions into the A80. Functional connectivity will remain constant throughout the transition.



Note: The dashed line denotes TCOM and other requirements that are routed through other sites.

Figure 3-04-2. Columbus and Macon Functional Connectivity Requirements (Phase II)

3-04.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

The ACT uses a combination of service providers to meet its functional requirements.

3-04.3.1 Operational Connectivity

The FAA's Leased Interfacility NAS Communications System (LINCS) Program will provide the primary transmission media for the A80 interfacility operational connectivity. It will be used for end-to-end service and, whenever possible, to provide connectivity to the nearest FAA-owned telecommunications system access point. The LINCS Program provides services ranging from individual voice grade circuits to DS-1 service.

An operational voice switching system will be provided for reliable air-to-ground and ground-to-ground voice switching between air traffic controllers, pilots and other ground based air traffic facilities.

3-04.3.2 Use Of FAA-Owned Assets

FAA-owned telecommunications systems, e.g., RCL and LDRCL are incorporated into the implementation strategy and may be used to provide diversity for critical services.

3-04.3.3 Administrative Telecommunications Services

Administrative interfacility telecommunications requirements will be supported by the Agency Data Telecommunications Network 2000 (ADTN2000) and the Federal Telecommunications System 2001 (FTS2001). A Voice Telecommunications Switch (VTS) will provide the switched voice connectivity within the ACT and to external facilities.

A summary of the circuit/channel connectivity requirements for the Atlanta TRACON relocation and the additional telecommunications functional requirements for a consolidation of the CSG TRACON and WRB RAPCON functions into the A80 is provided in Figures 3-04-3 and 3-04-4, respectively.

3-04.3.4 Diversity

Diversity or diversity waivers have been addressed in accordance with the diversity order FAA Order 6000.36A.

3-04.4 ACQUISITION ISSUES

3-04.4.1 Program Schedule and Status

June 1997	Site selection
December 1999	Construction BOD
August 2000	Complete Equipment Installation (Facility Availability)
November 2000	Complete Operational Testing and Evaluation
November 2000	Facility Commissioning (Phase I)
August 2001	Facility Commissioning (Phase II)

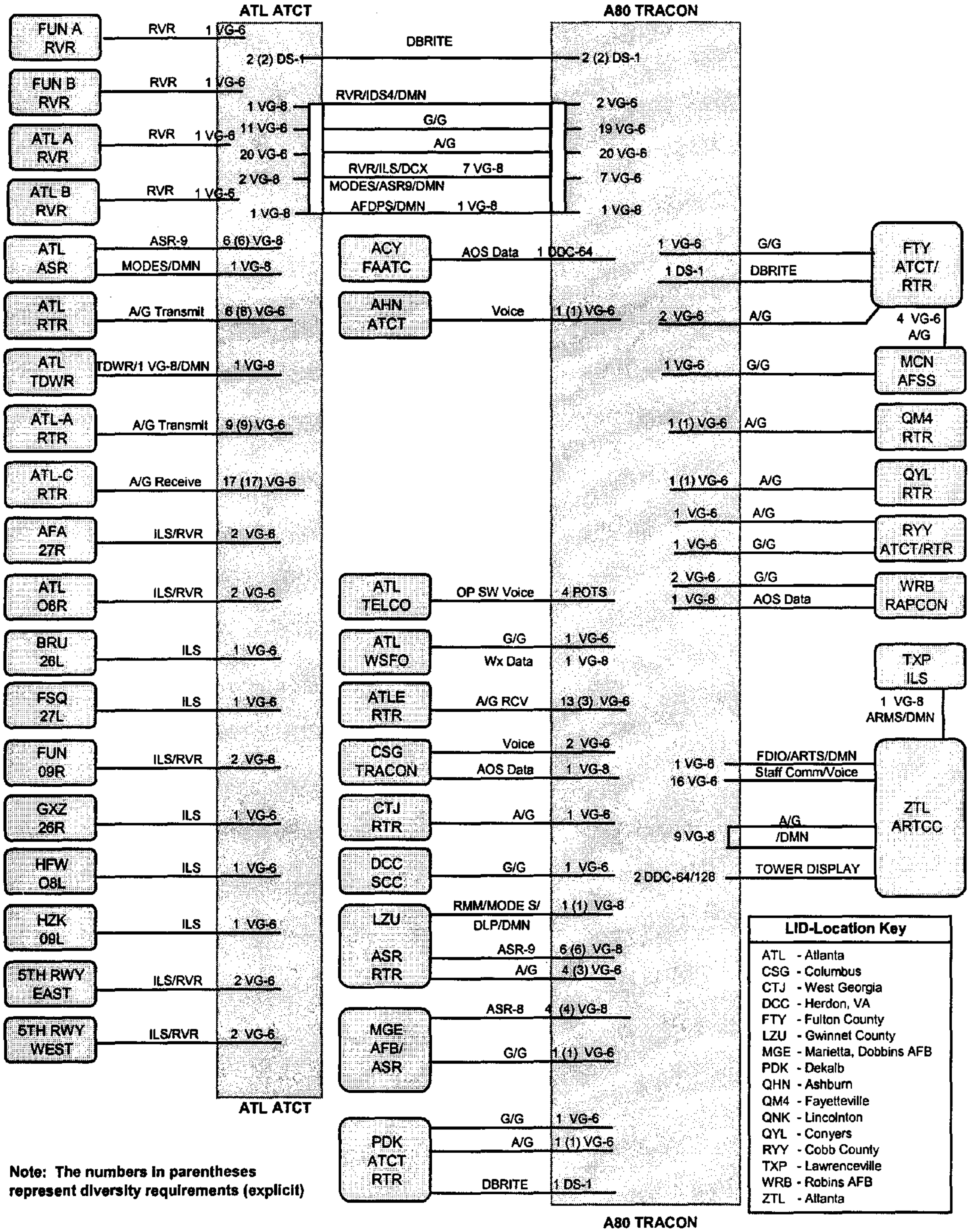


Figure 3-04-3. A80 TRACON Interface Requirements (Phase I)

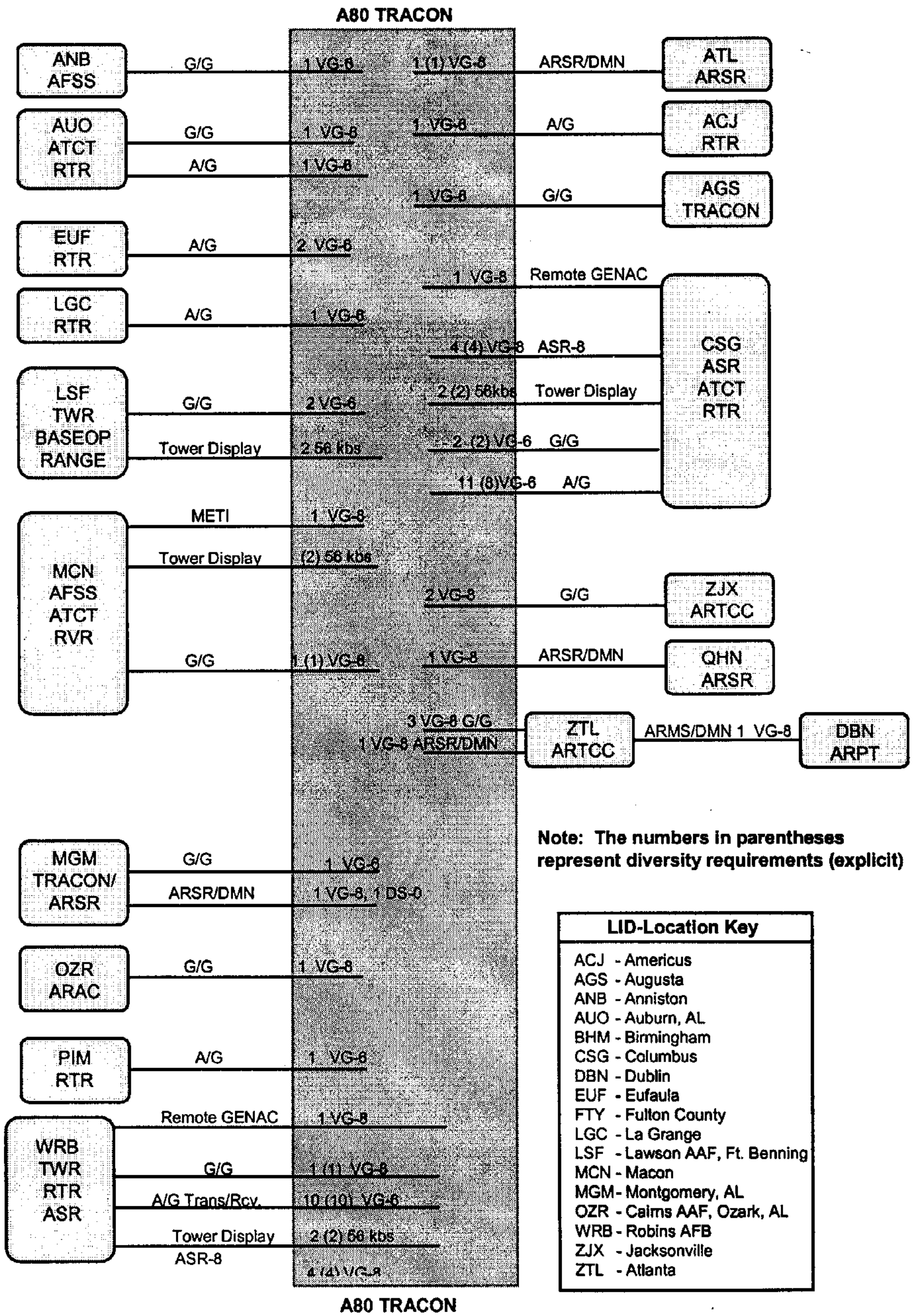


Figure 3-04-4. Columbus and Macon Interface Requirements (Phase II)

3-04.4.2 Telecommunications Costs

Table 3-04-1 provides a summary of the estimated telecommunications costs for the A80 Program (Phase I & II) from FY00 through FY06.

There are three categories of telecommunications costs for the A80 Program: leased circuits, telecommunications equipment, and telecommunications infrastructure. The equipment category includes DMN equipment, demarcation equipment, the VTS and associated equipment and ADTN2000 terminal equipment. The infrastructure category includes the new LINCS EUL-A Node at A80 and the LINCS EUL-B+ equipment at WRB. All items in the infrastructure category are related to providing the required communications diversity.

In accordance with FAA Order 2500.8A, the non-recurring cost and the recurring costs in the year of installation plus the next full fiscal year are included in the F&E Funded cost totals. After the second year, the recurring costs are OPS Funded. Based on the current implementation schedule associated with the relocation of the Atlanta TRACON, circuits, equipment and infrastructure improvements are required at the beginning of FY00. Consolidation of the CSG TRACON and WRB RAPCON into the ACT is scheduled to start at the beginning of FY01. The F&E Funded totals include 24 months of recurring charges.

The current combined OPS funded annual telecommunications cost for the three existing facilities is approximately $395K.

Table 3-04-1. Cost Summary - Atlanta Large TRACON

CIP # F-02 — All costs in 000's	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
Channel Costs								
Cost Profile: LINCS and ADTN2000 Circuits between the A80 TRACON and ASRs, RTRs, ATCTs, etc.								
Non-recurring Circuit Costs								
F&E Non-recurring Costs		$484	$0	$0	$0	$0	$0	$0
OPS Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
Recurring Circuit Costs								
F&E Recurring Costs		$420	$598	$0	$0	$0	$0	$0
OPS Recurring Costs		$0	$0	$628	$628	$628	$628	$628
Hardware Costs								
Cost Profile: Demarcation, DMN, VTS, ALTE, and ADTN2000 Terminating Equipment								
Non-recurring Equipment Costs								
F&E Non-recurring Costs		$903	$0	$0	$0	$0	$0	$0
OPS Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
Recurring Equipment Costs								
F&E Recurring Costs		$37	$37	$0	$0	$0	$0	$0
OPS Recurring Costs		$1	$1	$39	$39	$39	$39	$39
Telecommunications Infrastructure Costs								
Cost Profile: EUL-A at A80 TRACON and EUL-B+ at WRB.								
Non-recurring Costs								
F&E Non-recurring Costs		$3,121	$0	$0	$0	$0	$0	$0
OPS Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
Recurring Costs								
F&E Recurring Costs		$535	$525	$0	$0	$0	$0	$0
OPS Recurring Costs		(Captured in LINCS chapter, see table on next page)						

SUMMARY

		FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Totals	Non-recurring	$4,509	$0	$0	$0	$0	$0	$0
	Recurring	$992	$1,161	$0	$0	$0	$0	$0
	F&E Total	**$5,501**	**$1,161**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$1	$1	$666	$666	$666	$666	$666
	OPS Total	**$1**	**$1**	**$666**	**$666**	**$666**	**$666**	**$666**

Notes:

1. Totals shown above do not include costs associated with STARS Program connectivity requirements. To prevent double-counting, those costs are listed in the STARS chapter.
2. The current annual recurring cost of leased connectivity to the ATL TRACON, CSG TRACON, and WRB RAPCON Is approximately $395K.

Table 3-04-1. Cost Summary - Atlanta Large TRACON (concluded)

The following table shows requirements, which are identified in the LINCS chapter. They are repeated here
for information only and are not included in A80 program funding requirements.

All costs in 000's	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
Telecommunications Infrastructure Costs								
Cost Profile: LINCS EUL-A Upgrades and Overbuilds; and Primary and Diverse Access								
F&E Non-recurring EUL-A Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring EUL-A Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$0**	**$525**	**$525**	**$525**	**$525**	**$525**

TOTAL PROGRAM SUMMARY

(Includes Requirements Identified in LINCS Chapter)

F&E Totals	Non-recurring	$4,509	$0	$0	$0	$0	$0	$0
	Recurring	$992	$1,161	$0	$0	$0	$0	$0
	F&E Totals	**$5, 501**	**$1,161**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$1	$1	$1,192	$1,192	$1,192	$1,192	$1,192
	OPS Totals	**$1**	**$1**	**$1,192**	**$1,192**	**$1,192**	**$1,192**	**$1,192**

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CHAPTER 3-05 - SUMMARY SHEET

TRACON - NORTHERN CALIFORNIA (TR-NOCAL)

Program/Project Identifiers:

Project Number(s):	CIP, F-02
Related Program(s):	ARTS, STARS, ACE
New/Replacement/Upgrade?	New
Responsible Organization:	ANS-220
Program Mgr./Project Lead:	Tim Dyer ANS-220, (202) 493-4488
Fuchsia Book POC:	Sampath Krishnan, AOP-400, (202) 493-5951

Assigned Codes:

PDC(s):	AA, AC, AE, AQ, AR, BF, BM, BN, BR, BY, CT, DA, DC, DJ, DM, DR, DS, DT, FI, FN, IB, IC, ID, IY, MG, NG, NH, UF, UH
PDC Description:	ATC Computer Circuits, ARTCC to ATCT/TRACO; Terminal RTR Circuits; Diverse Path Of Terminal RTR Circuits; Terminal Primary Radar Circuits (Primary Path); Back-up Terminal Radar Circuits, Admin Voice, Admin Data,
Service Code:	ADDA, ADTN, ADVO, ASOS, BDAT, CFCS, DMN, FDAT, IDAT, METI, MISC, MNTC, MODS, RDAT, RTRD, SVFB, SVFC, TCOM, TRAD

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$4,015	$407	$0	$0	$0	$0	$0
F&E Recurring	$346	$3,161	$1,207	$0	$0	$0	$0
Total F&E	**$4,361**	**$3,568**	**$1,207**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$0	$0	$1,166	$2,373	$2,373	$2,373	$2,373
Total OPS	**$0**	**$0**	**$1,166**	**$2,373**	**$2,373**	**$2,373**	**$2,373**

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CIP Category: Facilities	3-05.0 NORTHERN CALIFORNIA TRACON

3-05.1 PROGRAM OVERVIEW

3-05.1.1 Purpose of the Program

The Northern California TRACON (NCT) program will commission a new air traffic control facility at the former Mather AFB near Sacramento, California. The new facility will control the terminal airspace currently assigned to the Monterey (MRY), BAY (O90), Stockton (SCK), and Sacramento (MCC) TRACONs, plus portions of airspace currently controlled by Oakland ARTCC (ZOA) and Travis AFB (SUU).

3-05.1.2 References

3-05.1.2.1 FAA Capital Investment Plan (CIP) Project F-02, January 1999.

3-05.1.2.2 National Airspace System (NAS) System Requirements, NAS-SR-1000.

3-05.1.2.3 National Airspace System (NAS) System Specification, NAS-SS-1000.

3-05.1.2.4 National Airspace System (NAS) Design Document, NAS-DD-1000D.

3-05.1.2.5 Operational Requirements Document, Northern California Metroplex, September 13, 1995.

3-05.1.2.6 Northern California Metroplex Control Facility Mission Need Statement, January 16, 1996 (Revision 1).

3-05.1.2.7 Northern California TRACON System Architecture Document, December 5,1997.

3-05.1.2.8 NCT Transition and Implementation Plan, May 15, 1998.

3-05.1.2.9 FAA Telecommunications Strategic Plan, January 25, 1996.

3-05.1.2.10 Future FAA Telecommunications Plan, April 1996.

3-05.1.2.11 Current FAA Telecommunications, FY1998 Edition.

3-05.1.2.12 NCT Telecommunications Program Plan, Version 3.0, December 6, 1999.

3-05.1.2.13 Northern California TRACON Schedule, Revision 1.037, August, 1999

3-05.2 SYSTEM DESCRIPTION

The terminal air services required in Northern California must support air traffic growth, reduce user delays through better traffic management, alleviate space and automation problems, and provide for future system growth. On January 16, 1996, the FAA issued a Key Decision Point-2 directive to proceed with the design and development of a new facility to be located at the former Mather AFB.

3-05.2.1 Program/System Components

3-05.2.1.1 Principal Components

The principal components of the Northern California TRACON are:

- The commissioning automation platform will be an ARTS IIIE processor. ARTS Color Display (ACD) equipment will provide Remote Tower Radar Display (RTRD) service. The final automation platform will be the Standard Terminal Automation Replacement System (STARS) air traffic control automation system at the TRACON and air traffic control towers in NCT's airspace.
- An operational voice switch (Rapid Deployment Voice Switch, RDVS) for operational voice connectivity between FAA facilities.
- ASOS Controller Equipment (ACE) Information Display System (IDS), also known as Data Display System, to provide weather and airport condition information to controllers and other air traffic control personnel.
- Terminal air/ground radio systems, including Emergency Communications Systems, to provide audio communications between the controller and aircrew.
- Terminal surveillance system providing primary and secondary radar services to allow air traffic controllers to follow the aircraft's flight path and maintain separation, give air traffic advisories, and sequence landings and takeoffs.

3-05.2.1.2 Functional Component Interface Requirements

The NCT will require interfaces to air/ground radio, ground/ground voice, surveillance, weather, and air traffic control and management systems within the Northern California area and adjoining areas. The Northern California TRACON operations will be implemented in four phases on a facility oriented, basis. Figure 3-05-1 depicts the functional interfaces between the NCT and other FAA facilities and systems.

3-05.2.1.3 Terminal Communications

Terminal Communications (TCOM) service is the air/ground voice communications provided by terminal ATC facilities through radios located at RTR sites. This includes VHF and UHF primary and backup plus Emergency Communications Systems (ECS) capabilities.

3-05.2.1.3.1 Interphone Services

Service F (Interphone) communications provides for the expeditious transfer of flight information between positions and facilities responsible for the safety of aircraft in flight. The service provides connectivity between controllers and between:

- NCT TRACON and ZOA ARTCC.
- NCT TRACON and air traffic control towers.
- NCT TRACON and Flight Service Stations.
- NCT and adjoining TRACONs.
- NCT TRACON and other air traffic control facilities.

3-05.2.1.3.2 Meteorological Information

Meteorological Information includes up-to-the minute weather and flight information in the local airfield facilities. The interface includes the ACE IDS that integrates the collection, distribution, and display of static and dynamic critical information to air traffic controllers, supervisors, and related personnel. The service includes DASI, ASOS, RVR and user-defined information. ACE IDS equipment will be used to provide the end equipment.

3-05.2.1.3.3 Radar Services

Radar services provide primary and/or secondary radar data from either terminal or long range radar facilities to the air traffic control automation system. These services allow air traffic controllers to follow the aircraft's flight path, maintain separation, give air traffic advisories, and sequence landings and takeoffs.

3-05.2.1.3.3.1 Terminal Radar

Terminal radar services from four ASR-9s (Beale (BAB) ASR, Camp Kohler (MCC) ASR, Moffett (NUQ) ASR, and Oakland (OAK) ASR provide primary and/or secondary radar data from ASR-7, -8, and -9, ATCBI, Mode S and other radar facilities. The Stockton ASR-7 is scheduled to be replaced by an ASR-11 in time to support NCT commissioning. The digitizers will be provided for the Fort Ord ASR-8 and Merced GPN-20.

3-05.2.1.3.3.2 En Route Radar

En Route radar services provide primary and/or secondary radar data from the Mill Valley (QMV) ARSR-4, Paso Robles (PRB) ARSR, and the Sacramento (SAC) ARSR.

3-05.2.1.3.3.3 Mode-S

Mode S Sensors collocated with the four ASR-9s provide beacon radar surveillance of all transponder-equipped aircraft and two-way digital data link communications with Mode S transponder-equipped aircraft.

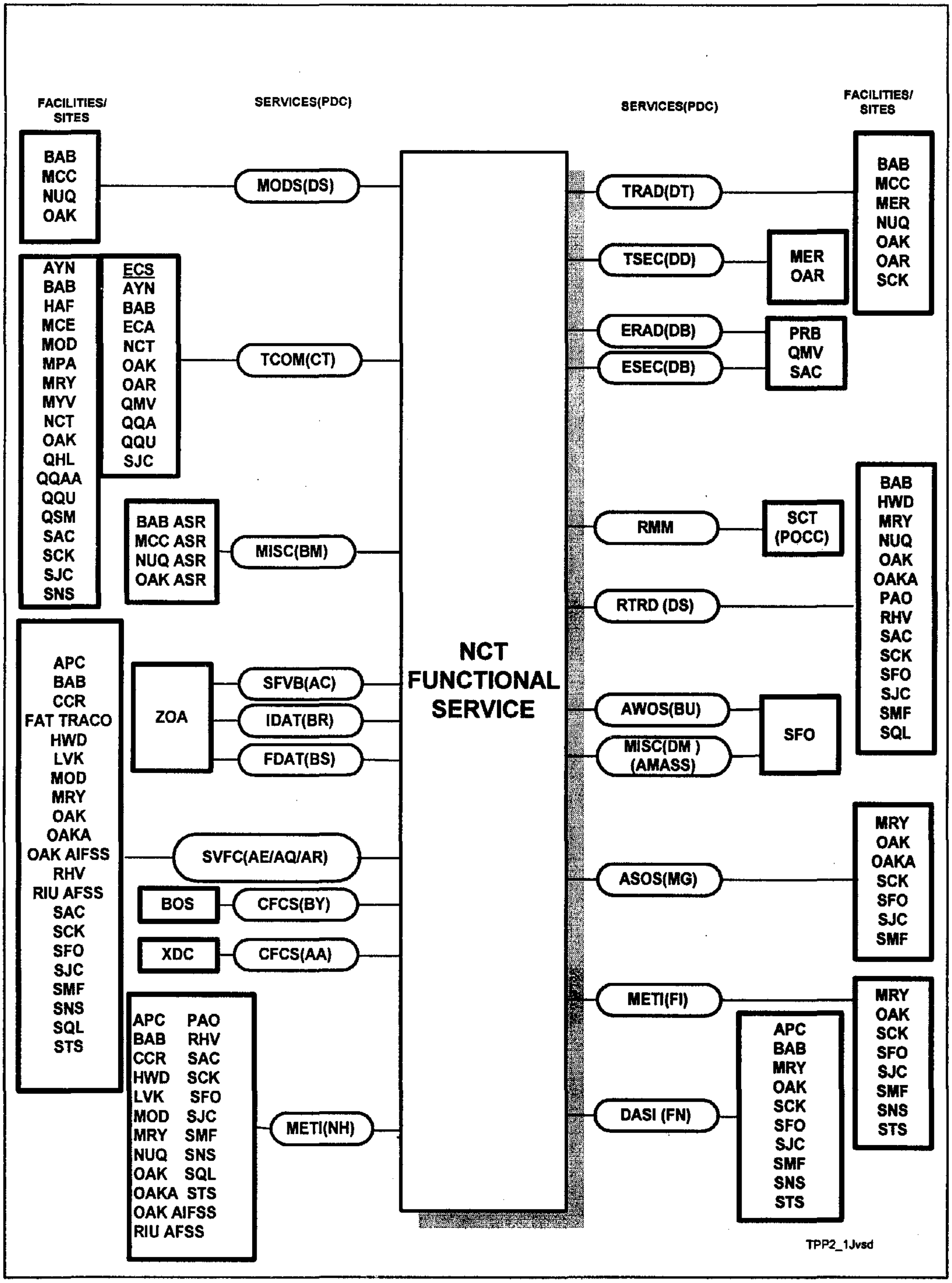

Figure 3-05-1. Northern California TRACON Functional Service Requirements

3-05.2.1.3.4 Automated Radar Terminal System- (ARTS-IIIE)

An ARTS-IIIE system will provide the terminal air traffic services for the TRACON at commissioning. The ARTS-IIIE will support ARTS Color Display (ACD) equipment at APC, BAB, CCR, HWD, LVK, MRY, NUQ, OAK, OAKA, PAO, RHV, SAC, SCK, SFO, SJC, SMF, SQL, STS ATCTs using two 56KBPS circuits to each tower.

3-05.2.1.3.5 Operational Voice Switch

A Rapid Deployment Voice Switch provides controllers with voice connectivity to other air traffic control facilities and other positions within the NCT TRACON.

3-05.2.1.3.6 Agency Communications

A Voice Telecommunications Switch (VTS) will provide the entire TRACON facility with switched voice connectivity within the NCT TRACON and to other FAA facilities and other external entities. A local area network will provide internal agency data connectivity within the NCT TRACON and gateways to external wide area networks. A video teleconferencing system will provide agency connectivity to other teleconferencing systems.

3-05.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

3-05.3.1 Telecommunications Interfaces

The ART-IIIE will be installed in the NCT and accept and process target reports, weather, and non-target messages from multiple ASR and ARSR sensors. The ARTS Color Display equipment will be located in selected Airport Traffic Control Towers and interface with the ARTS-IIIE processor located at NCT. ACE IDS equipment will be installed at NCT and selected Airport Traffic Control Towers and Flight Service Stations.

3-05.3.1.1 Leased Interfacility Network Communications System (LINCS)

The FAA's Leased Interfacility Network Communications System (LINCS) will be used as the primary transmission media source for the NCT program. LINCS will be used for end-to-end service and, whenever practicable, to provide connectivity to the nearest FAA-owned telecommunications service delivery point. This process provides for the simplified acquisition and implementation of services ranging from individual voice circuits up to T-1 service. Alternative commercial telecommunications providers may be used when operational or cost considerations warrant.

3-05.3.1.2 FAA Owned Assets

FAA-owned telecommunication systems such as Radio Communications Links (RCL) and Low Density RCL (LDRCL) are integrated into the implementation to provide primary or diverse connectivity where warranted by operational or cost considerations.

3-05.3.1.3 Agency Connectivity

The Agency Data Telecommunications Network 2000 (ADTN2000) and Federal Telecommunications System 2000 (FTS2000), or its replacement program FTS2001, will support requirements for interfacility agency communications connectivity.

3-05.3.2 Local Interfaces

The local interface requirements of the NCT will depend upon the outcome of studies being conducted to identify trade-offs associated with collocating specific functions with the NCT. Fiber optic or coaxial cable typically satisfies local interfaces.

3-05.3.3 Diversity Requirements

Diversity requirements have been considered in accordance with FAA Order 6000.36A. The NCT program will fund for diversity equivalent to the current operational baseline. Additional diversity requirements must be funded through other sources or waived in accordance with FAA Order 6000.36A.

3-05.4 ACQUISITION ISSUES

3-05.4.1 Program Schedule and Status

The interface implementation schedule is shown in Table 3-05-1.

Table 3-05-1. Program Milestones

Milestone	Date
Award Construction Contract	Nov 97
Submit Telecommunications Service Requests (TSR)	May 00
Begin Installing Electronics	April 00
All Circuits Available	Mar 01
Initial Operational Capability	Jul 01
Commission Facility	Jan 02
Complete Operational Transition to New Facility	Aug 02

3-05.4.2 Planned Telecommunications Strategies

The current telecommunications strategy is to use existing FAA commercial sources, primarily LINCS, and existing FAA-owned systems such as Radio Communications Link (RCL) to provide the required transmission services. In several cases, such as LINCS and Data Multiplex Network (DMN), follow-on acquisitions will be implemented close to the scheduled NCT implementation date. The strategy is to monitor the progress of these follow-on programs carefully to ensure they will provide the required services in a timely manner to support NCT commissioning.

3-05.4.2.1 FAA Resources

The FAA's NAS Interfacility Communications System will be used for NCT interfacility connectivity. For operational requirements, the LINCS is the planned transmission medium. LINCS EUL-A or a mix of transmission systems will provide required diversity in accordance with FAA Order 6000.36A. A new EUL-A node is required at NCT; EUL nodes at Monterey Airport Traffic Control Tower, Sacramento Executive Airport Traffic Control Tower, and McClellan ASR-9 will be upgraded to B+ nodes to meet operational requirements.

In addition to LINCS service, other FAA owned or leased services--such as FAA RCL, LDRCL, FTS2000, or other leased services--may be used as required to provide diverse routing for critical services or connectivity where commercial sources are not available.

3-05.4.2.2 ARTS-IIIE Availability

Current program planning is based on the assumption that ARTS-IIIE will be the automation system implemented at NCT until STARS attains its Full Service Capability.

3-05.4.3 Telecommunications Costs

Table 3-05-2 provides a summary of the estimated telecommunications costs for the NCT Program from FY00 through FY06. There are three categories of telecommunications costs: leased circuits, telecommunications equipment, and telecommunications infrastructure. The equipment category includes DMN modems and multiplexers, demarcation equipment, and ADTN2000 terminal equipment. The infrastructure category covers the new EUL-A node at the NCT, three EUL-B+ upgrades, two new EUL-B nodes, and three LDRCL systems. All items under the infrastructure category are related to providing the required communications diversity.

In accordance with FAA Order 2500.8A, the non-recurring cost and the recurring costs in the year of installation plus the next full fiscal year are included in the F&E Funded cost totals. After the second year, the recurring costs are OPS Funded. Based upon the current implementation schedule for the NCT Program, circuits, equipment and infrastructure improvements are required in the first half of FY00. For those items, the F&E Funded totals include 18 months of recurring charges. The non-recurring equipment costs in FY98 correspond to the acquisition of DMN equipment that has been accelerated since the DMN contract ends in the current fiscal year.

Table 3-05-2. Cost Summary - NCT Program

CIP # F-02	All costs in 000's	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
Channel Costs									
	Cost Profile: LINCS and FTS2001 Leased Circuits and Services								
	F&E Non-recurring Channel Costs		**$821**	**$407**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring Channel Costs								
	F&E Recurring Costs		**$64**	**$1,695**	**$1,207**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$0**	**$0**	**$811**	**$2,018**	**$2,018**	**$2,018**	**$2,018**
Hardware Costs									
	Cost Profile: Equipment for Interfacing to Operational and Administrative Networks.								
	F&E Non-recurring Equipment Costs		**$1,177**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring Equipment Costs								
	F&E Recurring Costs		**$279**	**$355**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$0**	**$0**	**$355**	**$355**	**$355**	**$355**	**$355**
Telecommunications Infrastructure Costs									
	Cost Profile: LINCS EUL-A Upgrades and Overbuilds; and Primary and Diverse Access								
	F&E Non-recurring EUL-A Costs		**$2,016**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring EUL-A Costs								
	F&E Recurring Costs		**$3**	**$1,111**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		(Captured in LINCS chapter, see table on next page)						
			SUMMARY						
F&E Totals		Non-recurring	$4,015	$407	$0	$0	$0	$0	$0
		Recurring	$346	$3,161	$1,207	$0	$0	$0	$0
		F&E Totals	**$4,361**	**$3,568**	**$1,207**	**$0**	**$0**	**$0**	**$0**
OPS Totals		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$1,166	$2,373	$2,373	$2,373	$2,373
		OPS Totals	**$0**	**$0**	**$1,166**	**$2,373**	**$2,373**	**$2,373**	**$2,373**

Notes:

1. Cost of ARTS-IIIE connectivity are listed in the ARTS chapter and are not included in the circuits costs shown above to avoid double-checking.

2. Existing connectivities to the four standalone TRACONs account for $758K of the Leased Telecommunications Budget (base).

Table 3-05-3. Cost Summary - NCT Program (concluded)

The following table shows requirements, which are identified in the LINCS chapter. They are repeated here for information only and are not included in NCT program funding requirements.

CIP # F-02	All costs in 000's	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
Telecommunications Infrastructure Costs									
Cost Profile: LINCS EUL-A Upgrades and Overbuilds; and Primary and Diverse Access									
F&E Non-recurring EUL-A Costs			**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring EUL-A Costs									
F&E Recurring Costs			**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs			**$0**	**$0**	**$1,782**	**$1,836**	**$1,836**	**$1,836**	**$1,836**

TOTAL PROGRAM SUMMARY

(Includes Requirements Identified in LINCS Chapter)

		FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Totals	Non-recurring	$4,015	$407	$0	$0	$0	$0	$0
	Recurring	$346	$3,161	$1,207	$0	$0	$0	$0
	F&E Totals	**$4,361**	**$3,568**	**$1,207**	**$0**	**$0**	**$0**	**$0**
OPS Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$0	$0	$2,949	$4,210	$4,210	$4,210	$4,210
	OPS Totals	**$0**	**$0**	**$2,949**	**$4,210**	**$4,210**	**$4,210**	**$4,210**

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CHAPTER 3-06 - SUMMARY SHEET

POTOMAC CONSOLIDATED TRACON (TR-PCT)

Program/Project Identifiers:

Project Number(s):	CIP F-02
Related Program(s):	
New/Replacement/Upgrade?	New facility
Responsible Organization:	
Program Mgr./Project Lead:	Arnold Stewart, ANS-220, 202-267-3122
Fuchsia Book POC:	Jack Robson, AOP-400/ITT, 202-314-5983

Assigned Codes:

PDCs:	AA, AC, AE, AM, AQ, AR, AS, BF, BR, BW, BY, CI, CN, CT, CU, DA, DJ, DL, DR, DT, FI, FN, HF, HT, IB, IC, ID, II, IS, KT, MN, NG, NH, UF, UH, UP, US, UY, WA, WC, WE
PDC Description:	Radar, weather, air/ground, beacon, ETMS, CTAS, ATOMS circuits
Service Codes:	ADDA, ADSY, ADVO, ATIS, BDAT, CFCS, DMN, EVCS, FDAT, HCAP, IDAT, METI, MISC, MNTC, RDAT, RTRD, SVFB, SVFC, SVFD, TCOM, TDWR, TRAD, TRNG, VDEO

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$6,197	$0	$0	$0	$0	$0
F&E Recurring	$0	$0	$1,174	$1,761	$0	$0	$0
Total F&E	**$0**	**$6,197**	**$1,174**	**$1,761**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$0	$0	$0	$0	$1,264	$1,264	$1,264
Total OPS	**$0**	**$0**	**$0**	**$0**	**$1,264**	**$1,264**	**$1,264**

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CIP Category: Facilities	3-06.0 POTOMAC CONSOLIDATED TRACON

3-06.1 PROGRAM OVERVIEW

The Potomac Consolidated TRACON (PCT) Program will provide full air traffic control services to the Baltimore-Washington Metropolitan Area. This new facility will consolidate and redesign the airspace currently controlled by terminal radar approach control (TRACON) facilities located at Andrews Air Force Base (ADW), Baltimore-Washington International Airport (BWI), Dulles International Airport (IAD), and Ronald Reagan Washington National Airport (DCA).

3-06.1.1 Purpose of the Potomac Consolidated TRACON

The Terminal Air Traffic Control (ATC) System in the Baltimore-Washington Metropolitan Area is approaching system capacity. The airspace associated with this area is segmented, resulting in excessive pilot/controller and controller/controller communications for aircraft entering, departing, or traversing the area. Additional justification for the PCT project includes: existing flight paths and flight profiles are inefficient, resulting in increased aircraft fuel consumption and flight delays; the IAD TRACON is undersized and experiencing infrastructure problems that cannot be remedied at the current location; the BWI TRACON will soon reach capacity and the end of its facility life cycle. The PCT will provide an optimal solution to the existing facility and airspace constraints by providing a platform to accommodate future air traffic growth and beneficial airspace design changes for the Baltimore-Washington Metropolitan airspace.

3-06.1.2 References

3-06.1.2.1 FAA Capital Investment Plan Project No. F-02 (January 1999).

3-06.1.2.2 Potomac System Architecture Document (June 1999).

3-06.1.2.3 Potomac Consolidated TRACON Telecommunications Program Plan, Version 2 (December 31, 1999).

3-06.1.2.4 Potomac Metroplex Control Facility (MCF) Operational Requirements Document (July 28, 1994).

3-06.1.2.5 FAA Order 6510.4A, Radio Communications Requirements for Air Traffic Control Facilities (June 19, 1980).

3-06.1.2.6 FAA Order 6000.36A, NAS Communications Diversity (Nov 14, 1995).

3-06.2 SYSTEM DESCRIPTION

The PCT will consolidate the ADW, BWI, DCA, and IAD terminal ATC operations of the Baltimore-Washington Metropolitan airspace, replacing the existing ADW, BWI, DCA, and IAD TRACONs in the NAS. To maximize airspace use, certain en route sectors, and possibly adjacent terminal sectors may also be consolidated into the PCT airspace. The PCT will require a telecommunication interface with several ATC facilities, including the Washington and New York Air Route Traffic Control Centers (ARTCC), Airport Traffic Control Towers (ATCT), en route (Air Route Surveillance Radar's, ARSR) and terminal radars (Airport Surveillance Radar, ASR), the Leesburg Automated Flight Service Station (AFSS), the ATC System Command Center (ATCSCC), an Operations Control Center (OCC), the Operational Support Facility (OPSUP) and other NAS facilities appropriate to its mission.

3-06.2.1 Program/System Components

3-06.2.1.1 Potomac Consolidated TRACON

PCT will consist of a single new structure adapted from the FAA's Generic Large Metroplex Control Facility (MCF) design. The building will contain approximately 95,000 square feet and be located on 30+ acres at a site near Warrenton, VA (Vint Hill).

3-06.2.1.2 Potomac Consolidated TRACON System Architecture

The PCT system architecture will include:

- Air Traffic Control (ATC) automation and display systems
- Surveillance (primary and secondary) systems
- Inter and intra-facility communications systems
- Weather systems
- Traffic and airspace management systems
- Navigation and landing systems
- Remote maintenance monitoring and control systems
- Training systems, and
- Administration and information display systems.

A brief description of each of the above areas follows.

3-06.2.1.2.1 ATC Automation System and Display

An ARTS IIIE with ARTS Color Displays (ACD) will be used as the automation system at PCT. Digital remote tower displays (DRTDs) will be used in the ADW, BAL, DCA, and IAD ATCTs. A DRTD will also replace the Digital Bright Radar Indicator Tower Equipment (DBRITE) in other selected ATCTs. When it becomes operational, STARS will replace the ARTS IIIE at PCT.

Using interfacility telecommunications, the ARTS IIIE will interface with the HOST computer at the ARTCC's, an independent time source, ARSRs, ASRs, a Maintenance Control Center (MCC) or Operations Control Center (OCC), the Operational Support Facility (OPSUP), and multiple ATCTs using the PCT's Master Demarcation System (MDS). The ARTS IIIE will interface with the Terminal

Controller Workstations (TCWs) and the Maintenance Display Terminals (MDT) through a Local Area Network (LAN).

3-06.2.1.2.2 Surveillance Systems

PCT will interface with terminal (ASR-9 or ASR-11) and en route (ARSR-3 or ARSR-4) radar systems for surveillance and weather information. Mode S Sensors will provide secondary radar surveillance of all transponder-equipped aircraft.

Planned radar connectivity for PCT is shown in Figure 3-06-1.

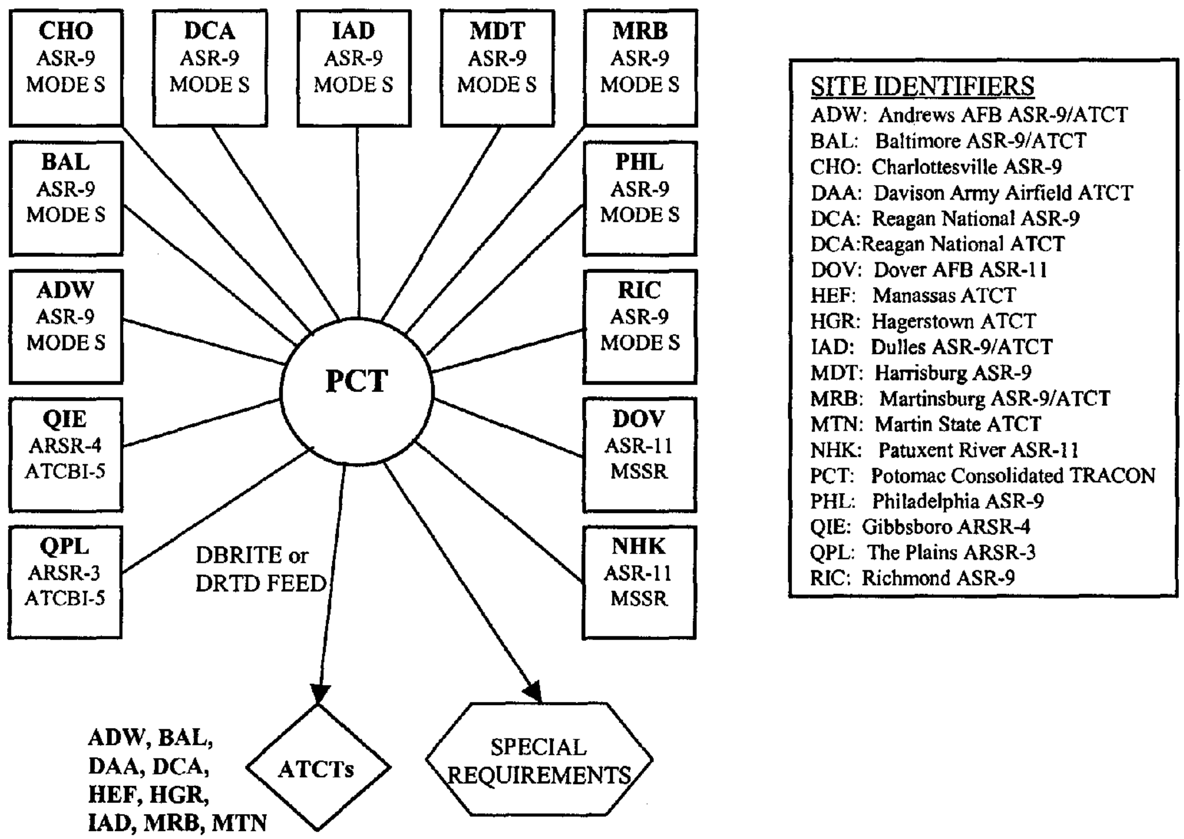

Figure 3-06-1. Currently Planned PCT Radar Connectivity

At commissioning, PCT will require connectivity to the following ASR-9s:

- Andrews Air Force Base (ADW);
- Ronald Reagan Washington National Airport (DCA);
- Baltimore-Washington International Airport (BAL);
- Dulles International Airport (IAD);
- Martinsburg, WV (MRB);
- Richmond, VA (RIC) and
- Charlottesville, VA (CHO).

Connectivity will also be required to the ARSR-3 at The Plains, VA (QPL) and the ARSR-4 at Gibbsboro, NJ (QIE).

Connectivity to ASR-9s at Harrisburg, PA (MDT), and Philadelphia, PA (PHL), and ASR-11s at Dover, DE (DOV) and Patuxent River, MD (NHK) will be required at end state.

3-06.2.1.2.3 Communications Systems

A Rapid Deployment Voice Switch (RDVS) will be the operational voice switching system for PCT. It will provide Air-to-Ground (A/G) and Ground-to-Ground (G/G) voice communications between air traffic controllers, pilots, and other ATC facilities. The RDVS will provide access to A/G and G/G communications from any operational position; access to an administrative voice switching system; dynamic reconfiguration of operational position equipment; and be capable of Remote Maintenance Monitoring. A voice switch bypass system will allow controllers to access selected frequencies in case of a RDVS failure.

An Emergency Communications System (ECS) will be implemented in the PCT area for use if both the main and standby A/G radio transmitter and receiver (RTR) equipment fails, or if connectivity to RTR sites is lost. The ECS transceivers will be located geographically diverse from the RTR sites.

Radio Control Equipment (RCE) will be included on all RTR telecommunications channels to provide radio channel signaling and control. Planned A/G radio connectivity is shown in Figure 3-06-2.

3-06.2.1.2.4 Weather Systems

The PCT will use weather information received from systems located at the four primary and selected satellite airports in the PCT area. These weather systems include the Low Level Windshear Alert System (LLWAS), Terminal Doppler Weather Radar (TDWR), Automated Surface Observing System (ASOS), Automated Weather Observing System (AWOS), Aviation Weather Distribution System (AWDS), Runway Visual Range (RVR) system, and Digital Altimeter Setting Indicator (DASI) system. Weather information will also be obtained from the Weather and Radar Processor (WARP) system, the Integrated Terminal Weather System (ITWS) and from selected ASR-9 and ARSR-3/4 systems.

In addition to weather information from the systems listed above, the ASOS Controller Equipment (ACE) will provide clock (coded time source) and Instrument Landing System (ILS) status and information display capability for PCT and its associated ATCTs.

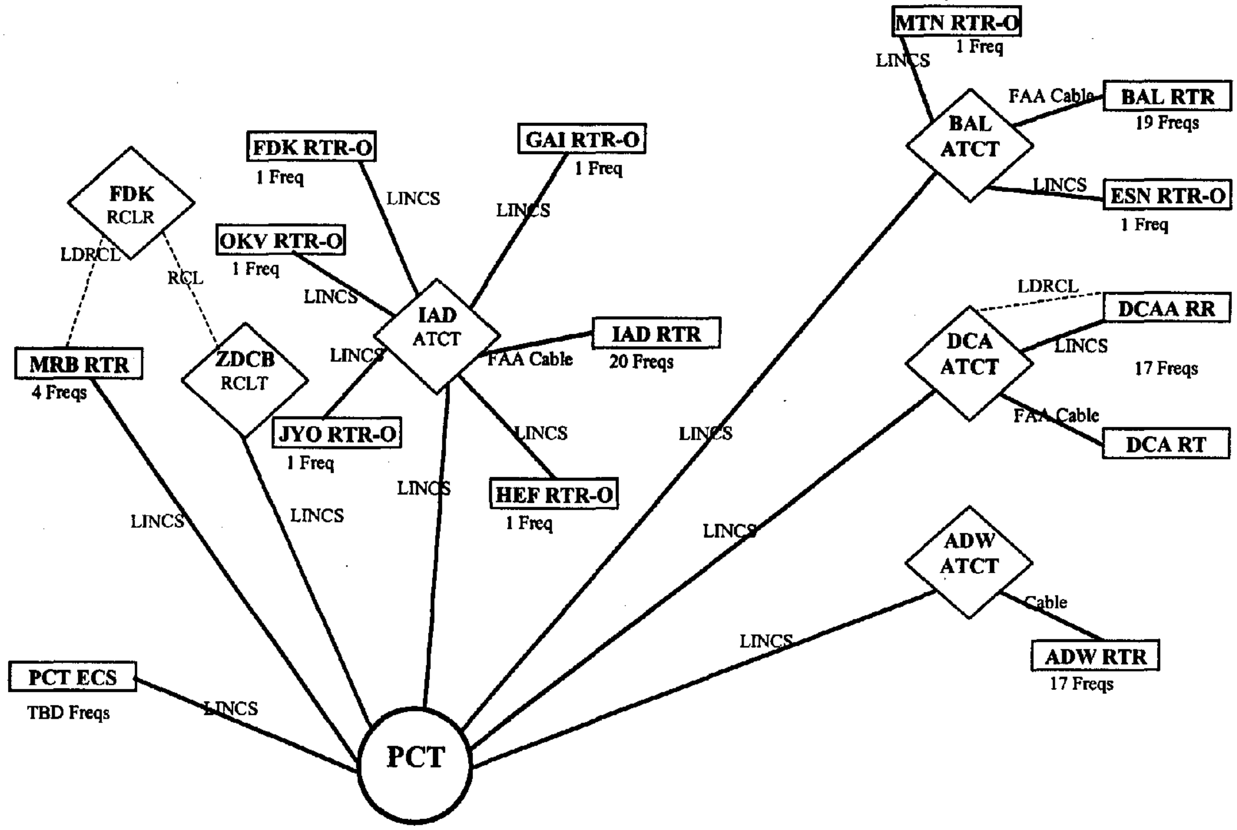

Figure 3-06-2. Currently Envisioned PCT A/G Radio Connectivity

3-06.2.1.2.5 Traffic and Airspace Management Systems

The Traffic and Airspace Management systems which may be available at the Traffic Management Unit (TMU) in PCT include the Enhanced Traffic Management System (ETMS), the Center/TRACON Automation System (CTAS), and the Air Traffic Operational Management System (ATOMS).

3-06.2.1.2.6 Navigation and Landing Systems

There are many navigation and landing subsystems in the PCT area that provide navigational signals, terminal flight path guidance and facility identification to pilots and flight crews. Monitoring (but not control of) the operational status of these navigation and landing systems will be required at certain positions within PCT.

3-06.2.1.2.7 Remote Maintenance Monitoring and Control Systems

The Maintenance Processor Subsystem (MPS), located at all ARTCC's and several other locations, provides the central monitoring and control for the Remote Maintenance Monitoring System (RMMS). The MPS has two major software components: the Maintenance Management System (MMS) which collects maintenance data for use by maintenance personnel and the Maintenance Automation System Software (MASS) which provides operational status of all NAS equipment included in the RMMS. The Maintenance Control Center (MCC) in Leesburg, VA provides monitoring and control of the remotely monitored facilities in the Baltimore-Washington area. When the NAS Infrastructure Management System (NIMS) replaces the RMMS architecture, the MCCs will be replaced by Operational Control Centers (OCCs) and Systems Operations Centers (SOCs). The Eastern OCC will be located in Atlanta and PCT will become a SOC.

3-06.2.1.2.8 Training Systems

The PCT should have the following training capabilities: Scenario Generated Controller training which will allow controller training without disruption to ATC operations, and Maintenance Personnel Site Proficiency training which will provide emulation functions for hardware and software training.

3-06.2.1.2.9 Administration and Information Display Systems

A Voice Telecommunications Switch (VTS) will provide administrative switched voice connectivity within PCT and to external facilities. A local area network will provide agency data connectivity within PCT with gateways to external wide area networks. A video teleconferencing system will provide agency connectivity to other teleconferencing systems.

3-06.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

3-06.3.1 Telecommunications Interfaces

An ARTS IIIE at PCT to accept and process target reports, weather, and non-target messages from multiple ASR and ARSR sensors. The ARTS IIIE will interface with ACDs at PCT and with DRTDs at selected ATCTs.

3-06.3.1.1 FAA Telecommunications Infrastructure Program (FTI)

The FTI program has a number of objectives, the most important is to consolidate and replace FAA owned and leased telecommunications transmission systems. Systems such as the Leased Interfacility NAS Communications System (LINCS) and the FAA-owned Radio Communications Link (RCL) will be included in the FTI program. The FTI program is currently being defined and will not be available for the first stage of the PCT program.

3-06.3.1.2 Leased Interfacility NAS Communications System (LINCS)

The Leased Interfacility NAS Communications System (LINCS) will be used to satisfy PCT telecommunication service requirements. LINCS will provide end-to-end service or, to satisfy diversity requirements, connectivity to the nearest FAA-owned telecommunications service delivery point. This process provides a simplified acquisition and implementation of telecommunications services ranging from voice grade through T-1 service.

3-06.3.1.3 FAA Owned Assets

FAA-owned telecommunication systems such as Radio Communications Link (RCL) and Low Density RCL (LDRCL) are integrated into the implementation to provide primary or diverse connectivity where warranted by operational or cost considerations.

3-06.3.1.4 Agency Connectivity

The Agency Data Telecommunications Network 2000 (ADTN2000) and Federal Technology Service 2001 (FTS2001) will support requirements for agency interfacility telecommunications requirements.

3-06.3.2 Local Interfaces

Local interfaces are typically satisfied by copper, fiber optic or coaxial cable. There are currently no planned local interfaces. However, they will be used if found to be cost-effective.

3-06.3.3 Diversity Requirements

Funding for initial telecommunication diversity, in accordance with FAA Order 6000.36A, Diversity, has been included in the PCT program. Funding for new or additional diversity requirements must be funded through other sources or waived in accordance with FAA Order 6000.36A.

3-06.4 ACQUISITION ISSUES

3-06.4.1 Program Schedule and Status

Site acquisition	Dec 99
Construction start	Jan 00
Beneficial Occupancy Date (BOD)	Jul 01
Equipment installation and Integration	Jul 01 – Feb 02
Operational Shakedown	Feb 02 – May 02
Commissioning	May 02

3-06.4.2 Planned Telecommunications Strategies

The LINCS and FTS2001 contracts will be the providers of telecommunications for the PCT, sized to allow for facility growth. However, if the FTI program is available for use, FTI may become the primary service provider.

3-06.4.3 Telecommunications Costs

Table 3-06-1 provides a summary of the estimated telecommunications cost projections for the PCT project for FY-00 to FY-06. In accordance with FAA Order 2500.8A, leased communications costs (non-recurring and recurring) for the year of activation and one year following are shown in the table as being funded under the Facilities and Equipment (F&E) account.

There are three categories of telecommunications costs for the PCT Program: leased channels, hardware, and LINCS EUL-A nodal equipment.

The ground rules defined by the PCT Program include an assumption that there will be a one-year period of parallel operations between new and existing capabilities. For this reason, the savings in OPS Funded costs associated with disconnecting and/or decommissioning existing capabilities is not shown until the second year for each cost category.

Table 3-06-1. Cost Summary – Potomac TRACON Program

CIP # F-02 All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
Channel Costs								
Cost Profile: LINCS and FTS2001 Circuits between PCT TRACON and ASRs, RTRs, ATCTs, etc.								
F&E Non-recurring Channel Costs		**$0**	**$988**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$0**	**$0**	**$768**	**$1,151**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$1,151**	**$1,151**	**$1,151**
Hardware Costs								
Cost Profile: Equipment to Interface with Operational and Agency Networks								
F&E Non-recurring HW Costs		**$0**	**$2,900**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Hardware Costs								
F&E Recurring Costs		**$0**	**$0**	**$75**	**$112**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$112**	**$112**	**$112**
Telecommunications Infrastructure Costs								
Cost Profile: LINCS EUL-A Upgrades and Overbuilds; Primary and Diverse Access								
F&E Non-recurring EUL-A Costs		**$0**	**$2,836**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring EUL-A Costs								
F&E Recurring Costs		**$0**	**$0**	**$291**	**$873**	**$0**	**$0**	**$0**
OPS Recurring Costs		(Captured in LINCS chapter, see table on next page)						

SUMMARY

		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
F&E Totals	Non-recurring	$0	$6,724	$0	$0	$0	$0	$0
	Recurring	$0	$0	$1,133	$2,137	$0	$0	$0
	F&E Total	**$0**	**$6,724**	**$1,133**	**$2,137**	**$0**	**$0**	**$0**
OPS Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$0	$0	$0	$0	$1,264	$1,264	$1,264
	OPS Total	**$0**	**$0**	**$0**	**$0**	**$1,264**	**$1,264**	**$1,264**

Note: Existing connectivity to the four standalone TRACONs account for $517K of the Leased Telecommunications Budget (base).

Table 3-06-1. Cost Summary – Potomac TRACON Program (concluded)

The following table shows requirements which are identified in the LINCS chapter. They are repeated here for information only and are not included in PCT program funding requirements.

CIP # F-02	All costs in 000's	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
Telecommunications Infrastructure Costs									
	Cost Profile: LINCS EUL-A Upgrades and Overbuilds; and Primary and Diverse Access								
	F&E Non-recurring EUL-A Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring EUL-A Costs								
	F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$873**	**$873**	**$873**

TOTAL PROGRAM SUMMARY

(Includes Requirements Identified in LINCS Chapter or Current OPS Base)

		FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Totals	Non-recurring	$0	$6,724	$0	$0	$0	$0	$0
	Recurring	$0	$0	$1,133	$2,137	$0	$0	$0
	F&E Totals	**$0**	**$6,724**	**$1,133**	**$2,137**	**$0**	**$0**	**$0**
OPS Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$0	$0	$0	$0	$2,137	$2,137	$2,137
	OPS Totals	**$0**	**$0**	**$0**	**$0**	**$2,137**	**$2,137**	**$2,137**

CHAPTER 4-01 - SUMMARY SHEET

FAA ACQUISITION MANAGEMENT SYSTEM (ACQUIRE)

Program/Project Identifiers:

CIP Number(s):	M-08
Related Program(s):	
New/Replacement/Upgrade?	Replaces the System for Acquisition Management (SAM)
Responsible Organization:	AIT
Program Mgr./Project Lead:	Jack Rogers, ASU-510, PM, (202) 267-7382
Fuchsia Book POC:	Simone Winchester , ASU-510, (202) 267-7987

Assigned Codes:

PDC(s):	HA
PDC Description:	Administrative Data Circuits for ACQUIRE
Service Code:	ADDA

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$465	$493	$523	$554	$587	$622	$660
Total OPS	**$465**	**$493**	**$523**	**$554**	**$587**	**$622**	**$660**

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CIP Category:
Mission Support

4-01.0 FAA ACQUISITION MANAGEMENT SYSTEM

4-01.1 PROGRAM OVERVIEW

The Mission Need Statement identifies the need to provide efficient and effective automated tools to support the new procurement process defined in Federal Aviation Administration's (FAA's) new Acquisition Management System put in place April 1, 1996. ACQUIRE is an administrative system needed to support mission-critical acquisitions throughout the agency. ACQUIRE is also needed to implement electronic commerce, which was mandated by the President in a memorandum dated October 26, 1993.

4-01.1.1 Purpose of ACQUIRE

The purpose of the FAA's Acquisition Management System is to reduce the time and cost of acquiring quality products and services. This goal can only be realized through dramatic re-engineering of the procurement processes and improvements in related automation support. A new automated procurement solution is needed to support streamlining the procurement process, obtain meaningful information about the procurement process and to promote Electronic Commerce as mandated by the President. It is also needed to ensure compliance with the existing and future procurement laws, regulations, and policies and provide users with simple tools to accomplish their tasks.

The proponent FAA office for ACQUIRE is the Integrated Product Team (IPT) for Information Systems, ASU-510.

4-01.1.2 References

4-01.1.2.1 ACQUIRE Requirements Document, December 3, 1996.

4-01.1.2.2 Mission Need Statement for Modernization of Procurement Automation System, Number 317, December 17, 1996.

4-01.1.2.3 ACQUIRE Integrated Program Plan, January 2, 1997

4-01.2 SYSTEM DESCRIPTION

ACQUIRE will modernize the FAA's procurement automation capabilities to make the procurement process more efficient and support electronic commerce. Two systems, the System for Acquisition Management (SAM) and the Procurement Automated System (PAS) are currently supporting some of these functions. Improving the efficiency of this process will affect the productivity of nearly 5000 users nationwide as they generate approximately 274,000 documents annually.

A market survey to determine the types of products currently available that could support agency needs indicate that there are commercial products available that are efficient, user friendly (Windows based), and can meet agency needs.

4-01.2.1 Program/System Hardware Components

- Database Server (UNIX) with appropriate configuration
- Application Server for local users (See Figure 4-01-1, Configuration 2)
- Applicable Network Connection Hardware (3Com, IBM Token Ring, etc.) Remote Access
- Server/Hardware for Dial-In Users
- ADTN 2000 for telecommunication for remote users

4-01.2.2 Client Hardware Requirements

- 33 MHz processor with at least 16Mb of memory
- 300 Mb of free disk space
- Applicable Network Connection Hardware (3Com, IBM Token Ring, etc.)
- SVGA Monitor
- Printer - LAN based, shared or local (Laser, InkJet, Dot-Matrix, Thermal)
- Pointing Device (Mouse, TrackBall, Pressure Pad, etc.)
- Modem of at least 28.8 Baud (for remote, dial-in users)

4-01.2.3 Functional Component Interface Requirements

The preferred client/server architecture will distribute the application between the server and the client workstations, optimizing performance, minimizing the initial investment and taking advantage of the existing client workstations. One example is the Remote Data Management model. In this configuration, the database resides on the server, while the presentation and business logic reside on the user workstations, i.e., the clients. A variation of this configuration has the application software and business logic reside on an application or LAN server rather than individual workstations. The functional connectivity for ACQUIRE is illustrated in Figure 4-01-1.

4-01.2.4 Software Environment

The software environment should consist of Windows 3.x or greater operating system, application software, Oracle 7.X RDBMS, SQL Plus database connection software, and the appropriate network connection software (Netware, etc.). Software needed to connect the Windows based application to the UNIX based RDBMS (SQL*Net for UNIX) will also be required.

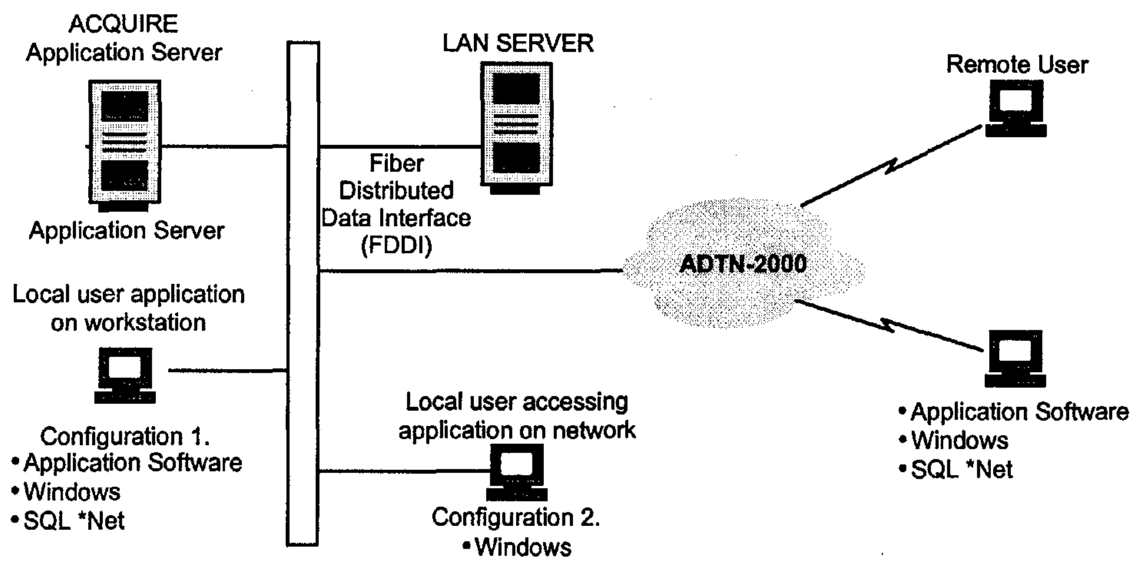

Figure 4-01-1. ACQUIRE System Interfaces

The runtime, or client, software may include Windows 3.x or greater operating system, application files, Windows compatible version of DOS (5.0 or later), and appropriate network connectivity software (Netware, SQL*Net). Users not connected to the LAN will require the above, with remote access software such as Citrix Winframe or ADTN Softoken to replace the network connectivity software.

4-01.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

Diversity is not required. The ACQUIRE interface requirements are summarized in **Table 4-01-1**.

4-01.3.1 Telecommunications Interfaces

4-01.3.1.1 ACQUIRE to LAN Server

Remote ACQUIRE users are connected to the LAN Server via modems and dial up circuits provided through the FTS2001.

4-01.3.2 Local interfaces

4-01.3.2.1 ACQUIRE to ACQUIRE Application Server

ACQUIRE users access the application server via the LAN.

Table 4-01-1. ACQUIRE Interface Requirements Summary

SUBSYSTEM INTERFACE		Remote Users to ACQUIRE
INTERFACE CONTROL DOCUMENTATION		None
PROTOCOL REQUIREMENTS	Network Layer	IP
	Data Link Layer	IEEE 802.3
	Physical Layer	RJ45
	Special Formats/ Codes	None
TRANSMISSION REQUIREMENTS	No. Channels	N/A
	Speed (kbps)	10 Mbps
	Simplex Half/Full Duplex	N/A
	Service	N/A
HARDWARE REQUIREMENTS	Modem	28.8k bps
	Cable/ Miscellaneous	N/A

4-01.4 ACQUISITION ISSUES

4-01.4.1 Program Schedule and Status

The FAA has 12 ACQUIRE site locations across the country. Table 4-01-2 lists the twelve installation sites with an estimated user base of 5,000. The installed system capability will support a user base of 5,000 (prorated distribution to 12 sites) with scalability of the software application to 20,000 users. Applications can rely on near 100% LAN availability for at those locations. Remote access users will require modems and ADTN Softoken or Citrix Winframe software.

Table 4-01-2. Overview of ACQUIRE User Community

Location	Total Users	Remote Users	Local Users	Estimated Concurrent Users
Washington, DC	1,123	115	1,008	114
Seattle	296	106	190	40
Oklahoma City	800	20	780	50
Kansas City, MO	206	53	153	22
Atlanta	523	315	208	60
Atlantic City	374	0	374	39
Boston	148	55	93	10
Fort Worth	421	205	216	44
Chicago	399	77	322	42
New York	392	197	195	41
Anchorage	155	50	105	16
Los Angeles	121	38	83	13
Total	4,958	1,231	3,727	491

The site installation schedule for ACQUIRE is presented in Table 4-01-3.

Table 4-01-3. ACQUIRE Site Installation Schedule

	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
Site Installations	12*	0	0	0	0	0	0	0

*: Full operational capability in FY98

The interface implementation schedule for ACQUIRE is presented in Table 4-01-4.

Table 4-01-4. ACQUIRE Interface Implementation Schedule

From	To	System/Rate/ Miles	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
Remote User	ACQUIRE	Dial Up	1231	0	0	0	0	0	0	0

4-01.4.1.1 Software/Hardware Installation

The ACQUIRE vendor was responsible for software and hardware installation, assisted by the ACQUIRE core implementation team

4-01.4.1.2 Roles and Responsibilities

The ACQUIRE core implementation team consisted of various subject matter experts. Throughout the implementation phases, the Implementation Plan was be re-evaluated and lessons learned were used to determine how the core implementation team could perform the remaining implementations most efficiently.

4-01.4.2 Telecommunications Strategies

The FAA Agency Data Telecommunications Network (ADTN2000) provides a WAN service for connectivity between users and host computers and among Local Area Networks (LANs) worldwide for interactive interfaces and bulk file transfers.

4-01.4.3 Telecommunications Costs

The projected telecommunications costs associated with satisfying the requirements of ACQUIRE are summarized in Table 4-01-5. All costs are OPS Funded. The two main categories of costs are related to ACQUIRE's use of ADTN2000:

- dial services used in accessing ADTN2000; and
- recurring charges for use of ADTN2000 backbone capacity.

The line item for capturing hardware costs is carried over from the 1999 Fuchsia Book although no costs have been identified for the FY00-FY06 timeframe.

Table 4-01-5. Cost Summary – ACQUIRE

CIP # A-1 All costs in 000's	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
Remote Users <---> ADTN2000 Network								
Channel Costs								
Dial-up Service Usage								
Cost Profile: FTS2000/2001 SVS Dial-up Service (see Note 1)								
Recurring Service Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$465**	**$493**	**$523**	**$554**	**$587**	**$622**	**$660**
Hardware Costs								
Cost Profile: Provisioning of Telecommunications Equipment for ACQUIRE Users								
Non-recurring Hardware Costs								
F&E Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

SUMMARY

		FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$0	$0	$0	$0	$0	$0	$0
	F&E Total	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$465	$493	$523	$554	$587	$622	$660
	OPS Total	**$465**	**$493**	**$523**	**$554**	**$587**	**$622**	**$660**

Notes:

1. Dial-up usage based upon 2 hours per week per user (1215 users). 6% growth expected in usage per year.
2. ADTN backbone usage expected to grow 10% per year.

The following table shows requirements, which are captured in the ADTN2000 chapter. They are repeated here for information only and are not included in ACQUIRE program funding requirements.

CIP # A-1 All costs in 000's	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
Channel Costs								
ADTN2000 Backbone Usage								
Cost Profile: ADTN2000 Backbone Usage at $250 per Gigabyte (see Note 2)								
Gigabytes per year		330	363	399	439	483	531	584
Recurring Backbone Usage Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$83**	**$91**	**$100**	**$110**	**$121**	**$133**	**$146**

CHAPTER 4-02- SUMMARY SHEET

AIRWAYS FACILITIES CORPORATE INFORMATION MANAGEMENT SYSTEM (AFCIMS)

Program/Project Identifiers:

Project Number(s):	CIPs M-05, M-26
Related Program(s):	CIPs A-19, F-17, M-07, M-10, M-24, M-27
New/Replacement/Upgrade?	Replacement
Responsible Organization:	AF-60
Program Mgr/Project Lead:	Rick Ford, AF-60, (202) 267-8970
Fuchsia Book POC:	Mike Kruger, AF-60, (202) 493-4068

Assigned Codes:

PDC(s):	HC
PDC Description:	Administrative Data Circuits For AF Corporate Information Management System
Service Code:	ADDA

Cost Estimates*:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$23	$26	$26	$28	$28	$31	$34
Total OPS	**$23**	**$26**	**$26**	**$28**	**$28**	**$31**	**$34**

*Cost data provided by the Program Office.

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CIP Category:
Mission Support

4-02.0 AIRWAY FACILITIES CORPORATE INFORMATION MANAGEMENT SYSTEM

4-02.1 PROGRAM OVERVIEW

4-02.1.1 Purpose of Airway Facilities Corporate Information Management System

The Airway Facilities (AF) realignment and downsizing resulted in fewer personnel and changed workloads in the Headquarters (HQ), Regional Offices (ROs), and Sector Offices. The consolidation of the 71 AF Sector Offices into 33 System Management Offices (SMOs) increased the reliance on the Air Traffic Services (ATS) information technology infrastructure to provide continuous and accurate National Airspace System (NAS) operational information. The Airway Facilities Corporate Information Management System (AFCIMS) project addresses the issues associated with improving the systems, technology, and processes required to fulfill the AF mission with this declining resource base. Starting with an assessment of the current AF infrastructure, the AFCIMS project is continuing through phased design and implementation stages. The assessment analyzed the current and planned information infrastructure within AF as well as the decision and work processes involved. Further analysis will be required to assess the impact of expanding the AFCIMS project to include Air Traffic requirements.

The AFCIMS will provide users with sufficient information to readily identify areas where meaningful, effective, and cost conscious change would enhance the capabilities of AF and realize the vision of the ATS Strategic Plan.

There are no diversity requirements for the AFCIMS.

4-02.1.2 References

4-02.1.2.1 U.S. Department of Transportation, Federal Aviation Administration. Airway Facilities Strategic Plan: Airway Facilities Services in 2010, Washington, DC 1993.

4-02.1.2.2 FAA Aviation System Capital Investment Plan, No. M-05, January 1999 (Formerly 36-24), NAS Regional/Center Logistics Support Services.

4-02.1.2.3 FAA Aviation System Capital Investment Plan, No. M-26, January 1999 (Formerly 56-56), NAS Regional/Center Logistics Support Services.

4-02.1.2.4 Airway Facilities Information Resources Management Order 1370.78, 1995.

4-02.1.2.5 Airway Facilities Corporate Information Management System (AF CIMS), Phase II, October 1995.

4-02.2 SYSTEM DESCRIPTION

The results of the AFCIMS project are a set of policies, procedures, strategies, applications, and technology that promote a corporate view of data for the ATS.

4-02.2.1 System Components

The primary components of AFCIMS include the following:

- Data administration policy to organize and formalize the definition and use of data in ATS;
- The process analysis which documents AF decision and work processes and identifies problems encountered with information systems throughout AF;
- The technology architecture which defines the environment for the physical components of AFCIMS;
- The data architecture which expresses the data model underlying the AFCIMS National Data Center;
- The National Data Center which provides a method to solve data access, data availability, and cross functional data analysis problems with legacy systems; and
- The Regional Information System (REGIS), which provides increased capabilities and support for field operational personnel, RO and SMO managers, supervisors, and staff, for planning and performing the operations and maintenance of the NAS

The AFCIMS National Data Center (NDC) is a special purpose relational database implemented within an open systems architecture. The NDC collects corporate data of interest in AF from the legacy systems that are the official source for that data and combines it in one environment. The NDC provides data to multiple host databases and applications located in the Headquarters, Regional Offices, the William J. Hughes Technical Center, and the Mike Monroney Aeronautical Center. All these 'hosts' are connected to the Local Area Network (LAN) at the local site, which is then connected to ADTN2000. All communication between the NDC and the host computers is accomplished via ADTN2000. The AFCIMS connectivity is illustrated in Figure 4-02-1.

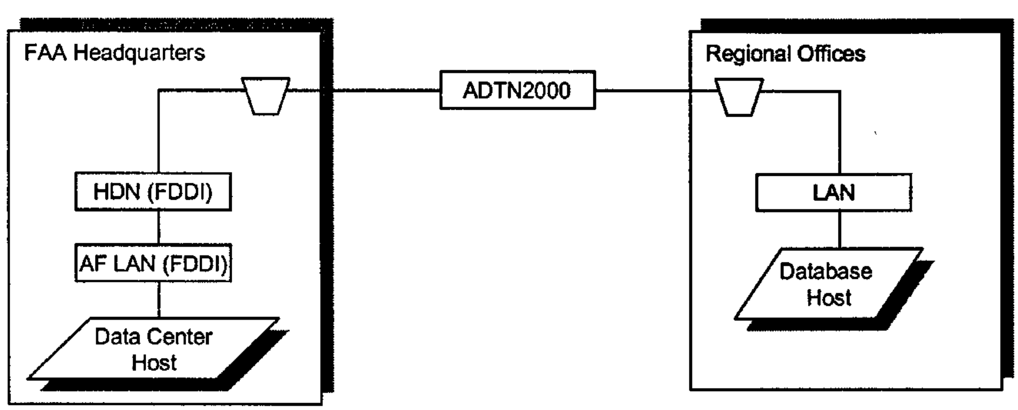

Figure 4-02-1. CIMS Network Architecture

In the current implementation, legacy data is supplied to the NDC where it is converted, consolidated, summarized, and otherwise transformed to meet the needs identified in the process analysis. The legacy data in the NDC is updated to reflect changes in the legacy system. Relevant NDC updates are replicated to the REGIS database hosts in the ROs. The distributed architecture is illustrated in Figure 4-02-2.

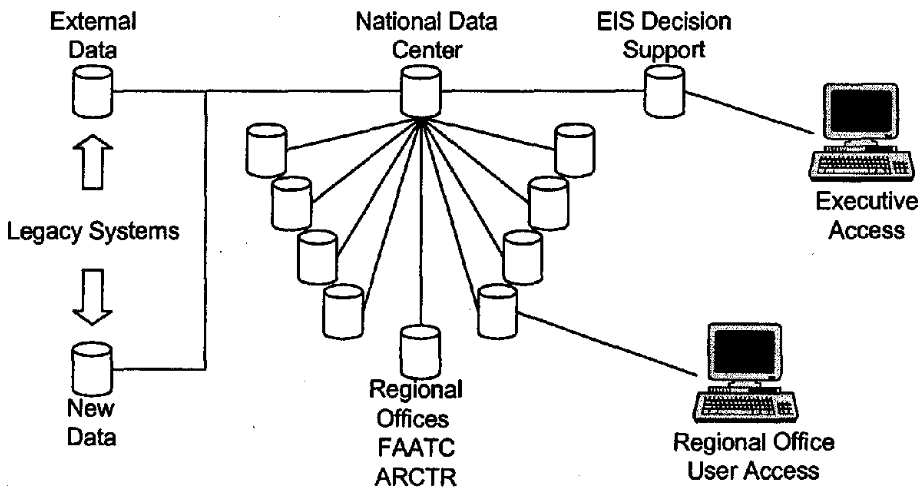

Figure 4-02-2. AFCIMS Distributed Database Architecture

REGIS is a group of applications that provide ROs and SMOs with the ability to track and plan budgets, training, certification, and personnel costs. The applications are supported by databases located in the ROs and SMOs. The RO databases communicate with the NDC for required legacy data inputs. The RO databases also communicate with their associated SMO databases for the transfer of base data updates and daily transactional information.

4-02.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

4-02.3.1 Telecommunications Interfaces

AF requires connectivity between the HQ, ROs, and SMOs for e-mail and other administrative purposes, to existing legacy systems, as well as the AFCIMS NDC for future AFCIMS applications. A list of ROs and SMOs, connected through the ADTN2000 network, is presented in Table 4-02-1.

4-02.3.2 Interface Requirements

As the AFCIMS project moves through its implementation phases, detailed performance requirements will be defined. Distributed databases and client/server applications will be a significant part of ATS's future technology base. Therefore, appropriate connection, delay, and end-to-end response times will be required.

Table 4-02-1. AF Regions and SMOs

FAA REGION	Airway Facilities SYSTEM MANAGEMENT OFFICE
Alaska Region	South Alaska; Anchorage, AK North Alaska; Fairbanks, AK
Central Region	Gateway; Earth City, MO Great Plains; Lenexa, KS
Eastern Region	Chesapeake Bay; Leesburg, VA Liberty; Garden City, NY Pittsburgh; Coraopolis, PA Independence; West Trenton, NJ
Great Lakes Region	Chicago; Elgin, IL Crossroads of America; Indianapolis, IN Superior; Belleville, MI Dakota Minnesota; Farmington, MN Ohio; North Olmsted, OH
New England Region	Southern New England; East Boston, MA Tri State Snow; Nashua, NH
Northwest Mountain Region	Pacific NW; Auburn, WA Rocky Mountain; Longmont, CO Salt Lake City, Salt Lake City, UT
Southern Region	Atlanta; Hapeville, GA Columbia; West Columbia, SC Memphis; Memphis, TN Miami; Miami, FL Montgomery; Hope Hull, AL Tampa; Tampa, FL Covington AF Sector; Erlanger, KY
Southwest Region	Gulf Coast; Houston, TX Lone Star; Bedford, TX Red River; Bethany, OK Rio Grande; Albuquerque, NM
Western Pacific Region	Golden Gate; Fremont, CA Hawaii-Pacific; Honolulu, HI L.A. Basin; Palmdale, CA Sierra-Nevada; Sacramento, CA Pacific Desert; San Diego, CA

4-02.3.3 Connectivity Requirements

The AFCIMS will use LANs and ADTN2000 to distribute data between the NDC located in the NAS Operations Control Center (NOCC) and the Regions (between the RO and SMO databases). The installation of additional telecommunication connections is not required to support the program.

4-02.3.4 Transmission Requirements

Communications traffic estimates for AFCIMS based on the REGIS deployment approach for FY 00 are presented in Table 4-02-2.

Table 4-02-2. Data Transfer Estimates

Description	# Sites	Times/Mo	Megabytes	Total Mbytes/Month
Inputs to AFCIMS National Data Center	1	30	20.00	600
National Data Center to ROs	9	30	12.00	3,240
ROs to National Data Center	9	30	8.00	2,160
REGIS data ROs to SMOs	10	30	2.00	600
SMO transactions to ROs	10	30	4.00	1,200
AFCIMS Total/Month (Mbytes)				7,800

4-02.4 ACQUISITION ISSUES

4-02.4.1 Program Schedule and Status

Table 4-02-3 shows the AFCIMS database deployment that began in FY 96.

Table 4-02-3. AFCIMS Deployment

SITE INSTALLATION	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
Database Deployment	13	0	0	0	0	0	0	0

4-02.4.2 Planned Telecommunications Strategies

4-02.4.3 The ADTN2000 backbone will be used.

4-02.4.4 Telecommunications Costs

The projected cost estimates provided in Table 4-02-4 is for the use of the ADTN2000 backbone by the Regions.

Table 4-02-4. Cost Summary - AFCIMS

The following table shows requirements, which are captured in the ADTN2000 chapter. They are repeated here for information only.

CIP # M-05	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
SMO And Regional Office Use of ADTN2000 Network									
	Cost Profile: The Following Projections are for Usage of the ADTN2000 Backbone.								
	SMOs Added to Network		0	0	0	0	0	0	0
	Total SMOs Connected	10	10	10	10	10	10	10	10
	RO's Connected to Network		0	0	0	0	0	0	0
	Total ROs Connected	9	9	9	9	9	9	9	9
	Annual Usage In Gigabytes		94	103	103	113	113	125	137
	Annual Cost: $250 per GByte		**$23**	**$26**	**$26**	**$28**	**$28**	**$31**	**$34**
Hardware Costs			*N/A - Uses Existing ADTN2000 Terminal Equipment*						

SUMMARY

		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
F&E Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$0	$0	$0	$0	$0	$0	$0
	F&E Totals	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Ops Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$23	$26	$26	$28	$28	$31	$34
	OPS Totals	**$23**	**$26**	**$26**	**$28**	**$28**	**$31**	**$34**

CHAPTER 4-03 - SUMMARY SHEET

OFFICE OF AIRPORTS (ARP) SYSTEMS

Program/Project Identifiers:

Project Number(s):	BIIP-982002
Related Program(s):	
New/Replacement/Upgrade?	Upgrade as bandwidth required
Responsible Organization:	ARP-10
Program Mgr./Project Lead:	Tim Booth, ARP-10, (202) 267-8796 Sabreenah Key, ARP-10, (202) 267-8389
Fuchsia Book POC:	Tim Booth, ARP-10, (202) 267-8796

Assigned Codes:

PDC(s):	HP
PDC Description:	Administrative Data Circuits for ARP Programs.
Service Code:	ADDA

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$159	$159	$159	$159	$159	$159	$159
Total OPS	**$159**	**$159**	**$159**	**$159**	**$159**	**$159**	**$159**

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CIP Category: Mission Support

4-03.0 OFFICE OF AIRPORTS (ARP) SYSTEMS

4-03.1 PROGRAM OVERVIEW

4-03.1.1 Purpose of Office of Airports ADP Systems

The Office of Airports (ARP) ADP Systems support the Associate Administrator for Airports, the Office of Airport Safety and Standards (AAS), the Office of Airport Planning and Programming (APP), Airport Divisions at the nine regional offices (ROs), Airport District Offices (ADOs), and Airport Field Offices (AFOs). There are six national automated systems, and the infrastructure that support the airports mission:

National Systems:
- National Plan of Integrated Airport Systems (NPIAS)/Airport Capital Improvement Program (ACIP)
- Airport Improvement Program (AIP)
- Passenger Facility Charges (PFC)
- Certification and Compliance Management Information System (CCMIS)
- Air Carrier Activity Information System (ACAIS)
- Airport Safety Data System (ASDS)

Infrastructure:
- LAN/WAN Support for Messaging, File Sharing, and Administration
- ADTN2000 connections for all field offices (many collocated with Flight Standards District Offices [FSDO's] or other FAA offices)

4-03.1.2 Future of National Systems

During FY99, a project was initiated to integrate and modernize the above national systems. The new integrated system is being called FAA Airports Management Information System, FAMIS. Once completed, it will replace the present systems. In FY99, a requirement specification was completed as well as a low level business design document. Work was begun late in the fiscal year to begin the coding and development of the new system. The system was envisioned to be hosted at the Volpe Computer Center, using an Oracle back end database with a web-enabled user interface via FAA's Intranet. The system will utilize the ADTN2000 network as the primary transport mechanism between users in HQ, Regions, and field offices and the host facility. As of mid-November 1999, funding for the program has ceased and prospects for starting back up in FY 2000 are uncertain, at best. In the absence of any near-term restarting of FAMIS, ARP will continue to make necessary enhancements and corrections to current systems, all of which rely on the ADTN2000 network to some degree.

4-03.1.3 Reference

US Department of Transportation, Federal Aviation Administration, Office of Information Technology (IT) Systems Division--AIT-600, FAA Agency Telecommunications Requirements--Final Report, October 1993.

4-03.2 SYSTEM DESCRIPTION

4-03.2.1 Data Sources

4-03.2.1.1 National Plan of Integrated Airport Systems (NPIAS)/Airport Capital Improvement Plan (ACIP)

The National Plan of Integrated Airport Systems (NPIAS)/Airport Capital Improvement Plan (ACIP) identifies the estimated airport planning and development costs necessary to expand and improve the national system of airports. The ACIP provides a systematic approach to determine the most efficient means of allocating available airport grant funds. Until CY1999, NPIAS-ACIP version 4 was decentralized with data maintained at ADOs. Periodically, data was submitted to the ROs, consolidated and sent to the Volpe National Transportation Systems Center (VNTSC) in Cambridge, MA, where it was compiled and forwarded to Washington headquarters. In FY99 NPIAS/ACIP version 5.0 was implemented hosted at VNTSC with access by ADO, RO and HQ users via TCP/IP connectivity using ADTN2000. If this communications support is disrupted or not adequately provided, the congressional, mandated publication of the National Report will be delayed and the lack of a complete national database to respond to congressional requests cannot be accomplished.

4-03.2.1.2 Airport Improvement Program (AIP)

The Airport Improvement Program (AIP) contains data on grants made to public agencies and/or private owners for the planning and development of public-use airports included in the FAA prepared NPIAS. Users reside in ADO's, RO's and HQ. It is a centralized system hosted at the VNTSC, using an ALPHA 4000 Platform and TCP/IP and ADTN2000 to conduct interactive sessions. Back up connectivity is uses dial-up modem (X.25). (Note: The PFC and ACAIS systems use the same host server and connectivity.)

4-03.2.1.3 Passenger Facility Charges (PFC)

The Aviation Safety and Capacity Expansion Act of 1990 allows public agencies controlling FAA approved commercial service airports to charge a $ 1, $ 2, or $ 3 passenger facility fee. The Passenger Facility Charges (PFC) is an information system containing data resulting from the Act. The PFC revenue can only be used on FAA approved projects. This PFC system tracks billion dollars in projects. Primary users are PFC functional area personnel in HQ. PFC has the same host server and connectivity as AIP.

4-03.2.1.4 Airport Safety Data System (ASDS)

The Airport Safety Data System (ASDS) displays information contained in the Airport Master Record (aka 5010) database, which is maintained by Air Traffic's National Flight Data Center. Periodically, the

ASDS takes 5010 data and loads it on the VNTSC Alpha server where the data can be queried and displayed by ARP users.

4-03.2.1.5 Certification and Compliance Management Information System (CCMIS)

The Certification and Compliance Management Information System (CCMIS) is used for storing and accessing Airport Certification Information associated with Federal Aviation Regulation (FAR), Part 139, Certification and Operations: Land Airports Serving Certain Air Carriers. Part 139 is a regulatory safety program that requires airports having air carrier service using aircraft with more than 30 passenger seats to meet certain minimum safety standards. The CCMIS includes a national database of airport inspection information used to provide oversight of airport safety by: (1) tracking discrepancies and deficiencies, (2) providing information for FAA report generation and letters of investigation, and (3) providing data for trending and other analyses. The system also allows the airport certification safety inspectors to enter inspection information and enforcement data directly into the database. In FY99, a new system (version 3.0), similar in architecture to the NPIAS/ACIP replacement system, was implemented. Users connect to the VNTSC server using the ADTN2000 network with TCP/IP protocol while running the application software on their local PC. Remote access to CCMIS using laptop PCs with modems was tested and may become an option to traveling inspectors. Any disruption or lack of capacity of ADTN/ADTN2000 circuits will impact FAA's ability to provide safety information for use by inspectors, certification and compliance specialists, and airport management personnel in making critical analyses and decisions.

4-03.2.1.6 Air Carrier Activity Information System (ACAIS)

The Air Carrier Activity Information System (ACAIS) is a database that contains revenue passenger enplanement and all-cargo data. The database supports the FAA's Airport Improvement Program (AIP) entitlement activities. The enplanement data is derived from a variety of sources: U.S. scheduled and nonscheduled large certificated air carriers, foreign flag air carriers, and commuter and small certificated air carriers, all of which collect and submit their data to the U. S. Department of Transportation.

Annually, the FAA conducts survey of air taxi/commercial operators that also report their nonscheduled activity. For AIP purposes, passengers enplaned also include passengers onboard international flights that transit an airport located in the 50 states for non-traffic purposes. All-cargo data is compiled for airports with a minimum of 100 million pounds of all-cargo aircraft landed weight annually. The data is submitted to the FAA and then compiled and merged into the ACAIS database. The data obtained from these sources is merged into the ACAIS database, which is reviewed by FAA staff and individual airports. ACAIS has the same host server and connectivity as AIP. ACAIS is primarily a "back-end" processing system, with no end user connectivity to the data.

4-03.2.2 Required Infrastructure.

Headquarters, ROs, and ADOs use local area networks and the ADTN wide area network with TCP/IP protocol to share ARP Program information and official correspondence between these offices. In FY1999, ADTN connections for Airport District Offices (ADOs) were completed, thus allowing the phase-out of remote access using dial-up modems. Those ADOs collocated with Flight Standards District Offices (FSDOs) did not require separate routers. Disruption or lack of capacity of ADTN2000 connectivity would result in additional workload (mailing, travel, staffing, and phone) to compensate.

4-03.2.3 Future of National Systems

ARP initiated FAMIS, a web-based system using the FAA Intranet to integrate and modernize existing national systems. As of November 1999, FAMIS is unfunded while FY2000 funding to complete the system is uncertain. If partial funding is identified, one of its major components (NPIAS/ACIP, AIP, or PFC) may be implemented while interfacing to existing systems. The Oracle database, with a web-based user interface architecture would continue. Future enhancements include geographical information systems, additional graphic files of airport layouts as attachments to systems, picture files from digital cameras, and video clips of accidents or runway incursions. To accommodate user growth and programmatic demand, these enhancements will require a significant increase in ADTN2000 bandwidth.

4-03.2.4 Components

Airports National Headquarters Staffs, Divisions, and Branches; Regional Office Divisions; and Airport District Offices and Field Office have installed their local area networks. Communications between the National Headquarters Staff, Regional Office Divisions / Branches and Airport District Offices (ADOs) and Field Offices are conducted using the ADTN/ADTN2000 backbone.

4-03.2.4.1 Functional Component Interface Requirements

The Associate Administrator for Airports requires connectivity between airport personnel working at the National Headquarters, Regional Offices, Airport Divisions, Airport District Offices, and remote Airport Field Offices. Data transmission between the ADOs and State Aviation Organizations is desired to help the FAA administer the State Block Grants Program. Nine States are currently participating in the program. A list of these ADOs is identified in Table 4-03-1.

The FAMIS program is designed to provide access by airport management and state organizations using the Internet or an Extranet. These groups would be online, interactive users of the system – identifying their airport development planning needs and monitoring the execution of their grants. With FAMIS on hold, this requirement for external, secure access will not be needed until after FY 2000.

Table 4-03-1. Airport District Offices

FAA REGION	*AIRPORT DISTRICT OFFICE/ AIRPORT FIELD OFFICE (ADO/AFO)*
Alaskan Region	*None*
Central Region	*None*
Eastern Region	*Garden City, NY* *Beckley, WV (AFO)* *Camp Hill, PA* *Dulles, VA*
Great Lakes Region	*Minneapolis, MN* *Des Plaines, IL* *Belleville, MI* *Bismarck, ND*
New England Region	*None*
Northwest Mountain Region	*Renton, WA* *Helena, MT* *Denver, CO*
Southern Region	*Jackson, MS* *Memphis, TN* *Atlanta, GA* *Orlando, FL*
Southwest Region	*Fort Worth, TX* *Bethany, OK** *Albuquerque, NM** * Both are 1-2 persons connect to FSDO LAN
Western Pacific Region	*Burlingame, CA* *Honolulu, Hawaii*
Total Regions = 9	***Total ADO = 19***

4-03.2.4.2 Performance Requirements

Service availability of the ADTN2000 network to support ARP shall be 99.95% when alternate routing or dual connectivity is provided at nodes serving major concentrations of users (14 major FAA sites). Users with dedicated or dial-up access connections shall be able to complete the ADTN2000 log-on sequence in 10 seconds or less from the entry of the last character of the sequence to receipt of the network menu. When service is provided via FTS2000 Packet-Switched Services (PSS), network delay shall not exceed 600 milliseconds and one second for the 95th percentile of all traffic over a 24-hour period using a packet size of 128 octets.

4-03.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

Airport applications, including Airport personnel at the National Headquarters, Regional Offices, and Airport District Offices use the ALPHA 4000 Platform at VNTSC and TCP/IP to conduct interactive sessions with individual workstations.

4-03.3.1 Protocol Requirements

Airport personnel currently use TCP/IP to interface with the ALPHA 4000 Platform.

4-03.3.2 Transmission Requirements

Communications traffic workload between the Regional Office and the Airport District Office (ADO) support dedicated circuits or switched data services.

4-03.3.3 Local Interface Requirements

ADO personnel will continue to utilize Novell Netware or Windows Network Advanced Servers (NTAS) with TCP/IP to share data and interface with the external ALPHA 4000 Platform.

4-03.4 ACQUISITION ISSUES

4-03.4.1 Project Schedule and Status

Schedule of activities for the Office of Airport System is reflected in Table 4-03-2.

4-03.4.2 Planned Telecommunications Strategies

There are no diversity requirements for the Office of Airport System per FAA Order 6000.36A.

4-03.4.3 Telecommunications Costs

Table 4-03-3 provides a summary of the estimated telecommunications costs for the ARP program. All non-recurring and recurring costs are OPS funded. The ADTN2000 backbone usage charges are based on the usage projections in Table 4-03-3 and the standard ADTN2000 cost factor of $1,250 per gigabyte.

Table 4-03-2. Schedule of Activities for Office of Airport System

ACTIVITIES	Daily Trans. Req.	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
ALASKA REGION (AAL)	*0*							
No ADOs								
CENTRAL REGION (ACE)	*0*							
No ADOs								
EASTERN REGION (AEA)								
Garden City, NY	*40 Mbyte*							
Beckley, WV (AFO)	*40 Mbyte*							
Camp Hill, PA	*40 Mbyte*							
Dulles, VA	*40 Mbyte*							
GREAT LAKES REGION (AGL)								
Minneapolis, MN	*40 Mbyte*							
Des Plaines, IL	*40 Mbyte*							
Belleville, MI	*40 Mbyte*							
Bismarck, ND	*40 Mbyte*							
NEW ENGLAND REGION (ANE)	*0*							
No ADOs								
NORTHWEST MOUNTAIN REGION (ANM)								
Renton, WA	*40 Mbyte*							
Helena, MT	*40 Mbyte*							
Denver, CO	*40 Mbyte*							
SOUTHERN REGION (ASO)								
Jackson, MS	*40 Mbyte*							
Memphis, TN	*40 Mbyte*							
Atlanta, GA	*40 Mbyte*							
Orlando, FL	*40 Mbyte*							
SOUTHWEST REGION (ASW)								
Fort Worth, TX	*40 Mbyte*							
Bethany, OK	*40 Mbyte*							
Albuquerque, NM	*40 Mbyte*							
WESTERN PACIFIC REGION (AWP)								
Burlingame, CA	*40 Mbyte*							
Honolulu, HI	*40 Mbyte*							
TOTAL: 20 sites		*20*	*20*	*20*	*20*	*20*	*20*	*20*

Table 4-03-3. Cost Summary - ARP

CIP # None	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
ADO/AFO <---> ADTN2000 Backbone Node									
Channel Costs									
	Cost Profile: Local Exchange Carrier T-1 and Fractional T-1 Circuits								
	Channels Added		0	0	0	0	0	0	0
	Total Channels	8	8	8	8	8	8	8	8
	F&E Funded Channels		0	0	0	0	0	0	0
	OPS Funded Channels		8	8	8	8	8	8	8
	OPS Non-recurring Channel Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring Channel Costs								
	F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$21.5**	**$21.5**	**$21.5**	**$21.5**	**$21.5**	**$21.5**	**$21.5**
Hardware Costs									
	Cost Profile: ADTN2000 Router and Ancillary Equipment								
	Hardware Units Added		0	0	0	0	0	0	0
	Total Hardware Units	12	20	20	20	20	20	20	20
	F&E Funded HW Units		0	0	0	0	0	0	0
	OPS Funded HW Units		20	20	20	20	20	20	20
	OPS Non-recurring Hardware Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring Hardware Costs								
	F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$137**	**$137**	**$137**	**$137**	**$137**	**$137**	**$137**
			SUMMARY						
F&E Totals		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Totals	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Totals		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$159	$159	$159	$159	$159	$159	$159
		OPS Totals	**$159**	**$159**	**$159**	**$159**	**$159**	**$159**	**$159**

Note: 12 of 20 ADOs do not require separate connectivity since they are collocated with other ADTN2000 sites and can make use of existing connectivity.

The following table shows requirements, which are captured in the ADTN2000 chapter. They are repeated here for information only and are not included in ARP program funding requirements.

CIP # None	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
ADTN2000 Backbone Usage									
Backbone Usage Costs									
	Gigabyte Requirements per Year		242	266	293	322	354	390	429
	OPS Recurring Costs		**$61**	**$67**	**$73**	**$81**	**$89**	**$97**	**$107**

CHAPTER 4-04 - SUMMARY SHEET

AIR TRAFFIC OPERATIONS MANAGEMENT SYSTEMS (ATOMS)

Program/Project Identifiers:

Project Number(s):	CIP, M-29
Related Program(s):	CIP, A-08
New/Replacement/Upgrade?	Upgrade
Responsible Organization:	ATX-400
Program Mgr./Project Lead:	Larry Silvious, S/B ATX-400, (202) 267-3029
Fuchsia Book POC:	Diana L. Jones, ATX-400, (202) 267-8294

Assigned Codes:

PDC(s):	HT
PDC Description:	Administrative Data Circuits for Air Traffic Operations Management System.
Service Code:	ADDA

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$216	$135	$135	$135	$54	$54	$54
F&E Recurring	$307	$235	$181	$181	$126	$72	$72
Total F&E	**$523**	**$370**	**$316**	**$316**	**$180**	**$126**	**$126**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$295	$458	$602	$692	$783	$873	$909
Total OPS	**$295**	**$458**	**$602**	**$692**	**$783**	**$873**	**$909**

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CIP Category:
Mission Support

4-04.0 AIR TRAFFIC OPERATIONS MANAGEMENT SYSTEMS

4-04.1 PROGRAM OVERVIEW

4-04.1.1 Purpose of Air Traffic Operations Management Systems

The Air Traffic Operations Management Systems (ATOMS) contain several subsystems used by FAA management for decision-making, traffic planning and daily review of the operation of the National Airspace System (NAS). The Air Traffic Executive Information System (AT EIS) and the Air Traffic Management Information System (AT MIS) have been expanded to allow use of the National Data Center at FAA Headquarters. The Air Traffic Information Architecture is designed to make maximum use of systems including the Corporate Air Traffic Management Information System (CATMIS) and Corporate Air Traffic Tool Set (CATTS).

The Operations Network (OPSNET) is used to collect traffic count and delay data for the day-to-day operation of the air traffic system. A redesigned OPSNET application delivered to field facilities prior to the end of FY99. The OPSNET has expanded collection to include all AT Facilities in the NAS.

ATOMS supports the integration of facility data through a product known as Cru-X. Cru-X is a suite of Air Traffic-developed software that will essentially automate most work processes in Air Traffic field facilities. Data collected in these processes are available for transmittal to storage in the ODS. The programs that make up the Cru-X suite are:

CruBrief will include ATS Track (MOU tracking) functionality. This module develops, manages, and tracks air traffic facility training and briefing items including approvals of briefing packages, union I&I, attendance, sign off, and TRAX record integration.

CruSupport will include an interface with IPPS, automated T&A entry, HUB resource management, inventory and mandatory tracking, as well as functionality from ATX Staffing Profiler, and a Forms Manager. This module will replace FMIS, managing personnel actions and records, and provide reports and an interactive organizational chart.

CruOps will contain an operational supervisor shift management tool displaying personnel scheduled, on duty, on position, on administrative assignment and on break, as well as time on position alerts. The ETAP and TTAP functions will be 'stand-alone' software that can be 'called' from this module. CruOps will also have crew scheduling, electronic sign-in sign-out, sign-on-sign-off, DASH-4 and DASH-10 (electronic position log).

CruQuality will offer automated reporting, tracking, and analysis for operational errors/deviations, pilot deviations, near mid-air collision (NMAC) and vehicle/pedestrian deviations.

- The ATS National Offload Project is another critical component under the ATOMS platform. This project consolidates, standardizes, and upgrades internal systems that collect or "offload" Air Traffic

Control (ATC) performance data from operational Radar computer systems. The project is necessary to adequately support broader FAA initiatives such as "fee for service", "Air Traffic Cost Accounting System", and "Performance Based Organization".

- ShiftLogic, a commercial off-the-shelf application, is being initially deployed at 4 ARTCC's in Southern Region as a means to standardize shift scheduling at ARTCCs and major TRACONs.

- The Corporate Air Traffic Toolset (CATTS) is an Intranet site providing access to a series of analytical and informational resources to support executives, management and staff. Online analysis is available through the use of multi-dimensional cube technology. Users have access to view the most recent facility data, obtained from various legacy systems and other CATMIS applications, consolidated in the Operational Data Store. Measures represented via this tool are activities, delays, deviations, errors, financials, staffing and unconditional conditions reporting.

4-04.1.2 References

4-04.1.2.1 Capital Investment Plan (CIP) No. M-29, January 1999.

4-04.1.2.2 FAA Memorandum, Dated May 13, 1993, Subject: ACTION: Mission Need Statement Approval for the Operational Data Management System.

4-04.2 SYSTEM DESCRIPTION

Administrative support for ATOMS is provided through the Air Traffic Service Local Area Network (LAN) Support function and includes electronic mail, access to the Aviation Daily, and a host of administrative office suite applications. ATS LAN Support, located in headquarters, maintains LANs that connect FAA National Headquarters, including FOB10A and FOB10B, with the Department of Transportation's Nassif Building, nine regional offices, and a number of field sites. The centralized LAN support function serves remote sites in Atlanta, Georgia, Dallas, Texas, and Seattle, Washington; at Dulles International Airport, Virginia; and at each of the 20 Air Route Traffic Control Centers (ARTCC) in the continental United States, as well as the Air Traffic System Command Center in Herndon, Virginia. The headquarters LAN supports over 600 personnel. Additionally, personal computers, software, and limited maintenance are provided to the air traffic organizations in the regional offices and to over 590 air traffic control field facilities for use in the collection of operational data.

4-04.2.1 Program/System Components

4-04.2.1.1 Principal Components

Personal computers and facility level networks will be used for operational data analysis and data collection and review at all Facilities and Regional Offices.

4-04.2.1.2 Functional Component Interface Requirements

The LANs located in the FAA Headquarters are connected to the ADTN2000 via the FAA Headquarters Data Network Backbone (Fiber Data Distribution Interface [FDDI]) that will be connected to the ADTN2000 Wide Area Network (WAN) equipment. The LANs at the FAA Headquarters office located in the Nassif Building will be connected through the Department of Transportation (DOT) Headquarters fiber backbone to the ADTN2000 WAN equipment. The remaining LANs in field facilities will be connected directly to the ADTN2000 WAN equipment through connections via the Airway Facilities LANs in individual facilities.

4-04.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

Data collected in the field is currently transmitted to FAA National Headquarters using PCs and dial-up commercial telephone lines. Over the next few years, additional facility and hub networks for operational data analysis, collection and review will be established at all Air Traffic Regional Offices, resulting in additional telecommunications requirements for OPSNET and other related data collection systems. As time critical exchange and analysis of operational data becomes more sensitive, the need for an expanded and highly reliable telecommunications capacity will become essential.

There is no diversity requirement for ATOMS.

4-04.3.1 Telecommunications Interface

The Standard Network Architecture (SNA) (Synchronous Data Link Control (SDLC), 3270 native protocols) connection to AIT's SNA gateways will be required for each LAN. SNA gateways will be connected to the ADTN2000 WAN equipment.

The ADTN2000 network supports the Integrated Computing Environment--Mainframe and Network (ICEMAN) response time requirements between the host and workstations for production sites of two (2) seconds for 90% of the prime user time.

4-04.3.2 Local Interfaces

Modems and dial-up voice lines are currently used to transport data from the airports to the central databases located in the FAA Headquarters. As part of this effort, soft tokens will be used to access the FAA Intranet through AF Winframe communication servers.

4-04.4 ACQUISITION ISSUES

4-04.4.1 Project Schedule and Status

The interface implementation schedule for ATOMS is reflected in Table 4-04-1.

Table 4-04-1. Interface Implementation Schedule

Interface	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
Circuits	76	24	15	15	15	6	6	6

4-04.4.2 Planned Telecommunications Strategies

Telecommunications circuit requirements by region are shown in Table 4-04-2.

Additional funding as detailed in Table 4-04-3. is required for the development, deployment and enhancement of telecommunications functions to support ATOMS. Access to enhanced telecommunications systems (including access to ADTN and ADTN-2000) is essential to allow the development and deployment of data collection and analysis tools for Air Traffic personnel at all levels of management throughout the entire air traffic system.

Table 4-04-2. Circuit Requirements by Region

Circuit Activation	No. of Circuits
Alaska Region (AAL)	3
Central Region (ACE)	9
Eastern Region (AEA)	17
Great Lakes Region (AGL)	20
New England Region (ANE)	6
Northwest Mountain Region (ANM)	15
Southern Region (ASO)	26
Southwest Region (ASW)	13
Western Pacific Region (AWP)	17
FAA National Headquarters	37
Total circuits for ATOMS	163

4-04.4.3 Telecommunications Costs

In accordance with FAA Order 2500.8A, leased telecommunications costs (non-recurring and recurring) for the year of activation and one year following are shown in Table 4-04-3. as being funded under the Facilities and Equipment (F&E) account. The costs are higher compared to the 1999 Fuchsia Book because the access bandwidth has been increased to 128 kbps which is more consistent with typical connectivity to the ADTN2000 network. The circuit cost is based upon accessing the ADTN2000 at the nearest existing point-of-presence.

Table 4-04-3. Cost Summary - ATOMS

CIP # M-29 All costs in 000's		Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
ATOMS <--> ADTN2000									
Cost Profile: 128 kbps Circuits to Nearest ADTN2000 Point-of-Presence									
Channel Costs									
Channels Added			24	15	15	15	6	6	6
Total Channels		76	100	115	130	145	151	157	163
F&E Funded Channels			51	39	30	30	21	12	12
OPS Funded Channels			49	76	100	115	130	145	151
Non-recurring Channel Costs									
F&E Non-recurring Costs			**$120**	**$75**	**$75**	**$75**	**$30**	**$30**	**$30**
Recurring Channel Costs									
F&E Recurring Costs			**$306**	**$234**	**$180**	**$180**	**$126**	**$72**	**$72**
OPS Recurring Costs			**$294**	**$456**	**$600**	**$690**	**$780**	**$870**	**$906**
Hardware Costs									
Cost Profile: 1 Pair of CSU/DSUs per Circuit									
Hardware Units Added			48	30	30	30	12	12	12
Total Hardware Units		152	200	230	260	290	302	314	326
F&E Funded HW Units			102	78	60	60	42	24	24
OPS Funded HW Units			98	152	200	230	260	290	302
Non-recurring Hardware Costs									
F&E Non-recurring Costs			**$96**	**$60**	**$60**	**$60**	**$24**	**$24**	**$24**
Recurring Hardware Costs									
F&E Recurring Costs			**$1.0**	**$0.8**	**$0.6**	**$0.6**	**$0.4**	**$0.2**	**$0.2**
OPS Recurring Costs			**$1.0**	**$1.5**	**$2.0**	**$2.3**	**$2.6**	**$2.9**	**$3.0**
			SUMMARY						
F&E Totals	Non-recurring		$216	$135	$135	$135	$54	$54	$54
	Recurring		$307	$235	$181	$181	$126	$72	$72
	F&E Total		**$523**	**$370**	**$316**	**$316**	**$180**	**$126**	**$126**
OPS Totals	Non-recurring		$0	$0	$0	$0	$0	$0	$0
	Recurring		$295	$458	$602	$692	$783	$873	$909
	OPS Total		**$295**	**$458**	**$602**	**$692**	**$783**	**$873**	**$909**

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CHAPTER 4-05 - SUMMARY SHEET

DEPARTMENT OF TRANSPORTATION'S FINANCIAL MANAGEMENT SYSTEM (DELPHI)

Program/Project Identifiers:

Project Number(s):	BIIP-982006
Related Program(s):	
New/Replacement/Upgrade?	Upgrade
Responsible Organization:	Office of Information Services (AMI)
Program Mgr./Project Lead:	Keith Burlison, AMI-500, (405) 954-0763
Fuchsia Book POC:	Same

Assigned Codes:

PDC(s):	HD
PDC Description:	Administrative Data Circuits for DELPHI
Service Code:	ADDA

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$0	$3	$10	$10	$10	$10	$10
Total OPS	**$0**	**$3**	**$10**	**$10**	**$10**	**$10**	**$10**

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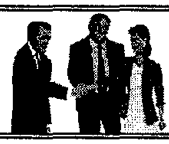
CIP Category:
Mission Support



4-05.0 DEPARTMENTAL ACCOUNTING AND FINANCIAL MANAGEMENT SYSTEM

4-05.1 PROGRAM OVERVIEW

The DELPHI Project is implementing a commercial-off-the-shelf (COTS) system, Oracle Federal Financials (FedFin), to replace the Department of Transportation's (DOT's) Departmental Accounting Financial Information System (DAFIS). The DELPHI Federal Railroad Administration (FRA) Pilot will begin in early FY00, using a web-based system with Hypertext Transfer Protocol (HTTP) and Internet Inter-ORB (Object Request Broker) Protocol (IIOP) Internet protocols. DELPHI will be the financial management system for all DOT agencies.

4-05.1.1 Purpose of DELPHI

DELPHI will provide financial management services for the DOT, implementing Oracle Financials modules for Federal General Ledger, Federal Accounts Receivable, Federal Accounts Payable, Federal Purchasing, Fixed Assets, Project Billing, Project Costing, Inventory, and Order Entry. DELPHI will support financial Decision Support System (DSS) activity through Oracle Financial Analyzer, Oracle Discoverer, and a DELPHI Data Warehouse. The DELPHI applications will provide DOT financial community users with a web-based interface.

4-05.1.2 References

Most DELPHI documentation is available through the Internet at http://www.delphi.jccbi.gov/. Updates and additions to DELPHI documentation will be made available at this web site as they become available. Documentation not available at the web site can be obtained from the DELPHI Program Office.

4-05.1.2.1 DAFIS-COTS Technical Architecture Paper.

4-05.1.2.2 DELPHI Program Charter.

4-05.1.2.3 DELPHI Financial and Operating Structure.

4-05.1.2.4 DELPHI Program Policies.

4-05.1.2.5 DELPHI Organization Chart (MMAC).

4-05.1.2.6 DELPHI Control and Reporting Procedures.

4-05.1.2.7 DELPHI Communication Plan.

4-05.1.2.8 DELPHI Quality Plan.

4-05.1.2.9 DELPHI Documentation Management Strategy.

4-05.1.2.10 DELPHI Team Training Strategy.

4-05.1.2.11 DELPHI Knowledge Transfer Strategy.

4-05.1.2.12 DELPHI User Training Strategy.

4-05.1.2.13 DELPHI Program Release Strategy.

4-05.1.2.14 DELPHI Data Conversion Strategy.

4-05.1.2.15 DELPHI Data Conversion Standards.

4-05.1.2.16 DELPHI Data Auditing Strategy.

4-05.1.2.17 DELPHI Interim Financial Reporting Strategy.

4-05.1.2.18 DELPHI Interface Standards.

4-05.1.2.19 DELPHI Interface Strategy.

4-05.1.2.20 DELPHI Solution Demonstration Lab Facility Plan.

4-05.1.2.21 DELPHI Performance Engineering Requirements.

4-05.1.2.22 DELPHI Reporting Strategy.

4-05.1.2.23 DELPHI Technical Infrastructure Conceptual Model.

4-05.1.2.24 DELPHI Principles, Constraints, and Assumptions.

4-05.1.2.25 DELPHI Information Flow Model.

4-05.1.2.26 DELPHI Technical Infrastructure Requirements.

4-05.1.2.27 DELPHI System Capacity Plan.

4-05.1.2.28 DELPHI Data Warehousing Technical Requirements.

4-05.1.2.29 DELPHI Data Warehousing Strategy.

4-05.1.2.30 DELPHI Data Warehousing Technical Infrastructure Impact Assessment.

4-05.1.2.31 DELPHI Data Warehousing Plan.

4-05.2 SYSTEM DESCRIPTION

4-05.2.1 DELPHI Components

4-05.2.1.1 DELPHI Application Architecture

The principal DELPHI components that support the application architecture are shown in Figure 4-05-1. The dashed lines demarcate the application tiers. The dotted lines represent candidate WAN traffic interconnectivity. The solid lines represent interconnectivity between collocated components. As shown in Figure 4-05-1, WAN traffic may occur between end-user client workstations and three types of services: form services, web services, and remote print services.

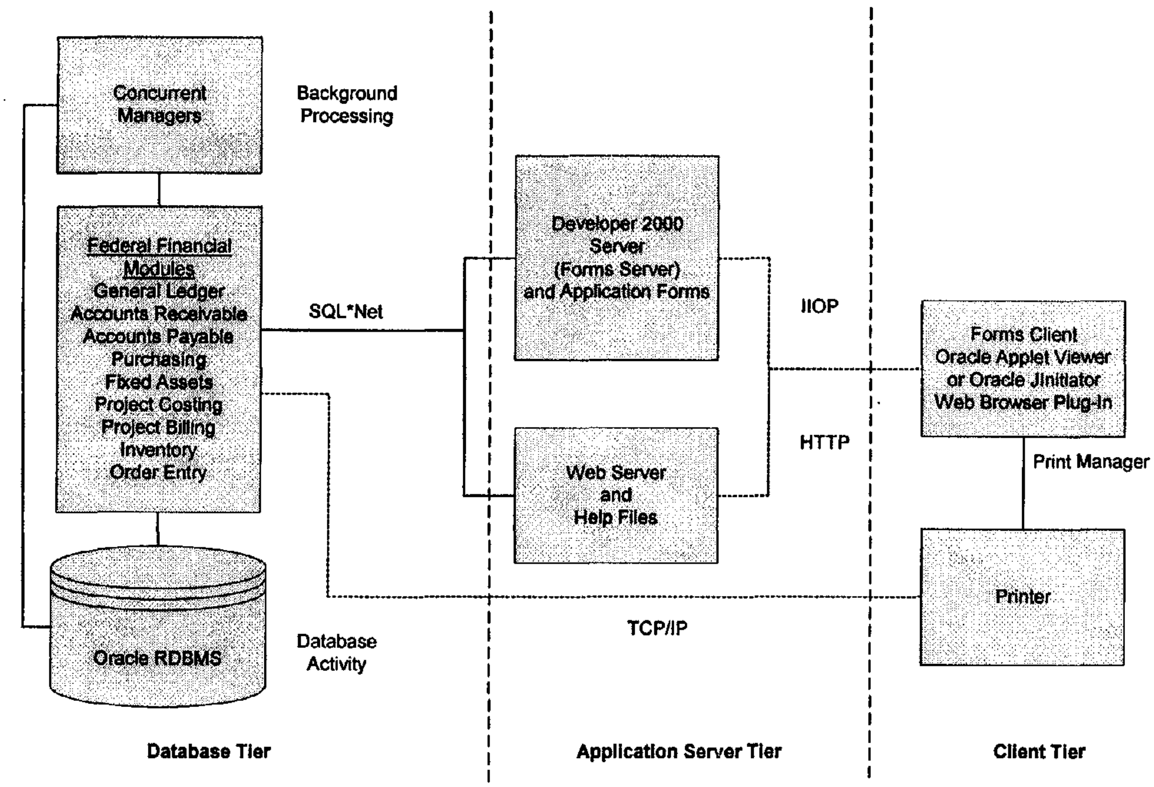


Figure 4-05-1. DELPHI Application Architecture

4-05.2.1.1.1 Database Tier

The database tier provides database services, centralized application logic, background processing, and remote print services for DELPHI. There is no SQL*Net WAN connectivity between the database tier and application server tier due to the collocation of these tiers. The concurrent managers spool print jobs that are sent to IP-addressable printers at client (end-user) locations. Remote printing (printing spooled at the database tier and sent over TCP/IP to the end-user printer) can produce WAN traffic.

The database tier also requires connectivity to external interfaces with applications on the FAA's ICE-MAN platform and with a yet to-be-determined number of external interfaces with DOT Operating Administration (OA) systems. Some of these interfaces will generate WAN network traffic.

4-05.2.1.1.2 Application Server Tier

The application server tier provides two types of services. The Forms Server processes form application logic that generates resource description information that is transmitted to the Forms Client using Common Object Request Broker Architecture (CORBA) messaging. The IIOP messaging is lightweight and optimized for reduced network activity. The Web Server provides access to HTML help files and other HTTP resources. Both the HTTP and IIOP transmissions are candidates for WAN traffic based on the location of end-users respective to the Database and Application Tiers.

4-05.2.1.1.3 Client Tier

The client tier consists of end-user workstations and printers. The workstations view forms information through either a Java Applet Viewer or a Web Browser plug-in called *Oracle JInitiator*. Oracle JInitiator is Oracle's version of JavaSoft's Java™ Plug-In. Oracle JInitiator is implemented as a plug-in component running in Netscape Navigator or an ActiveX component running in Microsoft Internet Explorer and provides the ability to specify the use of a specific Java Virtual Machine (JVM) on Web clients instead of relying on a browser's default JVM. Oracle JInitiator allows customers to run Oracle Developer Server applications in any Netscape Navigator 3.0 or later and Microsoft Internet Explorer 3.02 or later browser. Oracle JInitiator is currently available for Windows 95 and Windows NT 4.0.

The client component receives resource description information from the Forms Server that it uses to construct the view of a form. The IIOP messaging between the Forms Server and the Java component incorporates the Gartner Group's Remote Presentation client/server model providing telecommunications similar to that provided by X-Windows, PC Anywhere, or Citrix WinFrame. Additionally, a web browser on the client can access help information and other HTML pages (through HTTP) on the Web Server.

4-05.2.1.2 DELPHI Centralized Services

Figure 4-05-2 provides a representation of the server configuration that will host the collocated database and application server tiers. Inter-server communications between the Database Server, Application Server, Data Warehouse Server, and Development/Testing Server will be provided through the memory-channel interconnect and Digital TruCluster. Storage services will use either Ultra-Wide or Fiber Channel SCSI adapters and controllers. The RAID controllers will use redundant, write-back cache. Tape library services will also use SCSI interconnectivity and will initially be housed in the expander cabinet.

The Database and Application Servers are enterprise server-class computers sized for supporting financial management services for the DOT. The Data Warehouse and Development/Test Servers are department server-class computers. All servers use a clustered symmetric multi-processing (SMP) architecture.

The memory channel interconnect used for cluster data traffic is provided through memory channel cards, a memory channel hub, and memory channel cabling capable of supporting 100 Mbps throughput. The Database Server and Application Server will provide fail-over capability so that a failure of either server will switch the failed service to the remaining server. For example, a failure of the Application Server will result in the Database Server Platform simultaneously providing Database, Application, and Web services.

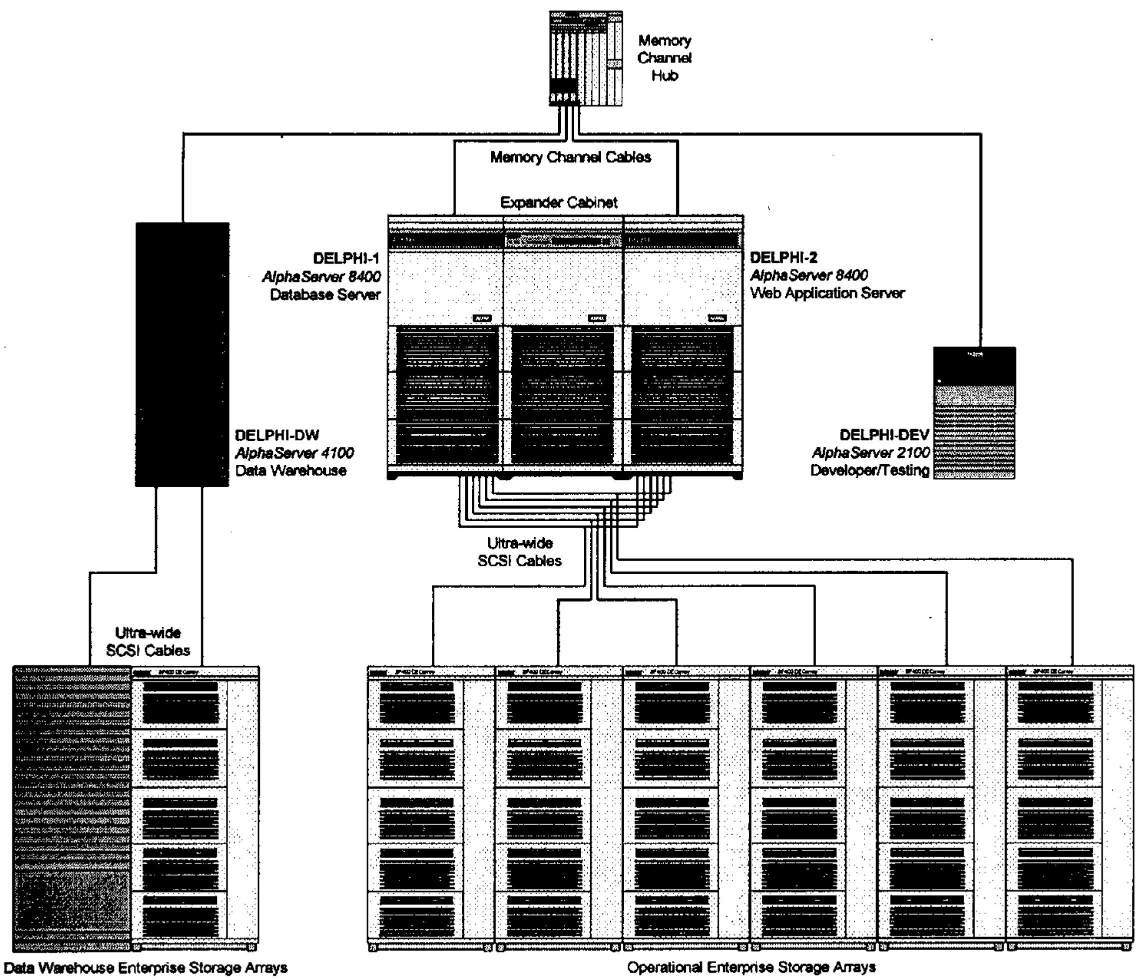


Figure 4-05-2. DELPHI Server Cluster Components

4-05.2.1.3 <u>DELPHI Network Traffic</u>

Figure 68-3 provides a breakdown of the types of network activity required supporting DELPHI. These network types are defined as follows:

- <u>Channel-Attached</u>. DELPHI will be using a channel-attached device called a Datablaster to transmit data between the FAA's ICE-MAN platform and the DELPHI Server Cluster. This will be used to satisfy connectivity requirements for interfaces hosted on ICE-MAN.

- Wide Area Network. Remote DELPHI end-users (i.e., users who are not located on the same campus backbone as the DELPHI Server Cluster) will require WAN connectivity. Since the location of the DELPHI Server Cluster has not yet been determined, the number of remote users is currently speculative. (DELPHI development and the DELPHI pilot deployment are occurring at the Mike Monroney Aeronautical Center.) WAN network traffic would include OLTP, decision support, and remote printing activity.

- Metropolitan (Backbone) and Local Area Networks. This refers to campus backbones such as the DOT's Intermodal Data Network or the MMAC campus backbone. More specifically, it refers to network traffic between the clients (workstations and printers) and server platforms that do not require WAN access.

- Campus Backbone (High-Speed Printers). DELPHI will require access to high-speed printers for high-volume print jobs. The current configuration requires that these printers be located on the same LAN or backbone as the DELPHI Server Cluster.

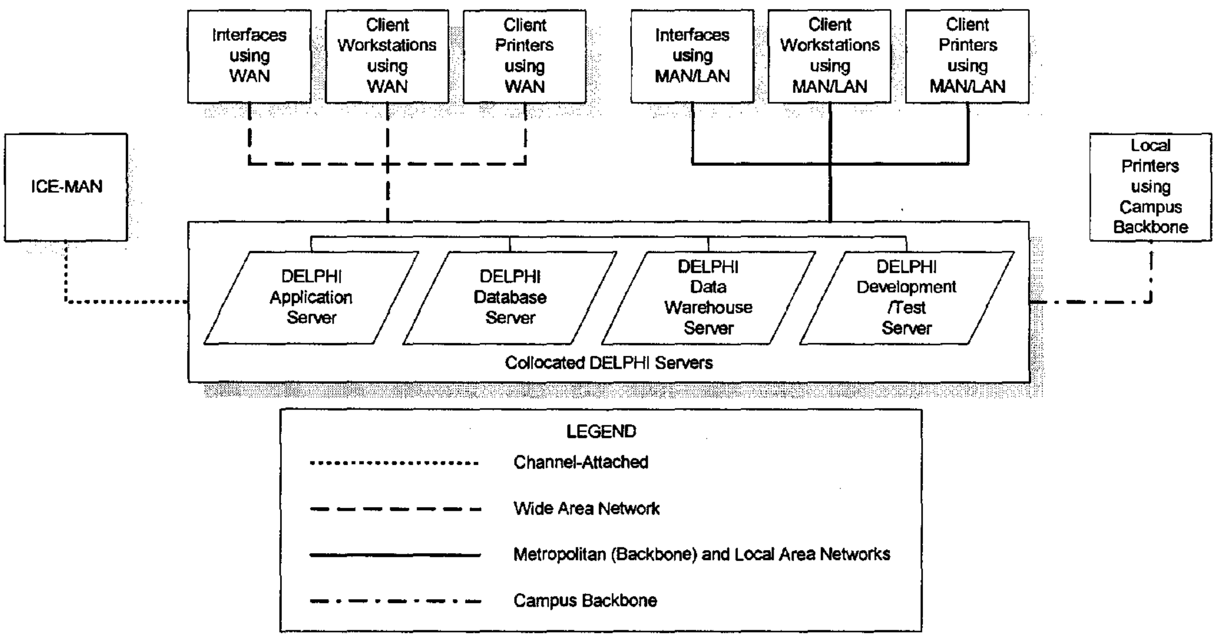


Figure 4-05-3. DELPHI Telecommunications

Other than the channel-attached transmissions, all telecommunications protocols that DELPHI will use are Internet Protocols (IP). Local and client-side printing requires IP-addressable printers. Telecommunications between the DELPHI Application Server and DELPHI Client workstations will use Internet Inter-ORB (Object Request Broker) Protocol (IIOP) and Hypertext Transfer Protocol (HTTP). Other TCP/IP activity will involve network transmission between the servers over the memory channel interconnect, system monitor agent transmissions to the collocated system management console, and SQL*Net transmission from DELPHI Servers to DELPHI Clients for decision support systems (DSS) activity.

4-05.2.1.4 <u>DELPHI Component Interface Requirements</u>

The DELPHI project and the DOT Operating Administrations are currently reviewing DAFIS (legacy system) interfaces to determine what interface feeder systems will be replaced by DELPHI functionality. Since DELPHI will be replacing many existing interfaces with DELPHI functionality, the net effect for telecommunications should result in a reduction in current DOT financial management systems interface telecommunications traffic.

Figure 4-05-4 displays the interfaces that have currently been identified that DELPHI will need to support. These interfaces currently exist in DAFIS. No new interfaces beyond the ones supported by DAFIS have been identified.

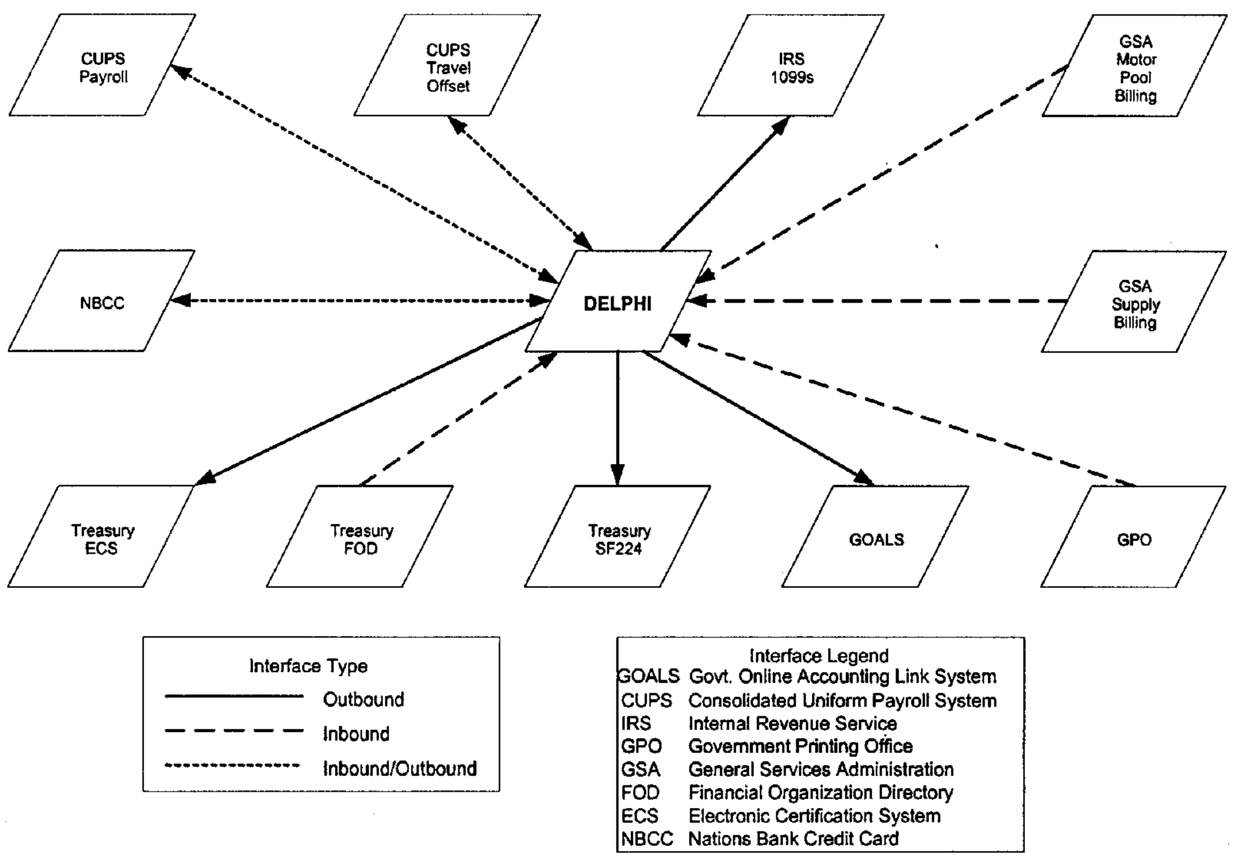


Figure 4-05-4. DELPHI Interfaces

4-05.2.1.5 Inbound/Outbound Interfaces

4-05.2.1.5.1 Consolidated Uniform Payroll System (CUPS) Payroll

CUPS is the DOT's automated payroll processing system. The CUPS interface will record personnel cost transactions. The interface will consist of three processes: (1) recording the estimated monthly payroll accruals, (2) paying the actual payroll expenses, and (3) reversing the estimated accruals to record the actual payroll liabilities.

Frequency	Record Count	Record Length	Transmit	Yearly MB
Biweekly	449,955	61	27,447,255	680.57

4-05.2.1.5.2 CUPS Travel Offset

This interface will provide functionality to create payroll deductions for employees who have failed to pay travel offsets. The CUPS travel advance salary offset process is used to collect all overdue travel advances through payroll deduction. A travel advance for TDY or PCS is considered overdue 30 days after completion of travel. A Travel Advance for Continuous Travel is considered overdue 45 days after completion of travel.

Frequency	Record Count	Record Length	Transmit	Yearly MB
Biweekly	934	200	186,800	4.63

4-05.2.1.5.3 Nations Bank Credit Card (NBCC)

The NBCC interface records will detail purchase transactions, administrative fees, and adjustments for DOT credit card usage. This interface will replace one that is currently being transitioned from the Rocky Mountain Bankcard interface. The Government Credit Card Electronic Invoicing (EI) System was initiated by a GSA Contract. EI is designed to transmit detail purchase transactions and administrative fees from the bankcard system to the DOT accounting system. These are purchases made by employees using the government credit card.

Frequency	Record Count	Record Length	Transmit	Yearly MB
Semi-Weekly	600	154	92,400	9.16

4-05.2.1.6 Inbound Only Interfaces

4-05.2.1.6.1 General Services Administration (GSA) Supply Billing

The Supply Billing interface will process GSA supply billing transactions. The interface will consist of two processes: (1) recording disbursements and (2) reversing the disbursements and liquidating the applicable undelivered orders.

Frequency	Record Count	Record Length	Transmit	Yearly MB
Monthly	8,743	120	1,049,160	12.01

4-05.2.1.6.2 General Services Administration (GSA) Motor Pool Billing

The GSA Motor Billing interface will process GSA automotive billing transactions. The interface will record disbursements for DOT motor pool usage. The Logistics Inventory System downloads obligations for purchase orders that will be processed through the GSA SIBAC process. These obligations are recorded into the accounting system via an automated interface.

Frequency	Record Count	Record Length	Transmit	Yearly MB
Monthly	9,637	100	963,700	11.03

4-05.2.1.6.3 Government Printing Office (GPO) Printing

The GPO Billing interface will process GPO printing cost transactions. The interface will consist of two processes: (1) recording disbursements and (2) reversing disbursements and liquidating the applicable undelivered orders. The GPO provides services and supplies to activities serviced by the OST Working Capital Fund (WCF) as well as to other OST activities. GPO bills these activities, for services rendered, on a monthly basis by sending billing information to the DOT accounting system.

Frequency	Record Count	Record Length	Transmit	Yearly MB
Monthly	120	80	9,600	0.11

4-05.2.1.6.4 U.S. Treasury Financial Organization Directory (FOD)

The FOD interface will be used to load bank routing and address information. The FOD is a file received monthly from Treasury that contains bank identification numbers. This bank information is used when making Automated Clearing House (ACH) payments. ACH payments are deposited electronically into a designated bank account.

Frequency	Record Count	Record Length	Transmit	Yearly MB
Monthly	28,110	397	11,159,670	127.71

4-05.2.1.7 Outbound Only Interfaces

4-05.2.1.7.1 Payments via the Electronic Certification System (ECS) to Treasury

This interface will transmit vendor payment information from DELPHI to the US Department of the Treasury using the Electronic Certification System. The interface consists of four types of records as shown in the tables below.

Pre-notification				
Frequency	Record Count	Record Length	Transmit	Yearly MB
Daily	500	160	80,000	19.07

Automated Clearing House				
Frequency	Record Count	Record Length	Transmit	Yearly MB
Daily	1,686	160	269,760	64.32

Vendor Data				
Frequency	Record Count	Record Length	Transmit	Yearly MB
Daily	3,100	160	496,000	118.26

Check Data				
Frequency	Record Count	Record Length	Transmit	Yearly MB
Daily	3,000	1,048	3,144,000	749.59

4-05.2.1.7.2 Receivables via the On-line Payment and Collection System (GOALS)

This interface will transmit intergovernmental billing information to the US Department of the Treasury. The Operations and Training Group receives charges on a daily basis through Treasury's Government Online Accounting Link System (GOALS) for both SIBAC and OPAC. In either case, a disbursement record is built in gross for each region to record the disbursement to general ledger and to clear the SF-224 reporting requirement. That information is passed to the Accounting Office to aid in reconciliation.

Frequency	Record Count	Record Length	Transmit	Yearly MB
Monthly	1,185	1,000	1,185,000	13.56

4-05.2.1.7.3 Bulk Transfer of (SF224)

This interface will transmit the Standard Form-224 report file to the US Department of the Treasury. Throughout the month, increases and decreases to many accounts are affected through collections, disbursements, and cancellations. There are three types of accounts affected – receipt accounts, expenditure accounts, and suspense (clearing) accounts. This interface transmits this information to the US Treasury.

Frequency	Record Count	Record Length	Transmit	Yearly MB
Monthly	750	58	43,500	0.50

4-05.2.1.7.4 IRS Vendor Disbursements (1099)

This interface will transmit 1099 vendor information to the Internal Revenue Service. The IRS 1099 file exists to retain payment data for reporting to the Internal Revenue Service via Form 1099-MISC. The 1099-MISC is used to report the calendar year accumulation of payments equal to at least $600.00. These types of payments are all types of rents and non-employee compensation services. Non-employee compensation payments are:

- Payments to someone who is not an employee of the payer's organization
- Payments for services rendered
- Payments to someone other than a corporation

Frequency	Record Count	Record Length	Transmit	Yearly MB
Monthly	10048	750	7,536,000	86.24

4-05.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

4-05.3.1 Interface Requirements

Since any DELPHI interfaces will replace legacy system (DAFIS) interfaces, there are no new interface requirements.

4-05.3.2 Connectivity Requirement

DAFIS currently has 2,250 users, with 500 expected to be the maximum for concurrent users. FAA DAFIS users are located at the regional offices, headquarters, William J. Hughes Technical Center, and FAA Aeronautical Center. Connectivity requirements for DELPHI are not expected to change. The following table identifies Operating Administration locations and their respective user counts for the DAFIS system. These numbers are expected to change minimally for DELPHI.

4-05.3.3 Traffic Characteristics

Traffic characteristics cannot be determined at this time. DELPHI traffic patterns will depend on implementation across all twelve agencies. This may take several years. However for planning purposes, the following projected traffic loads, as shown in Table 4-05-1, are being used. These are worst-case loads based on network activity that has been monitored during DELPHI Solutions Demonstration Lab (SDL) activity. The DELPHI Network Computing Architecture (NCA) may cut end-user WAN activity in half.

Table 4-05-1. Projected Annual WAN Traffic Loads in Gigabytes

	Gigabytes of WAN Transmission – Annually						
Transmission Activity	FY00	FY01	FY02	FY03	FY04	FY05	FY06
Interfaces	0	2	4	4	4	4	4
End-user Activity	0	10	36	36	36	36	36
Total	0	12	40	40	40	40	40

Table 4-05-2 shows the DELPHI User locations.

Table 4-05-2. DELPHI User Locations

Operating Administration Location	User Count
Maritime Administration (Total :44)	
Maritime Administration	38
Us Merchant Marine Academy	6
Federal Aviation Administration (Total: 1265)	
Mike Monroney Aeronautical Center	207
Great Lakes Region	51
New England Region	28
Northwest Mountain Region	44
William J. Hughes Technical Center	39
DAFIS Operations AMZ-2B	48
Headquarters	34
AMI-500	109
Eastern Region	131
Southwest Region	74
Central Region	72
Western Pacific Region	72
Southern Region	168
National Ledger	150
U.S. Coast Guard (Total: 504)	
1st Coast Guard District	9
2nd Coast Guard District	1
8th Coast Guard District	5
11th Coast Guard District	1
13th Coast Guard District	5
14th Coast Guard District	6
17th Coast Guard District	3
Coast Guard Finance Center	359
Coast Guard Headquarters	5
Coast Guard Headquarters Office of Acquisition	3
Coast Guard Headquarters Office of Engineering	2
Coast Guard Headquarters Office of Personnel	24
District Office	7
Fifth Coast Guard District	2
Governor's Island	33
HQ/Field Operations	1
MLC-PAC	24
Office of Command, Contracts	5
USCG NPFC	9
Volpe National Transportation Systems Center	26
Federal Highway Administration	250
Federal Railroad Administration, Office Of Financial Services	30
Office Of The Secretary (Total: 10)	
OST	1
OST National Ledger	9
National Highway Traffic Safety Administration, Headquarters	26
Federal Transit Administration, Accounting Division	100
Total	**2,255**

4-05.4 ACQUISITION ISSUES

4-05.4.1 DELPHI Schedules And Status

The DELPHI project is currently performing Solution Demonstration Labs to assess business process capabilities and business process reengineering needs for the Oracle Federal Financials Application COTS software. Technical infrastructure design is underway for platforms that will be used for the FRA pilot. Conversion and interface construction efforts are in preparation for continued support of legacy interfaces and data.

Current plans are to start converting DAFIS users to DELPHI on January 2000. The initial conversion will use Federal Railroads Administration as a pilot. The other operating administrations will be converted over 18 months starting after the FRA pilot is initiated. There will be brief periods of parallel activity for DAFIS and DELPHI during the DELPHI implementation.

4-05.4.2 DELPHI Telecommunications Strategies

DELPHI is an upgrade to the DOT's DAFIS system. As DELPHI functionality is implemented, DAFIS users will be transitioned from the legacy DAFIS system to the Oracle Federal Financials software being implemented by DELPHI.

4-05.4.3 DELPHI Telecommunications Costs

Table 4-05-3 provides the estimated program costs for FY99 to FY05. These costs are based on the projected annual usage profile in gigabytes contained in Table 4-05-1. Since the DELPHI users will use existing connectivity to the ADTN network, there are no additional channel or hardware costs associated with the system. The only telecommunications costs incurred are the ADTN2000 backbone usage charges at $1,500 per Gigabyte. Funding will be in accordance with FAA Order 2500.8A.

Table 4-05-3. Cost Summary - DELPHI

The following table shows requirements, which are captured in the ADTN2000 chapter. They are here for information only.

CIP # None	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
1. DELPHI <---> ADTN2000									
Channel Costs			N/A - Uses existing connectivity to ADTN2000						
Hardware Costs			N/A - Uses existing ADTN2000 terminating equipment						
2. ADTN2000 Backbone Usage									
Cost Profile: Annual Network Costs Calculated at $500 per Gigabyte									
Annual Traffic in Gigabytes			0	12	40	40	40	40	40
OPS Recurring Costs			**$0**	**$3**	**$10**	**$10**	**$10**	**$10**	**$10**
			SUMMARY						
F&E Totals	Non-recurring		$0	$0	$0	$0	$0	$0	$0
	Recurring		$0	$0	$0	$0	$0	$0	$0
	F&E Totals		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Totals	Non-recurring		$0	$0	$0	$0	$0	$0	$0
	Recurring		$0	$3	$10	$10	$10	$10	$10
	OPS Totals		**$0**	**$3**	**$10**	**$10**	**$10**	**$10**	**$10**

Notes:
1. Unit cost data provided by the ADTN2000 Program Office.
2. Ramp up of usage in FY01 allows for a brief period of parallel operations with the FAA's Departmental Accounting and Financial Information System (DAFIS).

CHAPTER 4-06- SUMMARY SHEET

DISTANCE LEARNING (DL)

Program/Project identifiers:

Project Number(s):	CIP M-10
Related Program(s):	All projects related to FAA training
New/Replacement/Upgrade?	New Service
Responsible Organization:	AMA-300B2
Program Mgr/Project Lead:	Linda Fennell, AMA-300B2, (405) 954-6323
Fuchsia Book POC:	Same

Assigned Codes:

PDC(s):	IR, IU
PDC Description:	Distance Learning circuits; Distance Learning circuit equipment
Service Code:	TRNG

Cost Estimates *:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$500	$401	$437	$0
F&E Recurring	$0	$0	$0	$0	$31	$10	$0
Total F&E	**$0**	**$0**	**$0**	**$500**	**$432**	**$447**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$279	$323	$381	$457	$555	$713	$887
Total OPS	**$279**	**$323**	**$381**	**$457**	**$555**	**$713**	**$887**

*Note: Cost Data provided by the Distance Learning Program Office (AMA-300B2)

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CIP Category:
Mission Support

4-06.0 DISTANCE LEARNING

4-06.1 PROGRAM/SYSTEM OVERVIEW

4-06.1.1 Purpose of Distance Learning

The purpose of the Distance Learning (DL) Program, specifically the Interactive Video Teletraining (IVT) Project, is to provide modern, cost-effective, and efficient training to a large, geographically dispersed work force and to reduce travel to centralized training facilities. Distance Learning allows timely training on system and equipment upgrades or refresher training on a regular and frequent basis. This program reduces the need to cycle personnel through resident training facilities (Oklahoma City, OK, and Palm Coast, FL), thereby reducing the impact to the course participant's workload. In addition, the DL program has demonstrated a significant savings in travel time and expenses, due to the fact that courses are conducted at or near the course participant's work location.

The Interactive Video Teletraining (IVT) System component of the DL Program provides a training system based on a live, one-way video/two-way audio, telecommunications design. An instructor's training video and audio signal is transmitted from a broadcast studio over a satellite network to independent receive sites. Course participants' audio and data responses are transmitted to the instructor using terrestrial telephone circuits.

The FAA Academy provides funding to AOP for the F&E telecommunications portion of the DL IVT system as needed. Only uplink and downlink maintenance, network management, satellite transmission time, and phone costs for DL are included in this chapter.

4-06.1.2 References

4-06.1.2.1 Department of Transportation, Federal Aviation Administration, Distance Learning Operational Requirements Document (February 1996).

4-06.1.2.2 Distance Learning IVT Integrated Program Plan (January 1997)

4-06.1.2.3 Distance Learning, IVT, Functional Specification (May 1995)

4-06.1.2.4 Distance Learning Mission Need Statement No. 124, Revision 10, (December 1996)

4-06.1.2.5 Capital Investment Plan (CIP) M-10 (Formerly No. 56-02), January 1999

4-06.2 PROGRAM/SYSTEM DESCRIPTION

A prototype IVT system established during FY-95/FY-96 provided a concept demonstration and validation studies. The initial system consisted of a single broadcast studio and a satellite uplink located at the FAA Academy in Oklahoma City, OK. Approximately 58 receive sites were planned for the IVT network by the end of FY-99. Forty-three receive sites are now operational with the remaining 15 scheduled to be operational by the end of the second quarter of FY-00. Thirty-three of these sites have a second channel capability to receive transmissions such as the Administrator's broadcasts and other FAA Public Affairs broadcasts. Receive site learning stations may receive any available channel under the central Compressed Digital Video (CDV) network.

In general, DL IVT receive sites have been located to optimize use by FAA organizations that have identified courses for delivery. The sites were installed to parallel DL course conversion activities to gain maximum use of the system.

The IVT System uses a satellite CDV - 3.3 Mbps service provided under the FTS-2000 contract to transmit the instructor's presentation to course participants. The satellite uplink facility located at the FAA Academy in Oklahoma City is able to generate multiple channels (4 expandable to 6) of one-way video and audio instruction. The FAA receive sites have 1.2 meter through 3.7 meter receive-only satellite antennas and associated equipment (Integrated Receiver Decoder (IRD)) to allow reception of "live" classroom style instruction. Video/audio signals from other agencies or FAA sites may also be transmitted to Oklahoma City for rebroadcast to the IVT System and other Federal government compatible receive sites. Incoming instruction may be received in Oklahoma City via compressed video circuits at fractional T-1, T-1 or T-3 data rates.

A Viewer Response System (VRS) site controller for student-instructor interface has been installed at all receive sites to provide an interactive network for a real-time instructor and student(s) audio and data communication interface in conjunction with the on-line satellite-transmitted training course, encouraging viewer participation, enhanced student comprehension and information retention. The VRS is hooked up to a host computer at the studio in Oklahoma City and currently utilizes a TCP/IP dial-up service through AT&T's World Net Virtual Private Network Service (OASIS) and standard telephone connections via the FTS-2000 contract.

Since the FTS-2001 contract does not contain a satellite services that will satisfy the needs of the FAA network (part of the Government Education and Training Network [GETN], which includes military and civilian government agencies), GSA establish a "niche" contract. The GETN is operating under the FTS-2000 extension, but will convert to the niche contract (part of the FTS offering) during FY-2000. At that time, the network will be converted to an IMPEG-II network since the current CLI network technology is outdated. At this time, it appears all or most conversion costs will be funded by the General Services Administration (GSA).

4-06.2.1 Principal Components

Uplink site equipment furnished by the FTS-2000 contract consists of an uplink satellite antenna, amplifier, and transmit/encoder system. Equipment furnished by other budget authority includes the broadcast studio and instructor equipment such as camera(s), monitors, audio/video switching and mixing equipment, VCRs, FAX machines, and the Viewer Response System (VRS) host computer.

Remote site equipment furnished by the FTS-2000 contract consists of a 1.2 meter through 3.7 meter satellite dish and an integrated receiver decoder. Equipment furnished by other budget authority includes the VRS, VCRs, monitor(s), FAX machine, security cabinet, and inside wiring.

Note: All components or owned components of the IVT System are Year 2000 compliant.

4-06.2.2 Functional Component Interface Requirements

Satellite CDV - 3.3 Mbps service is available from the FTS-2000 contract extension and will be available from an FTS niche contract in FY-2000.

a. Satellite transmission one-way audio and video specifications are shown below:
   - C band or Ku band satellite transmission - 1.2 meter through 3.7 meter receive antenna
   - NTSC analog video input/output
   - Two audio channels (stereo) with Dolby noise reduction
   - Audio dynamic range > 70 dB
   - Audio Frequency Response +/-3dB, 20 Hz - 15 kHz
   - Audio Distortion < 0.3%
   - Addressable Receiver/Decoder
   - Three 19.2 Kb/s auxiliary serial data channels included
   - Resolution: - NTSC - 480 lines x 368 pixels
   - Refresh rate at 30 frames/sec
   - Video signal to noise ratio > 49 dB
   - Error correction 16 bits in 1056 bit block

b. Viewer Response System (VRS) specifications are shown below:
   1. Student Site Controller
      - Built in 56K baud modem
      - Supports up to 64 response keypads
      - Dial up TCP/IP connection via AT&T's VPN "OASIS"
      - Auto dialer voice connection
      - Audio delay trim adjustment
      - Printer port, auxiliary RS-232 port, RJ -11 phone jack, and modem port provided

   2. Student Keypad
      - 2 line x 24 character LCD display
      - Membrane keypad w/12 calculator keys, 4 special keys, 5 programmable function keys

   3. Instructor Phone Controller
      - Three RJ-11 input jacks
      - Voice audio output 0 dB into 20 K-ohms
      - Dial up TCP/IP connection via AT&T's VPN OASIS

4-06.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

The IVT System has a transmission network reliability of 99% to support the large number of students dependent upon the immense volume of courses that must be taught via this system. The uplink site has maintenance available on a 24-hour notice. The IVT receive sites have maintenance available on a 24-hour notice. A plan to purchase redundant equipment for the uplink site in FY-03 will allow continuation of broadcasts if there is a failure of the primary uplink equipment.

4-06.3.1 Protocol Interfaces

- NTSC video
- TCP/IP via dial up circuit

4-06.3.2 Transmission Interfaces

- NTSC video
- RJ-11 voice circuits

4-06.3.3 Local Interfaces

The NTSC video interface is used to connect a local monitor for one-way video and audio; the student-instructor response system requires two (2) dials up RJ-11 voice circuits. A modem is included with the Viewer Response System (VRS) equipment.

4-06.4 ACQUISITION ISSUES

4-06.4.1 Program Schedule and Status

Schedules for channels and sites to be added are reflected in Table 4-06-1.

4-06.4.2 Telecommunications Costs

Table 4-06-1 provides a summary of the estimated telecommunications costs for the Distance Learning program. Cost data uses estimates from vendors bidding on the GSA FTS niche contract for satellite services. The cost data is also based on the assumption that the Government Training and Education Network (GETN) will continues to operate as a large government entity, minimizing the cost of satellite services for all users.

A plan to purchase redundant equipment for the uplink site in FY-2003 will allow continuation of broadcasts if there is a failure of the primary uplink equipment. From FY-2004 through FY-2006, the network may need to be upgraded and extra channels added at existing receive sites as broadcast hours increase and a second studio is added. Plans for this expansion have not been approved, although an investment analysis is to be completed in FY-2000.

Table 4-06-1. Cost Summary - Distance Learning

CIP # M-10 All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
1. Uplink Channels								
Channels Added		0	0	0	0	0	0	0
Total Channels	1	1	1	1	1	1	1	1
F&E Non-recurring Channel Costs		**$0**	**$0**	**$0**	**$500**	**$300**	**$300**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$23**	**$0**	**$0**
OPS Recurring Costs		**$69**	**$69**	**$69**	**$69**	**$69**	**$92**	**$92**
2. Downlink Sites								
Sites Added (F&E)	43	15	0	0	0	0	0	0
Total Sites		58	58	58	58	58	58	58
Channels Added (F&E)	33	0	0	0	0	25	34	0
Total Channels		33	33	33	33	58	92	92
F&E Non-recurring Site Costs		**$0**	**$0**	**$0**	**$0**	**$101**	**$137**	**$0**
Recurring Site Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$8**	**$10**	**$0**
OPS Recurring Costs		**$52**	**$52**	**$52**	**$52**	**$52**	**$59**	**$69**
3. Satellite Transmisson								
Annual Hours		360	467	606	786	1019	1321	1714
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$133**	**$172**	**$223**	**$289**	**$375**	**$487**	**$631**
4. TCP/IP-Voice Dial-up Capability								
Annual Hours		360	467	606	786	1019	1321	1714
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$25**	**$30**	**$37**	**$47**	**$59**	**$75**	**$95**

SUMMARY

		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
F&E Totals	Non-recurring	$0	$0	$0	$500	$401	$437	$0
	Recurring	$0	$0	$0	$0	$31	$10	$0
	F&E Totals	**$0**	**$0**	**$0**	**$500**	**$432**	**$447**	**$0**
OPS Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$279	$323	$381	$457	$555	$713	$887
	OPS Totals	**$279**	**$323**	**$381**	**$457**	**$555**	**$713**	**$887**

Note: Cost data provided by the IVT Program Office, AMA-300B2

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CHAPTER 4-07 - SUMMARY SHEET

DIGITAL VIDEO TELECONFERENCING SYSTEM (DVTS)

Program/Project Identifiers:

Project Number(s):	BIIP-981007
Related Program(s):	
New/Replacement/Upgrade?	New and Upgraded Systems
Responsible Organization:	ASU
Program Mgr/Project Lead:	Dani Levenson, ASU-520, (202) 267-9973
Fuchsia Book POC:	Same

Assigned Codes:

PDC(s):	HW
PDC Description:	Administrative Data Circuits for Video Conferencing
Service Code:	VDEO

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$70	$70	$70	$70	$70	$70
F&E Recurring	$0	$40	$80	$80	$80	$80	$80
Total F&E	**$0**	**$110**	**$150**	**$150**	**$150**	**$150**	**$150**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$408	$408	$408	$448	$488	$528	$568
Total OPS	**$408**	**$408**	**$408**	**$448**	**$488**	**$528**	**$568**

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CIP Category:
Mission Support

4.07.0 DIGITAL VIDEO TELECONFERENCING SYSTEM

4-07.1 OVERVIEW

The Office of Information Technology (ASU-520) has undertaken the program to make reliable video communications available throughout the Federal Aviation Administration (FAA). This includes establishing the standards required for Digital Video Teleconferencing System (DVTS) interoperability, desktop video technology, system implementation, operations support, problem identification, and problem resolution.

4-07.1.1 Purpose of the Digital Video Teleconferencing System

The purpose of this system is to provide timely, reliable, high quality interactive video communications services throughout the agency.

4-07.1.2 References

4-07.1.2.1 AT&T Technical Reference publication TR 41459.

4-07.1.2.2 AT&T Technical Reference publication TR 62310

4-07.1.2.3 AT&T Technical Reference publication TR 62411

4-07.1.2.4 ITU-T H.320, Standards for Video Teleconferencing Services at 56 to 1920 kbps

4-07.1.2.5 Federal Information Processing Standards Publication, FIPS 178

4-07.1.2.6 Video Standards and Guidance for the Federal Aviation Administration (FAA)

4-07.2 DESCRIPTION OF THE DIGITAL VIDEO TELECONFERENCING SYSTEM

This program provides the capability to conduct interactive business sessions among geographically separated FAA managers. It supports connectivity between two sites or among multiple sites. Experience with the system to date has demonstrated significant savings in travel days and costs.

The DVTS program is planned, implemented, and managed by ASU. ASU's role include overall management of the operational systems; planning, design and procurement of new capabilities; and leasing and purchasing all new video communications systems that use video Coders/Decoders (CODECs). They established video standards and guidance for the FAA, ensuring that all new video systems are equipped and configured using the ITU-T H.320 suite of standards at the video system application layer for both point-to-point and multipoint DVTS applications.

4-07.2.1 Functional Connectivity Requirements

At a minimum, all new video systems should be configured with factory-installed, dual RS-449 data and associated RS-366 dialing interfaces. This requirement ensures backward interoperability with the large existing base of dual channel only video systems. This interface arrangement provides the greatest range of flexibility for connection to the required network terminating equipment units that support Switched 56 kbps to ISDN PRI communications channel service as specified in FIPS 178. The functional connectivity is depicted in Figure 4-07-1.

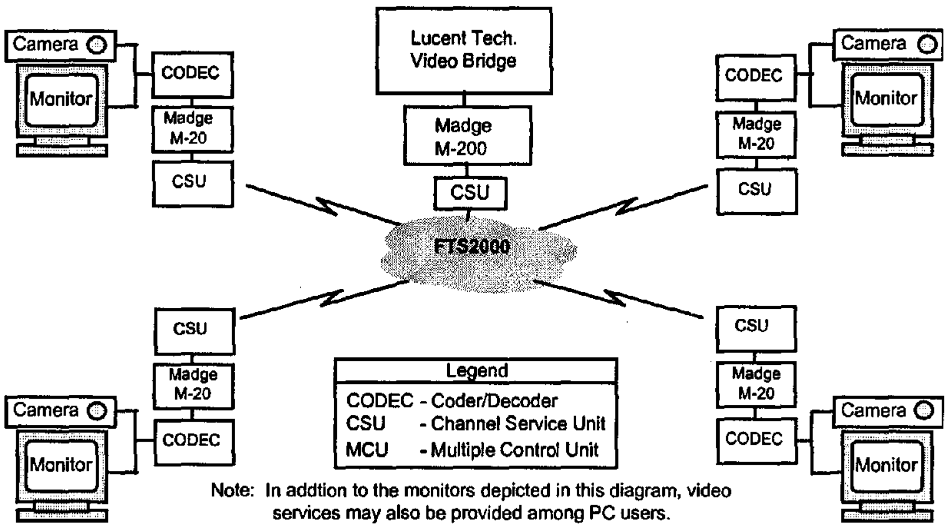

Figure 4-07-1. Functional Connectivity Diagram

4-07.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

4-07.3.1 Digital Network Interoperability

Interoperability at the Network layer will require FTS2000 switched data network connectivity at speeds ranging from dual channel switched 56/112 kbps to the ISDN PRI single channel maximum of 1472 kb (Nx23). ISDN PRI connectivity is required for FIPS 178 Class 2 full Video Teleconferencing (VTC) applications.

Compliance requires that all video systems must be equipped and configured to interoperate, at a minimum, using either dual channel switched 56/112 kbps or ISDN BRI service via RS-449 or V.35 data input/output plus the associated RS-366 dialing interfaces.

An exception exists for Class I locations using FTS2000 SDIS service with agency provided digital PBX or channel bank equipment. Such SDIS service locations may be equipped with dual switched four-wire (4W) RJ-45 interfaces to integrated (CSU/DSU) functionality that is included in certain video systems. Switched 56 kbps service locations that use integrated CSU/DSU functionality must be equipped with agency-provided switched 56 kbps 4W RJ-45 loop back test devices to enable remote testing and problem resolution by the network service provider.

4-07.3.2 Video System Test Capability Requirements

Loop back test devices must be provided to support both local and remote testing. Adequate test and problem resolution requires that all video systems be capable of generating proper video and audio test signals. Compliant systems must be capable of generating proper color bars, SEMPTE Bars preferred, and 1000 Hz tone at a 0/0 Test Level Point or -10.0 dBm level for both local and distant end set-up and performance measurements. Various levels of CODEC digital loop back devices are also necessary to enable "board level" problem identification and resolution.

4-07.3.3 Premise Wiring Requirements

T1 or ISDN PRI premise wiring connecting the Network Interface (NI) to the network terminating equipment provided by the network service provider must be in accordance with AT&T Technical Reference publication TR 62310.

Premise wiring connecting the network terminating equipment to the video system must be in accordance with the applicable interface standards used for those connections, i.e. RS-449/V.35 and RS-366.

4-07.3.4 Interactive Data Sharing

The T.120 Standards for Interactive Data Sharing via DVTS contain multiple layers of protocols to support both common data sharing and data transport. The features and functions supported under these standards are covered under T.12 - T.128. Only basic connectivity is currently adopted or fully implemented. Complete, ITU-T standards-based interoperability in application sharing and transport was completed and fully implemented in 1999.

Video users who are contemplating the purchase or lease of interactive, collaborative data sharing via DVTS must be aware that "T.120 compliant" systems are not fully T.120 - T.128 interoperable. Users should address these interoperability issues carefully before procuring and installing data sharing software.

4-07.4 ACQUISITION ISSUES

4-07.4.1 Program Schedule and Status

To establish management responsibilities for providing and funding these services, ASU has entered into agreements and formal Memorandums of Understanding/Agreement with the three major users of the existing video conferencing capabilities:

(1) Associate Administrator for Research and Acquisitions (ARA)

(2) NAS Implementation Support Contractor (NISC)

(3) Office of Air Traffic Systems Development (AUA)

(4) Free Flight Phase 1 Program Office (AOZ)

4-07.4.1.1 Associate Administrator for Research and Acquisitions (ARA)

With one exception, establishing, operating and managing the ARA DVTS is the responsibility of ASU, a subordinate element in the ARA organization. The exception is ACT, where local organizations establish and manage their own systems and conduct the day-to-day operations. ASU provides support for multipoint conferences or other technical support as required. The DVTS locations supporting ARA are shown in Table 4-07-1.

Table 4-07-1. Location of the VTC Systems Supporting ARA Systems

FOB10A	ARA-1 Conference Room ASU-500 Conference Room #2 ASU-500 Conference Room #3 ASU Presentation Room ACR Conference Room
FAA Technical Center	ACT-1 Conference Room ACT WKRM ACT- Room LEB405 ACT- Room LEB301 ACT- Room 2K26 ACT Bldg 28

4-07.4.1.2 NAS Implementation Support Contractor (NISC)

AAF/ANS transferred NISC DVTS resources to ASU for management, since ANS wanted to focus on NAS transition tasks. All NISC systems are compatible with newer systems. The former NISC systems are located at the regional offices listed in Table 4-07-2.

4-07.4.1.3 Office of Air Traffic Systems Development (AUA)

ASU, as AUA's agent and TeleVideo Conference Network (TVCN) project integrator, completed implementation of the AUA support facilities in November 1997. With implementation complete, ASU provides TVCN operations and management support for FAA headquarters. Operators designated by AUA assist ASU by providing DVTS field support. The distribution of AUA TVCN systems is summarized in Table 4-07-3.

4-07.4.1.4 Free Flight Phase 1 Program Office (AOZ)

ASU acts as AOZ's primary technical support agent for the Severe Weather Avoidance Program (SWAP) desktop video conferencing system. SWAP has installed desktop video conferencing systems at 12 sites and plans on expanding. ASU has installed a video bridge at the Air Traffic Control System Command Center (ATCSCC) in Herndon, VA, to serve as SWAP's primary video bridge as well as the back-up bridge for HQ.

Table 4-07-2. Location of Former NISC Systems

AAL Regional Office	ANM Regional Office
ACE Regional Office	ASO Regional Office
AEA Regional Office	ASW Regional Office
ANE Regional Office	AWP Regional Office
AGL Regional Office	AWA-ASU Presentation Room

Table 4-07-3. The AUA TVCN Systems Distribution.

Nassif Building Room 2426	ZAU - NCO Conference Room
ZBW - NCO Conference Room	ZKC - ATS Conference Room
ZNY - Main Conference Room	ZAB - NCO Conference Room
ZDC - Small Conference Room	ZFW - EOF Room
ZJX - NCO Conference Room	ZHU - NCO Conference Room
ZMA - NCO Conference Room	ZOA - NCO Conference Room
ZTL - NCO Conference Room	ZLA - NCO Conference Room
ZME - NCO Conference Room	ZSE - East Conference Room
ZMP - NCO Conference Room	ZLC - West Conference Room
ZID - NCO Conference Room	ZDV - AF/AT Briefing Room
ZOB - West Conference Room	ZAN - Small Conference Room

4-07.4.2 Planned Telecommunications Strategies.

Forty-seven FTS2000 PRI and three T1 circuits are used to meet the FAA video network system's inter-facility telecommunications requirements. These circuit connect 33 remote sites via the FTS2000 "cloud." Any site can call any other site for a point-to-point conference. In addition, the headquarters multipoint bridge can be used to establish a multipoint call (3 to 24 sites standard configuration or up to 30 sites on a expanded configuration). The distribution of the PRIs and T1s is provided in Table 4-07-4.

Table 4-07-4. Distribution of PRIs and T1 Circuits.

AWA		ZBW	1 PRI	ZMP	1 PRI	AWP	1 PRI
FOB10a	10 PRIs	AEA	1 PRI	ZOB	1 PRI	ZOA	1 PRI
Nassif	1 T1	ZNY	1 PRI	ZID	1 PRI	ZLA	1 PRI
		ZDC	2 PRIs	ZAU	1 PRI	ANM	1 PRI
ACT	2 PRIs	ASO	1 PRI	ACE	1 PRI	ZSE	1 PRI
AMC	1 PRI	ZTL	1 PRI	ZKC	1 PRI	ZDV	1 PRI
ANE	1 PRI	ZJX	1 PRI	ASW	1 PRI	ZLC	1 PRI
		ZMA	1 PRI	ZAB	1 PRI	AAL	1 T1
		ZME	1 PRI	ZFW	1 PRI	ZAN	1 T1
		AGL	1 PRI	ZHU	1 PRI	ATCSCC	5 PRIs

The DVTS is capable of connecting with AT&T Accunet or compatible systems that are not on the FTS2000 network. Requests for the use of other carriers outside the FTS2000 network are processed by ASU on a case-by-case basis.

4-07.4.3 <u>Telecommunications Costs</u>

Table 4-07-5 provides a summary of the estimated telecommunications costs for the DTVS program. Based upon formal Memorandums of Agreement between the three principal users (ARA, NISC, AUA, AOZ), telecommunications costs associated with DTVS will be paid by the users. Due to Leased Telecommunications budget cuts, ASU and the users will continue to fund DTVS.

Table 4-07-5. Cost Summary - DVTS

CIP # None — All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
TVCN Network								
Channel Costs								
Cost Profile: FTS2000/2001 Switched PRI ISDN and T-1 Circuits								
Channels Added		0	5	5	5	5	5	5
Total Channels	51	51	56	61	66	71	76	81
F&E Funded Channels		0	5	10	10	10	10	10
OPS Funded Channels		51	51	51	56	61	66	71
Non-recurring Channel Costs								
F&E Non-recurring Costs		**$0**	**$70**	**$70**	**$70**	**$70**	**$70**	**$70**
OPS Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$0**	**$40**	**$80**	**$80**	**$80**	**$80**	**$80**
OPS Recurring Costs		**$408**	**$408**	**$408**	**$448**	**$488**	**$528**	**$568**

SUMMARY

		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
F&E Totals	Non-recurring	$0	$70	$70	$70	$70	$70	$70
	Recurring	$0	$40	$80	$80	$80	$80	$80
	F&E Total	**$0**	**$110**	**$150**	**$150**	**$150**	**$150**	**$150**
OPS Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$408	$408	$408	$448	$488	$528	$568
	OPS Total	**$408**	**$408**	**$408**	**$448**	**$488**	**$528**	**$568**

CHAPTER 4-08 - SUMMARY SHEET

ENET INTERNET TELECOMMUNICATIONS SERVICES (ENET)

Program/Project Identifiers:

Project Number(s):	BIIP-991015
Related Program(s):	
New/Replacement/Upgrade?	New and Upgraded Systems
Responsible Organization:	ASU
Program Mgr./Project Lead:	Melody Hamilton (202) 493-4544
Fuchsia Book POC:	Alan Hayes (202) 267-7357

Assigned Codes:

PDC(s):	HE, SP
PDC Description:	Administrative Data Circuits for ENET (Internet Access), Administrative Services for ENET ISP Providers
Service Code:	ADDA

Cost Estimates*:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$65	$10	$0	$0	$0	$0	$0
F&E Recurring	$58	$62	$67	$72	$78	$84	$84
Total F&E	**$123**	**$72**	**$67**	**$72**	**$78**	**$84**	**$84**
OPS Non-recurring	$15	$0	$0	$0	$0	$0	$0
OPS Recurring	$383	$520	$566	$615	$668	$935	$959
Total OPS	**$398**	**$520**	**$566**	**$615**	**$668**	**$935**	**$959**

* Cost data provided by the Program Office.

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CIP Category:
Mission Support

4-08.0 ENET – INTERNET TELECOMMUNICATIONS SERVICES

4-08.1 PROGRAM OVERVIEW

The Office of Information Technology (ASU) provides FAA connectivity to the Public Internet at 4 FAA sites: Headquarters, AWP, FAATC, and the ARCTR.

4-08.1.1 Purpose

ENET provides secure access to the Public Internet and provides the public with access to non-proprietary FAA information. ASU, under the ENET umbrella, designed and deployed 4 Internet Access Points (IAP) to provide Internet access for all FAA users. The four access points are located at Headquarters (AWA), Western Pacific (AWP), the FAA Technical Center (FAATC), and the Mike Monroney Aeronautical Center (ARCTR).

4-08.1.2 Reference

Enterprise Network (ENET) Program Agency Internet Access Plan ENET1370-005.3, 4/21/98.

4-08.2 SYSTEM DESCRIPTION

Four Internet Access Points (IAP) have been deployed for all agency access. Each of the regional offices is assigned to one of the 4 IAP sites.

The Headquarters (AWA) Internet Service Provider (ISP) provides a 10MB Switched Multimegabit Data Service (SMDS) to the Headquarters backbone. The AWA ISP site supports users at Headquarters, New England Region, Eastern Region, Southern Region and all FAA sites on the East Coast (including ARTCC's, FSDOs, SMOs, ADOs, MIDOs, etc).

The AWP ISP provides T-1 service in support of the Western Pacific Region, Alaskan Region, Northwest Mountain Region and all FAA sites on the West Coast (including ARTCC's, FSDOs, SMOs, ADOs, MIDOs, etc).

The ARCTR ISP provides T-3 service to support the Aeronautical Center, Great Lakes Region, Central Region, Southwest Region and all geographically-central FAA sites in the US (including ARTCC's, FSDOs, SMOs, ADOs, MIDOs, etc).

The FAATC ISP provides dual-T1 in support of FAA Technical Center in Atlantic City, New Jersey.

4-08.2.1.1 Functional Connectivity Requirements

Figure 4-08-1 depicts basic architecture deployed at each IAP site.

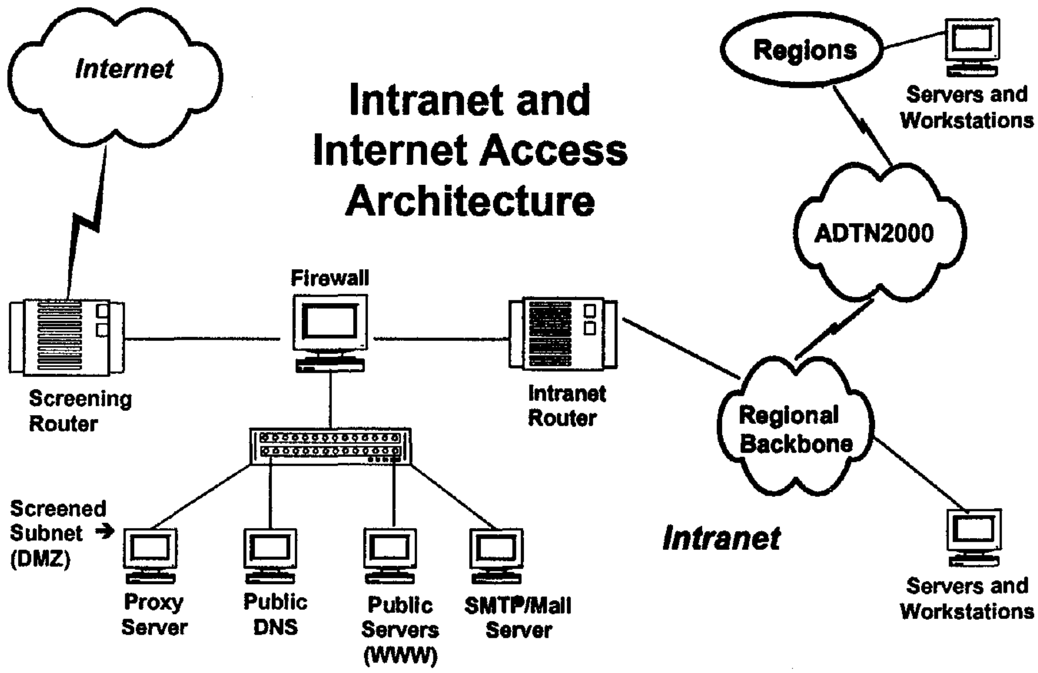

Figure 4-08-1. Functional Internet Architecture and Connectivity Diagram

4-08.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

Table 4-08-1 shows the telecommunications interface requirements for ENET.

Table 4-08-1. Telecommunications interface requirements

Location	Line Speed	Regions supported
AWA	10MB SMDS	AWA, ANE, AEA, ASO
AWP	T1	AWP, AAL, ANM
AMC	T3	AAC, AGL, ACE, ASW
ACT	dual-T1	ACT

4-08.3.1 Premise Wiring Requirements

ENET uses the existing LAN/WAN infrastructure respective to each Internet Access site (AWA, ARCTR, AWP, FAATC).

4-08.3.2 Interactive Data Sharing

The regional backbones, local LANs, the Metropolitan Area Network (MAN), and ADTN2000 promote the sharing of local and corporate resources. These resources also provide access to the public Internet and allow the public to access public FAA data.

4-08.4 ACQUISITION ISSUES

4-08.4.1 Program Schedule and Status

Internet Service Providers (ISPs) were selected based on competitive procurement in September 1997. The AWA ISP is e.spire, ARCTR ISP is OneNet, and AWP ISP is PacBell.

4-08.4.2 Telecommunications Costs

Table 4-08- provides a summary of the estimated telecommunications costs for the ENET & MAN programs. Per FAA Order 2500.8A, leased telecommunications costs (non-recurring and recurring) for the year of activation and one year following are shown in the table as being funded under Facilities and Equipment (F&E) account.

The 2000 Fuchsia Book combines the costs of the ENET and MAN chapters into one cost summary.

Table 4-08-2. Cost Summary – ASU Corporate Telecommunications Services

SIR # None	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
Cost Estimates for AIT Corporate Telecommunications Services									
1. Internet Program									
1A. Cost Profile: ISP Requirements at the Washington Headquarters Site									
	Non-recurring Channel Costs								
	F&E Non-Recurring Costs		$0	$0	$0	$0	$0	$0	$0
	OPS Non-Recurring Costs		$0	$0	$0	$0	$0	$0	$0
	Recurring Channel Costs								
	F&E Recurring Costs		$0	$0	$0	$0	$0	$0	$0
	OPS Recurring Costs		$70	$158	$170	$182	$196	$211	$225
1B. Cost Profile: ISP Requirements at the Western Pacific Regional Headquarters Site									
	Non-recurring Channel Costs								
	F&E Non-Recurring Costs		$0	$0	$0	$0	$0	$0	$0
	OPS Non-Recurring Costs		$10	$0	$0	$0	$0	$0	$0
	Recurring Channel Costs								
	F&E Recurring Costs		$0	$0	$0	$0	$0	$0	$0
	OPS Recurring Costs		$24	$70	$75	$80	$86	$92	$98
1C. Cost Profile: ISP Requirements at the Oklahoma Aeronautical Center Site									
	Non-recurring Channel Costs								
	F&E Non-Recurring Costs		$0	$0	$0	$0	$0	$0	$0
	OPS Non-Recurring Costs		$0	$0	$0	$0	$0	$0	$0
	Recurring Channel Costs								
	F&E Recurring Costs		$0	$0	$0	$0	$0	$0	$0
	OPS Recurring Costs		$26	$28	$30	$32	$34	$37	$39
2. Washington Metropolitan Area Network (MAN)									
2A. Cost Profile: Bell Atlantic Fiber Network System (FNS) Services (10 Mbps and 100 Mbps)									
	Non-recurring Channel Costs								
	F&E Non-Recurring Costs		$45	$10	$0	$0	$0	$0	$0
	OPS Non-Recurring Costs		$3	$0	$0	$0	$0	$0	$0
	Recurring Channel Costs								
	F&E Recurring Costs		$0	$0	$0	$0	$0	$0	$0
	OPS Recurring Costs		$233	$256	$282	$310	$341	$375	$375
2B. Cost Profile: Bell Atlantic Fiber Distribution Data Interface (FDDI) Services (100 Mbps)									
	Non-recurring Channel Costs								
	F&E Non-Recurring Costs		$20	$0	$0	$0	$0	$0	$0
	OPS Non-Recurring Costs		$3	$0	$0	$0	$0	$0	$0
	Recurring Channel Costs								
	F&E Recurring Costs		$0	$0	$0	$0	$0	$0	$0
	OPS Recurring Costs		$23	$0	$0	$0	$0	$209	$209

Table 4-08-2 Cost Summary—ASU Corporate Telecommunications Services (continued)

CIP # None — All costs in 000's	Prior Years	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
2C. Cost Profile: Metropolitan Area Network (MAN) T-1 Services							
Non-recurring Channel Costs							
F&E Non-Recurring Costs	$0	$0	$0	$0	$0	$0	$0
OPS Non-Recurring Costs	$0	$0	$0	$0	$0	$0	$0
Recurring Channel Costs							
F&E Recurring Costs	$35	$38	$42	$46	$51	$56	$56
OPS Recurring Costs	$6	$7	$7	$8	$9	$10	$10
2D. Cost Profile: Other Services (10 Mbps, 100 Mbps, and ATM Service)							
Non-recurring Channel Costs							
F&E Non-Recurring Costs	$0	$0	$0	$0	$0	$0	$0
OPS Non-Recurring Costs	$0	$0	$0	$0	$0	$0	$0
Recurring Channel Costs							
F&E Recurring Costs	$23	$24	$25	$26	$27	$28	$28
OPS Recurring Costs	$2	$2	$2	$2	$3	$3	$3

SUMMARY

		Prior Years	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
F&E Totals	Non-recurring	$65	$10	$0	$0	$0	$0	$0
	Recurring	$58	$62	$67	$72	$78	$84	$84
	F&E Totals	**$123**	**$72**	**$67**	**$72**	**$78**	**$84**	**$84**
OPS Totals	Non-recurring	$15	$0	$0	$0	$0	$0	$0
	Recurring	$383	$520	$566	$615	$668	$935	$959
	OPS Totals	**$398**	**$520**	**$566**	**$615**	**$668**	**$935**	**$959**

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CHAPTER 4-09 - SUMMARY SHEET

FINANCIAL SYSTEMS PROGRAM (FSP)

Program/Project Identifiers:

Project Number(s):	BIIP-991017
Related Program(s):	
New/Replacement/Upgrade?	Series of financial systems.
Responsible Organization:	ABA
Program Mgr./Project Lead:	Tim Lawler, ABA-20, (202) 267-9778
Fuchsia Book POC:	Gary Brill, (202) 267-8942

Assigned Codes:

PDC(s):	HK, HM
PDC Description:	Administrative Data Circuits for the Financial Systems Program (FSP); Administrative Data Circuits for DAFIS-MIR.
Service Code:	ADDA

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$4	$4	$5	$5	$5	$5	$5
Total OPS	**$4**	**$4**	**$5**	**$5**	**$5**	**$5**	**$5**

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CIP Category:
Mission Support

4-09.0 FINANCIAL SYSTEMS PROGRAM

4-09.1 PROGRAM OVERVIEW

In order to meet the objectives of the National Performance Review (NPR), the Government Performance and Results Act (GPRA), and the Chief Financial Officer's (CFO) Act, the Office of Financial Services (ABA) has been developing and deploying systems that will reduce resources required for operations, provide better service to customers, and enhance financial management practices.

4-09.1.1 Purpose

The purpose of the Financial Systems Program is to install a network of servers at the regional sites that can be used to deploy national systems. Included in this program are the following systems:

- Federal Express Automated Payment
- National Automated Travel System (NATS)
- Third Party Draft System (TPDS)
- DAFIS Accounting & Resource Tracking System
- National Automated Credit Card System (NACCS)
- Audit Systems & Tools

The Cost Accounting System (CAS) maintains two T1 lines between the FAA HQ and the USI vendor site in Annapolis, MD.

4-09.2 SYSTEM DESCRIPTION

The Financial Systems Program Phase I and II servers (24) have all been distributed to the regions and centers and are operational. For CAS, two T1 lines are maintained between the development and production servers. These lines run from FAA HQ to the USI vendor site in Annapolis, MD, with firewalls on both ends.

4-09.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

4-09.3.1 Interface Requirement

The WAN protocol is TCP/IP.

4-09.3.2 Connectivity Requirement

Current projections for the number and types of users are summarized in Table 4-09-1.

Table 4-09-1. Table of Full time and Casual Users (By Type of Access)

Type User	Number
Number of Casual Users	150
Number of Full Time Users	120
Number of Casual Dial-in users	1700
Number of Full Time Dial-in users	100
Total users	**2070**

4-09.3.3 Traffic Characteristics

Current projections are that approximately 5 megabytes/year of data will be exchanged by the casual user and 25 megabytes/year of data by the full time user. A typical session for a full time user is approximately an hour and for a casual user is about 10 minutes. Connectivity will be IP/PPP.

There will be data synchronization via file transfers. There are no plans for a central backup server since backups will be performed at each of the sites. Yearly transmissions to/from DAFIS and the servers at the sites will be approximately 12 gigabytes each. Most of the data transmissions will be on a daily basis totaling approximately 50 megabytes. The data will be transmitted via local ethernet connection across the ADTN2000. Table 4-09-2 shows Projected Traffic Loads in Gigabytes.

Table 4-09-2. Projected Traffic Loads in Gigabytes

Total file transfer and user interface			Gigabytes per interface - Annually						
From	**To**		**FY00**	**FY01**	**FY02**	**FY03**	**FY04**	**FY05**	**FY06**
DAFIS	Regions	ADTN2000	16.4	17.2	18.1	19.0	19.9	19.9	19.9

4-09.4 ACQUISITION ISSUES

4-09.4.1 Program Schedule and Status

The Phase I and II servers (24) have all been distributed to the regions and centers and are operational. Because these are new systems, there will be little overlap. NOTE: During FY00 and beyond it is anticipated that there will be an increase in users requiring access to the data via the intranet (from a browser). At this time, the traffic and changes in profiles that will occur are not known. It is recognized that in place of file transfers there will be more individual data base access queries.

The two T1 lines for the Cost Accounting System between the FAA HQ and the USI vendor site in Annapolis, MD are in place.

4-09.4.2 Telecommunications Costs

The projected telecommunications costs associated with FSP are summarized in Table 4-09-3. The annual recurring costs are based upon FSP's usage of the ADTN2000 network. The per gigabyte charge of $1.25K has been reduced over the past year from $1.5K. The unit cost reduction is due to greater efficiencies within the network that have been achieved by limiting cost growth to a rate lower than the rate of traffic.

Table 4-09-3. Cost Summary – FSP

The following table shows requirements, which are captured in the ADTN2000 chapter. They are repeated here for information only.

CIP # None	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
1. FSP <---> ADTN2000									
Channel Costs			*N/A - Uses Existing Connectivity to ADTN2000*						
Hardware Costs			*N/A - Uses Existing ADTN2000 Terminating Equipment*						
2. ADTN-2000 Backbone Usage									
Cost Profile: Annual Network Costs Calculated at $500 per Gigabyte (see Note 2).									
Annual traffic in Gigabytes			16.4	17.2	18.1	19	19.9	19.9	19.9
OPS Recurring Costs			**$4**	**$4**	**$5**	**$5**	**$5**	**$5**	**$5**
			SUMMARY						
F&E Totals	Non-recurring		$0	$0	$0	$0	$0	$0	$0
	Recurring		$0	$0	$0	$0	$0	$0	$0
	F&E Total		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Totals	Non-recurring		$0	$0	$0	$0	$0	$0	$0
	Recurring		$4	$4	$5	$5	$5	$5	$5
	OPS Total		**$4**	**$4**	**$5**	**$5**	**$5**	**$5**	**$5**

Notes:

1. Projected FSP activity required to process user queries equates to 1.25 Gigabytes per year.
2. Unit Cost data provided by ADTN2000 Program Office.

CHAPTER 4-10 - SUMMARY SHEET

INTEGRATED PERSONNEL AND PAYROLL SYSTEM (IPPS)

Program/Project Identifiers:

Project Number(s):	BIIP-991018
Related Program(s):	
New/Replacement/Upgrade?	
Responsible Organization:	M-12
Program Mgr./Project Lead:	Carolyn Bach, M-15 (202) 366-6309
Fuchsia Book POC:	Same

Assigned Codes:

PDC(s):	
PDC Description:	
Service Code:	

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$125	$125	$125	$125	$125	$125	$125
Total OPS	**$125**	**$125**	**$125**	**$125**	**$125**	**$125**	**$125**

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CIP Category:
Mission Support

4-10.0 INTEGRATED PAYROLL AND PERSONNEL SYSTEM (IPPS)

4-10.1 PROGRAM OVERVIEW

The Integrated Personnel and Payroll System (IPPS) is the Department of Transportation's (DOT) personnel and payroll system, incorporating time collection, personnel action request and training request functions. The IPPS is hosted on the FAA host mainframe maintained by the United States Department of Agriculture (USDA) under the Integrated Computing Environment-Mainframe and Networking (ICE-MAN) agreement. The mainframe computer is located at the USDA facility in Kansas City. The Office of Information Systems, Departmental Personnel and Payroll Systems Division, AMI-400, at the Mike Monroney Aeronautical Center, centrally manages the application and database maintenance. The IPPS program is managed by OST (M-15) at DOT headquarters. IPPS, primarily the time collection and personnel request functions, is implemented throughout the DOT, except the St. Lawrence Seaway Development Corporation (SLSDC) and the Surface Transportation Board (STB).

The IPPS corporate database, which resides on the FAA host mainframe, utilizes Software AG's ADABAS DBMS, the NATURAL fourth generation programming language, and COBOL programs.

4-10.1.1 Purpose of the Integrated Personnel and Payroll System

The purpose of this program is to support human resource management throughout DOT by integrating personnel functions with payroll functions. IPPS provides automated personnel and payroll services for over 63,000 DOT employees with a payroll distribution exceeding $4 billion annually and input and tracking of training and personnel action requests. IPPS replaces functions formally performed by the Electronically Generated And Transmitted SF-52 System (EGATS), The Training System (TRIMATES), and the Electronic Time and Attendance Management System (ETAMS).

The primary functions of IPPS include the following:

- Time Collection application which provides the DOT an electronic method of collecting, approving, reporting, processing, and maintaining employee time and attendance data for the biweekly payroll of over 64,000 government employees;

- Personnel Request application, an electronic Request for Personnel Action (SF-52) process that encompasses initiation, routing, approval, and processing of the request, as well as interfacing the request to CPMIS;

- Training application, consisting of identifying training requirements, processing enrollments, and recording training completions; and

- IPPS/Management Information Reporting (MIR), which provides the IPPS system manager and organizational managers a convenient and rapid access to personnel and payroll information for reporting and data analysis.

4-10.2 SYSTEM DESCRIPTION

IPPS has a mainframe and a client/server component. The user interactive portion is provided through the applications on the ICE-MAN mainframe. These are the time collection, personnel request and training applications that provide the IPPS data entry. The IPPS mainframe is in NATURAL, COBOL and JCL with the database in ADABAS. Users are located throughout the department, accessing the ICE-MAN mainframe via 3270 terminal emulation software.

The IPPS/Management Information Reporting System (IPPS/MIR) is a client/server system housed on Digital Equipment Alpha 2100 computers in a Digital UNIX and Oracle database environment. The IPPS/MIR servers are located at the Mike Monroney Aeronautical Center and FAA headquarters in Washington, DC. The IPPS team uses ORACLE RDMBS, PowerBuilder, Visual Basic, and other third party software tools to maintain and enhance the IPPS/MIR to provide a robust management information reporting system on a client/server platform.

4-10.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

4-10.3.1 Interface Requirement

IPPS users access the ICE-MAN mainframe via SNA protocol and the IPPS/MIR servers via IP protocol.

4-10.3.2 Connectivity Requirement

The IPPS ICE-MAN users access the IPPS via local area network/wide area network (LAN/WAN) connectivity using ADTN2000 or via dial-up connectivity using ADTN2000. IPPS users utilize SNA 3270 LAN gateways connected to the ADTN2000 network to communicate with the ICE-MAN mainframe for access and update. The installation of additional telecommunication equipment is not necessary to support the program. This connectivity is summarized in Figure 4-10-1.

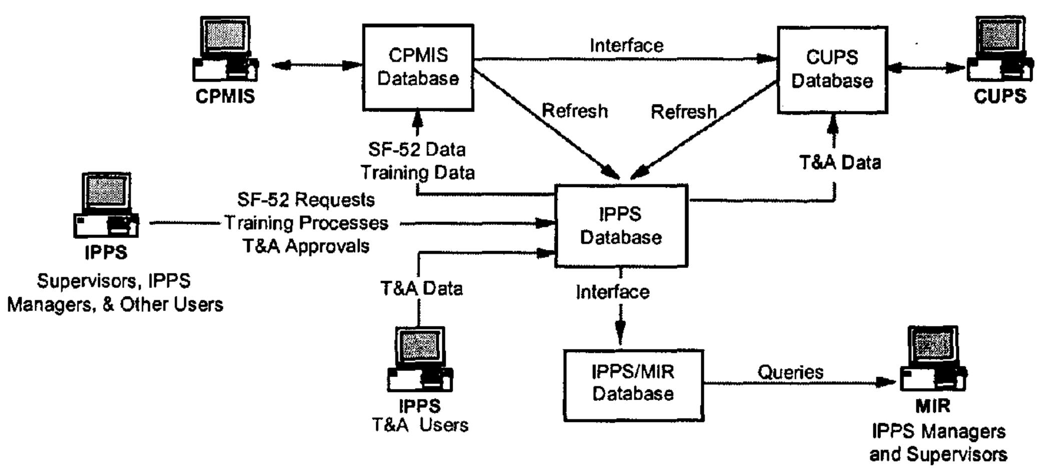

Figure 4-10-1. IPPS System Diagram with Internal Interfaces

The IPPS/MIR data replication has been ongoing since September 1996. IPPS users in DOT-HQ, Washington DC are connected to the Aeronautical Center server, IPPS_FAA_OKC via dedicated T-1 communication lines. Communications between FAA HQ and the Aeronautical servers, IPPS_FEP and IPPS_FA_OKC, is via ADTN2000 lines. Data is replicated biweekly from the ICE-MAN mainframe to the IPPS_FEP, with security data and other processing performed, then data is replicated to the other servers. The traffic between servers is from the source (IPPS_FEP) to the outlying servers, a unidirectional, biweekly process.

The IPPS/MIR servers are connected on the LAN at the local sites. The IPPS/MIR server sites are at the locations identified in Table 4-10-1.

Table 4-10-1. IPPS/MIR Server Locations

Location	Server
FAA-HQ, Washington DC	IPPS_FAA_HQ
Aeronautical Center, Oklahoma City	IPPS_FEP
(MMAC)	IPPS_FAA_OKC

The physical configuration of IPPS/MIR is illustrated in Figure 4-10-2.

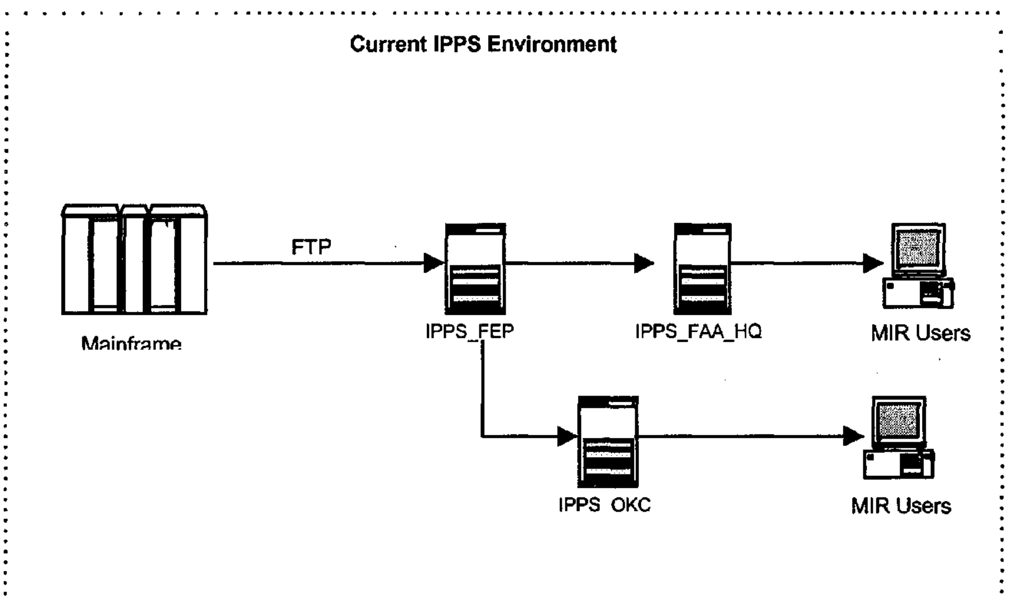

Figure 4-10-2. IPPS/MIR Current Physical Configuration

Users of the IPPS/MIR require connectivity to one of the servers via a LAN if there is a local server or via ADTN2000 if the user is at a remote location. Connectivity to other LANs will be via bridges/routers provided by ADTN2000 using Transmission Control Protocol/Internet Protocol (TCP/IP). Users access the servers when needed; there is not a set schedule. Users query the closest server, with answer sets then returned to the user.

The IPPS ICE-MAN user numbers are based on security roles in the IPPS. Each user may perform in several or all roles. IPPS ICE-MAN users are considered to be full-time users. Based on data collected from IPPS users security files (November 1999), IPPS has about 8685 actual users per month. There is not a scheduled frequency of usage. The time collection tends to be heaviest the 1st Monday through Wednesday of a pay period; other applications are usually evenly distributed throughout the month. Each user may use more than one application and, therefore, be counted more than once. All traffic is via ADTN2000 and totals about 7.19 MB per month. A table listing full time and casual users, by type of access, is shown in Table 4-10-2. All usage and cost data appearing in Table 4-10-2 through Table 4-10-7 are valid as of November 10, 1999.

Table 4-10-2. Table of Full Time and Casual Users (By Type of Access)

	ADTN2000	Dial-up	Local	TOTAL
Full Time				
IPPS ICE-MAN users	6948	*1737		8685
Casual				
IPPS MIR users	1188		297	1485
Total users	**8136**	**1737**	**297**	**10,170**

*ICE-MAN users for ADTN2000 LAN vs. dial-up are based on percentage for each type of access, from survey taken during the Southern Region implementation March 1998.

IPPS/MIR is a tool used by the IPPS system manager and organizational managers as needed; the users are considered to be casual users. These numbers assume 60% of IPPS MIR users will be at one of the three MIR server locations (FAA-HQ, DOT-HQ, or MMAC).

4-10.3.3 Traffic Characteristics

IPPS ICE-MAN mainframe application volume per pay period is shown in Table 4-10-3. On an annual basis, this equates to approximately 65.8 Gigabytes.

Table 4-10-3. Volume Data for IPPS ICE-MAN Mainframe per Biweekly Pay Period

Application	Megabytes
Time Collection	815,652
Personnel Actions	185,908
Training	37,873
Other Inquires	1,492,429
Totals	**2,531,862**

Projected IPPS/MIR activity per pay period is shown in Table 4-10-4. The data over ADTN2000 equates to 78 Gigabytes (GB)/year for replication and 6.6GB/year in FY98 for user queries. Dial-up users access IPPS via asynchronous connections and are estimated to average 60 minutes per session.

Table 4-10-4. Volume Data for IPPS/MIR per Biweekly Pay Period

Activity	Source/target	Frequency	FY00 MB	FY01 MB	FY02 MB	FY03 MB	FY04 MB	FY05 MB	FY06 MB	Connectivity
Data Replication	IPPS_FEP / FAA-HQ	Biweekly, 1st Saturday of each pay period	3,000	3,000	3,000	3,000	3,000	3,000	3,000	Dedicated T-1 line
User Queries	1485 users nationwide / IPPS/MIR servers	No scheduled use (estimate daily use)	254	254	254	254	254	254	254	ADTN2000

The total annual IPPS traffic load projections are summarized in Table 4-10-5 using 26 pay periods per year.

Table 4-10-5. Projected Annual Traffic Loads in Gigabytes

Gigabytes per Interface – Annually											
Activity	From	To	Frequency		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
Data Replication	IPPS_FEP	FAA-HQ	Biweekly, 1st Saturday of each pay period	*Dedicated T1 line	78	78	78	78	78	78	78
Data entry, reports	IPPS ICE-MAN Users distributed nationwide	ICE-MAN Mainframe	No scheduled use (estimate daily use)	ADTN 2000	65.8	65.8	65.8	65.8	65.8	65.8	65.8
IPPS/MIR User Queries	1485 users nationwide	IPPS/MIR Servers	No scheduled use (estimate daily use)	ADTN 2000	6.6	6.6	6.6	6.6	6.6	6.6	6.6
				Total Gigabytes (ADTN2000 Only)	**150.4**	**150.4**	**150.4**	**150.4**	**150.4**	**150.4**	**150.4**

*The dedicated T-1 line is funded in the recurring cost. See section 4-10.4.1 Telecommunications Costs.

4-10.4 ACQUISITION ISSUES

IPPS is implemented in all DOT administrations except SLSDC and STB. No additional implementation is planned. There is no equipment, other than local LAN connectivity, required for any additional IPPS users.

4-10.4.1 Telecommunications Costs

Costs for the IPPS requirements are provided in the Cost Summary, Table 4-10-7. The IPPS recurring costs due for ADTN equipment installed in FY96 are listed below in Table 4-10-6. All IPPS requirements are supported through operations funding in accordance with FAA Order 2500.8A.

Table 4-10-6. IPPS Recurring Costs

DOT (Token Ring and T-1) interface Costs:	$6,972
FTS-2000 PSS Gateway Costs:	$21,096
New FTS-2000 T-1 Cost (AHQ to USDA):	$75,129
Add'l Renex Protocol Converter Interface Costs (224 Added) :	$4,041
TOTAL Recurring costs	**$107,238**

Note: Above estimates provided by ADTN2000 Program Office.

The following table shows requirements, which are captured in the ADTN2000 Chapter. They are repeated here for information only.

Table 4-10-7. Cost Summary - Integrated Personnel and Payroll System (IPPS)

The following table shows requirements, which are captured in the ADTN2000 chapter. They are repeated here for information only.

CIP # None	All costs in 000's	FY00	FY01	FY02	FY03	FY04	FY05	FY06
IPPS <---> ADTN2000								
1. Connectivity Costs								
Cost Profile: Annual Recurring Costs for ADTN2000 Telecommunications Equipment								
OPS Recurring Costs		**$107**	**$107**	**$107**	**$107**	**$107**	**$107**	**$107**
2. ADTN2000 Backbone Usage Costs								
Cost Profile: Annual ADTN2000 Backbone Usage Costs @ $250 per Gigabyte*								
Annual Usage in Gigabytes		150.4	150.4	150.4	150.4	150.4	150.4	150.4
OPS Recurring Costs		**$38**	**$38**	**$38**	**$38**	**$38**	**$38**	**$38**

SUMMARY

		FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Totals	Non-Recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$0	$0	$0	$0	$0	$0	$0
	F&E Totals	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Totals	Non-Recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$145	$145	$145	$145	$145	$145	$145
	OPS Totals	**$145**	**$145**	**$145**	**$145**	**$145**	**$145**	**$145**

* Unit Cost Data Provided by the ADTN2000 Program Office

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CHAPTER 4-11 - SUMMARY SHEET

WASHINGTON HEADQUARTERS METROPOLITAN AREA NETWORK (MAN)

Program/Project Identifiers:

Project Number(s):	BIIP-981011
Related Program(s):	
New/Replacement/Upgrade?	New and Upgraded Systems
Responsible Organization:	ASU
Program Mgr./Project Lead:	Eric Chatmon, ASU-520, (202) 267-9949
Fuchsia Book POC:	Eric Chatmon, ASU-520, (202) 267-9949

Assigned Codes:

PDC(s):	HH, HJ
PDC Description:	HQ Metro Area LAN Terminating Equipment, Administrative data Circuits for HQ Metro Area LAN.
Service Code:	ADDA

Cost Estimates*:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$0	$0	$0	$0	$0	$0	$0
Total OPS	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

*MAN Program Costs are shown as part of the Enterprise Network INTERNET Telecom Service (ENET) chapter.

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CIP Category:
Mission Support

4-11.0 WASHINGTON HEADQUARTERS METROPOLITAN AREA NETWORK

4-11.1 PROGRAM OVERVIEW

The Office of Information Technology (ASU) provides Washington, DC, Metropolitan Area FAA and support contractor facilities with connectivity (a local area network) to support local and corporate FAA resources. This includes identifying and establishing the standards required for connectivity and interoperability, providing access to appropriate resources, prevention of access to unauthorized resources, system implementation, operations support, problem identification, problem resolution involving connectivity. The Washington Headquarters Metropolitan Area Network (MAN) falls under the ASU sponsored ENET program.

4-11.1.1 Purpose of the Washington Headquarters Metropolitan Area Network

The purpose of this program is to provide timely, reliable, high quality telecommunications services for local FAA customers using the headquarters managed MAN backbone for access to local and corporate resources.

4-11.1.2 References

ASU-1 Mandate for all organizations at HQ to use HDN.

4-11.2 SYSTEM DESCRIPTION

The Washington Headquarters Metropolitan Area Network (MAN) is a highly visible project, designed, developed, implemented, and maintained by ASU. It affects all organizations within the FAA Headquarters campus (FOB10A and FOB10B), as well as other organizations outside the campus in the Washington Metropolitan area, by allowing these organizations to communicate electronically.

The MAN is the major corporate infrastructure in the Washington Headquarters Metropolitan Area that interconnects the separate and diverse Local Area Networks (LAN's) to improve communications.

The campus backbone consists of a fiber cable plant with "runs" of 12-strand fiber to telephone closets and organizational LAN equipment rooms, including the ASU computer rooms. Each run terminates on a fiber patch panel in the closet or LAN equipment room, and at the fiber distribution frame located in each ASU Computer Room. Local area network equipment (HUB's and Switches), located in the telephone closets, connects to the fiber plants. In the computer rooms, the fiber connects to the MAN routers to provide connectivity to corporate resources.

The MAN utilizes several technologies, including 10 mbps Ethernet, 100 mbps Fast Ethernet, FDDI, CDDI, and ATM and Ethernet switching. Many of the MAN connections use Bell Atlantic's Fiber Network Service (FNS), others are connected via T1 or partial T1 services.

4-11.2.1 Functional Connectivity Requirements

The diagram below depicts the Washington MAN connectivity as of December 8, 1998.

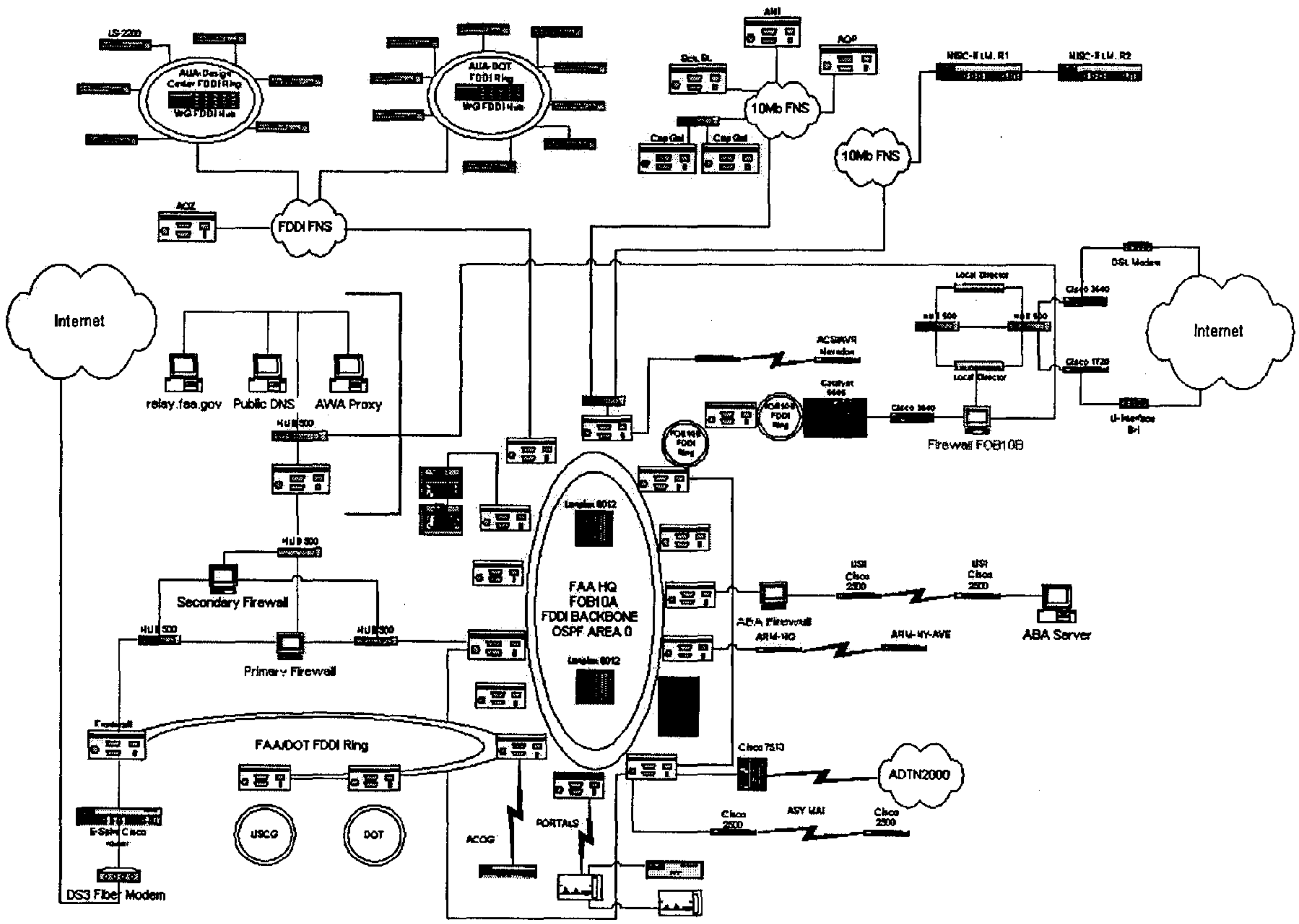

Figure 4-11-1. Functional Connectivity Diagram

4-11.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

Table 4-11-1 shows the telecommunications interface requirements for MAN.

Table 4-11-1. Telecommunications Interface Requirements

Location	Line Speed	Number of LANs	Number of Users	Comments
FAA FOB10A	10MB FNS Service, Domain 77			Connects Domain 77 nodes to FAA HDN
Capital Gallery Building	10MB FNS Service, Domain 77	11 LANs (ITT, DI, Digicon, SAIC, TRW WTAC, AOP, JIL, OTS, Unitech)	450 FAA Users (AOP-400/500/600, AOP Support Contractors)	Domain 77 reaching saturation point
375 School Street (TRW)	10MB FNS Service, Domain 77	1 LAN	400 users (AUA TAC support contractor)	
901 D St. SW (ITT)	10MB FNS Service, Domain 77	1 LAN	5-70 Users (ITT)	
FAA FOB10A	10MB FNS Service			Connects New Domain to FAA HDN
Capital Gallery ANI/AOP	10 MB FDDI	1 LAN	50-100 users	All use the same FNS connection
FAA 400 7th St, Washington D.C.	10 MB FDDI	1 LAN	50 users	
DOT (AUA only)	100MB FDDI			Connects AUA at DOT to Market Square
AUA Design Center	10MB FDDI	1 LAN	50-100 users	
DOT (All Modals)	100MB SMF FDDI	(All Modals)	(All Modals)	Dedicated Line
EDS Herndon	Fractional T1 (384K)	6 LANs	300-400 Users	Line saturated, needs to be upgraded
ACOG	T1	1 LAN	30 users	Support for AND
MAI	T1	1 LAN	50	Support contractor for ASY
GSA Advantage	T1			Provides FAA Access to GSA Advantage system for ordering products through GSA

4-11.3.1 Digital Network Interoperability

The MAN provides interoperability between varoius LAN technologies such as T1, FDDI fiber, ethernet copper and fiber.

All T1 circuits in the MAN terminate in the computer rooms. All terminating equipment is rack mounted using standard 19-inch equipment racks. The Bell Atlantic FNS service terminates in the computer rooms. All future FNS nodes will also terminate in the computer rooms.

4-11.3.2 Test Capability Requirements

4-11.3.3 Premise Wiring Requirements

4-11.3.3.1 The Fiber Plant

The fiber distribution frames, located in the computer rooms in 19-inch LAN racks, consolidate the fiber connections from building telephone closets and LAN rooms, separated by fiber cable management stacks.

4-11.3.3.2 The Fiber Distribution Frame FOB-10A

There are 8 closets per floor and, generally 12-strands of fiber to each closet for a total of 96-strands of fiber per floor, contained within one 96-port patch panel. Closets which have more than 12 strands of fiber will have the first 12-strands terminated in the main location, with the remaining fibers terminated in an overflow box located at the bottom of the first equipment rack.

4-11.3.3.3 The Fiber Distribution Frame FOB 10-B

There are 2 closets per floor and, generally 12-strands of fiber to each closet location for a total of 24-strands of fiber per floor, contained within one 96-port patch panel. Closets which have more than 12 strands of fiber will have the first 12-strands terminated in the main location, with the remaining fibers terminated in an overflow box located at the bottom of the first equipment rack.

4-11.3.3.4 Premise Wiring

ASU has been instrumental in promoting premise wiring systems at local facilities as well as the headquarters campus. The Capital Gallery building is a good example of providing a cable infrastructure to share a single high-speed connectivity to the MAN. Several FAA organizations and support contractors are located at the Capital Gallery building. All organizations have cable runs from their local LANs to the 4th floor North Closet where they connect to a MAN provided and supported router, which in turn connects to a node on the Bell Atlantic FNS service.

4-11.3.4 Interactive Data Sharing

The MAN promotes the sharing of local and corporate resources. The original purpose of the MAN was to provide access to NAS support networks and resources. Today, the MAN provides both mission support and NAS support with access to ADTN-2000, FAA's Wide-Area Network and resources at all FAA locations. The MAN also provides FAA access to the Internet, and public access to FAA data.

The MAN, WAN and regional LANs allow connectivity to corporate-wide resources such as ACQUIRE, ICEMAN, and others, thus reducing the cost of the deployment of agency-wide applications. It allows for the sharing of data and information across all lines of business, between regional offices, and between regional offices and headquarters.

4-11.4 ACQUISITION ISSUES

4-11.4.1 Program Schedule and Status

As more resources become accessible to the FAA user community, and as user begin to depend on the resources to perform their jobs, additional bandwidth will be required to support the users in their access corporate applications and resources. Correspondingly, the telecommunications costs associated with providing access to those resources are expected to increase.

The telecommunications cost projections for the MAN Program are included in the Enterprise Network INTERNET Telecom Service (ENET) chapter. Reference chapter 4-08.

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CHAPTER 4-12 - SUMMARY SHEET

MOBILE COMMUNICATIONS FOR AIRWAYS FACILITIES SPECIALISTS (MCAFS)

Program/Project Identifiers:

Project Number(s):	CIP C-26
Related Program(s):	
New/Replacement/Upgrade?	
Responsible Organization:	AOP-30
Program Mgr./Project Lead:	Dave Joyce AOP-30 (202) 493-5933
Fuchsia Book POC:	George Kaloudelis AOP-30 (202) 267-8289

Assigned Codes:

PDC(s):	OS, OT
PDC Description:	Mobile Communications Equipment for AF Specialist; Mobile Communications Services for AF Specialist.
Service Code:	MNTC

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$700	$1,240	$1,200	$0	$0	$0	$0
OPS Recurring	$480	$1,248	$1,968	$1,968	$1,968	$1,968	$1,968
Total OPS	**$1,180**	**$2,488**	**$3,168**	**$1,968**	**$1,968**	**$1,968**	**$1,968**

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CIP Category:
Mission Support

4-12.0 MOBILE COMMUNICATIONS FOR AIRWAYS FACILITIES SPECIALISTS (MCAFS)

4-12.1 PROGRAM OVERVIEW

Airways Facilities (AF) has approximately 8,100 field maintenance personnel. Approximately 3000 of these specialists, at various times, work at multiple remote sites and are frequently out of touch with the MCCs and management offices. AF NAS Operations needs the capability to coordinate the dispatching of field personnel and provide access to maintenance, reference, and log data information. While working off-line, it is also necessary for specialists to upload/download data changes. MCAFS supports the concepts provided in the document "Airway Facilities Concept of Operations for the Future", which calls for improving service and reducing costs, in part by centralizing work force management at Maintenance Control Centers (MCCs)/future Operations Control Centers (OCCs). MCAFS will allow for the MCCs/OCCs as well as Service Operations Centers (SOCs) and Work Centers (WCs) to achieve more effective and prompt communication readily with field specialists.

4-12.1.1 Purpose of Mobile Communications for Airways Facilities Specialists (MCAFS)

MCAFS will provide a wireless mobile communications system for communications between remote specialists, control center personnel, and management. MCAFS will improve service, reduce AF costs and enhance personnel safety by:

1. Transmitting maintenance assignments and instructions from control centers to specialists:
   - Reduces time to dispatch;
   - Minimizes unnecessary travel time; and
   - Provides specialists with the best information available about the nature of the problem.

2. Transmitting job status from specialists to control centers:
   - Provides accurate real-time information for AF and air traffic management;
   - Enables prompt deployment of additional resources, i.e. personnel, supplies;
   - Allows effective scheduling and assignment of other work.

3. Transmitting specialist location and availability information from the specialist to the control center. This enables the selection of the nearest/most appropriate specialist for an assignment, thereby minimizing travel time and reducing time to begin a maintenance action.

4. Transmitting safety and emergency information between specialists and control centers:
   - Protects specialists from unexpected hazards (e.g., predicted severe weather);
   - Enables specialists to summon help (e.g. medical emergency).

5. Transmitting technical data related to the maintenance assignment from the control center to the specialist:
   - Supports faster, more effective problem resolution.

4-12.1.2 References

4-12.1.2.1 Federal Aviation Administration, March 1995, Airway Facilities Concept of Operations for the Future, U.S. Department of Transportation.

4-12.1.2.2 Federal Aviation Administration, October 1997, Concept for NAS Infrastructure Operations and Maintenance, U.S. Department of Transportation.

4-12.1.2.3 Federal Aviation Administration, September 1998, Airway Facilities Operations in the NIM Environment, U.S. Department of Transportation.

4-12.2 SYSTEM DESCRIPTION

MCAFS will provide a wireless system for transmitting data messages and information between control centers and remote specialists. MCAFS will be an "end-to-end" communication service based on commercially available products and services that are analogous to industry practices. A two-staged approach is planned for MCAFS. During Stage A, prior to NIMS deployment, MCAFS will operate as a "stand-alone" system. In Stage B, after NIMS deployment, MCAFS will be integrated with NIMS.

4-12.2.1 System Components

System components include:

- A "mobile-communicator" for each mobile specialist – a simple capability to enter and read messages and information. This is also an interface to a specialist MDT, when available.
- A wireless communications service.
- A "control terminal" at each control center – a simple capability to enter and read messages and information that will interface to a NIMS automation element when it becomes available.

4-12.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

4-12.3.1 Telecommunications Interfaces

As shown in Figure 4-12-1 MCAFS has two telecommunications interfaces: (1) the mobile-communicator to the wireless communications services; and (2) the control terminal to the wireless communications services. MCAFS is an end-to-end service; thus interfaces internal to that part of the system are not specified, as they are vendor-specific. The mobile-communicator to the Maintenance Data Terminal (MDT) is a physical interface via a computer/communications port and a message interface that is to be defined. The control terminal to the NIMS compute interface is to be defined.

4-12.3.2 Functional Component Interfaces

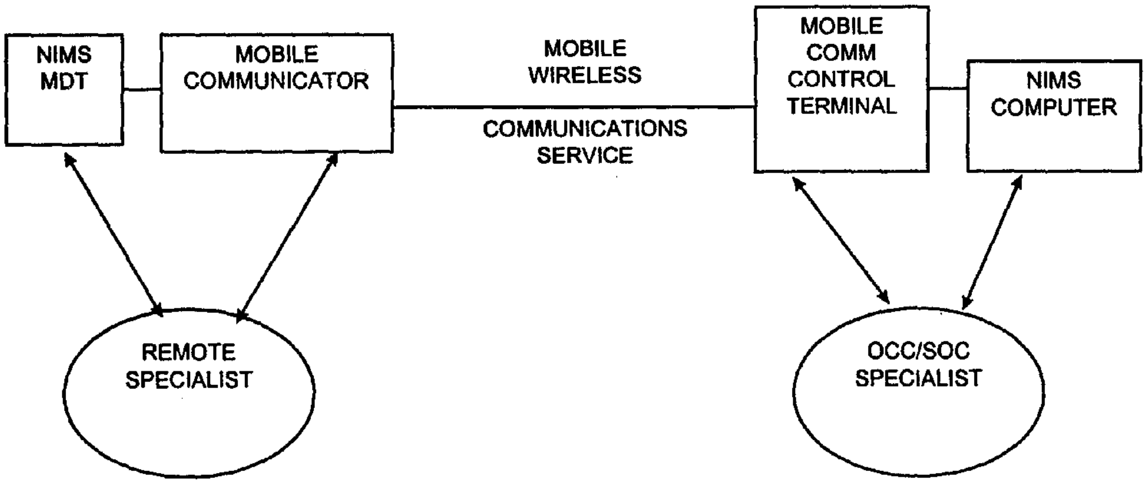

Figure 4-12-1. MCAFS Functional Component Interfaces

4-12.4 ACQUISITION ISSUES

4-12.4.1 Program Schedule and Status

Contract award goal is set for FY2000. Deployment is contingent on the availability of funds. There are no external system dependencies.

A two-staged approach is planned for MCAFS. In Stage A, the pre-NIMS approach, the mobile/communicator will allow the field specialist to view and enter data and the OCC specialist will use the control terminal to view and enter data. In Stage B, NIMS will provide an MDT to the specialist, and the mobile communicator will function as the MCAFS interface to the MDT. Similarly, NIMS will provide an integrated work force management application at the OCC, with the control terminal serving as an interface between the OCC and MCAFS.

Projected deployment is depicted in Table 4-12-1, Mobile Communications Site Installation Schedule.

Table 4-12-1. Mobile Communications Site Installation Schedule

Site	Prior Yrs	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
NOCC/OCCs/SOCs*		10	4	0	0	0	0	0
Mobile/Communicators		60	12	12	0	0	0	0

* NOCC, 3 OCCs, 10 Level-5 ATCT SOCs

4-12.4.2 Planned Telecommunications Strategies

MCAFS will be acquired as an end-to-end leased service on a requirement basis. Commercially available technologies will be used (candidates include cellular, radio, geo-synchronous satellite, LEO/MEO, and pager). Geographic coverage will be a discriminator.

4-12.4.3 Telecommunications Costs

The anticipated unit costs for the mobile communicators and control terminals are listed in Table 4-12-2.

Table 4-12-2. Anticipated Unit Costs of Mobile Communications Equipment and Services

Item	NRC	MRC
Mobile Communicator	1,000	50
Control Terminal	10,000	1,000

The program costs by Fiscal Year (FY) are based on the unit costs, as well as the quantities in service as shown in Table 4-12-3. The monthly recurring costs also include charges for leased wireless service usage.

Table 4-12-3. Mobile Communications -- Quantities in Service

Site	Prior Yrs	FY00	FY01	FY02	FY03	FY04	FY05	FY06
Control Terminals		10	4	0	0	0	0	0
Total Control Terminals in Service		10	14	14	14	14	14	14
Mobile Communicators		600	1,200	1200	0	0	0	0
Total Mobile Communicators in Service		600	1,800	3,000	3,000	3,000	3,000	3,000

Based upon the unit cost factors, the quantities in service, and the monthly recurring costs, the projected program costs for FY00-FY06 are listed in Table 4-12-4. All costs are expected to be OPS funded. Funding will be in accordance with FAA Order 2500.8A.

Table 4-12-4. Cost Summary - MCAFS

OIP # C026	All costs in 000's	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
1. Control Terminals									
	Units Added		10	4	0	0	0	0	0
	Total Units In service	0	10	14	14	14	14	14	14
	OPS Non-recurring Costs		**$100**	**$40**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$120**	**$168**	**$168**	**$168**	**$168**	**$168**	**$168**
2. Mobile Communicators									
	Units Added		600	1200	1200	0	0	0	0
	Total Units In service	0	600	1800	3000	3000	3000	3000	3000
	OPS Non-recurring Costs		**$600**	**$1,200**	**$1,200**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$360**	**$1,080**	**$1,800**	**$1,800**	**$1,800**	**$1,800**	**$1,800**
			SUMMARY						
F&E Totals		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Total	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Totals		Non-recurring	$700	$1,240	$1,200	$0	$0	$0	$0
		Recurring	$480	$1,248	$1,968	$1,968	$1,968	$1,968	$1,968
		OPS Total	**$1,180**	**$2,488**	**$3,168**	**$1,968**	**$1,968**	**$1,968**	**$1,968**

Notes:

1. Costs provided by the Program Office.
2. All costs expected to be OPS funded.
3. Recurring costs include leased wireless service usage.

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CHAPTER 4-13 - SUMMARY SHEET

NAS INFRASTRUCTURE MANAGEMENT SYSTEM (NIMS)

Program/Project Identifiers:

Project Number(s):	CIP M-07
Related Program(s):	CIP M-26
New/Replacement/Upgrade?	New/Replace/Upgrade
Responsible Organization:	AOP-10
Program Mgr./Project Lead:	Richard Simmons, (202) 493-0191
Fuchsia Book POC:	Ken Clark, (202) 493-5125

Assigned Codes:

PDC(s):	UG, UH
PDC Description:	Non-critical maintenance management circuits, (e.g. Auto-logging, NAPRS, VOT); Critical monitor and control of circuits (e.g., ARSR, ILS, VOR, etc.)
Service Code:	MNTC

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	TBD	TBD	TBD	TBD	TBD	TBD	TBD
F&E Recurring	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Total F&E	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**
OPS Non-recurring	$238	TBD	TBD	TBD	TBD	TBD	TBD
OPS Recurring	$767	TBD	TBD	TBD	TBD	TBD	TBD
Total OPS	**$1005**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**

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CIP Category:
Mission Support

4-13.0 NAS INFRASTRUCTURE MANAGEMENT SYSTEM

4-13.1 PROGRAM/SYSTEM OVERVIEW

4-13.1.1 Summary Purpose of the Program/System

The NAS Infrastructure Management System (NIMS) will provide the FAA with the capability to remotely monitor and control all NAS subsystems through the centralized use of modern management tools. Functionality to enable NAS-wide infrastructure service management will be added to track NAS events in near real-time, determine cost and performance metrics and trends with high accuracy and detail, and to prioritize and optimize the allocation of FAA resources.

4-13.1.2 Detailed Purpose of the Program/System

The NIMS is a sub-element of the National Airspace System (NAS) that will provide the means to migrate the FAA's equipment maintenance philosophy to a service management philosophy. Building upon the Remote Maintenance Monitoring System (RMMS) concept, but incorporating modern, commercially available management tools, NIMS will support the establishment of a national operations control center (NOCC) and three strategically located area operations control centers (OCCs), Service Operational Centers (SOCs), and Work Centers (WCs). NIMS will concentrate information and technical expertise to ensure the continued operation of the NAS in the most efficient and effective manner through the direct association of NAS infrastructure components with the delivery of specific NAS services. The objective is to ensure cost-effective service delivery that meets customer expectations throughout the NAS. NIMS supports both day-to-day operations and maintenance, as well as the longer term planning, engineering, work force management, and transition needs within AF and other FAA Services. NIMS will also provide necessary modern tools to allow the Field Maintenance Workforce to improve their effectiveness. NIMS will enable the FAA to track and monitor the actual cost of providing NAS services nationwide. RMMS will be absorbed into the NIMS architecture, per the MNS selected hybrid alternative. NIMS will be used for all maintenance monitoring of systems for both the new and old AF field components. The old RMMS architecture and communications requirements will remain intact to continue providing monitor and control for fielded systems.

4-13.1.3 References

4-13.1.3.1 FAA Aviation System Capital Investment Plan (CIP) M-07, January 1999.

4-13.1.3.2 National Airspace System Plan, April 1985, Chapter VI, Maintenance and Operations Support Systems.

4-13.1.3.3 FAA Order 6000.30C (Draft), National Airspace System Maintenance Policy

4-13.1.3.4 FAA Order 6000.37, May 23, 1991.

4-13.1.3.5 FAA Order 6090.1B, Development and Implementation of National Airspace System (NAS) Managed Subsystems (NMS) Within the NAS.

4-13.1.3.6 Operational Requirements Document (ORD) for the NAS Infrastructure Management Systems (NIMS), April, 1996

4-13.1.3.7 Initial (Operational) Requirements Document (IRD) for the NAS Infrastructure Management Systems (NIMS), October, 1999

4-13.1.3.8 NAS System Level Specification, NIMS Managed Subsystems FAA-E-2911, March 31, 1998.

4-13.1.3.9 NIMS Manager/Managed Subsystem using the Simple Network Management Protocol Version 1 (SNMPv1), NAS-IC-5107000-1, Revision A, Interface Control Document, May 1, 1998.

4-13.1.3.10 NIMS Manager/Managed Subsystem Interface Requirements Document, FAA-IR-51070000, May 28, 1997

4-13.1.3.11 NIMS System Level Specification, Version 1.0, FAA-E-2912, March 31, 1998.

4-13.2 PROGRAM/SYSTEM DESCRIPTION

NIMS will provide the NIMS user community with an interoperable system based on an open systems infrastructure and a shared data architecture and repository. NIMS will achieve an open system infrastructure by incorporation of approved FAA standards while accommodating existing devices with proprietary interfaces. Off-the-shelf hardware and tailored software will be used extensively to reduce short term and long term costs and to speed the delivery of NIMS services. NIMS will provide the user community with the capability to collect, assess, and distribute more information than currently available, enabling better management of the NAS infrastructure. Further, the NIMS acquisition will provide interface standards, such as a standard computer human interface (CHI), reducing incompatibility and promoting commonality of standard training across the AF community. Because of increased interoperability and accessibility to a data repository, the effort needed to maintain separate, inconsistent databases across the NIMS community would be significantly reduced.

The software on the existing MPS provides automated maintenance access to selected FAA facilities, allowing equipment performance monitoring, facility degradation and outage reporting, control, certification, automated logging, and configuration management. MPSs are processors through which all of the older non-standard managed systems interface. Most existing functions may be accomplished from MCCs, field offices, and remote sites or at the MPS. In the future, MCCs will be consolidated into OCCs, or evolve into Systems Operations Centers at high-impact facilities.

Managed systems are monitored by either embedded monitoring software or external hardware/software components. Managed systems report to manager systems such as the MPS and an enterprise function (software) located at the OCC. Remote Maintenance Subsystems (RMS) provide the maintenance interface to the manager. The industry refers to managed system software embedded as an "agent". External applications that take the existing monitored systems non-conforming agent interface and convert it into a standard open protocol are called proxy agents. Proxy agents can act as an agent for more than one managed subsystem. In the legacy RMMS, a Remote Maintenance VORTAC Concentrator (RMVC) provided functionality similar to a proxy agent in that it filtered and converted multiple managed systems maintenance interfaces into one that conformed to the FAA standards applicable at that time. At the present time, there are no plans to retrofit fielded systems with NAS-MD-790 interfaces so the legacy systems will continue to report to the MPS. All new NIMS managed systems will use standards based embedded agents or utilize a proxy agent. Managed subsystems provide status, alarms, diagnostics, and control functions. The actual functionality provided by the managed system interface will depend upon a tailored version of FAA-E-2911, NAS System Level Specification, NIMS Managed Subsystems.

The MPS is the central processing point for the legacy RMMS. The MPS will continue to function for several more years while NIMS is being implemented. The MPS contains two main software components, the maintenance automation system software (MASS) and the maintenance management system (MMS). MASS is primarily used to monitor and control the RMS systems, while the MMS is used for logging, scheduling and performance reporting.

4-13.2.1 Program/System Components

All the major hardware and software components of NIMS are listed below with a reference to the section in which each is discussed:

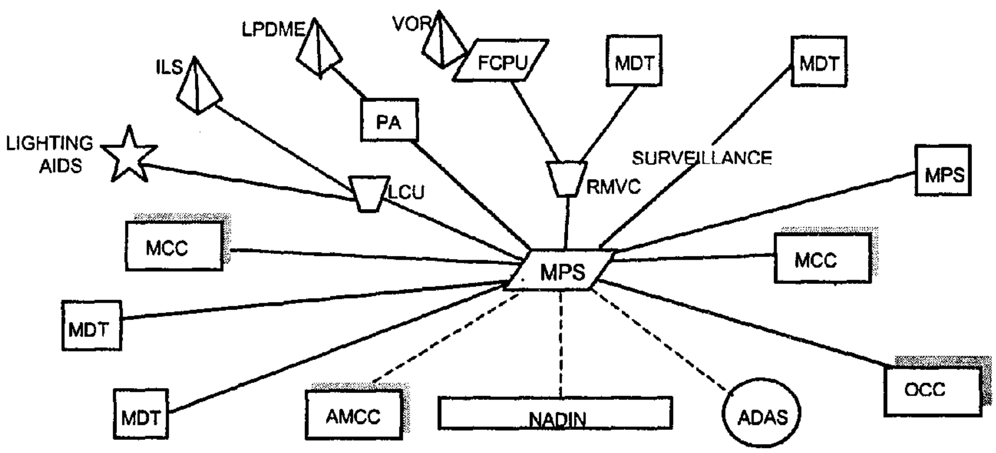
4-13.2.1.1 Principle Components

Section	Component
4-13.2.1.1.1	Remote Monitoring Subsystem (RMS) Modules
4-13.2.1.1.2	Maintenance Processor Subsystem (MPS)
4-13.2.1.1.3	Maintenance Control Center (MCC)/Service Operations Center (SOC)
4-13.2.1.1.4	Maintenance Automation System Software (MASS)
4-13.2.1.1.5	Maintenance Management System (MMS)
4-13.2.1.1.6	Maintenance Data Terminal (MDT)
4-13.2.1.1.7	Remote Maintenance VORTAC Concentrator (RMVC)
4-13.2.1.1.8	Link Control Unit (LCU)
4-13.2.1.1.9	Embedded Agent
4-13.2.1.1.10	Proxy Agent
4-13.2.1.1.11	Operations Control Center (OCC)
4-13.2.1.1.12	National OCC (NOCC)
4-13.2.1.1.13	Service Operations Center (SOC)

4-13.2.1.1.1 Remote Monitoring Subsystem (RMS) Module

A RMS continuously monitors the performance parameters of its associated equipment and automatically verifies that each is operating within its proper range. Each remotely monitored RMS is periodically

polled by an MPS and responds with appropriate system status reports or requested site data. The RMS module was built into most managed FAA equipment procured under the NAS Plan. All NAS subsystem RMS modules using the NAS-MD-790 protocol have been implemented except MODE-S.
On command, the RMS transmits selected parameter readings to the polling station and relays remote control signals to the equipment to which it is attached. The non-polled status reporting type automatically forwards changes and provides status messages to the MPS via the data communications network. The MPS can also request information from non-polled systems when necessary. Figure 4-13-1 illustrates some of the NIMS/RMS interface connections and provides a brief list of Agent to Manager and Agent to intermediate interfaces.



ABBREVIATIONS			
ADAS	- AWOS Data Acquisition System	LPDME	- Low Power Distance Measuring Equipment
AMCC	- ARTCC Maintenance Control Center	MDT	- Maintenance Data Terminal
ARTCC	- Air Route Traffic Control Center	MPS	- Maintenance Processor Subsystem
AWOS	- Automated Weather Observing System	NADIN	- National Airspace Data Interchange Network
FCPU	- Facility Central Processing Unit	OCC	- Operations Control Center
MCC	- Maintenance Control Center	PA	- Proxy Agent
ILS	- Instrument Landing System	RMS	- Remote Monitoring Subsystem
LCU	- Link Control Unit	RMVC	- Remote Maintenance VORTAC Concentrator
MCC	- Maintenance Control Center	VOR	- VHF Omnidirectional Range

Figure 4-13-1. MPS/RMS Typical Interfaces

4-13.2.1.1.2 Maintenance Processor Subsystem (MPS)

The MPS is the central monitoring and control processor for the RMMS. The two major software components of the MPS are the Maintenance Management System (MMS) and the Maintenance Automation System Software (MASS). MMS collects maintenance related data for use by maintenance personnel, as well as maintenance logs and equipment certification data. MASS is used to monitor, control, and display continuously the operational status of all NAS equipment included in the RMMS. MPSs are installed at all Air Route Traffic Control Centers (ARTCCs), FAA Headquarters (the National MPS), DOT Headquarters (software development), the William J. Hughes Technical Center (WJHTC), the FAA Aeronautical Center (FAAAC), and the FAA Academy. All of these MPSs have similar capabilities and are linked together by a communications network (see Figure 4-13-2)

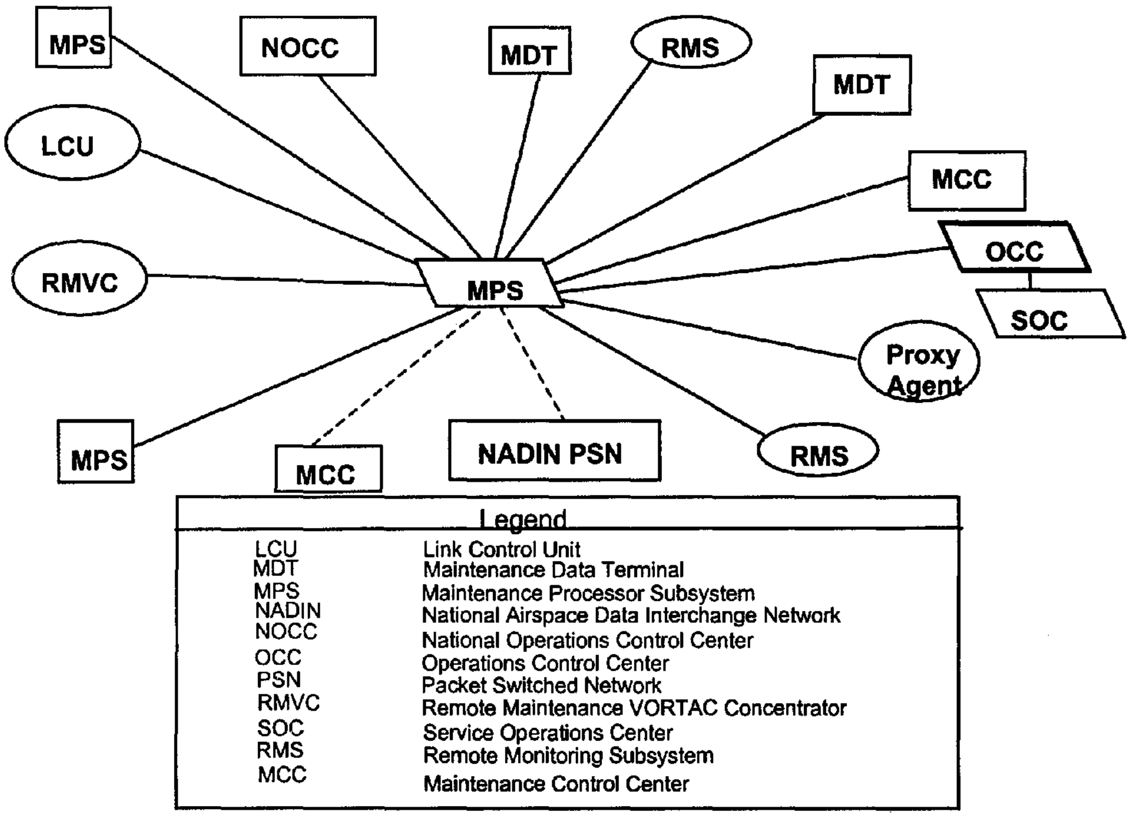


Figure 4-13-2. MPS/NIMS NAS Management Architecture

Starting in 2000 the MPS will fall under the NIMS umbrella and will act as another manager reporting summary information to the OCCs. As NIMS is developed further, many of the MMS and MCS functions will be migrated to the OCCs. Eventually, the MPS will function primarily as a front end to monitored systems with legacy interfaces.

4-13.2.1.1.3 Maintenance Control Center (MCC)/Service Operations Center (SOC)

The MCC/SOC is comprised of hardware and software that has functioned historically as a central point for monitoring and control of remotely monitored facilities. MCCs/SOCs will provide for both MMS and MASS functions via its connection to the MPS. The SOCs will connect directly to the OCCs instead of to the MPSs like the MCCs.

Service Operations Centers are a special class of Work Centers (WCs) located at major NAS facilities like ARTCCs and TRACONs. They will be responsible for all of the equipment within their area of domain, typically the equipment in their respective buildings and also that equipment which directly supports their operations such as remote radars and radios. NIMS will provide these facilities with an integrated display covering all the SOC equipment using a common display interface to make interpretation of status easier and more accurate. Current design plans place all the NIMS applications on the OCC file servers, requiring the connection between SOCs and their associated OCC to always be in place. The SOC displays will be remote "client" displays receiving data from the OCCs.

4-13.2.1.1.4 Maintenance Automation System Software (MASS)

MASS is one of two major MPS applications software components which allow remote monitoring and control of NAS facilities. MASS is composed of two main software segments. One of the segments, called applications, provides the capability to log on, display data screens, request help screens, issue commands, and maintain password authentication access security. The decoder module, the other MASS segment, provides most of the processing required during the transfer of data from the RMS to the MASS database. Currently, MASS develops a unique decoder module for each RMS type.

4-13.2.1.1.5 Maintenance Management System (MMS)

MMS runs concurrently with MASS in the MPS to permit the use of facility data at OCCs, SMOs, SSCs, regional offices, and FAA support organizations. All MPSs provide the basic information gathering functions, such as facility equipment logs, performance and outage reporting, periodic maintenance/certification scheduling, and report generation/distribution. MMS also maintains the Facilities, Services, and Equipment Profile database. MMS is the host for the National Airspace Performance Reporting System (NAPRS).

4-13.2.1.1.6 Maintenance Data Terminals (MDT)

MMS runs concurrently with MASS in the MPS to permit the use of facility data at SMOs, SSCs, regional offices, and FAA support organizations. All MPSs provide. Some historic RMS systems provide ports for direct MDT interfaces. Service and technical management personnel currently use an MDT to access MCS and MMS software and their corresponding databases within an MPS. In the future, these interfaces shall be to the software resident at the OCCs and SOCs. Fixed versions communicate with the MPS/OCCs through dedicated Data Multiplexing Network (DMN) circuits. Portable versions have built-in modems for access via the public switched telephone network (PSTN) and can also be used to communicate directly. Regional offices, sector offices, and sector field offices and units have both portable and fixed terminals for access.

Each fixed MDT has an accompanying printer. These printers may be driven by the collocated MDT terminal or by a direct connection to the manager. A directly connected printer will not interfere with MDT terminal usage and can receive reports initiated from remote sites without local intervention. The majority of the printers are attached to the collocated MDT terminals.

4-13.2.1.1.7 Remote Maintenance VORTAC Concentrator (RMVC)

The RMVC functions as an RMS concentrator for the VHF Omnidirectional Range (VOR), Distance Measuring Equipment (DME), Tactical Air Control and Navigation (TACAN), and the Long Range Aid to Navigation Monitor (LORAN-C). Facility Central Processing Units (FCPU) are collocated with the fielded equipment and perform the monitoring functions. RMVC may receive inputs from up to eight devices called Remote Monitor and Control-Flight Service Stations (RMC-F) which will first concentrate up to eight FCPUs from any combination of DMEs, VORs, LORAN-C, and TACANs before passing the information on to the RMVC. Additionally, the RMC-F may provide a direct connection or dial-in connection for MDT access. The RMVC and RMC-Fs are located at Automated Flight Service Stations (AFSS). Figure 4-13-3 illustrates the RMVC connectivity.

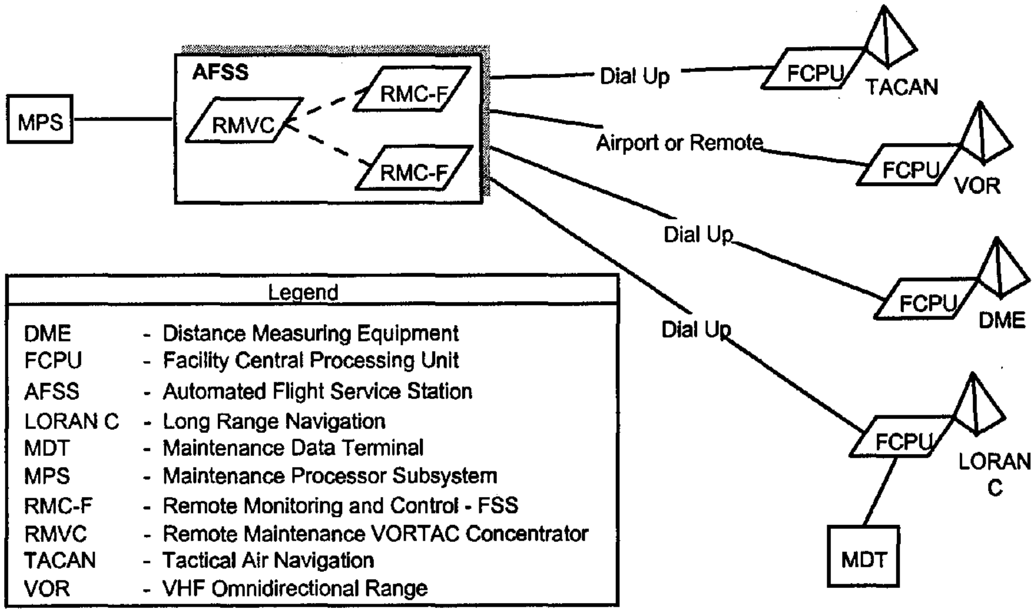
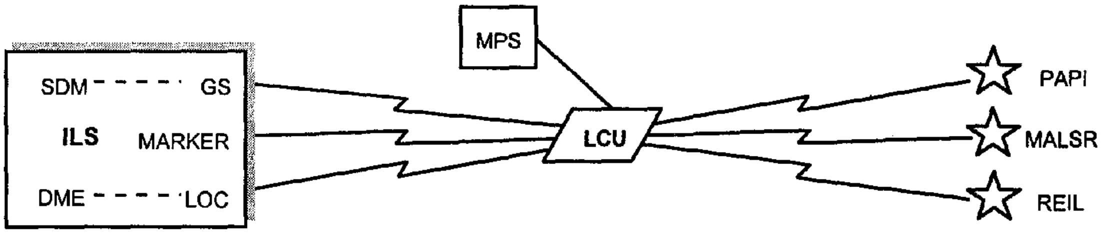


Figure 4-13-3. Remote Maintenance VORTAC Concentrator Interfaces

4-13.2.1.1.8 Link Control Unit (LCU)

The Link Control Unit is a common communications point for RMS equipment at major airports. The LCU is capable of interfacing up to 10 RMSs via RF links. One RS-232-C link may be used; the remaining nine are RF links. A single NAS-MD-790 output to the MPS is necessary. The ten RMS inputs may be composed of any mix of Instrument Landing System (ILS) and Lighting Systems equipment. The remotely monitored ILS is composed of the Localizer (LOC) and Glide Slope (GS), which in turn may accept RMS inputs from the Snow Depth Monitor (SDM) and DME. The lighting RMS systems consist of the Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR), Precision Approach Path Indicator (PAPI), and the Runway End Identification Lights (REIL). Over 300 LCUs have been purchased thus far with the final number dependent upon program offices that rely on its functions. Figure 4-13-4 illustrates LCU connectivity.



Legend			
DME	- Distance Measuring Equipment	MARKER	- Runway Markers
GS	- Glide Slope	MPS	- Maintenance Processor Subsystem
ILS	- Instrument Landing System	PAPI	- Precision Approach Path Indicator
LCU	- Link Control Unit	REIL	- Runway End Identifier Lights
LOC	- Localizer	SDM	- Snow Depth Monitor
MALSR	- Medium Intensity Approach Lighting System w/Runway Alignment Indicator Lights		

Figure 4-13-4. Link Control Unit Interfaces

4-13.2.1.1.9 Embedded Agent

The agent is a maintenance capability embedded in the NAS managed system and is considered to be a part of that system. Whether the agent is internal to the monitored systems main processor or external in a PC, it is considered to be part of the managed system. Functions performed on the managed system may include control, event reporting, data acquisition, data reporting, and status determination. These functions support fault management, configuration management, performance management, and security management. The actual functionality performed by the managed system will depend on the managed system's tailored functional requirements document. All future embedded agents shall utilize an open systems interface protocol such as SNMP.

4-13.2.1.1.10 Proxy Agent

The proxy agent is essentially a device that converts one type of data interface protocol into another, and it can also function as a concentrator to consolidate data input from multiple subsystems into a single data output stream to the MPS. The FAA's system will commonly use a proxy agent to convert a proprietary vendor protocol into a standard open systems interface protocol with which the manager can interface. The proxy agent can also provide additional value added functions historically performed by the manager by performing functions on the managed systems data. Most of the FAA proxy agents will be PC-based devices that can manage multiple subsystems composed of varying subsystem types simultaneously.

4-13.2.1.1.11 Operation Control Centers (OCC)

The OCC is comprised of hardware and software that functions as a central point for monitoring and control of infrastructure elements such as communications, automation, radars, navigation/landing, weather systems, and environmental systems, plus resource management. Currently there are three OCCs planned. NIMS shall support one OCC to assume responsibilities from another OCC for backup purposes. The OCC forwards systems and service status information to the NOCC. The OCC interfaces and architecture are illustrated in Figure 4-13-5.

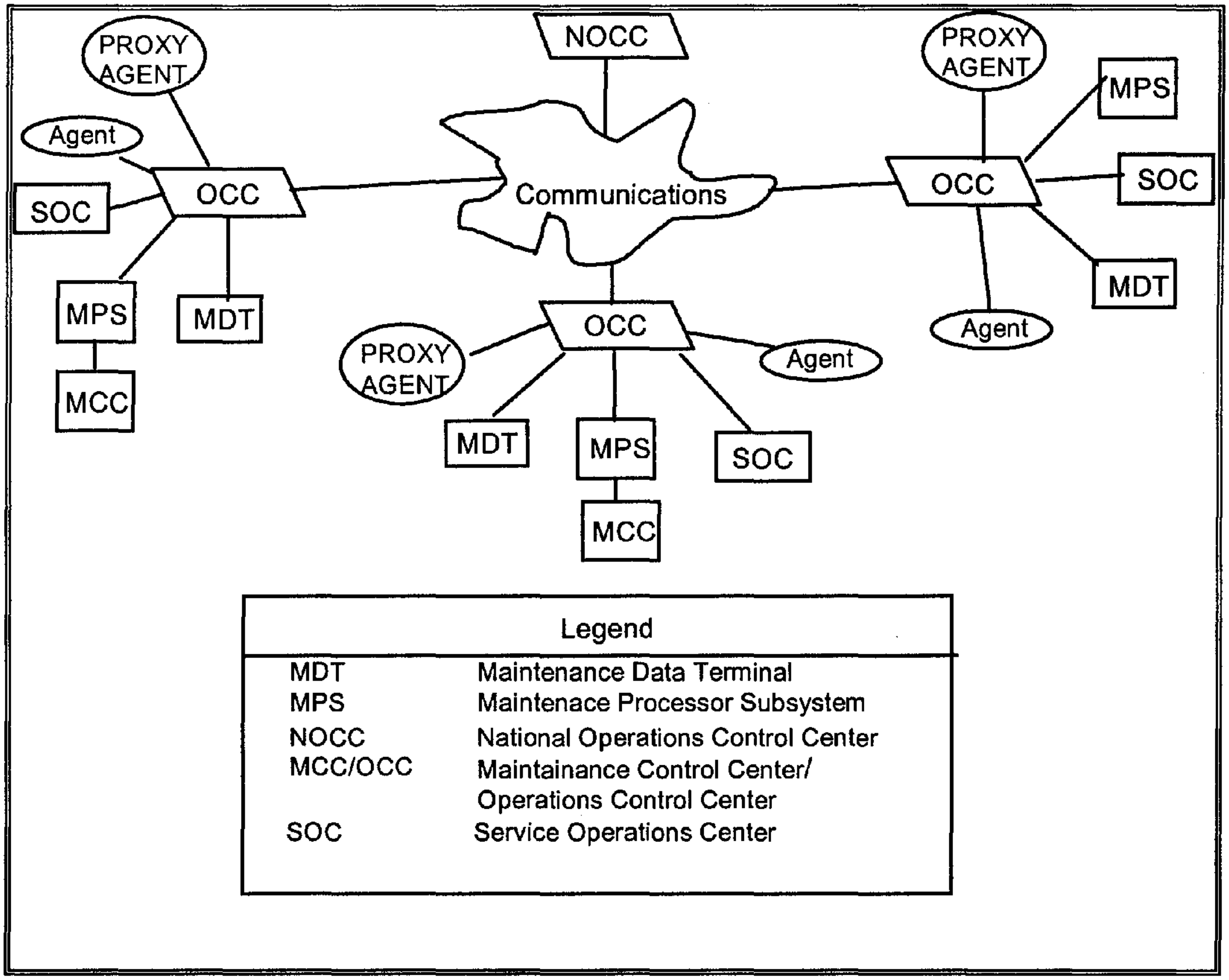


Figure 4-13-5. NIMS Architecture

4-13.2.1.1.12 National OCC (NOCC)

The NOCC is located in Herndon, Virginia, and it will interface to all of the OCCs. Its primary function is to present a NIMS nation-wide view of the NAS services status. It reports significant service events to senior management at FAA Headquarters. It oversees restoration activities for services that have a national impact by coordinating with other OCCs to set priorities and direct operations.

4-13.2.1.1.13 Service Operations Centers (SOC)

Service Operations Centers (SOCs) are high impact facilities responsible for O&M activities inside the boundaries of the SOCs.

4-13.2.1.2 Functional Component Interface Requirements

Each NIMS/NMS interface will provide the following functionality:

4-13.2.1.2.1 Process Control

NIMS will provide subsystem monitoring and maintenance operations support and control functions for the navigation, landing, surveillance, weather sensing, automation, and communications subsystems.

4-13.2.1.2.2 Specialist Access Security

The NIMS subsystem will incorporate security provisions to allow only authorized specialists access to its functional capabilities in accordance with FAA Order 1600.54.

4-13.2.1.2.3 Control Contention

NIMS will provide a priority scheme for resolution of contention for control of the NAS subsystem by more than one specialist at a time.

4-13.2.1.3 Performance Requirements

4-13.2.1.4 Process Priority

NIMS will provide a priority scheme for its processes so essential functional capabilities can be retained in the event of subsystem or equipment failures, and in response to changes in loading.

4-13.2.1.5 Timing Requirements

NIMS timing requirements are specified below in Table 4-13-1

Table 4-13-1. NIMS Response Time For Agent-Manager-Manager-SOC Configuration

NIMS SUBSYSTEMS AND COMMUNICATIONS LINKS	RESPONSE TIME	
	Avg	Max
Agent	2 sec	4 sec
Agent-Manager (Comm)	0.5 sec	1 sec
Manager	2 sec	6 sec
Manager-Manager (Comm)	5 sec	7 sec
Manager-SOC (Comm)	0.5 sec	1 sec
SOC	2 sec	4 sec
End-to-End	17.5 sec	17.5 sec

4-13.2.1.6 Functional/Physical Interface Requirements

Table 4-13-2 shows all current and planned NIMS interface subsystems and Fuchsia Book chapter references where applicable. If there is no Fuchsia Book chapter reference, "NONE" is shown.

Table 4-13-2. Remote Maintenance Monitoring System Interfaces

FUCHSIA BOOK SYSTEM/PROGRAM OR OTHER SUBSYSTEMS	FUCHSIA BOOK REF	INTERFACE
Air Route Surveillance Radar (ARSR-1/2/3)	NONE	DMN to MPS
Air Route Surveillance Radar Model 4 (ARSR-4, -60, FPS)	NONE	DMN to MPS
Air Traffic Control Beacon Interrogator (ATCBI-3/4/5/6)	6-03	DMN to MPS
Airport Surface Detection Equipment (ASDE-3)	NONE	DMN to MPS
Airport Surveillance Radar (ASR-7/8)	NONE	Local airport trans. To DMN to MPS
Airport Surveillance Radar Model 9 (ASR-9)	None	Local airport trans. To DMN to MPS
Airport Surveillance Radar Model 11 (ASR-11) (future)	6-02	Local airport trans. To DMN to MPS
Alaskan NAS Interfacility Communications System (ANICS)	2-04	Local center to the MPS
Automated Lightning Detection and Reporting System (ALDARS)	NONE	Local center trans. To MPS
Approach Lighting System (ALSF-2)	5-01	DMN to MPS
Aeronautical Data Link (ADL)	2-01	NADIN II to MPS
Automated Weather Observing System Data Acquisition System (ADAS)	7-02	Local center trans. To MPS
Compact Airport Remote Monitoring System (CARMS)	NONE	MICRONEASIA
Distance Measuring Equipment (DME)	NONE	Local airport trans. To LCU to DMN to MPS
Environmental Remote Monitoring Subsystem (ERMS)	NONE	Dial-up to MPS
Instrument Landing System - Category I/II/III (ILS CATI/II/III)	5-02	LCU to DMN to MPS
Integrated Terminal Weather System (ITWS) (future)	7-04	NADIN-II to MPS
Low Level Wind Shear Alert System (LLWAS)	NONE	Local airport trans. To DMN to MPS
Low Power Distance Measuring Equipment (LPDME)	NONE	LPDME to Proxy Agent Dial-up to MPS
Medium Intensity Approach Lighting System w/Runway (MALSR)	5-03	Local airport trans. To DMN to MPS or LCU to DMN to MPS
Mode Select Beacon System Sensor (MODE-S) (future)	NONE	DMN to MPS
National Airspace Data Interchange Network II (NADIN II)	2-14	PSN to MPS
Next Generation Weather Radar (NEXRAD)	NONE	
Precision Approach Path Indicator (PAPI)	5-04	Local airport trans. To DMN to MPS or LCU to DMN to MPS
Runway Visual Range System (RVR)	5-06	DMN to MPS
Runway End Identification Lights (REIL)	5-05	Local RF transmission to LCU
Snow Depth Monitor (SDM)	NONE	Local airport trans. To LCU to DMN to MPS

Table 4-13-2. Remote Maintenance Monitoring System Interfaces (Continued)

FUCHSIA BOOK SYSTEM/PROGRAM OR OTHER SUBSYSTEMS	FUCHSIA BOOK CHAPTER	INTERFACE
Standard Terminal Automation Replacement System (STARS) – (future)	1-13	STARS - DMN to MPS
Terminal Doppler Weather Radar (TDWR)	7-06	DMN to MPS
Traffic Management Processor (TMP) (future)	NONE	Remote to MPS via NADIN II
VHF Omnidirectional Range	NONE	DMN to MPS
VHF Omnidirectional Range/Distance Measuring Equipment VOR/DME	NONE	DMN to MPS
VHF Omnidirectional Range/Tactical Air Navigation (VORTAC)	NONE	Local to RMVC to DMN to MPS
Voice Switching and Control System (VSCS) – (future)	NONE	VSCS to MPS
Weather Systems Processor (WSP) – (future)	7-09	
Weather And Radar Processor (WARP) – (future)	7-08	NADIN II to MPS

4-13.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

4-13.3.1 Telecommunications Interfaces

The telecommunications interfaces are described in the paragraphs that follow. The related protocol, transmission, and hardware requirements are summarized in Table 4-13-3.

4-13.3.1.1 MPS to RMS

This interface supports polling and data exchange. The interface requires, in general, a 2.4 kbps circuit. Electrical and mechanical characteristics of the interface must conform to RS-232-C. Modems will have local/remote diagnostic and test mode capabilities.

4-13.3.1.2 MPS to MPS

The MPSs at en route facilities must exchange data and files among themselves, eventually via NADIN II. The MPSs must also interface either directly to, or through, the NADIN II for connectivity with selected systems such as the Voice Switching and Communications System (VSCS), Real time Weather Processor (RWP), and Flight Service Data Processing System (FSDPS). The MPSs are interconnected for the following purposes:

- To allow transfer of various records and files between MPSs,
- To allow remote monitoring messages to be relayed from an RMS to an MCC through an intermediate MPS, and
- To allow communications between maintenance data terminals anywhere within the RMMS network.

4-13.3.1.3 MPS to MCC

This interface supports the exchange of data between MPSs and MCCs. Protocol requirements are proprietary; Tandem MULTILAN is used for MPS/MCC communications. The MCC to MPS interface requires a 38.4 kbps synchronous, full-duplex connection compatible with RS-232-C.

4-13.3.1.4 MPS to Fixed MDT/Printer

This interface supports the exchange of data from the MDTs and printers to the MPS supporting both MMS and MCS software. A proprietary protocol, Tandem 6530/6540, is used for this interface. The interface requires a 4.8 kbps asynchronous communications circuit for the terminal and a 2.4 kbps circuit for the printer circuit. The interface may also be handled via dial-up access at 2.4 kbps or may be locally connected to the MPS. Locally connected terminals operate asynchronously at 9.6 or 19.2 kbps. Electrical and mechanical characteristics for the interface must conform to RS-232-C. Modems will have local/remote diagnostic and test mode capabilities.

4-13.3.1.5 MPS to Portable MDT

Portable MDTs may communicate to the MPS in several ways: dial-up, direct connect, or through an RMS interface. Protocol arrangements are proprietary; a Tandem 6530/6540 terminal protocol is used for MPS/Portable MDT Communications. The dial-up interface requires analog modems and access to the public switched telephone network (PSTN) using RS-366 or RS-232-C for direct connections. Dial-up connections for the MPS to portable MDT interface will operate at speeds determined by the modem and require an asynchronous, half-duplex, 2-wire, analog transmission line. Connectivity via the DMN using 4.8 kbps, asynchronous, half-duplex, digital transmissions are to be provided at designated field locations. The DMN interfaces will use an RS-232-C connector.

4-13.3.1.6 MPS to RMVC

The concentrator interface supports polling and data exchange. The protocol for the MPS to RMVC interface is NAS-MD-790. This interface requires a 4.8 kbps, synchronous, full-duplex, 4-wire channel. Clocking will be provided by the modem. Electrical and mechanical characteristics for the interface must conform to RS-232-C. Modems will have local/remote diagnostic and test mode capabilities.

4-13.3.1.7 MPS to LCU

This interface supports polling and data exchange. The protocol for the MPS to LCU interface is NAS-MD-790. This interface requires a 4.8 kbps, synchronous, full-duplex, 4-wire channel. Clocking will be provided by the modem. Electrical and mechanical characteristics for the interface must conform to RS-232-C. Modems will have local/remote diagnostic and test mode capabilities.

4-13.3.1.8 Embedded Agent to MPS/ OCC (Manager to Manager)

The embedded agent systems connected to the OCC/MPS will require varying speeds of connection depending upon the systems being monitored. For example, a simple system with a limited number of parameters to monitor will require, minimally, 2.4 kbps while a major automation system could conceivably require up to 56 kbps. All currently planned systems will use TCP/IP protocols.

4-13.3.1.9 Proxy Agent to MPS/OCC

The current planned proxy agents will interface to the monitored systems via a dial-up connection. The proxy agent may be connected to multiple monitored systems. Future proxy agents will be a mix of dial-in and direct connectivity. Actual connections to the monitored subsystem will vary depending upon the media available including RF modem, direct connect, dial-up, and limited distance modems. The direct connected proxy agent speeds required vary depending upon the number of systems monitored and the complexity of these systems. At a minimum, these systems should have a 9.6 transmission speed, with the maximum transmission speed envisioned being 56 kbps. A large variance in utilization will occur depending upon the monitored system's condition.

4-13.3.1.10 OCC to OCC/NOCC

The OCC to OCC/NOCC interface will require the 128 kbps circuits to utilize TCP/IP communications protocols. This is the initial transmission speed. As NIMS expands, the speed will be revised upward. Each OCC will communicate with the NOCC, and the OCCs are expected to communicate among themselves. TCP/IP is expected to be the primary protocol utilized, which could (if required) be configured to run over other sub-network protocols.

4-13.3.1.11 OCC to SOC

The SOC is the second level of control in NIMS. The SOCs are expected to have a minimum of three display terminals at each site. Real time control of equipment and response to alarms will require a 56 kbps communications circuit to the OCC. This is the initial transmission speed. As NIMS expands, its speed will be revised upward. The utilization of this circuit is expected to be highly variable depending on the time of day and the current maintenance situation. TCP/IP is expected to be the primary protocol used.

4-13.3.1.12 RMS to Local MDT

This is a local interface. Protocol, transmission, and hardware requirements will be provided in a future edition of this document.

4-13.3.1.13 MPS to Collocated RMS

The MPS to collocated RMS interface is a local internal interface, which allows the MDT to communicate directly to the RMS module or to the MPS via the RMS.

4-13.3.1.14 MPS to Collocated NADIN II Node

This data will be directed to the appropriate MPS by the assigned network address. Access to the National MPS and Oklahoma City databases will also be accomplished via this interface. X.25 standard protocol requirements are as specified in the NADIN users IRD. Transmission requirements are as specified in the NADIN users IRD. A cable is used to provide this interface. The MPS end of the cable is RS-232-C and the NADIN end is EIA-530. The cable will have a minimum of 13 pairs. Local/remote loop back and test mode is not required.

4-13.3.1.15 LCU to Monitored System

The LCU will interface to the monitored systems via an RF link or a directly connected RS-232-C line. The LCU may be connected to up to 20 monitored systems, but only one may be connected via an RS-232-C link with the rest connected via RF communications (see Figure 4-13-4).

4-13.3.1.16 OCC Switched Voice

The OCCs will communication via switched voice service with AF field technicians, other OCCs, the NOCC, SOCs, WC, FAA facilities, and other organizations. Call into the OCC will be serviced by an 800-service using a single national number. The 800-service will map the calling number to the appropriate OCC. Calls from the OCC to other facilities will be supported through the appropriate voice trunk connectivity to FTS-2001 or the public switched telephone network.

4-13.3.1 Diversity Requirements

There are no diversity requirements for this program, although there is a NIMS System Level Specification for telecommunication service with an availability of greater than or equal to .9998.

Table 4-13-3. NIMS Interface Requirements Summary

SUBSYSTEM INTERFACE		MPS to RMS	MPS to MPS	MPS to MCC	MPS to Fixed MDT/Printer
INTERFACE CONTROL DOCUMENTATION		NAS-MD-790 FED-STD-1005	FED-STD-1007A	TBD	NAS-MD-790
PROTOCOL REQUIREMENTS	Network Layer	None & X.25	X.25	None	None
	Data Link Layer	HDLC	HDLC	HDLC	HDLC
	Physical Layer	EIA-530/RS-232-C	RS-232-C	RS-232-C	RS-232-C
	Special Formats/Codes	NAS-MD-790/793	Tandem Corp. X.25. "Pathway" Software	Tandem Corp. "MULTILAN" Software	Tandem Corp. "6530/6540"
TRANSMISSION REQUIREMENTS	No. Channels	1	1	1	1
	Speed (kbps)	2.4 kbps	56 kbps	38.4 kbps	4.8 kbps 2.4 kbps
	Simplex Half/Full Duplex	FD 4w Synchronous Channel	FD 4w Synchronous Channel Via NADIN II	FD	4.8 is asynchronous. May also be dial-up at up to 19.2 or connected locally at 9.6 or 19.2. Local connections are asynchronous.
	Service	DMN/NADIN II data link	Pt-to-pt. data link	Pt. to pt. data link	Dialed = 2w asynchronous Pt-to-pt. =TBD
HARDWARE REQUIREMENTS	Modem	Clocking provided by modem FED-STD-1005	NADIN II	NADIN II	NADIN II
	Data Bridge				
	Clock				
	Cable/Misc				

Table 4-13-3. NIMS Interface Requirements Summary (Continued)

SUBSYSTEM INTERFACE		MPS to Portable MDT	MPS to RMVT	MPS to LCU	RMS to Local MDT
INTERFACE CONTROL DOCUMENTATION		NAS-MD-790	NAS-MD-790	NAS-MD-790	NAS-MD-790
PROTOCOL REQUIREMENTS	Network Layer	None	None	None	None
	Data Link Layer	HDLC	HDLC	HDLC	HDLC
	Physical Layer	RS-232-C; RS-366 for dial-up	RS-232-C	RS-232-C	RS-232-C
	Special Formats/Codes	Tandem Corp. "6530/6540"	NAS-MD-790	NAS-MD-790	NAS-MD-790
TRANSMISSION REQUIREMENTS	No. Channels	1 Dial-up	1	1	1
	Speed (kbps)	2.4/28.8 kbps	4.8 kbps	4.8 kbps	TBD
	Simplex Half/Full Duplex	HD 2w analog Asynchronous	FD 4w Synchronous	FD 4w Synchronous	TBD
	Service	dial-up speed is modem dependent, direct connect is 19.2, or RMS interface	Pt-to-pt. data link	Pt-to-pt. data link	Pt-to-pt. Data link
HARDWARE REQUIREMENTS	Modem	Dial-up is Internal None for 4.8			
	Data Bridge				
	Clock				
	Cable/Misc	None	None	None	None

SUBSYSTEM INTERFACE		MPS to Collocated RMS	LCU to Monitored Systems	MPS to NADIN II Node	MPS To Proxy Agent
INTERFACE CONTROL DOCUMENTATION		Local Interface	NAS-MD-790	NADIN Interface Req's Document (IRD)	NAS-IC-51070000-1
PROTOCOL REQUIREMENTS	Network Layer	None	None	X.25	IP
	Data Link Layer	HDLC	HDLC	HDLC	Dialed=PPP Direct = TBD
	Physical Layer	RS-232-C	RS-232-C	MPS End RS-232-C NADIN End EIA-530	RS-232-C direct; RS-366 Dialed
	Special Formats/Code	None	None	None	SNMP & Other
TRANSMISSION REQUIREMENTS	No. Channels	1	1	1	1
	Speed (kbps)	2.4 kbps	2.4 kbps	9.6 - 56 kbps	dial-up modem dependent kbps, Pt-to-pt. 9.6 kbps
	Simplex Half/Full Duplex	FD Synchronous	FD Synchronous	FD Synchronous	FD 4w Synchronous
	Service	Pt. to pt.	Radio Freq	NADIN II	Pt-to-pt. Data link
HARDWARE REQUIREMENTS	Modem	Limited Distance Modem or Direct			
	Data Bridge				
	Clock				
	A/B Switch				None
	DSC				
	Cable/ Misc.	None	None	A cable is used for this interface. Requires minimum of 13 pairs	

Table 4-13-3. NIMS Interface Requirements Summary (Continued)

SUBSYSTEM INTERFACE		MPS to OCC	OCC to OCC/NOCC	OCC to SOC	OCC to MDT/WC
INTERFACE CONTROL DOCUMENTATION		Data Base TBD	Vendor Determined	Vendor Determined	Vendor Determined
PROTOCOL REQUIREMENTS	Network Layer	IP	IP	IP	IP
	Data Link Layer	TBD	TBD	TBD	Dialed=PPP
	Physical Layer	RS-232-C	TBD	RS-232-C	RS-232-C direct; RS-366 Dialed
	Special Formats/Codes	TBD	TBD	TBD	NAS-MD-790
TRANSMISSION REQUIREMENTS	No. Channels	1	1	1	1
	Speed (kbps)	56 kbps	128 kbps	64 kbps	dial-up modem dependent kbps, Pt.-To-Pt 19.2 kbps
	Simplex Half/Full Duplex	FD 4w Synchronous		FD 4w Synchronous	TBD
	Service	Pt-to-pt. data link	Pt-to-pt. data link	Pt-to-pt. data link	Pt-to-pt. Data link or Telephone Line
HARDWARE REQUIREMENTS	Modem				Dial-up is Internal None for Pt-to-pt.
	Data Bridge				
	Clock				
	Cable/Misc	None	None	None	None

SUBSYSTEM INTERFACE		OCC to Proxy Agent	OCC to Embedded Agent	MPS to Embedded Agent
INTERFACE CONTROL DOCUMENTATION		NAS-IC-51070000-1	NAS-IC-51070000-1	NAS-IC-51070000-1
PROTOCOL REQUIREMENTS	Network Layer	IP	IP	IP
	Data Link Layer	Dialed=PPP Direct = TBD	Dialed=PPP Direct = TBD	Dialed=PPP Direct = TBD
	Physical Layer	RS-232-C direct; RS-366 Dialed	RS-232-C direct; RS-366 Dialed	RS-232-C direct; RS-366 Dialed
	Special Formats/Codes	SNMP & Other	SNMP & Other	SNMP & Other
TRANSMISSION REQUIREMENTS	No. Channels	1	1	1
	Speed (kbps)	dial-up modem dependent kbps, Pt-to-pt. 9.6 kbps	dial-up modem dependent kbps, Pt-to-pt. 9.6 kbps	dial-up modem dependent kbps, Pt-to-pt. 9.6 kbps
	Simplex Half/Full Duplex	Dialed = 2w asynchronous Pt-to-pt.=TBD	Dialed = 2w asynchronous Pt-to-pt.=TBD	Dialed = 2w asynchronous Pt-to-pt.=TBD
	Service	Pt-to-pt data link	Pt-to-pt. data link	Pt-to-pt. data link or Telephone Line
HARDWARE REQUIREMENTS	Modem			Dial-up is Internal None for Pt-to-pt
	Data Bridge			
	Clock			
	Cable/Misc	None	None	None

4-13.4 ACQUISITION ISSUES

4-13.4.1 Project Schedule and Status

The NIMS Phase-1 program breached baselines primarily due to the 45 percent budget reductions over the past 4 years to fund higher priority programs. Delivery orders issued to the NIMS Integrated Services Contractor (Raytheon) was closed out in 1999 with no new tasking assigned. The NIMS Product Team staff, and support were reduced drastically with the dissolution of the Infrastructure IPT (AND-100). The FAA directed the team to revalidate the mission need and requirements and rebaseline the program. The revised Acquisition Program Baseline for NIMS Phase-1, approved by the JRC in August 1999, rebaselined the program to match available funding and ends Phase-1 as originally scheduled with the opening of the three Operations Control Centers (OCC) in 10/00 with initial operational capabilities. Subsequently, the NIM Mission Need Statement was revalidated in August 1999 and the Phase-2 Initial Requirements Document approved in October 1999. The NIMS Phase-2 Investment Decision is planned for April 2000. The NIMS program is employing an evolutionary spiral development approach and will be segmented into a minimum of three phases:

- NIMS Phase-1 (FY-99 to FY-00) lays the groundwork by establishing the OCCs and providing new resource management capabilities. Modern commercial-off-the-shelf (COTS) tools will be integrated with existing management systems to facilitate the transition.. Remote monitoring and control capabilities will be added to accommodate new NAS subsystems and equipment.

- NIMS Phase-2 (FY-01 to FY-05) functions performed at the Maintenance Control Centers (MCC) will be consolidated into OCCs to concentrate technical expertise and improve NAS-wide situational awareness. Service Operations Centers (SOC) will continue to provide an on-site, 24/7, AF presence at the major ATS facilities. Functionality to enable NAS-wide infrastructure service management will be added to track NAS events in near real-time, determine cost and performance metrics and trends with high accuracy and detail, and to prioritize and optimize the allocation of resources.

- NIMS Phase-3 (FY-06 to TBD) will add intelligent fault correlation, information sharing, and automated decision support capabilities to further improve the efficiency and effectiveness of infrastructure services. The Maintenance Processor Subsystem (MPS) platforms will have become unsupportable and will be decommissioned.

4-13.4.1.1 Remote Monitoring and Control

All NAS subsystems are required to have remote monitoring and control capabilities unless the Airway Facilities Service Director approves a waiver. Product Teams are responsible for all costs associated with providing an interface to NIMS including new telecommunications if required. There are multiple means to fulfill this interface requirement depending on the system in question, e.g., develop and embed software into the system, develop and install an external proxy agent to translate the data into an open protocol, utilize inherent COTS capabilities, or some combination. Determination of specific data points is a joint iterative process based on a given system's certification and performance parameters. Table 4-13-4 provides current status and verified implementation schedules.

4-13.4.1.2 MDT Project Status

Currently, 5,444 fixed and portable MDTs are functioning in the regions. Approximately 3,744 new laptop PCs have recently been distributed to replace aging systems. NADIN II connections will, in most cases, be allotted to fixed MDTs. Field technicians who use portable MDTs will also need limited access to dedicated NADIN channels for high speed communications to the MPS at designated sites. The mobile PC users will in most cases utilize dialed connections.

4-13.4.1.3 OCC Project Status

The FAA Joint Resources Council has approved the commissioning of three OCCs in 10/99.
This work is underway and on schedule.

4-13.4.2 Planned Telecommunications Strategies

4-13.4.2.1 Cellular Telephones/Beepers

Cellular telephones and beepers are planned for field technicians. Areas not covered by the typical terrestrial cellular systems will utilize satellite telephones. Refer to Chapter 4-12, MCAFS for funding information.

4-13.4.2.2 Airport Communications

DMN currently provides modem functions for RMSs near DMN node equipment. Additionally, limited-distance modems and RF modems are required in unique instances. All required hardware will be FAA-owned.

4-13.4.3 Telecommunications Costs

Since the preparation of the 1998 Fuchsia Book, it has been determined that many of the NIMS interface requirements will be satisfied by multiplexing them with the primary data stream of the system being monitored. Consequently, the associated costs have been removed from the NIMS cost summary since they are already captured in the DMN chapter.

Despite the numerous changes, the OPS Funded costs for the "non-mobile" interfaces are similar to those derived in the 1998 Fuchsia Book because the cost reductions noted above have been offset by the additional cost of higher bandwidth connectivity requirements that have been identified between the OCCs and the NOCC.

Table 4-13-4. NIMS Interface Implementation Schedule

From NIMS To	System/Rate/Miles	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
NIMS EXTERNAL SYSTEMS									
ADAS	A-B/DMN/LINCS/2.4kbps(VG-8)/10 mi.	22			0	0	0	0	0
ALSF-2	A-B/DMN/LINCS/2.4kbps(VG-8)/125 mi.	8	12	2	0	0	0	0	0
ARSR-1/2	A-B/DMN/LINCS/2.4kbps(VG-8)/200 mi.	92	0	0	0	0	0	0	0
ARSR-3	A-B/DMN/LINCS/2.4kbps(VG-8)/200 mi.	20	0	0	0	0	0	0	0
ARSR-4	A-B/DMN/LINCS/2.4kbps(VG-8)/400 mi.	29	2	0	0	0	0	0	0
ASDE-3	A-B/DMN/LINCS/2.4kbps(VG-8)/200 mi.	38	3	3	2	2	0	0	0
ASR-7/8	A-B/DMN/LINCS/2.4kbps(VG-8)/125 mi.	13	0	0	0	0	0	0	0
ASR-9	A-B/DMN/LINCS/2.4kbps(VG-8)/125 mi.	125	0	0	0	0	0	0	0
ASR-11		2	10	10	10	10	10	10	10
ATCBI-4/5	A-B/DMN/LINCS/2.4kbps(VG-8)/125 mi.	26	0	0	0	0	0	0	0
HID/NAS LAN	A-B/NADIN II/DMN/LINCS/2.4 kbps (VG-8) Access Circuits/10 mi.	0	7	4	3	0	0	0	0
ERMS	A-B/DMN/LINCS/2.4kbps(VG-8)/50 mi.	650	300	300	300	300	300	300	300
ILS Cat I/II/III	A-B/DMN/LINCS/2.4kbps(VG-8)/50 mi.	266	23	23	0	0	0	0	0
ITWS		0	15	19	0	0	0	0	0
LLWAS	A-B/DMN/LINCS/2.4kbps(VG-8)/125 mi.	5	0	17	36	35	35	0	0
Mode S	A-B/DMN/LINCS/2.4kbps(VG-8)/200 mi.	0	0	0	0	0	0	0	0
NEXRAD	A-B/DMN/LINCS/2.4kbps(VG-8)/125 mi.	5	7	7	6	6	6	0	0
RVR	A-B/DMN/LINCS/19.2kbps(VG-8)/125 mi.	164	13	30	30	38	35	0	0
STARS	A-B/DMN/LINCS/9.6-19.2kbps(VG-8)/125 mi.	0	0	0	90	90	0	0	0
TDWR	A-B/DMN/LINCS/2.4kbps(VG-8)/125 mi.	45	0	0	0	0	0	0	0
VOR	A-B/DMN/LINCS/2.4kbps(VG-8)/125 mi.	176	30	30	30	30	30	0	0
VOR/DME-DME	A-B/DMN/LINCS/2.4kbps(VG-8)/300 mi.	242	0	0	0	0	0	0	0
VSCS	A-B/DMN/LINCS/2.4kbps(VG-8)/10 mi.	5	5	5	5	5	0	0	0
WSP		0	0	10	20	4	0	0	0
WARP		0	0	12	13	0	0	0	0
WMSCR	A-B/DMN/LINCS/56kbps/125 mi.	0	0	0	0	0	0	0	0
NIMS INTERNAL SYSTEM									
LCU	A-B/DMN/LINCS/2.4kbps(VG-8)/125 mi.	292	23	23	23	23	61	0	0
MPS ACF/ARTCC	A-B/DMN/LINCS/56kbps/125 mi.	22	0	0	0	0	0	0	0
MPS FAATC	A-B/DMN/LINCS/56kbps/125 mi.	2	0	0	0	0	0	0	0
MPS FAAAC	A-B/DMN/LINCS/56kbps/300 mi.	2	0	0	0	0	0	0	0
MPS Natl. HQ	A-B/DMN/LINCS/56kbps/125 mi.	1	0	0	0	0	0	0	0
MDT/WC Fixed	A-B/DMN/LINCS/19.6kbps(VG-8)/300 mi.	2000	0	0	0	0	0	0	0
MDT/WC Mobile	dial up	3200	0						
MDT Printers	A-B/DMN/LINCS/2.4kbps(VG-8)/300 mi.	1209	0	0	0	0	0	0	0
OCC/NOCC	1.44 mbps/1000 mi.		4						
Proxy Agent	A-B/DMN/LINCS/56kbps/300 mi.	0	80	100	100	100	20	0	0
RMVC	A-B/DMN/LINCS/2.4kbps(VG-8)/125 mi.	69	0	0	0	0	0	0	0
SOC	56kbps/400 mi.	0	28	0	0	0	0	0	0

Note: Bold print indicates new entry (added since previous edition)

Table 4-13-5. NIMS Telecommunications Interfaces and Associated Costs

		Terminal Environment	En Route Environment
		NIMS connectivity requirement satisfied by muliplexing status data and controls over the same circuit carrying the primary data to the Air Traffic Contol Facility.	
		NIMS connectivity to ARTCC or OCCs captured under NIMS internal interfaces.	
		Costs for primary data feed contained in the respective chapters.	
		ALSF-2, ASR-7/8, ASR-9, ASR-11, ATCBI-3/4/5, ATCBI-6, CD, LLWAS, NEXRAD, RVR, TDWR, VOR, WSP	ACE, ITWS, STVS, STARS, TVSR, WARP
		NIMS connectivity requirement satisfied by local cabling.	
		NIMS connectivity to ARTCC or OCCs captured under NIMS internal interfaces.	
		No leased telecommunications costs associated with local cabling.	
		ARSR-1/2, ARSR-3, ARSR-4, ARSR-60, ASDE-3, Mode S, ATCBI-6, FPS	ADAS, ADL, ANICS, HID/NAS LAN, VSCS, WAAS

Table 4-13-6. Cost Summary - NIMS

CIP # M-07	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
NIMS Telecommunications Costs									
Cost Profile: TIMS CC&O Report of Expenditures for NIMS Related PDC and Service Codes									
Non-critical Maintenance Management Circuits (PDC/SVC = UG MNTC)									
OPS Non-recurring Costs			$188	TBD	TBD	TBD	TBD	TBD	TBD
OPS Recurring Costs			$214	TBD	TBD	TBD	TBD	TBD	TBD
Critical Monitor and Control Circuits (PDC/SVC = UH MNTC)									
OPS Non-recurring Costs			$49	TBD	TBD	TBD	TBD	TBD	TBD
OPS Recurring Costs			$520	TBD	TBD	TBD	TBD	TBD	TBD
OCC									
New Channels Added			70	70	70	0	0	0	0
Total Channels			70	140	210	210	210	210	210
F&E Funded			70	70	70				
Total OCC Cost			$34	$64	$64	$64	$64	$64	$64
SUMMARY									
F&E Totals	Non-recurring		TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Recurring		TBD	TBD	TBD	TBD	TBD	TBD	TBD
	F&E Totals		**TBD**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**
OPS Totals	Non-recurring		$238	TBD	TBD	TBD	TBD	TBD	TBD
	Recurring		$767	TBD	TBD	TBD	TBD	TBD	TBD
	OPS Totals		**$1005**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**

Notes
:

1. As of the date of completion of the Fuchsia Book estimates, the requirements furnished by the former Product Team have not been validated.
2. The approach to costing this program is driven by actual billing statements obtained from the CC&O report in TIMS for Feb 2000 and projected to the end of the fiscal year.

CHAPTER 4-14 - SUMMARY SHEET

NEW PERSONNEL/PAYROLL SYSTEM (NPPS)

Program/Project Identifiers:

Project Number(s):	BIIP-991021
Related Program(s):	CPMIS, CUPS, IPPS, SWIFT, ACQUIRE
New/Replacement/Upgrade?	Replacement
Responsible Organization:	AHP
Program Mgr./Project Lead:	
Fuchsia Book POC:	

Assigned Codes:

PDC(s):	HR
PDC Description:	Administrative Data Circuits for the New Personnel Payroll System (NPPS)
Service Code:	ADDA

Cost Estimates *:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$0	$73	$147	$147	$0	$0	$0
Total F&E	**$0**	**$73**	**$147**	**$147**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$0	$0	$0	$0	$147	$147	$147
Total OPS	**$0**	**$0**	**$0**	**$0**	**$147**	**$147**	**$147**

*Estimates for use of the ADTN-2000 backbone.

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CIP Category:
Mission Support

4-14.0 NEW PERSONNEL/PAYROLL SYSTEM (NPPS)

4-14.1 PROGRAM OVERVIEW

The New Personnel/Payroll System (NPPS) will replace several legacy Human Resource and Payroll systems, including CPMIS, CUPS, IPPS, and IPPS/MIR. The NPPS will also replace and/or integrate various components from the Selections Within Faster Times (SWIFT) project. It will allow the FAA to meet its National Performance Review (NPR) employee reduction requirements.

4-14.1.1 Purpose

Major functions of the NPPS On-Line Transaction Processing (OLTP) system are tracking and maintaining employee, employment, position, organization, pay, benefits, compensation, training, applicant, vacancy, personnel action, labor distribution, security, civil rights, and performance appraisal data. The major functions of the NPPS On-Line Analytical Program (OLAP) system are reporting (MIS/MIR), Decision Support System (DSS) analysis, and Executive Information System (EIS) access to the NPPS OLTP corporate Human Resource and Payroll data.

4-14.1.2 References

4-14.1.2.1 NPPS Mission Need Statement #319.

4-14.1.2.2 FAA Administrative Information System Technical Architecture Feasibility Study and Cost Benefit Analysis.

4-14.1.2.3 FAA Administrative Information System Telecommunications Needs Assessment Methodology.

4-14.1.2.4 Technical Alternatives for NPPS: The FAA Personnel and Payroll System.

4-14.1.2.5 New Personnel/Payroll System (NPPS) Client/Server Data Center Implementation Options.

4-14.2 SYSTEM DESCRIPTION

NPPS will implement two primary systems.

4-14.2.1 On-Line Transaction Processing System

The On-Line Transaction Processing (OLTP) system will support processing personnel, payroll, and training transactions, including personnel action requests, training enrollments, and time and attendance collection. OLTP will include procurement of a Federalized Commercial-Off-the-Shelf (COTS) package, analysis of the COTS capabilities and the FAA requirements, customization to address the deficiencies identified in the analysis, and client-side implementation to all ROs, ARTCCs, and selected other facilities. The system uses a client/server technical architecture having TCP/IP and SQL*Net telecommunications, a centralized Oracle Server database, and Win32 (Windows '9x or Windows NT) clients.

4-14.2.2 On-Line Analytical Processing System

The On-Line Analytical Processing (OLAP) system provides Management Information System reporting and Decision Support System ad hoc data analysis. This system will use the same technical architecture components as listed for the OLTP COTS package, but will use OLAP features, including a Multiple Dimension Database.

4-14.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

4-14.3.1 Interface Requirements

The telecommunications protocol will use TCP/IP for the transport and network layers and SQL*Net with TCP/IP drivers for the presentation and session layers. This will include Point-to-Point Protocol (PPP) access for all dial-up users. The NPPS interface will include both client-side Internet browser access and client-side application access. During legacy data conversion, NPPS will use existing Mike Monroney Aeronautical Center (ARCTR) mainframe connectivity (SNA) to obtain IPPS, CUPS, and CPMIS program data. During the phased implementation, NPPS will continue to use this access to prepare a new region or line of business for NPPS usage. There will be no end-user SNA access requirements after NPPS implementation. NPPS will reduce Integrated Computing Environment-Mainframe and Network (ICE-MAN) SNA access used by CPMIS, CUPS, and IPPS.

The COTS solutions under consideration use a Remote Data Access client/server model, however, a three-tier, distributed processing model may be included in future product versions.

4-14.3.2 Connectivity Requirements

4-14.3.2.1 OLTP Connectivity Requirements

The NPR targeted a reduction of NPPS Human Resource (HR) Specialists and Payroll Technicians (PYT) to approximately 400 employees. These users will be located at Regional Offices, Centers, and Headquarters with HR users typically connected to the system between 25% and 50% of the time while PYT users will approach 100% connectivity. NPPS is proposing that NPPS Administrative Assistants (WAA) perform the types of duties currently provided by the IPPS Time and Attendance Clerks, IPPS Personnel Action Request Initiators, and IPPS Training Request Initiators. The proposed count for this user class is 800 users. Due to the number of FAA employees the WAAs would support, these users would require direct ADTN2000 connectivity through their location at ROs, ARTCCs, FSDOs, etc.

The remaining NPPS OLTP users would consist of first and second line supervisors, and managers, divided into two categories: 2,057 managers or second line supervisors, and 2,743 first line supervisors. These users would be casual users accessing NPPS for time and attendance approval, personnel action request approval, and training request approval. Approximately 2,700 members of this user class would require dial-up connectivity using PPP. The connect time for these users would be approximately 10 minutes per pay period.

4-14.3.2.2 OLAP Connectivity Requirements

The NPPS project-planning group is evaluating a large centralized OLAP server versus small regional OLAP servers. The telecommunications implication is that a centralized OLAP server would be sending result sets "as-needed" to OLAP users (most likely to sites connected to ADTN2000) while distributed OLAP servers would require bulk data transfers at some regularly scheduled intervals. This is more than a database replication issue since a transaction at the OLTP level can affect multiple summary tables in the multidimensional OLAP database. Due to the cost effectiveness of a centralized OLAP server, this solution will be used for telecommunications estimates. The number of users requiring this type of connectivity would be similar to the current number of IPPS/MIR users (500). It is likely that most or all OLAP users would have direct ADTN2000 connectivity.

OLAP users would be divided into NPPS Managers/Analysts and NPPS Casual Users. The Managers/Analysts would be responsible for reporting, decision support system analysis, and providing executive information summary interfaces. These users (approximately 100 of the 500) would probably average 20% connectivity using large result sets. The casual users would access canned reports or other pre-programmed information. These 400 users would average approximately 20 minutes per pay period.

4-14.3.3 Program Development

Since NPPS involves the implementation of a modified COTS package to fit deficiencies identified in the analysis, primary development will take place within the ARCTR backbone using clustered database servers. This will provide increased data availability and better performance in comparison to distributed database servers. Extensive testing and a phased implementation will require ADTN2000 use for beta testing ROs and various user types. ADTN2000 will be used during various development stages, including data conversion from those legacy systems that NPPS will replace.

4-14.3.4 Traffic Characteristics

Table 4-14-1 summarizes estimates of the volume of data by the various user types across types of connectivity. These volume estimates are based on actual NPPS data transmission estimates and do not include any telecommunications overhead. Note: Often the NPPS users will have been transitioned from one or more of the legacy systems that NPPS will replace.

Table 4-14-1. Amount of Data for Various User Types

User Class	Users	Transactions per Pay Period	Volume per Transaction	Yearly Volume
Personnel Specialists and Payroll Technicians	400	200	20,000 Bytes	41.6 GB
Administrative Clerks	800	300	10,000 Bytes	62.4 GB
Managers and Supervisors - ADTN2000	2,100	10	6,000 Bytes	3.3 GB
Managers and Supervisors - Dial-up	2,700	10	6,000 Bytes	4.2 GB
OLAP Managers and Analysts	100	25	500,000 Bytes	32.5 GB
OLAP Casual Users	400	2	500,000 Bytes	10.4 GB
Developers and Testers	60	100	30,000 Bytes	4.7 GB

Specific volume information will be available after the COTS package is selected and the gap analysis is performed. The development of a more detailed project management plan will provide better information for the transition schedule to convert from legacy systems to NPPS. Once a transition schedule is developed, year by year projections can be made for ADTN2000 usage.

4-14.3.5 Replication Requirements

The NPPS technical architecture will use multiple database servers that form clusters. These clusters will be located at the MMAC. There are no ADTN2000 requirements for data replication and/or backups within the clustered servers or transporting data to regional database servers. The implementation of application servers will be considered when this type of technology is available within the COTS vendors' product application architecture.

4-14.4 ACQUISITION ISSUES

The NPPS program plan is to conduct a conference room pilot test that will include the analysis data necessary to determine the COTS software changes required to satisfy agency requirements. A pilot test using a FAA Region and a Line of Business began in early FY99. The proposed technical architecture was implemented, tuned and further prototype testing was conducted with the SWIFT and IPPS/MIR systems transitioned to the NPPS infrastructure. NPPS expects to reduce the need for dial-up access when compared to the legacy systems it will replace and will eliminate the need to access mainframe systems such as ICE-MAN.

4-14.4.1 Transition Planning

During system transition in FY99, CPMIS, IPPS, and SWIFT users were transitioned to NPPS, although some parallel operation continued. Business critical areas such as Time and Attendance Collection (IPPS) and Pay (CUPS) will have extended parallel testing. The current projection is to complete NPPS implemented (and legacy systems replacement) by the end of FY01.

4-14.4.2 Telecommunications Costs

Table 4-14-2 provides the estimated program costs for FY00 to FY06, based on the projected annual usage. Since the NPPS system's users will use existing connectivity to the ADTN network, there are no additional channel or hardware costs associated with the system. The telecommunication costs consist of the ADTN2000 backbone usage charge at $250 per gigabyte, which will be funded in accordance with FAA Order 2500.8A.

Table 4-14-2. Cost Summary - NPPS

The following table shows requirements, which are captured in the ADTN2000 chapter. They are repeated here for information only.

CIP # None	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
NPPS <---> ADTN2000									
1. Connectivity Costs									
Cost Profile: Annual Recurring Costs for ADTN2000 Telecommunications Equipment									
F&E Recurring Costs			**$0**	**$54**	**$107**	**$107**	**$0**	**$0**	**$0**
OPS Recurring Costs			**$0**	**$0**	**$0**	**$0**	**$107**	**$107**	**$107**
2. ADTN2000 Backbone Usage Costs									
Cost Profile: Annual ADTN2000 Backbone Usage Costs @ $250 per Gigabyte									
Annual Usage In Gigabytes			0	80	159	159	159	159	159
F&E Recurring Costs			**$0**	**$20**	**$40**	**$40**	**$0**	**$0**	**$0**
OPS Recurring Costs			**$0**	**$0**	**$0**	**$0**	**$40**	**$40**	**$40**
			SUMMARY						
F&E Totals		Non-Recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$73	$147	$147	$0	$0	$0
		F&E Totals	**$0**	**$73**	**$147**	**$147**	**$0**	**$0**	**$0**
OPS Totals		Non-Recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$147	$147	$147
		OPS Totals	**$0**	**$0**	**$0**	**$0**	**$147**	**$147**	**$147**

CHAPTER 4-15 - SUMMARY SHEET

SPECIAL USE AIRSPACE MANAGEMENT SYSTEM (SAMS)

Program/Project Identifiers:

Project Number(s):	BIIP-991026
Related Program(s):	Central Altitude Reservation Function (CARF)
New/Replacement/Upgrade?	Upgrade
Responsible Organization:	ATP-200
Program Mgr./Project Lead:	Steven Dukes, SAMS Program Office, ATP-200 (202) 267-9327
Fuchsia Book POC:	

Assigned Codes:

PDC(s):	HY
PDC Description:	Operational Data Circuits for Special Use Airspace Mgmt System (SAMS)
Service Code:	NDNB

Cost Estimates*:

Costs in $000:	FY99	FY00	FY01	FY02	FY03	FY04	FY05
F&E Non-recurring	$96	$0	$0	$0	$0	$0	$0
F&E Recurring	$77	$77	$0	$0	$0	$0	$0
Total F&E	**$174**	**$77**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$0	$0	$77	$77	$77	$77	$77
Total OPS	**$289**	**$273**	**$352**	**$368**	**$368**	**$368**	**$368**

*Cost data calculated by AOP.

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CIP Category:
Mission Support

4-15.0 SPECIAL USE AIRSPACE MANAGEMENT SYSTEM

4-15.1 PROGRAM OVERVIEW

4-15.1.1 Purpose of the Special Use Airspace Management System

SAMS will assist in the management of Special Use Airspace (SUA) and other related airspace, which affect the National Airspace System (NAS) operations. Current management and accounting of SUA activity is a predominantly manual operation.

The Special Use Airspace Management System (SAMS) is one component of the FAA's comprehensive Special Operations and Procedures mission allocated to Air Traffic Operations. SAMS is the FAA's subsystem, which provides integrated SUA schedule operations within the FAA and between the FAA and DoD. DoD entities use the Military Airspace Management System (MAMS) to prepare and transmit their requests to the FAA. The Central Altitude Reservation Function (CARF) is another major component supporting special operations within the FAA and resides on the SAMS computer network. SAMS handles schedule information regarding "fixed" or "charted" SUAs while CARF handles *ad hoc* time/altitude reservations (ALTRVs). Both subsystems deal with planning and tracking the military's use of the nation's airspace. FAA military operations specialists (MOS) and others assigned the MOS function prepare, enter, track, and audit SUAs, ALTRVs, and airspace for special use utilization.

Per FAR Part 73, the FAA reports annually on the overall utilization of SUA within United States airspace. Sufficient information will be available for managers to determine where establishment, modification, revocation, or status quo of SUA may be appropriate.

4-15.1.2 References

4-15.1.2.1 "Military Airspace: Better Planning is Needed to Meet Future Requirements," General Accounting Office Report, 1987.

4-15.1.2.2 "Report On The Joint Review of Special Use Airspace," Secretary Of Defense And The Secretary Of Transportation To The United States Congress, 1987.

4-15.1.2.3 Airspace Use, FAA Needs to Improve Its Management of Special Use Airspace", General Accounting Office Report, August 1988.

4-15.1.2.4 System Specification

4-15.1.2.5 Implementation Plan

4-15.2 SYSTEM DESCRIPTION

The SAMS architecture is based on an "Internet model" of networked and independent applications operating via the TCP/IP family of protocols. A centralized site, Air Traffic Control System Command Center (ATCSCC) provides a cluster of various types of servers, e.g., Oracle RDBMS, HTTP/HTTPS, and ftp, among others. SUA information is currently collected and/or distributed using a combination of traditional database client-server applications and web server/browser applications. Connectivity is via local area networks (LANs) within the ATCSCC and via NADIN/2(FAA) and ADTN2000 (FAA), and NIPRNet (DoD) wide area networks (WANs).

External users, i.e., those not directly creating or updating SUA data, access SAMS/CARF information via the SUA Gateway (SUA/GW) after approval by and registration with ATP-200. These users are also reached via TCP/IP protocol applications over the LAN/WAN connections.

The central facility uses Sun/Solaris workstations/servers as well as Micron/WinNT systems. Primary mass storage uses a combination of RAID and hot-backup mechanisms to ensure high availability and fail-over capability.

4-15.2.1 Program/System Components

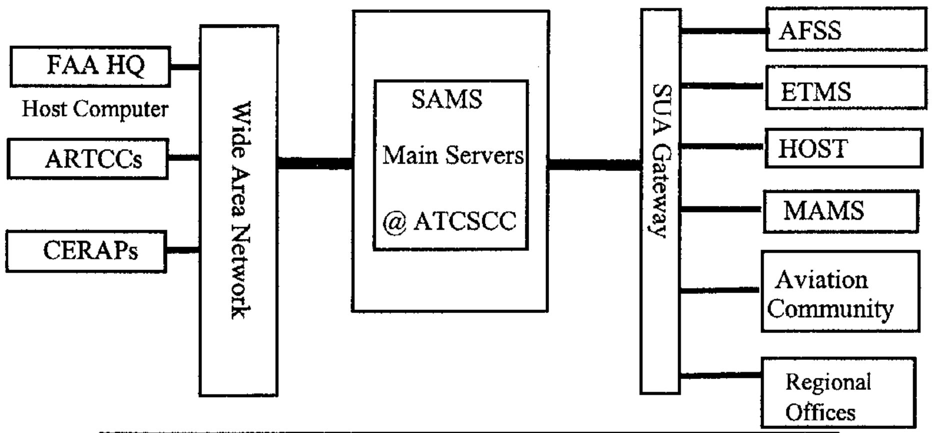
SAMS consists of workstations, servers, mass storage, printing, communications, and interfacing devices. The central facility is at the FAA's ATCSCC, Herndon, VA location. The ATCSCC provides uninterruptable power for all critical units. Management and oversight functions are conducted via network connection to the FAA/HQ building at ATP-200.

SAMS field sites are configured with a Sun workstation, Cisco 2500 series WAL/LAN router, and LAN hub, and a printer. These workstations are generally located in the TMU or MOS areas at the assigned ARTCC/CERAP.

4-15.2.1.1 Functional Component Interface Requirements

The central facility interconnects systems using multiple Cisco 2924MXL switches at 100Mbps full duplex. WANs are connected at the serial port of Cisco 2500 or 4000 series firewall routers with conversion to ethernet (802.3) LAN media. NADIN/2 traffic is interfaced via a C2501. The ADTN2000and NIPRNet traffic is interfaced via a C2514 and C4000M router LAN/LAN bridge, respectively.

Several field sites have an external modem connected to the C2500's auxiliary port for emergency dial-up if maintenance is required. Traffic flow could be provided via this link for very short periods of time should the WAN link fail.



Legend	
AFSS	Automated Flight Service Station
ARTCC	Air Route Traffic Control Center
ATCSCC	Air Traffic Control System Command Center
CERAP	Combined Center RAPCON
ETMS	Enhanced Traffic Management System
HOST	Host Computer
MAMS	Military Airspace Management System
ODMS	Operational Data Management System
SAMS	Special Use Airspace Management System
SUA	Special Use Airspace

Figure 4-15-1. Functional Connectivity Diagram

4-15.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

4-15.3.1 Telecommunications Interfaces

4-15.3.1.1 SAMS Clients to ATCSCC

Communication between the SAMS servers, located at the ATCSCC, and each SAMS client requires a full duplex circuit supporting data rates up to TBD kbps. The interface protocol stack is Transmission Control Protocol/Internet Protocol (TCP/IP).

4-15.3.1.2 Interface Requirements

SAMS uses Cisco 2500 series routers at all field sites. The interface protocol TCP/IP, is utilized at the SAMS client sites

4-15.3.1.3 Connectivity Requirements

SAMS must have continuous connectivity to fulfill its mission. The number of sites requiring connectivity is 37. The number of clients may increase as the system matures. Service restoration time for the network is expected to be .25 to 1.0 hours. Restoration of remote systems, which failed due to hardware/software problems, will be rapid. Replacement computers will be shipped overnight to return facilities to service.

4-15.3.1.3.1 Secondary Interfacility (Backup) Interface Requirements

The SAMS client secondary interface uses a CISCO 2500 series router and an external modem connected to POTS. The interface protocol is Transmission Control Protocol/Internet Protocol (TCP/IP).

4-15.3.1.4 Traffic Characteristics

TBD

4-15.3.2 Other Interfaces

Other systems will access SAMS via the SUA Gateway Subsystem.

4-15.3.3 Local Interfaces

Not permitted.

4-15.4 ACQUISITION ISSUES

4-15.4.1 Program Schedule and Status

Presently ADTN2000 is installed at all FAA Regional Headquarters and 5 SAMS field sites. 22 sites are on NADIN II and thirteen are currently on ADTN2000. Of those thirteen, six are in the process of converting to NADIN. The other seven will remain on ADTN2000. SAMS software and hardware implementation was completed in January 1998.

4-15.4.2 Planned Telecommunications Strategies

Network requirements have been reviewed and AOP has recommended moving SAMS from NADIN II to the Bandwidth Manager System to improve performance.

4-15.4.3 Telecommunications Costs

Program Costs were provided by AOP. See Table 4-15-1.

Table 4-15-1. Cost Summary Table - SAMS

CIP # N-08	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
	Special Airspace Management System								
	SAMS users <---> ARTCC								
	Cost Profile: LINCS 128k (F-128) lines								
	Channel Costs								
	Channels added	0	15	0	0	0	0	0	0
	Total channels	0	15	15	15	15	15	15	15
	F&E Funded Channels	0	15	15	0	0	0	0	0
	OPS Funded Channels	0	0	0	15	15	15	15	15
	Non-recurring F&E Channel Costs		$96	$0	$0	$0	$0	$0	$0
	Non-recurring OPS Channel Costs		$0	$0	$0	$0	$0	$0	$0
	Recurring Channel Costs								
	F&E Recurring Costs		$77	$77	$0	$0	$0	$0	$0
	OPS Recurring Costs		$0	$0	$77	$77	$77	$77	$77
	NADIN Node <----> NADIN Node								
	Cost Profile: SAMS incurs 1/12 NADIN ARC								
	(Also noted in NADIN chapter)								
	OPS Recurring Costs		$289	$273	$274	$291	$291	$291	$291

SUMMARY

			FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
F&E Totals		Non-recurring	$96	$0	$0	$0	$0	$0	$0
		Recurring	$77	$77	$0	$0	$0	$0	$0
		F&E Totals	**$174**	**$77**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Totals		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$77	$77	$77	$77	$77
		OPS Totals	**$289**	**$273**	**$352**	**$368**	**$368**	**$368**	**$368**

Notes:

1 The SAMS program office has recently increased its data rate requirement from 56kbps to 128kbps.
2 Bandwidth Manager does not typically charge users for its service.
3 NADIN does not typically charge users for its service.
4 Existing modems and routers are used as interface equipment.
5 There are channels added for 6 TRACONs and 9 regional offices.

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CHAPTER 4-16 - SUMMARY SHEET

TELECOMMUNICATIONS REMOTE MAINTENANCE AND MONITORING (TRMM) PROGRAM

Program/Project Identifiers:

Project Number(s):	BIIP-991022
Related Program(s):	
New/Replacement/Upgrade?	
Responsible Organization:	AOP-400
Program Mgr./Project Lead:	Howard Frey, ZLCAFS, (801) 320-2166
Fuchsia Book POC:	Don Fong, ITT/AOP-400, (202) 863-7321

Assigned Codes:

PDC(s):	OR
PDC Description:	Critical Telecommunications Monitor and Control Circuits.
Service Code:	MNTC

Cost Estimates *:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$125	$15	$15	$15	$15	$15
F&E Recurring	$100	$150	$225	$394	$591	$886	$975
Total F&E	**$100**	**$275**	**$240**	**$409**	**$606**	**$901**	**$990**
OPS Non-recurring	$945	$220	$242	$266	$293	$322	$354
OPS Recurring	$151	$89	$104	$104	$104	$104	$104
Total OPS	**$1,096**	**$309**	**$346**	**$370**	**$397**	**$426**	**$458**

*Cost data provided by TRMM Program Office.

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CIP Category:
Mission Support

4-16.0 TELECOMMUNICATIONS REMOTE MAINTENANCE AND MONITORING (TRMM) PROGRAM

4-16.1 PROGRAM OVERVIEW

The TRMM Program encompasses the procurement, implementation, and management of resources to satisfy the successful remote management of FAA-owned and leased network telecommunications. The TRMM Program Office (PO) has been established to support the activities necessary to implement Telecommunication Service Management (TSM) in the NAS Infrastructure Management System (NIMS) environment. The TRMM PO supports the requirement (as identified in the AF Strategic Plan, Concepts of Operations of the Future, and Telecommunications Strategic Plan) to consolidate and centrally manage the operations of the FAA-owned and leased networks. Near-term plans call for the TRMM PO to support the requirement for the two National Network Control Centers (NNCCs) to monitor the following networks:

- Agency Data Telecommunications Network (ADTN 2000)
- FAA Telecommunications Satellite System (FAATSAT)
- Federal Telecommunications System - 2001 (FTS 2001)
- FAA Owned Microwave Systems (FOMS)
- NAS Data Interchange Network (NADIN)
- Bandwidth Manager (BWM) Network
- Leased Interfacility NAS Communications System (LINCS)
- International Aeronautical Telecommunications Network (AFTN)

FAA Order 6000.50, FAA Facilities National Airspace Operations, delegates operational responsibility to the NNCCs (located in Hampton, GA, and Salt Lake City, UT) for providing telecommunications services to customers of the national and international networks. The TRMM functions performed by the NNCCs are an extension of the National Operations Control Center (NOCC) responsibilities. The most important feature of the TRMM functions performed by the NNCCs is the change in orientation from the current focus on operating and maintaining individual FAA telecommunications networks, systems, circuits, and paths to providing integrated delivery of telecommunications services to both FAA and non-FAA customers. In particular, the NNCCs have consolidated the Service 'A', Service 'B', and AFTN data communications networks, as well as implemented the packet switching and message switching networks.

At present, the principal tool available to support TRMM at the NNCCs is the Remote Users Monitor System (RUMS), which is a fault isolation system fielded as a NADIN enhancement by the AOP-400 NADIN PSN manager. Subsequent requirements for other systems to have the functional capability provided by RUMS have led to a significant upgrading and expansion of the RUMS as a more universal TRMM tool, with its support coming from the TRMM Program Office.

4-16.1.1 Purpose of the Remote User Monitor System

The Remote User Monitor System (RUMS) provides the NNCCs with the capability to isolate network faults that are having an adverse affect on the ability of the FAA to deliver advertised telecommunications services. Isolating the fault location (ARTCC, Telco, User premises) enables NNCC personnel to contact the relevant restoration organization, coordinate their efforts, and otherwise assist in service restoration procedures. The RUMS capability enables the NNCCs to provide the desirable single point of contact sought by AF and AT managers, as well as other customers/users of the FAA telecommunications networks. The RUMS also provides the NNCC with the capacity to be a centralized monitoring and control facility for all FAA-owned telecommunications networks.

This program is an outgrowth of the remote maintenance monitoring, diagnostic and testing concept that proved successful in the NADIN MSN and PSN environment. The program will establish remote monitoring, diagnostic and test capabilities for all telecommunications networks for which the NNCCs have service delivery mandates.

NOTE: Although the NNCC is responsible for the delivery of services carried by the Data Multiplex Network (DMN), at the present time there is no RUMS capability available for restoration of DMN services. Future plans call for the inclusion of DMN within the NNCC's Remote Users Monitoring System.

4-16.1.2 References

4-16.1.2.1 FAA Order 6000.50, December 1996.

4-16.1.2.2 FAA Telecommunications Strategic Plan, January 1997.

4-16.1.2.3 Telecommunications Service Management Transition Plan, distribution TBD.

4-16.1.2.4 NCP/CCD No.14654.

4-16.2 SYSTEM DESCRIPTION

In its present configuration, the RUMS consists of two master monitoring and control facilities, one at the Salt Lake City (SLC) NNCC and the other at the Atlanta (ATL) NNCC. There are 20 slave facilities located in the CONUS ARTCCs and two located in Alaska and Hawaii. The slave facilities consist of switching equipment and a state-of-the-art protocol analyzer that allows the master facilities to connect into and receive data (level one to four) from any circuit to which it has connectivity.

The RUMS is capable of diagnosing and emulating telecommunication circuit protocols up to and including Open Systems Integration (OSI) Model Levels One to Four. RUMS has the capability of isolating and testing computer telecommunications interfaces as well as isolating and testing the line side of the circuit interface. RUMS can be commanded to trigger on time and event traps. Therefore, the Command and Control Center does not have to be "tied up" while waiting for certain events to occur in the traffic under test. Once the event has occurred, the RUMS will notify the Command and Control Center of the occurrence and the controlling facility can play back the captured data for analysis.

From a telecommunications perspective, the RUMS functional requirements are to support the restoration of failed telecommunication services for FAA's customers/users. RUMS is a non-intrusive system that monitors remotely the circuits between the ARTCCs and customers/users of the networks. RUMS also utilizes intrusive diagnostic and test functions to isolate problems after the monitoring function confirms a service disruption is occurring. The NNCCs perform intrusive functions in coordination with the ARTCC NAS Operations Managers (NOMS).

4-16.2.1 Components

From a telecommunications perspective, the RUMS is made up of three components:

- The master control facilities located at the two NNCCs,
- The switching and analyzer located at each of the ARTCCs,
- A test system located at the William J. Hughes Technical Center (WJHTC) that has dial-up capability to the operating RUMS equipment.

The components, together with their functional connectivity, are shown in Figure 4-16-1.

4-16.2.1.1 Functional Component Interface Requirements

Command and control of the RUMS components located in the ARTCCs are presently accomplished by dial-up circuits between the master control facilities (NNCCs) and the selected ARTCC. Two such interrogations can take place simultaneously from either NNCC. Once a connection has been established, the RUMS function as a remote user of the digital and analog jack panels at the ARTCC.

There are three primary interfaces related to the present RUMS configuration, as discussed in the following paragraphs.

4-16.2.1.1.1 RUMS NNCCs to ARTCCs

This is a dial-up interface between the master control facilities (NNCCs) and modems located in the RUMS cabinet at the ARTCCs. This interface allows the command and control facility to communicate with and control the remote RUMS equipment.

4-16.2.1.1.2 FAATC to ARTCCs

This interface is used to provide second level support. It is a dial-up interface between the RUMS test equipment at the Technical Center and modems located in the RUMS cabinet at the ARTCCs. It provides the connectivity needed by the WJHTC to accomplish its mission of providing a higher level analysis of selected faults.

4-16.2.1.1.3 RUMS Switching Equipment to ARTCCs Digital and V-F Jack Panels

This interface is established between the RUMS switching equipment, located in the RUMS cabinet at the ARTCC, and the Digital and V-F jack panels associated with the targeted network. This interface provides the connectivity for the RUMS monitoring, diagnostic and test functions.

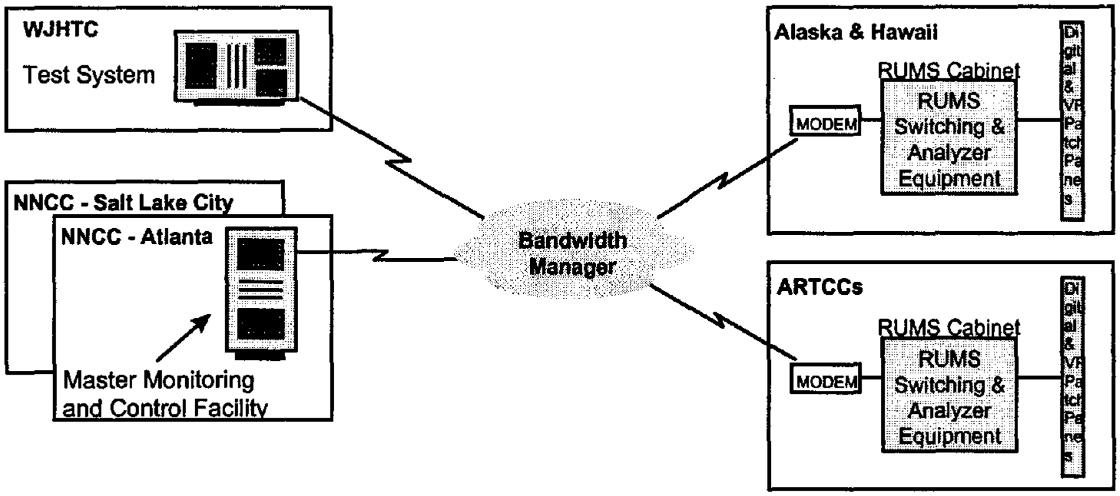

Figure 4-16-1. RUMS Functional Connectivity Diagram

4-16.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

RUMS equipment is capable of accommodating all the speeds and protocols now being used by the FAA-owned networks. Plans call for upgrading the analyzers to accommodate future protocols and speed requirements anticipated by the TIPT. Interface requirements are described in the paragraphs that follow and summarized in Table 4-16-1..

4-16.3.1 Telecommunications Requirements

4-16.3.1.1 RUMS NNCC to ARTCC RUMS Cabinet

This is a dial-up interface between the master control facilities (NNCCs) and modems located in the RUMS cabinet at the ARTCCs.

Future RUMS command and control interface requirements between the NNCCs and the ARTCCs will require a 64kbs BWM channel. To accommodate the BWM connectivity, two master switches (one in each NNCC) must be acquired in order to select the appropriate ARTCC. The present 19.2kbs dial-up circuit will continue to be used as the primary connectivity for Alaska and Hawaii and as a backup for the BWM connectivity in the CONUS facilities. At present, the only diversity requirement is the ability of both NNCCs to address all of the ARTCCs. This will preclude a total loss of command and control functions if a NNCC master control capability is out of service.

Table 4-16-1. RUMS Interface Requirements Summary

SUBSYSTEM INTERFACE		NNCC/FAATC RUMS to ARTCC/CERAP	RUMS Cabinet to Digital Patch Panel	RUMS Cabinet to VF Patch Panel
INTERFACE CONTROL DOCUMENTATION		NADIN Interface Req's Document (IRD)	ST-5	ST-5
	Type Interface:	Internal Interface	External Interface	External Interface
PROTOCOL REQUIREMENTS	Network Layer	TBD	RS-232	RJ-11
	Data Link Layer	BWM	RS-232	RJ-11
	Physical Layer	RS-232	RS-232	RJ-11
	Special Formats/ Codes	CORESCAN	None	None
TRANSMISSION REQUIREMENTS	No. Channels	TBD	TBD	TBD
	Speed (kbps)	19.2 kbps (64kbps)	TBD	TBD
	Simplex Half/Full Duplex	FDX	FDX	FDX
	Service	dial access (BWM)	local cable	local cable
	Restoration Time*	TBD	TBD	TBD
HARDWARE REQUIREMENTS	Modem	TBD	TBD	TBD
	Data Bridge	TBD	TBD	TBD
	Clock	TBD	TBD	TBD
	A/B Switch	TBD	TBD	TBD
	DSC	TBD	TBD	TBD
	Cable/ Miscellaneous	None	Two cables req'd for each Monitored circuit	Two cables req'd for each Monitored circuit

*See FAA Order 6000.36A, Communications Diversity

4-16.3.1.2 RUMS Switching Equipment to ARTCCs Digital and V-F Jack Panels

The RUMS switching equipment at the ARTCC needs connectivity to the Digital and V-F jack panels. For each circuit connected to the RUMS, two sets of two cables are needed to connect the RUMS equipment to the jack panels of the network needing RUMS services. In its present configuration, two printed circuit cards are needed at each ARTCC for each circuit interface connected to the RUMS.

4-16.4 ACQUISITION ISSUES

At its inception, the RUMS was an integral part of the NADIN System. As such, the NADIN Program Office was responsible for fulfilling the hardware and software requirements of the RUMS. As the NADIN networks have expanded and demand for the RUMS services increased, it has become apparent the NADIN Program Office will not provide the necessary resources to support an efficient and effective RUMS operation.

Therefore, a separate program office representing the operational network monitoring needs of the NNCCs has been established. The new TRMM Program Office, operating under the auspices of AOP-400, will provide program office functions, such as acquisition of funding needed to support the ongoing requirements of RUMS and other operational monitoring obligations of the NNCCs not supported by AOP-400 network managers. Further, the TRMM Program Office will be instrumental in providing funding for and acquisition of systems required by telecommunications service management when the NNCCs support network functions in the NIMS environment. This includes securing funding for operational necessities from NIMS program offices, when appropriate.

All interface hardware is provided by the TRMM Program Office.

4-16.4.1 Project Schedules and Status

Table 4-16-2 summarizes the RUMS interface implementation schedule. The RUMS near-term procurement schedule calls for the TRMM Program Office to acquire the necessary printed circuit boards and cables to support the service restoration requirements of the NADIN MSN & PSN networks.

Table 4-16-2. RUMS Interface Implementation Schedule

From	To	Diversity Req'mt	System/Rate/ Miles	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
ARTCC/ CERAP	RUMS NNCS	TBD	BWM 19.2kbps	0	20	0	0	0	0	0	0
RUMS NNCS	ARTCC	TBD	BWM 64 kbps	0	24	0	0	0	0	0	0
ARTCC RUMS Cabinet	VF Jack Panel	TBD	Local Cable X 2	40	0	0	0	0	0	0	0
ARTCC RUMS Cabinet	Digital Jack Panel	TBD	Local Cable X 2	0	0	205	50	50	50	50	50
WJHTC RUMS	ARTCC	TBD	PTSN Dial-up/ 19.2kbps	20	0	0	0	0	0	0	0

4-16.4.2 Planned Telecommunications Strategies

Future strategies, to be funded and implemented by the TRMM Program Office, include obtaining new state-of-the-art protocol analyzers to modernize the RUMS. In addition, a major effort will be made to acquire remote monitoring, control, diagnostic and testing capabilities in the NNCCs for all FAA owned telecommunications networks (i.e., a help desk concept). This effort will include incorporating the DMN within the RUMS environment.

4-16.4.3 Telecommunications Costs

The replacement of the present Protocol Analyzer requires funding by the TRMM Program Office. Present estimates call for an expenditure of approximately $720K (24 units at approximately $30K per unit, includes trade in allowance) plus installation costs.

Further, since it is not possible to predict the exact quantity of connectivity to all networks in any given year, RUMS funding will have to be based on an estimate. The current projection is that each NNCC will establish a minimum of 10 calls per day with each call averaging two hours. At the present time, the costs to connect to one circuit depend on whether there is a need for TMS-64 cards, which are for analog circuits, as well as TMS-16 cards, which are for digital circuits. For example, if the tail circuits are interfacing the DMN network, then only TMS-16 cards are necessary. If any other interface is used, then TMS-64 as well as TMS-16 is necessary. If plans to bring the DMN into the RUMS environment become a reality, only TMS-16 cards will be necessary for interfaces connected to the DMN.

At the present time, an installation consisting of only TSM-16 cards and the associated cables cost approximately $400. If a TMS-64 card is also needed, the cost is about $700. The price includes associated cables, but does not include shipping and labor costs.

Current projections for TRMM costs are provided in Table 4-16-3 and include costs for the TMS-16 cards, cabling, and installation. The cost of acquiring RUMS capability for the DMN at the present time must be put in the TBD category.

Although the individual program offices supply the monitoring and control equipment in support of their programs, there is a requirement for the TRMM PO to support those aspects of the help desk environment not covered by the individual programs. For example, the hardware and software required to support network configuration and reporting obligations and training for help desk operators is provided by the TRMM PO.

Table 4-16-3. Cost Summary Table - TRMM Program

CIP # A-01 All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
NNCCs - RUMS <---> ARTCCs/CERAP								
Cost Profile: Dial-up lines via FTS-2000 and Codex 3261 Fast Modems								
Channel Costs								
Channels Added		0	0	0	0	0	0	0
Total Channels	25	25	25	25	25	25	25	25
F&E Funded Channels		0	0	0	0	0	0	0
OPS Funded Channels		25	25	25	25	25	25	25
F&E Non-recurring Channel Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$30**	**$30**	**$30**	**$30**	**$30**	**$30**	**$30**
Hardware Costs								
Hardware Units Added		0	0	0	0	0	0	0
Total Hardware Units	50	50	50	50	50	50	50	50
F&E Funded Hardware Units		0	0	0	0	0	0	0
OPS Funded Hardware Units		50	50	50	50	50	50	50
F&E Non-recurring Hardware Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Hardware Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$1**	**$1**	**$1**	**$1**	**$1**	**$1**	**$1**
Hardware Costs								
Cost Profile: TMS-16 Cards, Cable, and Installation								
Hardware Units Added		0	227	27	27	27	27	27
Total Hardware Units	0	0	227	254	281	308	335	362
F&E Funded Hardware Units		0	227	0	0	0	0	0
OPS Funded Hardware Units		0	0	25	27	27	27	27
F&E Non-recurring Hardware Costs		**$0**	**$125**	**$15**	**$15**	**$15**	**$15**	**$15**
Recurring Hardware Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$0**	**$15**	**$15**	**$15**	**$15**	**$15**
Hardware Costs								
Cost Profile: Upgraded Analyzers								
Hardware Units Added		24	0	0	0	0	0	0
Total Hardware Units	0	24	24	24	24	24	24	24
F&E Funded Hardware Units		0	0	0	0	0	0	0
OPS Funded Hardware Units		24	0	0	0	0	0	0
Non-recurring Hardware Costs								
F&E Non-recurring HW Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring HW Costs		**$720**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Hardware Costs								
F&E Recurring HW Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring HW Costs		**$0**	**$36**	**$36**	**$36**	**$36**	**$36**	**$36**

Table 4-16-3. Cost Summary Table - TRMM Program Continued

CIP # A-01 All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
Help Desk Costs								
Cost Profile: Recurring Cost of $10K per Year per NNCC								
Help Desk Support Required		2	2	2	2	2	2	2
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$20**	**$20**	**$20**	**$20**	**$20**	**$20**	**$20**
Software Costs								
Cost Profile: Software for Master Switches for NNCCs								
Licenses Sites		2	0	0	0	0	0	0
Total Software Licenses	0	2	2	2	2	2	2	2
F&E Funded Software		0	0	0	0	0	0	0
OPS Funded Software		2	0	0	0	0	0	0
Non-recurring Software Costs								
F&E Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring Costs		**$25**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Software Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$1**	**$1**	**$1**	**$1**	**$1**	**$1**
TRMM Program Management and Engineering (PM&E) Costs								
Cost Profile: AOP Costs for Program Management and Engineering								
Non-recurring Costs								
F&E Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Non-recurring Costs		$200	$220	$242	$266	$293	$322	$354
Recurring Costs								
F&E Recurring Costs (see Note 1)		$100	$150	$225	$394	$591	$886	$975
OPS Recurring Costs		$100	$0	$0	$0	$0	$0	$0

SUMMARY

		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
F&E Totals	Non-recurring	$0	$125	$15	$15	$15	$15	$15
	Recurring	$100	$150	$225	$394	$591	$886	$975
	F&E Total	**$100**	**$275**	**$240**	**$409**	**$606**	**$901**	**$990**
OPS Totals	Non-recurring	$945	$220	$242	$266	$293	$322	$354
	Recurring	$151	$89	$104	$104	$104	$104	$104
	OPS Total	**$1,096**	**$309**	**$346**	**$370**	**$397**	**$426**	**$458**

Notes:

1. Includes funding for risk assessment.

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CHAPTER 5-01 - SUMMARY SHEET

HIGH INTENSITY APPROACH LIGHTING SYSTEM W/SEQUENCED FLASHING LIGHTS (ALSF-2)

Program/Project Identifiers:

Project Number(s):	CIP N-04
Related Program(s):	CIPs, F-18, M-03, M-07, M-20, M-22, M-27, N-03
New/Replacement/Upgrade?	New/Replacement
Responsible Organization:	AND-740
Program Mgr./Project Lead:	Billy Nesmith, AND-740, (202) 493-4764 Manuel Vega, AND-740 , (202) 267-7795
Fuchsia Book POC:	Fred Scheeren, AND-740/SRC, (202) 488-9740 (x125)

Assigned Codes:

PDC(s):	FO
PDC Description:	Approach-Light-Systems Circuits.
Service Code:	VNAV

Cost Estimates *:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$0	$0	$0	$0	$0	$0	$0
Total OPS	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

*Telecommunications costs for support of the ALSF-2 System installation, operations and maintenance will be detailed in regional submissions in the annual request for funds.

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**CIP Category:
Navigation &
Landing**

5-01.0 HIGH INTENSITY APPROACH LIGHTING SYSTEM W/SEQUENCED FLASHING LIGHTS

5-01.1 PROGRAM OVERVIEW

5-01.1.1 Purpose of the High Intensity Approach Lighting System

The High Intensity Approach Lighting System with Sequenced Flashing Lights (ALSF-2) is a landing subelement of the NAS Ground-to-Air (G/A) systems element. It is a visual guidance lighting system consisting of high intensity, steady burning, as well as sequenced flashing lights, used to present approach lighting patterns to landing aircraft on selected Category II/III runways.

The overall program management of the ALSF-2 project is the responsibility of the Navigation and Landing Product Team, AND-740. The Product Team accomplishes management tasks within the guidelines provided by FAA directives. The Team controls the schedule, funding, matrix support, and all technical engineering project activities.

5-01.1.2 References

5-01.1.2.1 NAS-SS-1000, Volume III, 3.1.2.4.c (ALSF-2), December 1986.

5-01.1.2.2 FAA-E-2689a, Dec 9, 1993, Dual Mode High Intensity Approach Lighting System (ALSF-2/SSALR), Notices I and II.

5-01.1.2.3 NAS-MD-790, RMMS Interface Control Document.

5-01.1.2.4 FAA Order 6850.35, ALSF-2 Project Implementation Plan (PIP).

5-01.1.2.5 FAA-E-2782, RMMS Core System/Segment Specification.

5-01.1.2.6 FAA Capital Investment Plan (CIP) No. N-04, January 1999.

5-01.2 SYSTEM DESCRIPTION

The present ALSF-2 population includes several generations of equipment, none of which have Remote Maintenance Monitoring (RMM) capability. Incorporating the Remote Monitoring Subsystem (RMS) in current and future buys will enable maintenance specialists to monitor and control the system from a centralized location through the maintenance processor subsystem (MPS) (also permitting local monitoring and control of the system through a maintenance data terminal (MDT)).

The steady burning light patterns consist of a group of light bars installed symmetrically about the extended runway centerline, starting at the runway approach threshold and extending a distance of 2,400 feet and up to 3,000 feet (i.e., when the approach slope is less than 2.75) outward into the approach zone. The flashing light section of the ALSF-2 will consist of a minimum of 15 flashers. The ALSF-2 operates in two modes: 1) the ALSF-2 mode, and 2) the Simplified Short Approach Lighting System with Runway Alignment Indicator Lights (SSALR) mode.

5-01.2.1 Program/System Components

5-01.2.1.1 Principal Components

The size and configuration of the ALSF-2 is varied to meet operational requirements, terrain features, etc., but all systems have the following major components:

a. The 480 volt input cabinet receives the 480 VAC, three-phase, four wire, 60 Hz, 150 kW primary input power to the substation shelter; provides power distribution to the constant current regulators; and accommodates main power switching, fusing, metering takeoff and system input lightning protection. (Older systems, those prior to the New Bedford Panoramex (NBP) design, receive 2400/4160 VAC, 3-phase, 60 Hz, 150 kW input power through a high voltage input cabinet.)

b. The five constant current regulators distribute 30 kW constant current power to the high voltage output cabinet. (Older, pre-NBP designs distribute power through three 50 kW, constant current regulators.)

c. The high voltage output cabinet distributes regulated power to the five output lighting loops in the ALSF-2 light field, monitors output voltage level and contains shorting disconnects for light field isolation during servicing and maintenance. (Older, pre-NBP designed ALSF-2s distribute power to three (3) lighting loops through the high voltage output cabinet.)

d. The 300, 500, and 1500 watt transformers isolate the PAR-56 lamps from the high voltage current loop and maintain loop integrity in the event of lamp failure.

e. PAR-56 lamp holders receive power from the output lighting loops in the ALS light field. The PAR-56 steady burning lamps are white, green, or red filtered and are aimed into the approach to the runway and away from the runway threshold.

f. The control system consists of the substation control and monitor assembly, which also contains the electronics for operational control, and for distributing status and alarm signals when lamp failures are detected and for switching between ALSF-2 and SSALR modes. It contains the remote monitoring subsystem (RMS) which interfaces the monitor and control subsystem to the MPS and MDT. (Older, pre-NBP designs do not have the capability for remote maintenance monitoring.) It contains the remote electronic chassis, providing an interface between the remote control panel and the substation control and monitor assembly. Its purpose is to perform the electronic functions required by the Airport Traffic Control Tower (ATCT) and the communications link. The control panel provides control functions and status information to the ATCT. A 50 kW transformer provides power to the control and monitor subsystem, the flashers, and substation utilities.

g. The flasher master controller controls flasher intensity and conveys status signals to the remote control panel in the ATCT via the control and monitor subsystem and provides for switching between the ALSF-2 and SSALR modes.

h. Flasher assemblies consist of control cabinets and flasher light units. The flasher light unit emits a bluish-white flash in sequence toward the runway threshold at a rate of twice per second, giving the impression from the air of a white fireball moving rapidly toward the runway threshold. The light unit is adjustable to permit proper alignment and aiming.

i. The aiming device permits field aiming and alignment of the PAR-56 and flasher lamps.

j. The Flasher Tester is a maintenance tool used to test and diagnose the flasher individual control cabinets and to monitor the flasher.

k. The Remote Monitoring Subsystems (RMS) (with the exception of the environmental sensors) are an integral part of the ALSF-2 and consist of the various embedded sensors required for sampling signals from the equipment units, an interface unit to buffer or preprocess the sampled signals, and a data acquisition system for digitizing, formatting, and transmitting the signals to the MPS on a periodic basis or on request. Each ALSF-2 RMS will incorporate a terminal interface, so that when connected to an MDT, the operator can monitor the ALSF-2, record site data, perform fault isolation and diagnostics, and control and adjust system parameters. (Older, pre-NBP ALSF-2s do not have the capability for remote maintenance monitoring.)

5-01.2.1.2 Functional Component Interface Requirements

Operational control of the ALSF-2 is from the control tower, or at unmanned ATCT via the MPS.

5-01.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

Telecommunications requirements vary from location to location, depending on the size and type of FAA facility, availability and practicality of commercial lines/equipment, and installation schedules. Accordingly, the requirements outlined below are generic to current generation ALSF-2 with RMS.

The ALSF-2 performance requirements are detailed in NAS-SS-1000, Volume III, 3.1.2.4.c (ALSF-2), December 1986.

5-01.3.1 Telecommunications Interfaces

5-01.3.1.1 ALSF-2 to RMS

The ALSF-2 with RMS can be monitored by the RMMS described in FAA-E-2782, Remote Maintenance Monitoring System Core System/Segment Specification. The ALSF-2 Interface characteristics are detailed in Table 5-01-1.

Table 5-01-1. ALSF-2 Interface Requirements Summary

SUBSYSTEM INTERFACE		RMS	ATCT
INTERFACE CONTROL DOCUMENTATION		FAA-E-2782 RMMS SS Spec	
PROTOCOL REQUIREMENTS	Network Layer		
	Data Link Layer	RS-232	FSK
	Physical Layer	RS-232	RS-232
	Special Formats/Codes		
TRANSMISSION REQUIREMENTS	No. Channels	2	1
	Speed (kbps)	.110 - 9.6	2.4
	Simplex Half/Full Duplex	FD	
	Service		
HARDWARE REQUIREMENTS	Modem	GFE	FED-STD-2723/GFE
	Data Bridge		
	Clock		
	A/B Switch		
	DCS		
	Cable/ Miscellaneous		

5-01.3.2 Interface Requirements

The MPS interface is in accordance with EIA Standard RS-232 wired as synchronous data terminal equipment (DTE), duplex type D. The data rate across the MPS interface will be 2400 bites per second (bps). The RMS terminals, following RS-232, and wired as asynchronous data interfaces, use even parity and automatically adjust to baud rates of 110, 150, 300, 1200, 2400, 4800, and 9600 bps.

5-01.3.3 Connectivity Requirements

RMS interface to the MPS is by the built-in or GFE modems. Minimum phone line quality in this configuration shall be 3002 (AT&T Tariff FCC-260), conditioned C-2 per Bell System Technical Reference Publication 41001 or equivalent (or if using AT&T Tariff 9,10,11, the current line equivalent is channel type 5 conditioned C-2 with protocol type "NO" of AT&T Publication 43202. The line may be unconditioned (basic) if the modems can still transmit 2400 bps at an acceptable bit error rate.

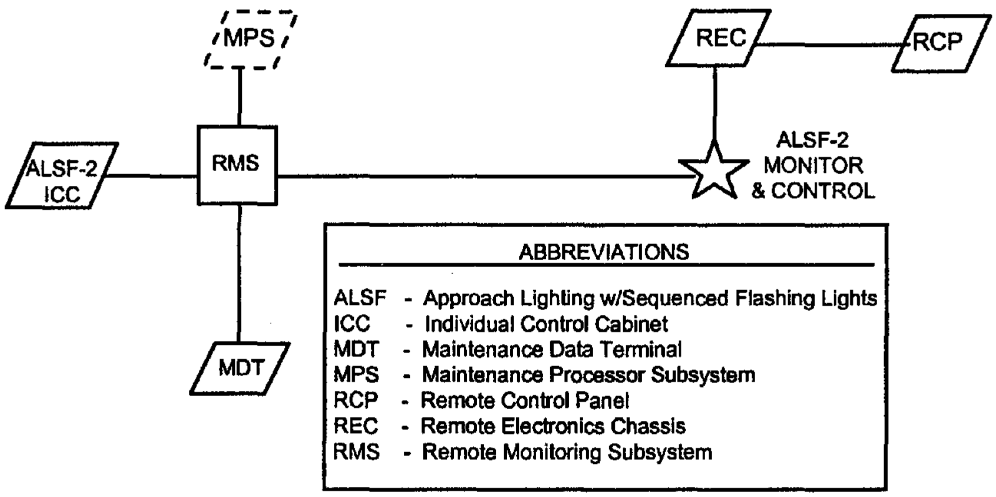

Figure 5-01-1. ALSF-2 Functional/Physical Interfaces

ALSF-2 with RMS functional/physical interfaces are illustrated in Figure 5-01-1. Besides the interface characteristics above, the DTE interface will have the capability to use an external modem meeting the requirements of FED-STD-2723. Data rates across the DTE interface shall be programmable to 2400, 4800, 9600, and 19,200 bps.

Protocol requirements are defined in NAS-MD-790, June 10, 1986.

5-01.3.4 Diversity Requirements

There are no diversity requirements for this program.

5-01.4 ACQUISITION ISSUES

5-01.4.1 Program Schedule and Status

A contract was awarded on September 24, 1993, to New Bedford Panoramex of Upland, CA. The initial award was for a First Article plus 18 Production Units, with site spares, parts peculiar and training material. Two options totaling thirty additional systems with site spares, parts peculiar and training material have been exercised to bring the total to 49 systems. Thirty-seven sites have been selected so far.

Table 5-01-2. Acquisition Schedule

	PRIOR YEARS	FY00	FY01	FY02	FY03	FY04	FY05	FY06
ALSF-2	37	12	0	0	0	0	0	0

5-01.4.2 Planned Telecommunications Strategies

Installation planning is accomplished at the Regional level.

5-01.4.3 Telecommunications Costs

Telecommunications costs for support of the ALSF-2 System installation and operations and maintenance with be detailed in regional submissions in the annual call for funds. Funding will be in accordance with FAA Order 2500.8A.

Required hardware is included with the procurement of the ALSF-2 systems. Equipment which may be required to meet specific conditions, but is not furnished, is listed in FAA Order 6850.35, ALSF-2 Project Implementation Plan (PIP).

CHAPTER 5-02 - SUMMARY SHEET

INSTRUMENT LANDING SYSTEM I/II/III (ILS CAT I/II/III)

Program/Project Identifiers:

Project Number(s):	CIP N-03
Related Program(s):	CIPs F-03, F-10, F-11, M-03, M-07, M-15, M-21, M-27, N-04, N-08, N-09, N-10, N-12, R,E&Ds 032-110, 032-120
New/Replacement/Upgrade?	New/Replacement/Upgrade
Responsible Organization:	AND-740
Program Mgr./Project Lead:	William McPartland, AND-740, (202) 493-4762 Manuel Vega, AND-740, (202) 267-7795
Fuchsia Book POC:	Fred Scheeren, AND-740/JIL, (202) 488-9740 (x125)

Assigned Codes:

PDC(s):	FC
PDC Description:	ILS Terminal NAVAID Circuits
Service Code:	TNAV

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$43	$4	TBD	TBD	TBD	TBD	TBD
F&E Recurring	$187	$16	$0	$0	$0	$0	$0
Total F&E	**$230**	**$20**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$538	$709	$725	$725	$725	$725	$725
Total OPS	**$538**	**$709**	**$725**	**$725**	**$725**	**$725**	**$725**

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CIP Category: Navigation & Landing 	5-02.0 INSTRUMENT LANDING SYSTEM I/II/III

5-02.1 PROGRAM OVERVIEW

The Mark (Mk) 20 Instrument Landing System (ILS) is designed to provide Category I, Category II, and Category III precision approaches at designated replacement, establish, and upgrade locations. The Mk 20 design and equipment features are identical for all categories of operation.

5-02.1.1 Purpose of the Instrument Landing System

The Mk 20 will satisfy all Category I, II and III ILS replacement, establish, and upgrade requirements in the National Airspace System (NAS) through at least 1999. ILSs to be replaced by the Mk 20 include the obsolete Mark 1A Category I ILS, all AN/GRN-27 Category I, II and III ILSs, and up to 25 older Wilcox Category III ILSs. Establish Category I, II and III ILS requirements approved by the Congress will be met with Mk 20s. Upgrade locations will have their requirements satisfied by replacing existing ILS equipment with Mk 20 equipment to provide the required approach capability.

The overall program management of the MK 20 ILS project is the responsibility of the Navigation and Landing Product Team, AND-740. The Product Team accomplishes management tasks within the guidelines provided by FAA directives. AND-740 controls the schedule, funding, matrix support, and all technical engineering project activities.

5-02.1.2 References

5-02.1.2.1 FAA Capital Investment Plan (CIP) No. N-03, January 1999.

5-02.1.2.2 NAS-SS-1000, Volume I, 3.1.1.1.1.6.1a (ILS).

5-02.1.2.3 NAS-SS-1000, Volume III, 3.2.1.4.1.1 (ILS).

5-02.1.2.4 FAA-E-2852, Specification: Category II/III Instrument Landing System.

5-02.2 SYSTEM DESCRIPTION

The Mark 20 Instrument Landing System contains all elements required to meet Category I, Category II, and Category III operational requirements. The localizer and glide slope are dual equipment. The standby transmitting equipment is operational at all times to meet changeover time requirements and monitored to ensure it is operating satisfactorily. Marker beacon subsystems are single equipment as they are not critical with respect to landing minimums. All subsystems operate with battery backup to ensure continued operation if primary power is lost.

Remote status monitoring and control of the Mk 20 subsystems is provided by Remote Indicator and Control Equipment (RICE) located in the airport control facility, typically an Airport Traffic Control Tower. The RICE provides subsystem status and interlock control to controllers and maintenance personnel. Co-located with the RICE is the Link Control Unit (LCU) that provides connectivity between the Remote Maintenance Subsystem (RMS) contained in the localizer, glide slope and marker beacon subsystems and a remote Maintenance Processor System (MPS).

5-02.2.1 Program System Components

5-02.2.1.1 Principal Components

The MK 20 ILS consists of the following major elements:

- VHF Localizer Subsystem (LOC) - The localizer provides a precision course and lateral guidance in the azimuthal plane directed along the centerline of the runway toward the direction of the approaching aircraft.

- UHF Glide Slope Subsystem (GS) - The glide slope transmits precision vertical guidance along the approach course defined by the localizer.

- VHF I Marker Beacon (MB) Subsystems - The marker beacons, located on the extended runway centerline, generate "over the station" patterns received by overflying aircraft to mark positions along the approach localizer course.

- Localizer Far Field Monitor (FFM) - The far field monitor is located at the inner and/or middle marker site and monitors deviation of the localizer course. If the course deviates beyond category III and/or II limits for predetermined periods, the localizer will transmit course out-of-tolerance information to the RICE to alert controllers.

- Remote Indication and Control Equipment (RICE) - The RICE, located in the airport control facility, provides status monitoring and control of the Mk 20 based upon data received from each subsystem. Based upon the status of the localizer and glide slope subsystems, the RICE generates a Mk 20 “category” display for controllers.

- Link Control Unit (LCU) - The LCU, located in the airport control facility, serves as a data concentrator and link controller to the Maintenance Processor System for Remote Maintenance Monitoring data received from each Mk 20 subsystem.

- Portable ILS Receiver (PIR) - Test equipment for the localizer, glide slope and marker beacon subsystems.

The Mk 20 is the first ILS that incorporates Remote Maintenance Monitoring (RMM) into its basic design to facilitate status monitoring and control of each subsystem (localizer, glide slope, and marker beacons). Local status monitoring and control of the Mk 20 is provided by Remote Indication and Control Equipment (RICE) located in the Airport Traffic Control Tower (ATCT) or Terminal Radar Approach Control (TRACON). Remote status monitoring and control is made possible by provision of a Link Control Unit (LCU) that interconnects to a work center Maintenance Processor Subsystem (MPS).

The Mk 20 ILS utilizes dual transmitter and monitor equipment in the localizer and glide slope subsystems to meet high reliability and availability requirements for category II and III operation. Inner, middle and outer marker beacon reliability requirements are met with single equipment. Two FFM receivers located at the inner and/or middle marker beacon monitor the integrity of the localizer course for category II and III operation. Each Mk 20 subsystem contains a Remote Monitoring Subsystem (RMS) that monitors equipment and transmits the data locally to a logged-on Maintenance Data Terminal (MDT) or remotely to the Mk 20's Link Control Unit (LCU) located in the airport traffic control tower. Each Mk 20 subsystem receives, and responds to, commands initiated at the RICE or LCU.

5-02.2.1.1.1 Functional Component Interface Requirements

5-02.2.1.1.2 Subsystem Communications

Ten circuits are needed to interconnect the Mk 20 subsystems (localizer, glide slope, and three marker beacons) to the RICE and the LCU. Two circuits are required to connect the Far Field Monitor (FFM) to the localizer (for monitoring the FFM receiver), and one circuit is required to provide connectivity between the LCU and the MPS.

Circuit requirements between the RICE and LCU and all subsystems except the outer marker beacon can be satisfied with on-airport buried land lines. On-airport landlines can also provide the connectivity between the FFM receivers and the localizer subsystem. Telephone company (TELCO) circuits are required between the outer marker and the RICE and LCU, and between the LCU and the MPS. If the airport telecommunications infrastructure can not provide voice grade quality of service, the connectivity requirements may be satisfied using telco or other means as long as the performance requirements are met. The remote monitoring capability is mandatory for integrity monitoring and hence, the connectivity must be provided.

5-02.2.1.1.3 Performance Requirements

The Mark 20 ILS performance requirements are detailed in NAS-SS-1000, Volume III, and FAA-E-2852b.

The Mk 20 functional/physical interfaces are illustrated in Figure 5-02-1.

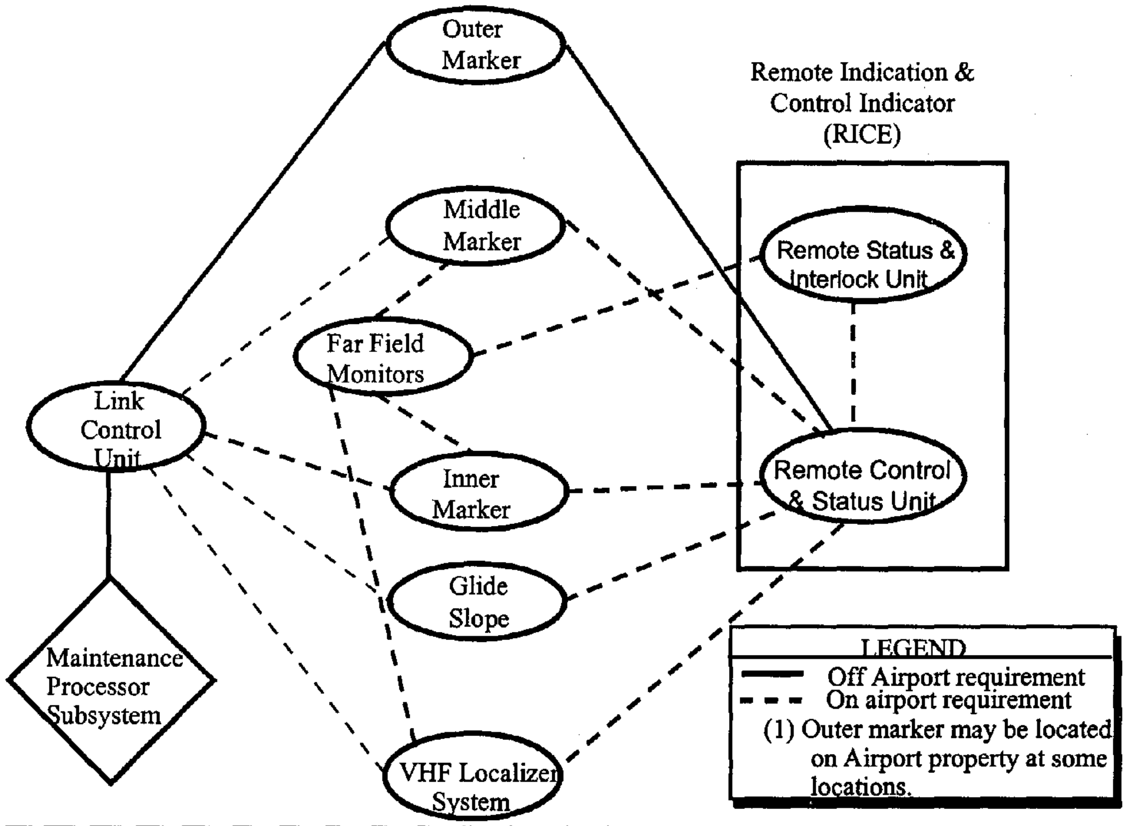

Figure 5-02-1. Mark 20 Instrument Landing System Interfaces

5-02.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

5-02.3.1 Telecommunications Interfaces

Protocol, transmission, and hardware requirements related to the interfaces are summarized in Table 5-02-1.

5-02.3.1.1 Instrument Landing System to Link Control Unit

5-02.3.1.1.1 Interface Requirements

The Remote Maintenance Subsystem (RMS) in each ILS subsystem (localizer, glide slope and three marker beacons) interfaces to the LCU located in the airport control facility. This interface provides the transmission path for the exchange of data including function commands, performance parameter status, alarm and alert status. The interface also facilitates the use of fault isolation diagnostics at each subsystem.

5-02.3.1.1.2 Connectivity Requirements

Protocol requirements for generation of message formats are defined in NAS-MD-790. The protocol used to control the data link between the LCU and ILS subsystem RMS is in accordance with ANSI X3.66, American Standard for Advanced Data Communication Control Procedures.

The LCU to ILS subsystem RMS interface requirement is in accordance with EIA Standard RS-232. A built-in modem, which meets the requirements of CCITT V.22 bus for data transmission, is provided in each subsystem and the LCU.

5-02.3.1.1.3 Traffic Characteristics

The LCU and each ILS subsystem RMS terminal interface operate as a two-wire, voice-grade line, asynchronous channel at a rate of 2400 bps.

Table 5-02-1. Mark 20 ILS Interface Requirements Summary

SUBSYSTEM INTERFACE		ILS to LCU or RCSU	LCU to MPS (Concentrator)
INTERFACE CONTROL DOCUMENTATION		NAS-MD-790 NAS-SS-1000	NAS-MD-790 NAS-SS-1000
PROTOCOL REQUIREMENTS	Network Layer		
	Data Link Layer	ANSI X3.66	
	Physical Layer	RS-232	RS-232
	Special Formats/ Codes		
TRANSMISSION REQUIREMENTS	No. Channels	1	1
	Speed (kbps)	2.4 kbps	2.4 - 19.2 kbps
	Simplex Half/Full Duplex	FD 2-Wire Asynchronous	FD 4-Wire Synchronous
	Service	VG-8	VG-8
HARDWARE REQUIREMENTS	Modem	V.22	
	Data Bridge		
	Clock		
	A/B Switch		
	DSC		
	Cable/ Miscellaneous		

5-02.3.1.2 ILS Subsystem to Remote Control and Status Unit

Each ILS subsystem interfaces to the Remote Control and Status Unit (RCSU). This interface provides the transmission path for control status and commands to all subsystems and status data from all subsystems to the RCSU. The Portable Maintenance Data Terminal (PMDT) also interfaces to the RCSU to enable entry of configuration data.

5-02.3.1.2.1 Interface Requirements

Protocol information used to accomplish the data link between the RCSU and each subsystem is specified in design documentation to support the design of the interface assemblies.

5-02.3.1.2.2 Connectivity Requirements

A dedicated two-wire voice-grade line between the RCSU located in the airport control facility (typically the ATCT equipment room) and each ILS subsystem provides the data link transmission. The data transmission rate is 2400 bps. Built-in modems at each subsystem and at the RCSU will be used for data transmission at 2400 bps.

5-02.3.1.3 Link Control Unit to Maintenance Processor Subsystem

The purpose of this interface is maintenance polling, control, and status data exchange at a data rate of up to 19,200 bps. This interface provides a central point for communication between a MPS and the ILS RMS. The LCU manages communications to each subsystem's RMS and periodically outputs the data to the MPS on a dedicated circuit.

5-02.3.1.3.1 Interface Requirements

Protocol requirements for generating the message formats to the LCU interface and the MPS interface are defined in NAS-MD-790. This interface must comply with NAS-SS-1000.

5-02.3.1.3.2 Connectivity Requirements

The interface requires a four-wire, full-duplex telephone line between the LCU and the MPS. This line must support two-way communication at rates of 2,400 bps to 19,200 bps.

The LCU interface is configured in accordance with EIA Standard RS-232 wired as synchronous Data Terminal Equipment (DTE). Modems are required. Modem electrical and mechanical interface characteristics are RS-232.

5-02.3.2 Diversity Requirements

There are no telecommunications diversity requirements for the Mk 20 program.

5-02.4 ACQUISITION ISSUES

The Mark 20 ILS contract was awarded in September 1991. The contract currently calls for delivery of 186 systems under Facility and Equipment (F&E) Procurement Contract No. DTFA01-91-C-00035. Options are available through December 1998. Equipment shelters and portable maintenance data terminals are not included in the contract.

5-02.4.1 Program Schedule and Status

Production of the Mark 20 ILS began in February 1995 at a rate of five systems per month. All systems were delivered by February 1998, 179 to airport installation sites, and seven to the FAALC for Product Team control. Three additional systems were procured under the contract option in 1999 for airport installation sites. Table 5-02-2 lists the site installation schedule for the Mark 20 ILS.

Table 5-02-2. Site Installation Schedule

SITE INSTALLATION	PRIOR YEARS	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
Mark 20 ILS	158	16	1	1	2	4	TBD	TBD

5-02.4.2 Planned Telecommunication Strategies

Mk 20 ILSs were shipped from the manufacturer on a priority basis developed in concert with installation schedules coordinated with regional associate program managers. This schedule satisfied all regions' replacement requirements for AN/GRN-27 and selected older Wilcox Category III and Mk 1A, as well as approved established and upgrade projects. This implementation strategy was designed to ensure sufficient delivery flexibility so the Mk 20 project engineer can quickly respond to changing regional requirements.

5-02.4.3 Telecommunications Costs

The Mk 20 program is required to fund the initial cost of new telecommunications requirements associated with installation of new establishment Mk 20 ILSs. Funding will be in accordance with FAA Order 2500.8A.

Table 5-02-2 summarizes recurring and non-recurring costs of the Mk 20 program.

Table 5-02-2. Cost Summary - Mark 20 ILS

CIP # N-03	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
ILS Subsystem <---> LCU or RCSU									
	Cost Profile: LINCS A -B / DMN / VG-8 (2.4 kbps) Circuits								
Channel Costs									
	Sites Added		16	1	1	2	4	TBD	TBD
	Total Sites	158	174	175	176	178	182	186	186
	Channels Added		14	TBD	TBD	TBD	TBD	TBD	TBD
	Total Channels	633	647	647	647	647	647	647	647
	F&E Funded Channels		167	14	0	0	0	0	0
	OPS Funded Channels		480	633	647	647	647	647	647
	F&E Non-recurring Channel Costs		**$43**	**$4**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**
	Recurring Channel Costs								
	F&E Recurring Costs		**$187**	**$16**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$538**	**$709**	**$725**	**$725**	**$725**	**$725**	**$725**
Hardware Costs			*N/A - ILS System has Built-in Modems*						

SUMMARY

		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
F&E Totals	Non-recurring	$43	$4	TBD	TBD	TBD	TBD	TBD
	Recurring	$187	$16	$0	$0	$0	$0	$0
	F&E Total	**$230**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**
OPS Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$538	$709	$725	$725	$725	$725	$725
	OPS Total	**$538**	**$709**	**$725**	**$725**	**$725**	**$725**	**$725**

CHAPTER 5-03 SUMMARY SHEET

MEDIUM INTENSITY APPROACH LIGHTING SYSTEM WITH RUNWAY ALIGNMENT INDICATOR LIGHTS (MALSR)

Program/Project Identifiers:

Project Number(s):	CIP N-04
Related Program(s):	CIPs, F-18, M-03, M-07, M-20, M-22, M-27, N-03
New/Replacement/Upgrade?	New/Replacement
Responsible Organization:	AND-740
Program Mgr./Project Lead:	Seth Couslar, AND-740, (202) 493-4756 Manuael Vega, Product Lead, (202) 267-7795
Fuchsia Book POC:	Fred Scheeren, SRC/AND-740, (202) 488-9740 (x125)

Assigned Codes:

PDC(s):	FO
PDC Description:	Approach-Lighting-Systems Circuits.
Service Code:	VNAV

Cost Estimates *:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$0	$0	$0	$0	$0	$0	$0
Total OPS	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

*Telecommunications costs for support of MALSR installation, operations and maintenance will be detailed in regional submissions in the annual request for funds.

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**CIP Category:
Navigation &
Landing**

5-03.0 MEDIUM INTENSITY APPROACH LIGHTING SYSTEM WITH RUNWAY ALIGNMENT INDICATOR LIGHTS

5-03.1 PROGRAM OVERVIEW

5-03.1.1 Purpose of the Medium Intensity Approach Lighting System

The Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) is a landing sub-element of the National Airspace System (NAS) Ground-to-Air (G/A) systems element. It is a visual guidance lighting system consisting of a combination of steady-burning and sequentially flashing lights, appropriate control devices, and Remote Monitoring Subsystem (RMS), providing the pilot with visual information on runway alignment, height perception, roll guidance, and horizontal reference on Category I runways.

The overall program management of the MALSR project is the responsibility of the Navigation and Landing Product Team, AND-740. The Product Team accomplishes management tasks within the guidelines provided by FAA directives. The Team controls the schedule, funding, matrix support, and all technical engineering project activities.

5-03.1.2 References

5-03.1.2.1 NAS-SS-1000, Volume III, 3.1.2.4.d. (MALSR), December 1986.

5-03.1.2.2 FAA Order 6850.29, PIP for the MALSR w/RMS.

5-03.1.2.3 NAS-MD-790, Rev A, June 30, 1992.

5-03.1.2.4 FAA Capital Investment Plan (CIP) N-04, January 1999.

5-03.2 SYSTEM DESCRIPTION

5-03.2.1 Program/System Components

The presents MALSR population is made up of several generations of equipment, of which a limited amount has a Remote Maintenance Monitoring (RMM) capability. This situation makes total population failure prediction difficult. Incorporating the RMS in all new MALSRs will improve reliability as well as system longevity. There are no current plans to retrofit older MALSRs with RMS.

5-03.2.1.1 Principal Components

The MALSR consists of two lighting sections, controls, transformers, RMS, etc. The first section, called the Medium Intensity Approach Lighting System (MALS) is seven, five-light bars installed on the extended runway centerline. Two additional five-light bars are located, one on each side of the centerline bar, 1000 feet from the runway threshold, forming a crossbar. A row of 18 green filtered threshold lights is located within ten feet of the threshold. When turned on, the MALS lights are steady burning. The second section is the Runway Alignment Indicator Lights (RAIL) consisting of five sequenced flashers on the extended runway centerline, the first located 200 feet from the approach end of the MALS. Successive units are located at 200-feet intervals. These lights flash in rapid sequence, giving the impression of a ball of light moving toward the runway at a high rate of speed.

a. The white MALS light-bar lights are 120v, PAR-38 spot lamps; the green-filtered threshold lights are 300-watt, PAR-56 lamps. RAIL is described below.

b. The control cabinet is an outdoor enclosure that accepts the 120/240v, 60Hz, 3-wire input power required, that provides power to the 15 kilovoltampere (KVA) power transformer and to the individual control cabinets (ICC). The control cabinet also provides signal intensity and timing sequence, accepts local or remote operation direction (if so equipped), and interfaces test points and control signals.

c. The sequenced flasher assemblies consist of flasher light units and individual control cabinets containing the power supply and triggering circuitry.

d. The junction box interfaces the power and control signals from the control cabinet to the individual control cabinets.

e. The power transformer unit provides three intensity steps for the steady burning lights.

f. The flasher tester is used to verify the performance of any functional module in the individual control cabinet, including line voltages, control signals, power and triggering circuits.

g. The aiming device for the lights and flasher units permits field aiming within one degree of actual angle.

h. The Remote Monitoring Subsystem preprocesses the monitored signals from the current sensors and MALSR control cabinet and transmits the digitized data to a centralized Link Control Unit (LCU). With a modification kit, it can monitor the function of an air-to-ground receiver.

i. The Link Control Unit is a central communication point that manages all communications between the Maintenance Processor Subsystem (MPS) and equipment RMSs. It also can directly interface with maintenance Data Terminal (MDT).

j. At ATCTs, control may be provided via the ground-to-ground Remote (Radio) Control System (RRCS), a switch in the control cabinet or, if the airport is unmanned, via the air-to-ground VHF radio from an aircraft.

5-03.2.1.2 Functional Component Interface Requirements

Functional interfaces are illustrated in Figure 5-03-1.

5-03.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

Telecommunications requirements vary from location to location, depending on the size and type of FAA facility, availability and practicality of commercial lines/equipment, and installation schedules. Accordingly, the requirements outlined below are generic to current generation MALSRs with RMS.

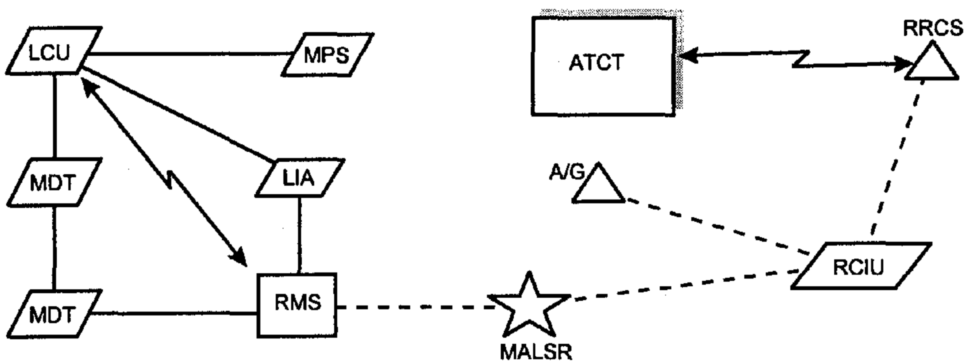
The MALSR, when equipped with an optional A/G receiver, will provide the capability to receive VHF radio transmissions to turn on and increase the intensity.

MALSR performance requirements are detailed in NAS-SS-1000, Volume III, 3.1.2.4.d (MALSR), December, 1986.

5-03.3.1 Telecommunications Interfaces

5-03.3.1.1 MALSR (with RMS) to RMS

The MALSR with RMS can be monitored by the RMMS described in FAA-E-2750/1/2/4, Remote Maintenance Monitoring System Core System/Segment Specification. Its other major interface point will normally be the Remote Control Interface Unit described in FAA-E-2663, Interface Unit MALSR Remote Control.



LEGEND	
A/G	- Air-to-Ground
ATCT	- Airport Traffic Control Tower
MALSR	- Medium Intensity Approach Lighting System w/Runway Alignment Indicator Lights
LCU	- Link Control Unit
LIA	- Link Interface Adapter
MDT	- Maintenance Data Terminal
MPS	- Maintenance Processor Subsystem
RCIU	- Remote Control Interface Unit
RMS	- Remote Monitoring Subsystem
RRCS	- Remote Radio Control System

Figure 5-03-1. MALSR Functional/Physical Interfaces

5-03.3.1.1.1 Interface Requirements

Interface of the Link Control Unit (LCU) with the RMS units is via built-in modems and the GFE radio links or a direct wire connection via a line interface adapter. Frequencies assigned are site-dependent. The technical characteristics of the interfaces are summarized in Table 5-03-1.

Table 5-03-1. MALSR Interface Requirements Summary

SUBSYSTEM INTERFACE		RMS	RCIU
INTERFACE CONTROL DOCUMENTATION		FAA-E-2750/1/2/4	FAA-E-2663 RCIU
PROTOCOL REQUIREMENTS	Network Layer	RS-232	TBD
	Data Link Layer	TBD	TBD
	Physical Layer	TBD	TBD
	Special Formats/ Codes	TBD	TBD
TRANSMISSION REQUIREMENTS	No. Channels	1	1
	Speed (kbps)	110 to 9.6	
	Simplex Half/Full Duplex	HD	HD
	Service		
HARDWARE REQUIREMENTS	Modem	GFE	GFE
	Data Bridge		
	Clock		
	A/B Switch		
	DSC		
	Cable/ Miscellaneous	GFE Radio Link	MALSR PIP

The MPS interface meets EIA Standard RS-232 wired as a synchronous, Data Terminal Equipment (DTE), duplex, type D interface with a data rate of 2400 bps. The DTE interface shall have the capability to use either the built-in modem for transmission or an external modem meeting the requirements of FED-STD-1005, less paragraphs 2.2 and 2.4, with data rates across the interface programmable from 2,400 to 19,200 bps.

5-03.3.1.1.2 Connectivity Requirements

Data interface between the LCU and each equipment RMS is a half-duplex, 2400 bps, multipoint data radio link. Provision to operate via point-to-point, half-duplex, two-wire phone line is also available by means of wirestrapping. Minimum phone line quality in this configuration will be 3002 (AT&T Tariff FCC-260) per Bell System Technical Reference Publication 41004, or equivalent. (Since AT&T FFC-260 has been replaced by AT&T Tariff 9, 10, 11, the current line equivalent is channel 5 conditioned C-2 with protocol type "NO" of AT&T publication 43202.) The line may be unconditioned (basic) if the modems can still transmit 2400 bps at an acceptable bit error rate. FAA Order 6000.22A, dated 12/30/96, replaces the AT&T standard.

5-03.3.1.1.3 Traffic Characteristics

As is the case with the MPS, the LCU and RMS terminal interfaces use even parity and automatically adjust to seven common bit rates (110 to 9600). ASCII characters received via the terminal interface shall also be echoed as they are received.

5-03.3.1.2 MALSR to RRCS

The RCIU provides the MALSR with connectivity to the Remote (Radio) Control System (RRCS). The RRCS is an external remote control system that provides MALSR control to an operator in the ATCT. (The RCIU is not provided with the MALSR and must be purchased separately.)

5-03.3.1.3 MALSR to RCE

The RCIU also provides the MALSR with connectivity to the Radio Control Equipment (RCE). The RCE provides control to the pilot of the MALSR at an unattended facility via an A/G receiver. (The RCIU is not provided with the MALSR and must be purchased separately.)

5-03.3.2 Diversity Requirements

Diversity requirements have not been identified for this program.

5-03.4 ACQUISITION ISSUES

5-03.4.1 Program Schedule and Status

The contract was for 59 systems in the base year and 21 systems in the first option year. Future requirements will be determined by urgency and funding availability. Systems were shipped directly to installation sites and others were shipped to the FAALC for draw down to meet regional requirements.

Table 5-03-2. Acquisition Schedule

	PRIOR YEARS	FY00	FY01	FY02	FY03	FY04	FY05	FY06
MALSR	80	0	TBD	TBD	TBD	TBD	TBD	TBD

5-03.4.2 Planned Telecommunications Strategies

Installation planning is accomplished at the Regional level.

5-03.4.3 Telecommunications Costs

Telecommunications costs for support of the MALSR System installation and operations and maintenance will be detailed in regional submissions in the annual call for funds and will be in accordance with FAA Order 2500.8A.

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CHAPTER 5-04 - SUMMARY SHEET

PRECISION APPROACH PATH INDICATOR SYSTEM (PAPI)

Program/Project Identifiers:

Project Number(s):	CIP N-04
Related Program(s):	CIPs, F-18, M-03, M-07, M-20, M-22, M-27 N-03
New/Replacement/Upgrade?	New/Replacement (VASI)
Responsible Organization:	AND-740
Program Mgr./Project Lead:	Seth Couslar, AND-740, (202) 493-4756 Manuel Vega, AND-740, (202) 267-7795
Fuchsia Book POC:	Fred Scheeren, SRC/AND-740, (202) 488-9740 (x125)

Assigned Codes:

PDC(s):	FL
PDC Description:	Visual NAVAIDS and Airport Lighting Circuits (VASI, REIL, etc.)
Service Code:	VNAV

Cost Estimates *:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$0	$0	$0	$0	$0	$0	$0
Total OPS	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

*Telecommunications costs for support of PAPI installation, operations and maintenance will be detailed in regional submissions in the annual call for funds.

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CIP Category: Navigation & Landing

5-04.0 PRECISION APPROACH PATH INDICATOR SYSTEM (PAPI)

5-04.1 PROGRAM OVERVIEW

5-04.1.1 Purpose

The Precision Approach Path Indicator (PAPI) is a landing sub-element of the National Airspace System (NAS) Ground-to-Air (G/A) systems element. It provides the pilot with visual descent guidance during a non-precision approach; PAPI presents the descending aircraft with an on-glidepath signal of two whites and two red high intensity lights. Deviations from the correct glidepath produce different light patterns to alert the pilot.

The overall program management of the PAPI project is the responsibility of the Navigation and Landing Product Team, AND-740. The Product Team accomplishes management tasks within the guidelines provided by FAA directives and controls the schedule, funding, matrix support, and all technical engineering project activities.

5-04.1.2 References

5-04.1.2.1 NAS-S-1000, Volume III, 3.1.2.4.i. (PAPI), December 1986.

5-04.1.2.2 FAA-E-2756, Four Box Precision Path Indicator System Specification.

5-04.1.2.3 FAA-E-2782, Remote Monitoring System Core System/Segment Specification.

5-04.1.2.4 NAS-SS-1000, Volume III, FAA-E-2756, and FAA-E-2782.

5-04.1.2.5 Capital Investment Plan (CIP) N-04, January 1999 (Formerly 24-09).

5-04.2 SYSTEM DESCRIPTION

The first PAPI contract for 90 systems, including provision for future installation of Remote Monitoring Subsystem (RMS), was awarded in October 1985. A follow-on letter contract provided modification kits for field installation. Subsequent contracts for PAPI systems included imbedded RMS.

5-04.2.1 Program/System Components

5-04.2.1.1 Principal Components

The PAPI with RMS consists of four lamp housing assemblies (LHAs), a power and control assembly, a remote monitoring subsystem, an A/G receiver/controller unit (when required), and an aiming instrument set. The Link Control Unit (LCU) (when required) consists of one rack-mounted unit installed at a remote location in a protected environment, usually at the airport.

- The LHAs each contains three lamps and filters arranged in a bar perpendicular to and typically on the left side of the runway approach end. The optical system is factory set (or calibrated) and requires no adjustment. The LHAs are installed on a rigid mounting base with frangible, adjustable legs, which permits aiming the LHA from horizontal to 6 degrees up angle.

- The Power and Control Assembly (PCA) is a self-cooled unit in a cabinet installed on frangible couplings. The PCA contains all power and control components, including terminal blocks, photoelectric switching circuitry to control light intensity, a rotatable photosensing device mounted on the top of the cabinet, and a current control device to provide constant root mean square load current through the lamps of the LHA.

- The PAPI Remote Monitoring Subsystem consists of voltage and current sensors and hardware necessary to route required samples of signals and control functions. It also consists of a data acquisition system with terminal interfaces and provisions for interface with a Government Furnished Equipment (GFE) radio link for communication with a Link Control Unit (LCU).

- The LCU consists of a direct current (DC) power supply, a radio operating in the ultra high frequency (UHF) band, a Versa Module Eurocard (VME) bus interface card cage, and data links (consisting of a Maintenance Processor Subsystem (MPS) interface, the LCU-to-RMS multipoint data link, and terminal interface). It is designed to provide connectivity with up to 10 low data rate systems with RMSs at the same airport location; this capacity can be doubled with an expansion kit.

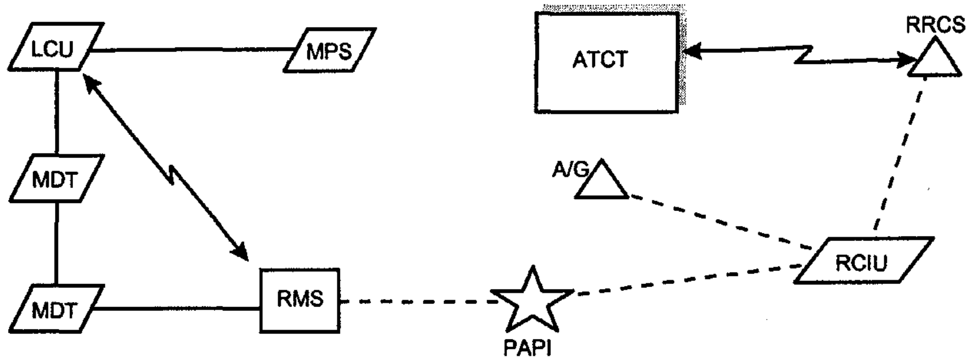
5-04.2.1.2 Functional Component Interface Requirements

Ground control of the PAPI will primarily be from the tower. Should the airport be unmanned, operational control will be given directly to the pilot through the use of the aircraft very high frequency (VHF) transmitter. This occurs when the PAPI is switched from the ground-to-ground (G/G) mode to the air-to-ground (A/G) mode.

5-04.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

Telecommunications requirements vary from location to location, depending on the size and type of FAA facility, availability and practicality of commercial lines/equipment, and installation schedules. Accordingly, the requirements outlined below are generic to the current generation of PAPIs with RMS.

PAPI with RMS functional/physical interfaces are illustrated in Figure 5-04-1.



LEGEND	
A/G	- Air-to-Ground
ATCT	- Airport Traffic Control Tower
LCU	- Link Control Unit
MDT	- Maintenance Data Terminal
MPS	- Maintenance Processor Subsystem
PAPI	- Precision Approach Path Indicator
RCIU	- Remote Control Interface Unit
RMS	- Remote Monitoring Subsystem
RRCS	- Remote Radio Control System

Figure 5-04-1. Precision Approach Path Indicator Interfaces

5-04.3.1 <u>Telecommunications Interfaces</u>

The PAPI with RMS can be monitored by the RMMS described in FAA-E-2782. Its other major interface points have not yet been defined; however, the PAPI will interface through existing Link Control Units (LCU) with the Maintenance Control Center (MCC) and with the Remote Radio Control System (RRCS). The summary of the PAPI System interfaces is presented in Table 5-04-1.

The PAPI, when equipped with an optional A/G receiver, will provide the capability to receive VHF/UHF radio transmissions to turn the system on/off and control lighting intensity at unmanned airfields.

The PAPI (FA-10620) performance requirements are detailed in NAS-SS-1000, Volume III, FAA-E-2756, and FAA-E-2782.

5-04.3.2 <u>Diversity Requirements</u>

There are no diversity requirements for this program.

Table 5-04- 1. Precision Approach Path Indicator Interface Requirements Summary

SUBSYSTEM INTERFACE		RMS	RCIU
INTERFACE CONTROL DOCUMENTATION		FAA-E-2750/1/2/4	FAA-E-2663 RCIU
PROTOCOL REQUIREMENTS	Network Layer	TBD	TBD
	Data Link Layer	TBD	TBD
	Physical Layer	RS-232	TBD
	Special Formats/ Codes	TBD	TBD
TRANSMISSION REQUIREMENTS	No. Channels	1	1
	Speed (kbps)	110 to 9.6	
	Simplex Half/Full Duplex	HD	HD
	Service		
HARDWARE REQUIREMENTS	Modem	GFE	GFE
	Data Bridge		
	Clock		
	A/B Switch		
	DSC		
	Cable/ Miscellaneous	GFE Radio Link	

5-04.4 ACQUISITION ISSUES

5-04.4.1 Project Schedule and Status

Ninety PAPI Systems (w/o RMS) were procured from the Sonicraft Corporation of Chicago. Two RMS modification kits and a reprocurement data package were provided in 1996.

A contract with AVW Electronic Systems, of Los Angeles, produced 110 systems (w/RMS).

The New Bedford Panoramex (NBP), Upland, CA contract has produced 237 PAPIs, that include embedded RMS. A new contract was awarded to NBP to provide 10 Congressionally mandated PAPIs to Alaskan Region locations. An option for 25 additional systems has been exercised to provide replacement of 25 VASI systems with PAPI at ICAO airports.

Since installation is scheduled and performed by each region, most PAPI Systems are shipped from the factory to the FAA Logistics Center, permitting draw-down as required to meet regional priorities.

The acquisition schedule can be seen in Table 5-04-2.

Table 5-04-2. Precision Approach Path Indicator Site Installation Schedule

	PRIOR YEARS	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
PAPI	447	25	TBD	TBD	TBD	TBD	TBD	TBD

5-04.4.2 Planned Telecommunications Strategies

Installation planning is accomplished at the regional level.

5-04.4.3 Telecommunications Costs

Telecommunications costs for support of PAPI System installation, operations and maintenance will be detailed in regional submissions in the annual call for funds and will be in accordance with FAA Order 2500.8A.

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CHAPTER 5-05 - SUMMARY SHEET

RUNWAY-END INDICATOR LIGHTS (REIL)

Program/Project Identifiers:

Project Number(s):	CIP N-04
Related Program(s):	CIPs , F-18, M-03, M-07, M-20, M-22, M-27, N-03
New/Replacement/Upgrade?	New/Replacement
Responsible Organization:	AND-740
Program Mgr./Project Lead:	Seth Couslar, AND-740, (202) 493-4756 Manuel Vega, AND-740, (202) 267-7795
Fuchsia Book POC:	Fred Scheeren, SRC/AND-740, (202) 488-9740 (x125)

Assigned Codes:

PDC(s):	FL
PDC Description:	Visual NAVAIDS and Airport Lighting Circuits (VASI, REIL, etc.)
Service Code:	VNAV

Cost Estimates *:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$0	$0	$0	$0	$0	$0	$0
Total OPS	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

*Telecommunications costs for support of the REIL System installation operations and maintenance will be detailed in regional submissions in the annual request for funds.

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CIP Category: Navigation & Landing 	**5-05.0 RUNWAY-END INDICATOR LIGHTS**

5-05.1 PROGRAM OVERVIEW

5-05.1.1 Purpose of the Program/System

The Runway-End Identifier Lights (REIL) is a landing sub-element of the National Airspace System (NAS) Ground-to-Air (G/A) systems element. It is a visual guidance lighting system consisting of two flashing light assemblies, appropriate controls, and Remote Monitoring Subsystem (RMS). The REIL provides the pilot with rapid and positive identification of the approach end of the runway.

The overall program management of the REIL project is the responsibility of the Navigation and Landing Product Team, AND-740. The Product Team accomplishes management tasks within the guidelines provided by FAA directives. AND-740 controls the schedule, funding, matrix support, and all technical engineering project activities

5-05.1.2 References

5-05.1.2.1 NAS-SS-1000, Volume III, 3.1.2.4.g. (REIL), December 1986.

5-05.1.2.2 TI 6850.80, REIL System with RMS, March 30, 1990.

5-05.1.2.3 FAA Order 6850.30, REIL with RMS Project Implementation Plan, February 12, 1990.

5-05.1.2.4 FAA Aviation System Capital Investment Plan (CIP) N-04, January 1999.

5-05.2 SYSTEM DESCRIPTION

The current population of REIL consists of several generations of equipment, only the newest of which have a remote maintenance monitoring capability. Incorporating the Remote Monitoring Subsystem (RMS) in all new REIL will enable cost savings associated with improved system maintenance. There is no current plan to retrofit older REIL with RMS.

5-05.2.1 Program/System Components

5-05.2.1.1 Principal Components

a The REIL consists of two synchronized flashing lights, a control cabinet, an aiming device to permit field aiming of the lights, the Remote Monitoring Subsystem (RMS), and a link control unit to manage communications between the RMS and remote locations.

b The two flashing lights, designated identifier assemblies, are placed on either side of the runway-landing threshold and are designed to attract the attention of the pilot (by rapid flashing) so that the approach end of the runway can be quickly identified when contrast with the surrounding environment is lacking. The identifier assemblies contain flash tubes, which are triggered by a circuit energized from the control cabinet at half-second intervals. The identifier assembly also contains a current detection device used to monitor the operation of the flash tube.

c The control cabinet accepts and routes the 120/240 VAC, three-wire, 60 Hz power and control signals to the identifier units. It also houses the remote monitoring subsystem and interfaces the REIL with the remote monitoring circuitry.

d The aiming device permits manual alignment of the identifier assemblies.

e The Remote Monitoring Subsystem monitors the REIL equipment, pre-processes the signals from the sensors and REIL control cabinet, and transmits the digitized data to a centralized Link Control Unit (LCU). The RMS controls the REIL equipment on receipt of commands from the LCU, and provides an interface for use with a portable maintenance data terminal. It also provides an RMM capability for an air-to-ground receiver, through an optional mod kit.

f The Link Control Unit is the central point of communications between the Maintenance Processor Subsystem (MPS) and remote maintenance monitoring equipment within REIL.

5-05.2.1.2 Functional Component Interface Requirements

Control of the REIL will be provided via the Remote Radio Control System (RRCS), runway edges lighting circuitry, a switch in the control cabinet, or if the airport is unmanned, via VHF radio from an aircraft.

The REIL with RMS consists of two identifier assemblies, one control cabinet, one A/G receiver/controller and associated interconnection equipment. The LCU (when required) consists of one rack-mounted unit installed at a remote location in a protected environment.

5-05.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

Telecommunications requirements vary from location to location, depending on the size and type of FAA facility, availability and practicality of commercial lines/equipment, and installation schedules. Accordingly, the requirements outlined below are generic to current generation REIL with RMS.

The REIL (FA-10264) performance requirements are detailed in NAS-SS-1000, Volume III, 3.1.2.4.g., and FAA Specification FAA-E-2159d.

The REIL, when equipped with an optional A/G receiver, will provide the capability to receive VHF radio transmissions to turn the system on/off and control lighting intensity at unmanned airfields.

A summary of the REIL System interfaces is presented in Table 5-05-1. REIL with RMS functional/physical interfaces are illustrated in Figure 5-05-1.

5-05.3.1 Telecommunications Interfaces

5-05.3.1.1 RMS to LCU

The REIL with RMS can be monitored by the RMMS described in FAA-E-2782, Remote Maintenance Monitoring System Core System/Segment Specification. Its other major interface points will be either the Remote Control Interface Unit described in FAA-E-2663, Interface Unit MALSR Remote Control, or the runway edge lights.

5-05.3.1.1.1 Interface Requirements

The RMS interface with the LCU is by the built-in modems and GFE UHF radio links (406 to 420 MHz band).

The data interface between the LCU and each equipment RMS is normally a half-duplex, 2400 bps, multi-point data radio link; however, provision to operate via a point-to-point, half-duplex, two-wire phone line is also available by means of wirestrapping. Minimum phone line quality in this configuration shall be 3002 (AT&T Tariff FCC-260), conditioned C-2 per Bell System Technical Reference Publication 41001 or equivalent. If using AT&T Tariff 9,10,11, the current line equivalent is channel type 5 conditioned C-2 with protocol type "NO" of AT&T Publication 43202. The line may be unconditioned (basic) if the modems can still transmit 2400 bps at an acceptable bit error rate.

Besides the interface characteristics above, the LCU will also be capable of interfacing with the RMS in accordance with EIA Standard RS-232. The DTE interface will have the capability to utilize an external modem meeting the requirements of FED-STD-2723. Data rates across the DTE interface shall be programmable to 2400, 4800, 9600, and 19,200 bps.

5-05.3.1.2 LCU to MPS

5-05.3.1.2.1 Interface Requirements

The LCU interface with the MPS is by the built-in modems and GFE UHF radio links (406 to 420 MHz band).

The LCU to MPS interface is in accordance with EIA Standard RS-232 wired as synchronous Data Terminal Equipment (DTE), duplex, type D. The data rate across the MPS interface will be 2400 bits per second (bps). The LCU and RMS terminals, following RS-232 and wired as asynchronous data interfaces, use even parity and automatically adjust to bit rates of 110, 150, 300, 1200, 2400, 4800, and 9600.

5-05.3.2 Diversity Requirements

There are no diversity requirements for this program.

Table 5-05-1. REIL System Interface Requirements Summary

REIL SYSTEM INTERFACES		RMMS	RCIU
INTERFACE CONTROL DOCUMENTATION		FAA-E-2782 RMMS S/S	FAA-E-2663 RCIU
PROTOCOL REQUIREMENT	Network Layer		TBD
	Data Link Layer		TBD
	Physical Layer	RS-232	TBD
	Special Formats/ Codes	C-2 Cond	TBD
TRANSMISSION REQUIREMENT	No. of Channels	1	1
	Speed (kbps)	2.4	TBD
	Simplex Half/Full Duplex	Speed Range .110 - 9.6 kbps HD	HD
	Service	LEC/FAA	TBD
HARDWARE REQUIREMENT	MODEM	GFE	TBD
	Data Bridge		
	Clock		
	A/B Switch		
	DSC		
	Cable/ Miscellaneous		REIL PIP

5-05.4 ACQUISITION ISSUES

5-05.4.1 Program Schedule and Status

Procurement of REIL with RMS is via a firm, fixed-price contract with DME Corporation of Ft. Lauderdale, FL. Contract modifications have increased the original 60 systems to a total of 251, all of which have been delivered to the FAA Logistics Center in Oklahoma City.

There are currently no activities directed at contracting for additional REIL.

Installation is scheduled and performed by each Region; all REIL have been shipped from the factory to the FAA Logistics Center, permitting draw-down as required to meet Regional priorities.

The installation schedule is developed by the regions.

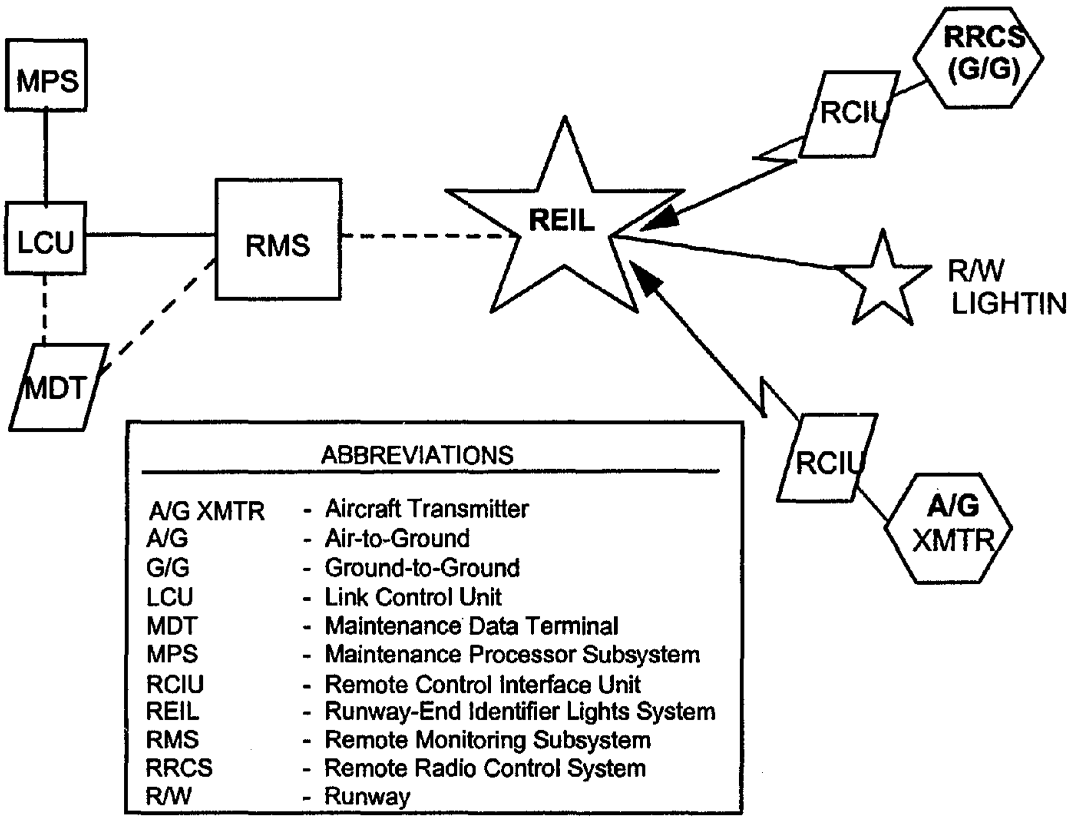

Figure 5-05-1. Runway-End Identifier Lights Physical/Functional Interfaces

5-05.4.2 Planned Telecommunications Strategies

Installation planning is accomplished at the Regional level.

5-05.4.3 Telecommunications Costs

Telecommunications costs for support of REIL System installations and operations and maintenance will be detailed in regional submissions in the annual request for funds.

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CHAPTER 5-06 - SUMMARY SHEET

NEW GENERATION RUNWAY VISUAL RANGE SYSTEM (RVR)

Program/Project Identifiers:

Project Number(s):	CIP N-08
Related Program(s):	CIPs, F-02, F-03, F-10, M-03, M-07, M-21, M-27, N-03, N-12, R,E&D 032-110, W-01
New/Replacement/Upgrade?	New/Upgrade
Responsible Organization:	AND-740
Program Mgr./Project Lead:	Deborah Lucas, AND-740, (202) 493-4761 Manuel Vega, Product Lead, (202) 267-7795
Fuchsia Book POC:	Fred Scheeren, SRC/AND-740, (202) 488-9740 (x125)

Assigned Codes:

PDC(s):	FI
PDC Description:	Critical remote weather measuring circuits for RVR and LLWAS
Service Code:	METI

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$88	$105	$122	$184	$105	$105	$122
F&E Recurring	$29	$41	$47	$55	$53	$45	$47
Total F&E	**$117**	**$146**	**$169**	**$239**	**$158**	**$150**	**$169**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$127	$137	$164	$186	$211	$242	$264
Total OPS	**$127**	**$137**	**$164**	**$186**	**$211**	**$242**	**$264**

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CIP Category: Navigation & Landing 	5-06.0 NEW GENERATION RUNWAY VISUAL RANGE SYSTEM (RVR)

5-06.1 PROGRAM OVERVIEW

5-06.1.1 Purpose of the New Generation Runway Visual Range

New Generation Runway Visual Range (RVR) Systems support Category I, II and III a/b precision landing operations. The New Generation RVR provides information on runway visual range at up to three points along the runway: touchdown, midpoint and rollout, depending on the approach category. The information provides pilots a measure of the forward visibility they can expect to have at each respective runway position.

The program management of the RVR project is the responsibility of the Navigation and Landing Product Team, AND-740. The Product Team will accomplish management tasks within the guidelines provided by FAA policies, procedures and directives. The Team controls the schedule, funding, matrix support, and technical engineering project activities.

5-06.1.2 References

5-06.1.2.1 FAA-E-2772, Runway Visual Range Systems.

5-06.1.2.2 NAS-MD-790, RMS Interface Control Document.

5-06.1.2.3 NAS-MD-792, Operational Requirements for RMMS.

5-06.1.2.4 NAS-MD-793, RMMS Functional Requirements for the Remote Monitoring Subsystem (RMS).

5-06.1.2.5 Capital Investment Plan (CIP), Project N-08, January 1999.

5-06.2 SYSTEM DESCRIPTION

The New Generation RVR system consists of Visibility Sensor(s) (VS), Runway Light Intensity Monitor(s) (RLIM), an Ambient Light Sensor (ALS), Sensor Interface Electronics (SIE), a Data Processing Unit (DPU) and Controller Displays (CDs). The VSs are located along the runway 250-500 feet from the runway center line. Touchdown and rollout VSs are typically 1,000 feet from the runway ends, with midpoint VSs located within 1,000 feet of the midpoint of the runway. RLIMs are located in the airport lighting vault, where they monitor the output of the constant current regulators which power the runway edge and centerline lighting circuits. The ALS is located at a VS site or on top of the Airport Traffic Control Tower (ATCT). The DPU is typically located in the equipment room of the ATCT. CDs are provided for the controller operating positions in the ATCT and Terminal Radar Approach Control (TRACON) facilities. The New Generation RVR is equipped with Remote Maintenance Monitoring to enable local and remote monitoring and control by certified maintenance personnel.

5-06.2.1 Program/System Components

5-06.2.1.1 Principal Components

Each RVR sensor--Visibility Sensor (VS), Runway Light Intensity Monitor (RLIM) and Ambient Light Sensor (ALS)--has a Sensor Interface Electronics (SIE) unit with embedded remote maintenance monitoring capabilities. The SIEs provide power to the sensors, convert sensor analog data to digital data, provide surge protection, and transmit RVR sensor data to the DPU.

The VS measures particles in the air, which obstruct visibility. The RLIM monitors the runway edge and centerline brightness levels (steps 0, 1, 2, 3, 4 and 5), and the ALS monitors the north sky to determine day/night conditions. The Remote Monitoring Subsystem functions independently of the RVR sensors to enable local and remote access to operational and maintenance parameters.

The Data Processing Unit collects RVR sensor data, calculates RVR values for both daytime and nighttime RVR, and transmits the higher RVR value to controller displays. The Remote Monitoring Subsystem functions independently of the DPU to enable local and remote access to operational and maintenance parameters.

5-06.2.1.2 Functional Component Interface Requirements

Functional component interfaces are depicted in Figure 5-06-1.

5-06.2.1.2.1 RVR DPU to the MPS in the ARTCC

A telecommunications circuit is required between the New Generation RVR DPU unit and the remotely located Maintenance Processor System (MPS) located in the Air Route Traffic Control Center (ARTCC). Interface between the RVR DPU and the MPS will be through the Data Multiplex Network (DMN) provided by AOP-400 and AND-340. This telecommunications interface supports the exchange of maintenance status data.

5-06.2.1.2.2 RVR DPU to CDs in the TRACON

Two telecommunications circuits are also required between the DPU and CDs in remotely located Terminal Radar Control (TRACON) facilities. This telecommunications interface provides RVR data to the controllers in the TRACON.

5-06.2.1.2.3 RVR DPU to the ASOS

Telecommunications circuits are also required between the DPU and remotely located Automated Surface Observation Systems (ASOS). This telecommunications interface provides RVR data that is appended to the weather observation and transmitted via long-line by the ASOS.

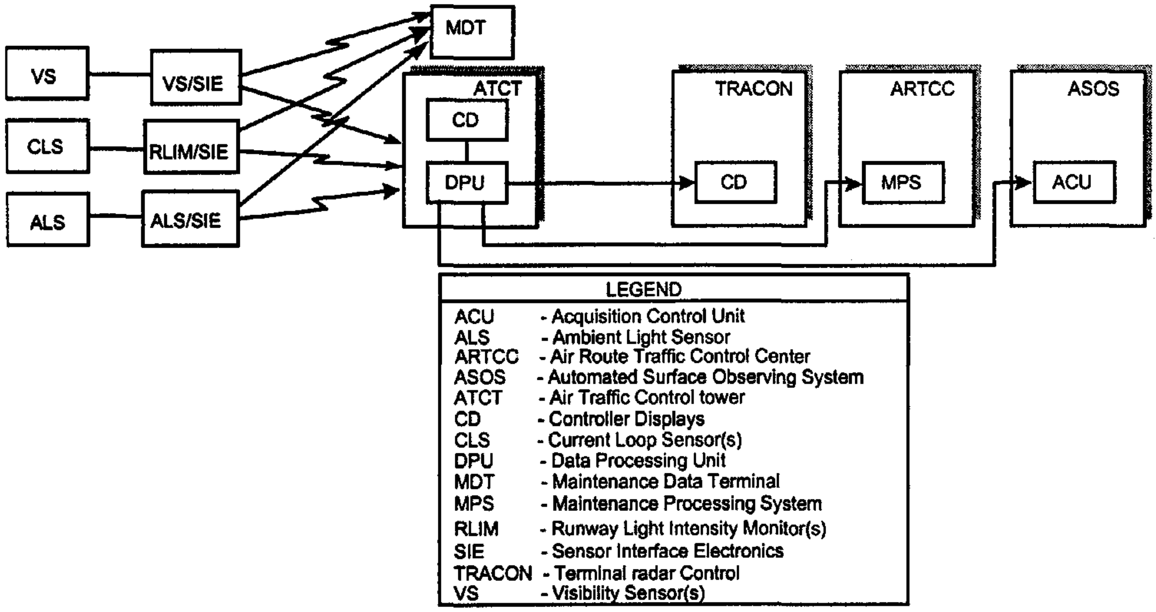

Figure 5-06-1. RVR Functional Connectivity

5-06.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

Table 5-06-1 summarizes the RVR interface requirements.

5-06.3.1 Telecommunications Interfaces

5-06.3.1.1 SIEs to the DPU

Requirements for communication between SIEs and the DPU are as specified in equipment specification FAA-E-2772.

5-06.3.1.2 SIEs to the MDT

MDT access to SIEs requires use of a local RS-232 interface. Communication is asynchronous and 2400 bps. Additional requirements for Maintenance Data Terminal (MDT) access to SIEs and the DPU are specified in FAA-E-2772. MDT access to the DPU also requires use of a local RS-232 interface. MDT DPU communication is asynchronous and 9600 bps.

5-06.3.1.3 DPU to the Local CDs

Communication between the RVR DPU and ATCT located Controller Displays (CDs) requires use of an RS-485 interface and is limited to 26 CDs and a maximum distance of 2000 ft. No additional telecommunications equipment is required.

Table 5-06-1. RVR Interface Requirements Summary

SUBSYSTEM INTERFACE		DPU TO REMOTE CDs	DPU TO MPS	DPU TO REMOTE ASOS	DPU TO ASOS
INTERFACE CONTROL DOCUMENTATION		FAA-E-2772 Teledyne Drawing 861233	NAS-MD-790	50-SANW-1-00050	50-SANW-1-00050
PROTOCOL	Network Layer	Not used	Not used	Not used	Not used
	Data Link Layer	X3.28 Link Layer	X3.28 Link Layer	X3.28 Link Layer	X3.28 Link Layer
	Physical Layer	RS-232 synchronous 2400 bps with ADCCP link and NAS-MD-790 message requirements	RS-232 synchronous 2400 bps with ADCCP link and NAS-MD-790 message requirements	EIA-530 asynchronous 2400 bps	EIA-530 asynchronous 2400 bps
	Special Formats/Codes				
TRANSMISSION REQUIREMENTS	No Channels	2 RS-232	1	1	1
	SPEED (kbps)	2.4	2.4	2.4	2.4
	Simplex, Half/Full Duplex	Simplex	Full Duplex	Simplex	Simplex
	Service				
HARDWARE REQUIREMENTS	Modem	Modem	DMN	Dedicated Line/Modem	
	Cable/Miscellaneous				EIA-530 Compatable Cable

5-06.3.1.4 DPU to the MPS in the ARTCC

RVR DPU and MPS communication is facilitated through use of an RS-232 interface. Requirements for communication are synchronous and 2400 bps, using the Advanced Data Communication Control Process (ADCCP) link and NAS-MD-790 message requirements. Additional specifics concerning the MPS interface are specified in FAA-E-2772.

5-06.3.1.5 DPU to the Remote CDs in the TRACON

Communication to remotely located CDs is facilitated through the use of a separate RS-232 interface. Connection to the DMN from this interface is also required. Two RS-232 lines are required for communication to the first remote CD. Subsequent remote CDs (26) use RS-485.

5-06.3.1.6 DPU to the ASOS

Communication between the DPU and the ASOS is facilitated through an EIA-530 interface. The communication is asynchronous and 2400 bps using X3.28 protocol. For distances between the DPU and ASOS Acquisition Control Unit (ACU) of less than 4000 ft., no access to the DMN is required. Additional specifications are provided in the Interface Control Document, 50-SANW-1-00050.

5-06.3.1.7 DPU to the External User

The DPU External User interface allows monitoring of RVR System parameters by systems not included in the National Airspace System (NAS). The physical interface is RS-232 and the communication protocol is 2400 bps, even parity, 7 data bits, and 1 stop bit. This interface provides one-way communication from the RVR System to a monitoring device.

5-06.3.2 Diversity Requirements

Diversity requirements necessitate that the remote CD interface to remotely located TRACONs be implemented with two channels assigned on the DMN and auto-dial backup. The MPS and ASOS interface do not have a diversity requirement.

5-06.4 ACQUISITION ISSUES

5-06.4.1 Program Schedule and Status

The RVR contract was awarded to Teledyne Controls on June 29, 1988. The contract, including all hardware options, is for 264 RVR systems at 264 airport locations. The first 106 systems are commissioned. Table 5-06-2 shows the RVR Telecommunications Interface Implementation Schedule. Table 5-06-3 contains the site installation schedule.

Table 5-06-2. RVR Telecommunications Interface Implementation Schedule

From	To	Diversity Req'mt	System/Rate/ Miles	Prior Year	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
DPU	Remote TRACON	Yes	DMN/LINCS/2.4	55	1	8	3	5	2	2	2
DPU	Remote TRACON	Yes	Dial Backup	55	1	8	3	5	2	2	2
DPU	MPS	No	DMN/LINCS/2.4	140	20	22	24	30	22	22	24
DPU	ASOS	No	Dedicated Line	28	10	10	20	20	10	10	11

Table 5-06-3. RVR Site Installation Schedule

Site	Prior Yr	FY00	FY01	FY02	FY03	FY04	FY05	FY06
AAL	11	0	2	0	0	2	0	2
ACE	12	2	2	0	2	2	0	2
AEA	12	3	3	4	4	3	4	4
AGL	26	2	3	4	4	3	4	4
ANE	13	1	2	2	4	2	2	2
ANM	15	3	2	4	4	2	4	2
ASO	19	3	2	4	4	3	4	4
ASW	15	3	3	3	4	3	2	2
AWP	17	3	3	3	4	2	2	2
Total	**140**	**20**	**22**	**24**	**30**	**22**	**22**	**24**

5-06.4.2 Planned Telecommunications Strategies

Telecommunications requirements between the New Generation RVR and the Remote Maintenance Monitoring System (RMMS) have been provided to AOP-1 (formerly ASM-300) and are accounted for in the NIMS Chapter.

5-06.4.3 Telecommunications Costs

Table 5-06-4 provides a summary of the estimated telecommunications costs for the RVR program. Per FAA Order 2500.8A, leased telecommunications costs (non-recurring and recurring) for the year of activation and one year following are shown in the table as being funded under Facilities and Equipment (F&E) account.

The cost estimates are due to:

(1) the addition of sites to the implementation schedule; and

(2) the replacement of the distance-based average unit cost factor used to develop last year's estimates with an average unit cost factor derived from the actual TIMS Billing Reports for existing circuits.

Table 5-06-4. Cost Summary --RVR

CIP # N-08	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
Tower <---> TRACON									
	Cost Profile: LINCS VG-8 Circuit with a Pair of Codex 3600P Modems								
Channel Costs									
	Channels Added		20	22	24	30	22	22	24
	Total Channels	140	160	182	206	236	258	280	304
	F&E Funded Channels		30	42	46	54	52	44	46
	OPS Funded Channels		130	140	160	182	206	236	258
	F&E Non-recurring Channel Costs		**$19**	**$21**	**$23**	**$29**	**$21**	**$21**	**$23**
	Recurring Channel Costs								
	F&E Recurring Costs		**$27**	**$38**	**$44**	**$51**	**$49**	**$42**	**$44**
	OPS Recurring Costs		**$118**	**$127**	**$152**	**$173**	**$196**	**$225**	**$246**
Hardware Costs									
	Cost Profile: Codex 3600P Modems								
	Hardware Units Added		40	44	48	60	44	44	48
	Total Hardware Units	280	320	364	412	472	516	560	608
	F&E Funded Hardware Units		60	84	92	108	104	88	92
	OPS Funded Hardware Units		260	280	320	364	412	472	516
	Non-recurring Hardware Costs		**$69**	**$84**	**$100**	**$156**	**$84**	**$84**	**$100**
	Recurring Hardware Costs								
	F&E Recurring HW Costs		**$2**	**$3**	**$3**	**$4**	**$4**	**$3**	**$3**
	OPS Recurring HW Costs		**$9**	**$10**	**$12**	**$13**	**$15**	**$17**	**$19**
			SUMMARY						
F&E Totals		Non-recurring	$88	$105	$122	$184	$105	$105	$122
		Recurring	$29	$41	$47	$55	$53	$45	$47
		F&E Totals	**$117**	**$146**	**$170**	**$239**	**$158**	**$150**	**$170**
OPS Totals		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$127	$137	$164	$186	$211	$242	$264
		OPS Totals	**$127**	**$137**	**$164**	**$186**	**$211**	**$242**	**$264**

Note: Costing based upon TIMS Billing Reports for existing circuits.

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CHAPTER 5-07 - SUMMARY SHEET

WIDE AREA AUGMENTATION SYSTEM (WAAS)

Program/Project Identifiers:

Project Number(s):	CIP N-12
Related Program(s):	CIPs A-01. A-02, A-04, A-05, A-10, C-20,M-15, M-27, N-03, N-08, N-09, N-10, R,E&Ds 021-140, 032-110, 032-120
New/Replacement/Upgrade?	New
Responsible Organization:	AND-730
Program Mgr./Project Lead:	David Roth, AND-730, (202) 493-4622
Fuchsia Book POC:	Gary Solom, (703) 841-2668

Assigned Codes:

PDC(s):	UN, UX
PDC Description:	National Satellite Test Bed Data Circuits for Satellite Navigation (WAAS); Wide Area Augmentation System (WAAS) Circuits.
Service Code:	SAT

Cost Estimates: Terrestrial and Satellite

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$11	$12,000	$0	$0	$0	$0	$0
F&E Recurring	$14,504	$19,629	$29,261	$29,261	$49,661	$49,661	$68,061
Total F&E	**$14,515**	**$31,628**	**$29,261**	**$29,261**	**$49,661**	**$49,661**	**$68,061**
OPS Non-recurring	$0	$0	$433	$1,659	$223	$1,613	$37
OPS Recurring	$0	$487	$8,554	$10,415	$11,142	$11,170	$11,248
Total OPS*	**$0**	**$487**	**$8,987**	**$12,073**	**$11,365**	**$12,783**	**$11,285**

* OPS total does not include Logistics and Systems Maintenance.

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CIP Category:
Navigation &
Landing

5-07.0 WIDE-AREA AUGMENTATION SYSTEM (WAAS)

5-07.1 PROGRAM OVERVIEW

5-07.1.1 Purpose of Wide-Area Augmentation System

The Wide-Area Augmentation System (WAAS) augments the Department of Defense (DoD) Global Positioning System (GPS) Standard Positioning Service (SPS). This enables use of the GPS satellite constellation for precise guidance by civil and military aircraft operating in the National Airspace System (NAS). The GPS, as provided by the DoD, does not furnish sufficient navigation accuracy for precision approaches, lacks system integrity, and does not meet the availability requirements to satisfy the Required Navigation Performance (RNP) for the civil aviation user. The WAAS program will eliminate these shortfalls and provide a navigation capability from en route through precision approach.

5-07.1.2 References

5-07.1.2.1 FAA-E-2892B Change 1, U.S. Department of Transportation, Federal Aviation Administration Specification, Wide Area Augmentation System (WAAS).

5-07.1.2.2 Wide Area Augmentation System (WAAS) Contract, DTFA01-96-C-00025.

5-07.1.2.3 Acquisition Plan, Satellite Navigation Program Wide Area Augmentation System, April 26, 1996.

5-07.1.2.4 Capital Investment Plan, N-12, January 2000.

5-07.1.2.5 COMSAT Contract, DTFA01-97-C-00008.

5-07.2 SYSTEM DESCRIPTION

The WAAS consists of a network of geographically separated Wide-area Reference Stations (WRS) at precisely known locations, an inter-facility communications network, Wide-area Master Stations (WMS) and a satellite broadcast system. The GPS satellites' data is received and processed at the WRS and then forwarded to the WMS. The WMS processes the data to determine the integrity, differential corrections, residual errors, and ionospheric information for each monitored satellite and generates Geostationary Earth Orbit (GEO) Satellite navigation parameters. The information is then sent to a Geostationary Communication Segment (GCS) where it is uplinked to the WAAS GEO satellites. These GEO satellites downlink this information on the GPS Link 1 (L1) frequency with a modulation similar to that used by

GPS. The user aircraft receives both the GPS and WAAS messages and combines them to meet all RNP requirements for all phases of flight from en route through precision approach.

WAAS messages from the GEO satellites provide information for GPS integrity and accuracy improvements made through clock, ephemeris and ionospheric corrections suitable for precision approach. The WAAS provides availability and continuity of service improvements because the GEO satellites offer an additional ranging signal and, with WAAS integrity messages, only four satellites are needed for a reliable position solution.

Program management for the WAAS is provided by the GPS Product Team (AND-730) of the GPS/Navigation Integrated Product Team (AND-700).

5-07.2.1 Wide-Area Augmentation System Architecture

The WAAS Specification, FAA-E-2892B provides functional and performance requirements, but does not direct a particular architecture. The WAAS letter contract was awarded on May 1, 1996, to Raytheon System Company (formerly Hughes Aircraft Company) and definitized in October 1996. A separate letter contract was awarded to COMSAT Mobile Communications in December 1996 and definitized in June 1998 to provide GEO uplink services and the broadcast rights to the INMARSAT III AOR-W and POR navigation transponders.

The team has developed a preliminary architecture. The basic architectural components for the Phase 1 WAAS include:

- A network of geographically separated Wide-area Reference Stations (WRS) at precisely known locations,
- Wide-area Master Stations (WMS) to determine GPS integrity, differential correction, and GEO satellite navigation data,
- A Terrestrial Communications System,
- Geostationary Communications Segments (GCS) consisting of satellite uplink system(s) and GEOs. A GCS consists of a single GEO satellite service and two dedicated geographically and operationally diverse GEO Uplink Subsystems (GUS), and
- The capability to broadcast WAAS signals on the GPS L1 frequency.

The constellation of 24 satellites that make up the GPS is considered an external part of the architecture, i.e., the signals are used; however, the GPS control segment and the space segment are operated by the Department of Defense.

The WAAS will be implemented in three increments as follows: (1) the Functional Verification System (FVS), (2) Phase 1 WAAS, and (3) Phase 2/3 WAAS. The components planned for each of these increments are as follows:

- Functional Verification System (FVS)
  - 2 Wide-Area Master Stations (WMS)
  - 5 Wide-Area Reference Stations (WRS)

- 1 GEO Uplink Subsystem (GUS)
- 1 Terrestrial telecommunications network among stations (leased through LINCS).

- Phase 1 WAAS
  - 2 Wide-Area Master Stations (WMS)
  - 25 Wide-Area Reference Stations (WRS)
  - 2 Geostationary Communications Segments (GCS)
  - 1 Terrestrial telecommunications network among stations (leased through existing FAA assets).

- Phase 2/3 WAAS (additional components will be added by contract option; the number shown is the maximum that will be added to the Phase 1 WAAS).
  - 2 Wide-Area Master Stations (WMS)
  - 23 Wide-Area Reference Stations (WRS)
  - 3 Geostationary Communications Segments (GCS)
  - 1 Terrestrial telecommunications network among stations (leased through existing FAA assets).

5-07.2.1.1 Wide-area Reference Stations (WRS)

The WRS locations will be precisely surveyed to facilitate the determination of the GPS pseudorange errors caused by the satellite clock inaccuracies, satellite ephemeris inaccuracies, and the ionosphere. Using a tropospheric model, the WRSs correct for any errors caused by local weather conditions. The data from each WRS is transmitted to each of the WMSs.

5-07.2.1.2 Wide-area Master Station (WMS)

The WMS uses the information from all WRSs to determine the correction and integrity data for each satellite, the ionospheric corrections, and the GEO satellite navigation data. The WMS also monitors the operating/maintenance status of each WRS, WMS and GCS. After calculating the integrity, ionospheric data, and clock and ephemeris corrections for each satellite, the WMS sends this information to the GCS.

5-07.2.1.3 Inter-facility Communications

Each WRS interfaces and communicates directly with two WMSs. WMSs have two-way communications to broadcast directly to all GCSs. Each WMS interfaces with all other WMSs. The Phase 1 WAAS will have no interface with the Remote Maintenance Monitoring System (RMMS) or the NAS Infrastructure Management System (NIMS). All system operation and maintenance functions will be accomplished at the WMSs. The contract stipulates the WAAS is to be connected to the RMMS or NIMS by Phase 2/3.

5-07.2.1.4 GCS and WAAS GEO Communications Satellite

Each GCS has two GEO Uplink Subsystems (GUSs) and one GEO. Each GUS contains a GPS-type signal generator that produces a signal that is broadcast to a GEO satellite. This signal contains a WAAS satellite navigation message, WAAS information on each GPS and WAAS satellite, and information on the ionosphere. The WAAS GEO satellite re-broadcasts this information to the aviation users on the GPS L1 frequency with a unique Pseudo-Random Noise (PRN) code to allow it to be used as a ranging source.

5-07.2.1.5 User Equipment

The aircraft WAAS user equipment will receive the GPS SPS and WAAS information and process the received data to derive the navigation data needed by the pilot and the aircraft guidance systems. The navigation data will provide the information necessary to conduct en-route, terminal, non-precision approaches. WAAS will not replace ILS for landing aircraft when the ceiling and visibility drops below 200 feet and 1/2 mile. The LAAS system under development by FAA/Raytheon/Honeywell, will provide for precision approach landing under near zero visibility. The FAA will not develop the WAAS user equipment. RTCA, Inc. has provided the WAAS User Equipment standards through a Minimum Operational Performance Standard (MOPS), RTCA/DO-229A. The FAA will utilize the data in the MOPS to issue a Technical Standard Order (TSO) to be employed in the manufacture and certification of WAAS user equipment.

5-07.2.1.6 Independent Data Verification and Validation

The WAAS has an independent data verification function that must verify all data provided to WAAS users prior to transmission and validate the data while it is active. The method of accomplishment and the hardware required for this function will be defined by the WAAS contractor.

5-07.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

The WAAS specification establishes overall performance requirements and the Statement of Work (SOW) requires the contractor to use the NAS Interfacility Communications System (NICS). The SOW also states the contractor may propose alternate communications architecture if the Government Furnished Equipment (GFE) communications circuits and services will not meet the overall WAAS performance requirements. The telecommunications requirements discussed below assume the contractor will use the NICS and an augmentation to the NICS, if necessary, to meet the performance requirements. The WAAS Interfaces are shown in Figure 5-07-1.

5-07.3.1 Functional Requirements

The major communications functions performed by the WAAS include the following:

- Transmission of data between each WRS and the WMS.
- Transmission of data between each WMS and the GCS.
- Transmission of data between each WMS.
- Transmission of WAAS data messages from the GCSs to the WAAS users.

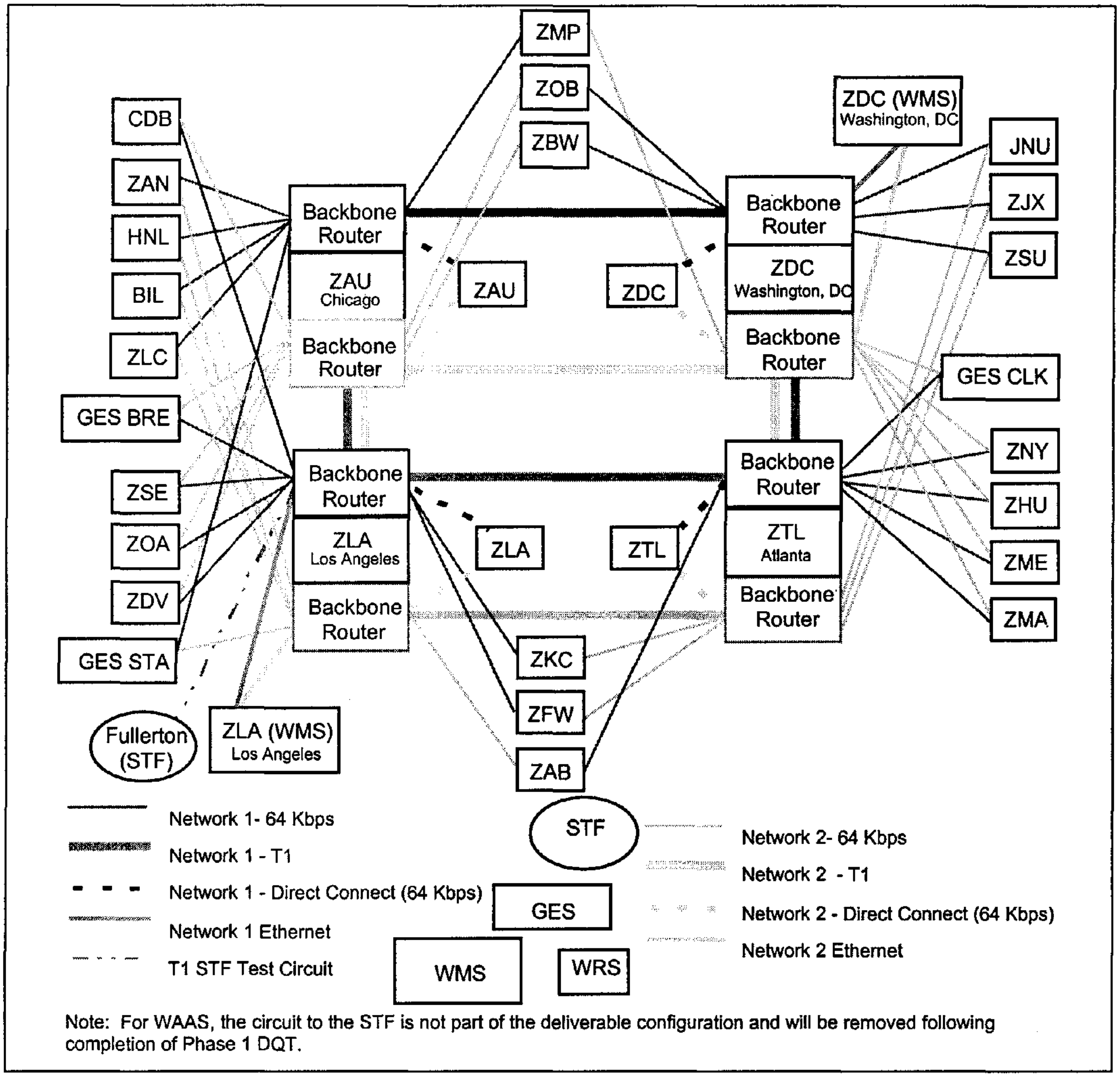

Figure 5-07-1. WAAS Functional Connectivity

5-07.3.2 Functional/Physical Interface Requirements

The functional and physical interface requirements for the NICS interfacility communications have been established for the FAA. The WAAS contractor will establish the functional and physical interface requirements for the WAAS components data input and output. For any communications augmentation to the NICS, the WAAS contractor will be responsible for establishing the functional and physical interface requirements for both the interfacility and intrafacility communications.

5-07.3.3 Diversity Requirements

The network design must be such that no single point of failure exists in the system. The FAA/Raytheon team worked with the commercial providers to determine the optimal circuit routing to maximize diversity. By moving two of the WAAS communications nodes to central US locations, improved diversity is achieved when using the existing commercial telecommunications infrastructure.

5-07.3.4 Components

The expected WAAS components were discussed in paragraph 5-07.2.1.

5-07.3.5 Telecommunications Interfaces

The expected WAAS telecommunications interfaces were discussed in paragraph 5-07.3.2. The WAAS contractor will provide the final components. The protocol, transmission, and hardware requirements for the interfaces are identified in Table 5-07-1.

5-07.3.6 Local And Other Telecommunications Interfaces

The contractor will use the NICS and an augmentation to the NICS, if necessary, in order to meet the performance requirements. The local and other telecommunications interfaces for the NICS augmentation to the NICS will be provided by the WAAS contractor.

5-07.3.7 Diversity Implementation

The WAAS diversity requirements were discussed in paragraph 5-07.3.3. No additional diversity is required.

Table 5-07-1. Wide-Area Augmentation System Interface Requirements Summary (FY00)

SUBSYSTEM INTERFACE		WRS to WMS	WMS to GCS	WMS to WMS
INTERFACE CONTROL DOCUMENTATION				
PROTOCOL REQUIREMENTS	Network Layer	OSPF/MOSPF	OSPF/MOSPF	OSPF/MOSPF
	Data Link Layer	PPP	PPP	PPP
	Physical Layer	V.35	V.35	V.35
	Special Formats/Codes			
TRANSMISSION REQUIREMENTS	No. Channels	46(WAAS) + 1 EUL-A upgrade 3 (FVS)	4 (WAAS 64 Kbps) +2 (WAAS upgrade to 128 Kbps)	8 (WAAS) 1 (FVS) 2 (Test)
	Speed (kbps)	64Kbps	64Kbps and 128 Kbps	T-1
	Simplex Half/Full Duplex Service	FD Dedicated	FD Dedicated	FD Dedicated
HARDWARE REQUIREMENTS	Modem			
	Data Bridge			
	Clock			
	A/B Switch			
	DSC			
	Cable/Misc.	Cable to Demarc	Cable to Demarc	Cable to Demarc

5-07.4 ACQUISITION ISSUES

The WAAS letter contract, awarded to Hughes Aircraft Company on May 1, 1996 included all required hardware and software and the design of an interfacility communications network using existing FAA telecommunications circuits. The contract also includes Interim Contractor Maintenance Logistics Support (ICMLS) for the life of the contract. The lease of the required GEO uplink service and navigation transponders is through COMSAT. Hardware deliveries began in calendar year 1996 for FVS and were completed in 1998 for Phase 1 WAAS. The full delivery of the Phase 1 WAAS software was 1999 and Initial Operational Capability (IOC) is expected in mid CY00. Contract options may be exercised to meet Phase 2/3 requirements between CY 2000 - 2003. Table 5-07-2 shows the contract schedule.

Table 5-07-2. WAAS Contract Schedule

ACTIVITY	SCHEDULE	STATUS
Contract Award	1996	complete
FVS Delivery	1996	complete
Phase 1	2000	in progress
Phase 2/3	2003	pending Phase 1

5-07.4.1 Project Schedule and Status

The planned site installation/activation schedule is provided in Table 5-07-3, with the proposed implementation schedule for the associated telecommunications interfaces shown in Table 5-07-4. The interface implementation schedule reflects the maximum number of circuits needed for implementation of the system. The numbers take into account the potential need for additional bandwidth should the actual implementation requirements differ from the projections determined by modeling during the system development. Efforts are being made to minimize the number of circuits and bandwidth needed for implementation of all three phases.

Table 5-07-3. Facility/Site Installation/Activation Schedule

FACILITY/SITE	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
FVS WRS	5							
FVS WMS	2							
FVS Terrestrial Comm	1							
FVS GCS	1							
Phase 1 WRS	25							
Phase 1 WMS	2							
Phase 1 Terrestrial Comm	1							
Phase 1 GCS	3							
Phase 1 Software		1						
Phase 2/3 WRS				15		8		
Phase 2/3 WMS			2					
Phase 2/3 Terrestrial Comm			1					
Phase 2/3 GCS				1		1		1

Table 5-07-4. Interface Implementation Schedule

From	To	Diversity Req'mt	System/Rate/Miles	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
WRS	WMS	Yes	LINCS/64kbps/750	49	0	49	60	0	32	0	0
WRS	WMS	Yes	ANICS/64kbps	4	0	4	8	0	0	0	0
WMS	GES	Yes	LINCS/64kbps/750	7	2	4	4	0	4	0	4
WMS	WMS	Yes	LINCS/T1/2600	10	0	8	0	8	0	0	0
GES	GEO	Yes	Satellite Lease Service	2	0	0	1	0	1	0	1

5-07.4.2 Planned Telecommunications Strategies

The satellite communications segment for the WAAS is acquired separately from the terrestrial communications segment, but their implementation schedules match the phased deployment of WAAS master stations, reference stations, and ground uplink stations.

To support Phase I of the WAAS Program, GEO services are being leased on two INMARSAT satellites through COMSAT. In the later phase, it is expected these INMARSAT leases will be extended, and up to three additional GEO satellites or other type will be leased to meet the specific requirements of the WAAS Program (e.g., coverage, availability, etc.).

With respect to the terrestrial communications segment, the WAAS program will take maximum advantage of existing LINCS EUL-A sites, which provide the diverse communications paths required. In addition, each WRS will be homed to multiple WMSs, while the WMSs will be homed to multiple GUSs to eliminate single points of failure.

5-07.4.3 Telecommunications Costs

Table 5-07-5 provides a summary of the estimated telecommunications costs for the WAAS Program from FY00 to FY06. The cost summary is based on the site activation dates established in Table 5-07-3 and the number of interfaces to be implemented each year as shown in Table 5-07-4.

Separate subtotals are provided for the terrestrial segment and the satellite segment because, per an agreement with AFZ, WAAS's terrestrial communications costs are not handed-off to OPS until FY02 and WAAS's satellite communications costs are not handed-off to OPS until FY06. Note: This funding approach represents an exception to FAA Order 2500.8A.

The WAAS Program Office provides the satellite communications cost estimates.

Through an agreement with the terrestrial communications vendor (MCI-Worldcom for LINCS), the non-recurring costs for the EUL-A upgrades supporting the GESs have been spread across two years starting at FY98 through FY99 to reduce the impact in any given year. In some cases, the cost of circuits as well as EUL-A nodes incurred in FY99 are not shown since the funds were actually obligated in prior years.

Note: All cost projections are subject to change depending upon the outcome of the rebaselining of the WAAS Program.

5-07.4.3.1 Diversity Costs and Savings

Diversity requirements have been established by the WAAS contractor and are reflected in WAAS CDRL A042-005F and WAAS CDRL A052-005C.

Table 5-07-5. Cost Summary – WAAS

CIP # N-12 All costs in 1000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
1. WRS <---> WMS (Includes FVS and four ANICS circuits)								
Cost Profile: DDC64 circuits. Based on actual costs associated with installations through FY98.								
Channel Costs								
Channels Added	53	0	53	68	0	32	0	0
Total Channels	53	53	106	174	174	206	206	206
Number of Channels to be F&E Funded	53	53	106	0	0	0	0	0
Number of Channels to be OPS Funded	0	0	0	174	174	206	206	206
Non-recurring Channel Costs								
F&E Funded Non-recurring Costs		$0	$308	$0	$0	$0	$0	$0
OPS Funded Non-recurring Costs		$0	$0	$395	$0	$186	$0	$0
Recurring Channel Costs								
F&E Funded Recurring Costs		$1,075	$2,151	$0	$0	$0	$0	$0
OPS Funded Recurring Costs		$0	$0	$3,531	$3,531	$4,180	$4,180	$4,180
Total Channel Cost Estimate (NRC &ARC)		$1,075	$2,459	$3,926	$3,531	$4,366	$4,180	$4,180
Hardware Costs								
Cost Profile: DDC Platforms								
Hardware Units Required	7	0	0	2	0	2	0	2
Total Hardware Units	7	7	7	9	9	11	11	13
Number of Units to be F&E Funded		7	7	0	0	0	0	0
Number of Units to be OPS Funded		0	0	9	9	11	11	13
Non-recurring Hardware Costs								
F&E Funded Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Funded Non-recurring Costs		$0	$0	$8	$0	$8	$0	$8
Recurring Hardware Costs								
F&E Funded Recurring Costs		$4	$4	$0	$0	$0	$0	$0
OPS Funded Recurring Costs		$0	$0	$5	$5	$7	$7	$8
Total Hardware Cost Estimate (NRC &ARC)		$4	$4	$13	$5	$15	$7	$16
TOTAL WRS <---> WMS TERRESTRIAL COMM COSTS		**$1,080**	**$2,463**	**$3,939**	**$3,536**	**$4,380**	**$4,186**	**$4,196**

Table 5-07-5. Cost Summary – WAAS (Continued)

CIP #N-12 All costs in 1000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
2. WMS <---> GES (Includes FVS)								
Cost Profile: DDC64 circuits.								
Channel Costs								
Channels Added	7	2	4	4	0	4	0	4
Total Channels	7	9	13	17	17	21	21	25
Number of Channels to be F&E Funded		9	13	0	0	0	0	0
Number of Channels to be OPS Funded		0	0	17	17	21	21	25
Non-recurring F&E Channel Costs								
F&E Funded Non-recurring Costs		$11	$21	$0	$0	$0	$0	$0
OPS Funded Non-recurring Costs		$0	$0	$21	$0	$21	$0	$21
Recurring Channel Costs								
F&E Funded Recurring Costs		$169	$245	$0	$0	$0	$0	$0
OPS Funded Recurring Costs		$0	$0	$320	$320	$395	$395	$471
Total Channel Cost Estimate (NRC &ARC)		**$180**	**$245**	**$341**	**$320**	**$417**	**$395**	**$492**
Hardware Costs								
Cost Profile: DDC Platforms								
Hardware Units Required	4	0	0	2	0	2	0	2
Total Hardware Units	4	4	4	6	6	8	8	10
Number of Units to be F&E Funded		4	4	0	0	0	0	0
Number of Units to be OPS Funded		0	0	6	6	8	8	10
Non-recurring Hardware Costs								
F&E Funded Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Funded Non-recurring Costs		$0	$0	$8	$0	$8	$0	$8
Recurring Hardware Costs								
F&E Funded Recurring Costs		$2	$2	$0	$0	$0	$0	$0
OPS Funded Recurring Costs		$0	$0	$4	$4	$5	$5	$6
Total Hardware Cost Estimate (NRC &ARC)		**$2**	**$2**	**$12**	**$4**	**$13**	**$5**	**$14**
EUL-A Costs								
Cost Profile: EUL-A's								
EUL-A Sites Added	3	0	1	0	1	0	1	0
Total Number of Sites	3	3	4	4	5	5	6	6
Number of Sites to be F&E Funded		3	3	0	0	0	0	0
Number of Sites to be OPS Funded		0	1	4	5	5	6	6
Non-recurring EUL-A Costs								
F&E Funded Non-recurring Costs		$0	$1,613	$0	$0	$0	$0	$0
OPS Funded Non-recurring Costs		$0	$0	$0	$1,613	$0	$1,613	$0
Recurring EUL-A Costs								
F&E Funded Recurring Costs		$129	$258	$0	$0	$0	$0	$0
OPS Funded Recurring Costs		$0	$29	$115	$143	$143	$172	$172
Total EUL-A Cost Estimate (NRC &ARC)		**$129**	**$1,899**	**$115**	**$1,756**	**$143**	**$1,784**	**$172**
TOTAL WMS <---> GES TERRESTRIAL COMM COSTS		**$311**	**$2,146**	**$467**	**$2,079**	**$573**	**$2,185**	**$678**

Table 5-07-5. Cost Summary – WAAS (Continued)

CIP # N-12	All costs in 1000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
3. WMS <---> WMS (Includes FVS)									
	Cost Profile: DDC T-1 circuits.								
Channel Costs									
	Channels Added	10	0	10	0	8	0	0	0
	Total Channels	10	10	20	20	28	28	28	28
	Number of Channels to be F&E Funded		10	18	0	0	0	0	0
	Number of Channels to be OPS Funded		0	2	20	28	28	28	28
	Non-recurring F&E Channel Costs								
	F&E Funded Non-recurring Costs		$0	$58	$0	$0	$0	$0	$0
	OPS Funded Non-recurring Costs		$0	$0	$0	$46	$0	$0	$0
	Recurring Channel Costs								
	F&E Funded Recurring Costs		$2,290	$4,122	$0	$0	$0	$0	$0
	OPS Funded Recurring Costs		$0	$458	$4,580	$6,412	$6,412	$6,412	$6,412
	Total Channel Cost Estimate (NRC &ARC)		**$2,290**	**$4,580**	**$4,580**	**$6,458**	**$6,412**	**$6,412**	**$6,412**
Hardware Costs			**N/A - All WMS sites assumed to be already DDC Capable**						
TOTAL WMS <---> WMS TERRESTRIAL COMM COSTS			**$2,290**	**$4,580**	**$4,580**	**$6,504**	**$6,412**	**$6,412**	**$6,412**
	TOTAL TERRESTRIAL COMM F&E COSTS		$3,681	$8,781	$0	$0	$0	$0	$0
	TOTAL TERRESTRIAL COMM OPS COSTS		$0	$487	$8,987	$12,073	$11,365	$12,783	$11,285
TOTAL TERRESTRIAL COMMUNICATIONS COSTS			**$3,681**	**$9,268**	**$8,987**	**$12,073**	**$11,365**	**$12,783**	**$11,285**

Table 5-07-5. Cost Summary – WAAS (Continued)

CIP # N-12	All costs in 1000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
4. GES <---> GEO (Includes FVS)									
	Cost Profile: Satellite Lease Service								
Channel Costs									
	Channels Added	2	0	0	1	0	1	0	1
	Total Channels	2	2	2	3	3	4	4	5
	Number of Channels to be F&E Funded		2	2	3	3	4	4	5
	Number of Channels to be OPS Funded		0	0	0	0	0	0	0
	Non-recurring Channel Costs		$0	$10,000	$0	$0	$0	$0	$0
	Recurring Channel Costs								
	F&E Funded Recurring Costs		$5,400	$7,400	$21,400	$21,400	$39,400	$39,400	$55,400
	OPS Funded Recurring Costs		0	0	0	$0	0	$0	$0
	Total Channel Cost Estimate (NRC & ARC)		**$5,400**	**$17,400**	**$21,400**	**$21,400**	**$37,400**	**$47,400**	**$63,400**
Hardware Costs									
	Cost Profile: RFU Lease								
	Hardware Units Added	5	0	0	2	0	2	0	2
	Total Hardware Units	5	5	5	7	7	9	9	11
	Number of Units to be F&E Funded		5	5	7	7	9	9	11
	Number of Units to be OPS Funded		0	0	0	0	0	0	0
	Non-recurring Hardware Costs		$0	$0	$0	$0	$0	$0	$0
	Recurring Hardware Costs								
	F&E Funded Recurring Costs		$5,434	$5,447	$7,861	$7,861	$10,261	$10,261	$12,661
	OPS Funded Recurring Costs		$0	$0	$0	$0	$0	$0	$0
	Total Hardware Cost Estimate (NRC & ARC)		**$5,434**	**$5,447**	**$7,861**	**$7,861**	**$10,261**	**$10,261**	**$12,661**
	Total Satellite Comm. F&E Funded Costs		$10,834	$22,847	$29,261	$29,261	$49,661	$49,661	$68,061
	Total Satellite Comm. OPS Funded Costs		$0	$0	$0	$0	$0	$0	$0
TOTAL SATELLITE COMMUNICATIONS COSTS			**$10,834**	**$22,847**	**$29,261**	**$29,261**	**$49,661**	**$49,661**	**$68,061**

Table 5-07-5. Cost Summary – WAAS (Concluded)

CIP # N-12	All costs in ır Years 1000's	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
	SUMMARY - Combined Totals (Terrestrial and Satellite)							
F&E Totals	Non-recurring	$11	$12,000	$0	$0	$0	$0	$0
	Recurring	$14,504	$19,629	$29,261	$29,261	$49,661	$49,661	$68,061
	F&E Total	**$14,515**	**$31,628**	**$29,261**	**$29,261**	**$49,661**	**$49,661**	**$68,061**
OPS Totals*	Non-recurring	$0	$0	$433	$1,659	$223	$1,613	$37
	Recurring	$0	$487	$8,554	$10,415	$11,142	$11,170	$11,248
	OPS Total	**$0**	**$487**	**$8,987**	**$12,073**	**$11,365**	**$12,783**	**$11,285**
	SUMMARY - Combined Totals (Terrestrial Only)							
F&E Totals	Non-recurring	$11	$2,000	$0	$0	$0	$0	$0
	Recurring	$3,670	$6,782	$0	$0	$0	$0	$0
	F&E Total	**$3,681**	**$8,781**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Totals*	Non-recurring	$0	$0	$433	$1,659	$223	$1,613	$37
	Recurring	$0	$487	$8,554	$10,415	$11,142	$11,170	$11,248
	OPS Total	**$0**	**$487**	**$8,987**	**$12,073**	**$11,365**	**$12,783**	**$11,285**

OPS total does not include Logistics and Systems Maintenance.

CHAPTER 6-01 - SUMMARY SHEET

AIRPORT MOVEMENT AREA SAFETY SYSTEM (AMASS)

Program/Project Identifiers:

Project Number(s):	CIP S-01
Related Program(s):	ASR-9/ARTS, ASDE-3
New/Replacement/Upgrade?	New
Responsible Organization:	AND-410
Program Mgr./Project Lead:	Maria Tavenner, AND-410, (202) 267-9653
Fuchsia Book POC:	Jack Lisiecki, AND-410, (202) 267-9522

Assigned Codes:

PDC(s):	DO
PDC Description:	Airport Movement Area Safety System.
Service Code:	RTRD

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$3	$1	$5	$0	$0	$0	$0
F&E Recurring	$9	$3	$6	$4	$0	$0	$0
Total F&E	**$12**	**$4**	**$11**	**$4**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$0	$7	$9	$10	$14	$14	$14
Total OPS	**$0**	**$7**	**$9**	**$10**	**$10**	**$14**	**$14**

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CIP Category:
Surveillance

6-01.0 AIRPORT MOVEMENT AREA SAFETY SYSTEM

6-01.1 PROGRAM OVERVIEW

The Airport Movement Area Safety System (AMASS) implements a solution to provide a system at airports already equipped with Airport Surveillance Detection Equipment - Model 3 (ASDE-3) RADARs. The ASDE-3 RADAR provides ground surveillance information at a one second scan rate on aircraft and vehicles on or near airport movement areas. On its own, the ASDE-3 does not provide information on aircraft on final approach for landing at the airport, nor does it provide automated alerts (warnings and cautions) when hazardous or potentially hazardous situations occur. The AMASS is an enhancement to the ASDE-3 system. It processes beacon data from the Airport Surveillance Radar Model 9 (ASR-9), RADAR data from the ASDE-3, Aircraft Identification (ACID) and flight plan data from ARTS, and applies the resulting track data generated to its safety logic analysis section. Runway advisory information is then computed and a complete situational analysis is generated once per ASDE-3 scan. AMASS information is presented to the air traffic controller both aurally (via loudspeakers in the control tower cab) and visually, as both visual and textual alerts, on the ASDE-3 monitors installed in the tower cab.

In this program, 40 systems will be delivered.

6-01.1.1 Purpose of the Airport Movement Area Safety System (AMASS)

AMASS is a runway safety advisory system for air traffic controllers. It detects potential runway accidents and provides automatic alerts (warnings and cautions) to increase air traffic controller situational awareness.

6-01.1.2 References

Capital Investment Program (CIP) Project S-01, January 1999.

6-01.2 SYSTEM DESCRIPTION

The program will install 40 systems at 34 operational airports (four airports which have two towers will receive two systems) and two support sites.

The AMASS receives digitally processed target data from the ASDE-3. This data is subsequently applied to the AMASS target collection function where ASDE-3 RADAR returns are detected and track reports generated. The track reports are subsequently output to the track management function that provides the position and motion parameters to be applied to each track. The preceding tracks are then applied to the AMASS incursion analysis/detection function where tracks are applied to the safety logic tables. Outputs that satisfy the situations described in the safety logic are then output by the alert management function and other voice and display functions to the ASDE-3 display and AMASS loudspeakers in the tower cab.

6-01.2.1 Principal Components

The major components of AMASS from a telecommunications perspective are the:

- AMASS Cabinet
- Terminal Automation Interface Unit (TAIU)
- ASDE-3 Cabinet

The TAIU receives beacon target report information from Air Surveillance Radar (ASR-9) via the Surveillance Communications Interface Processor (SCIP), and uses ARTS flight plan information to correlate Aircraft Identification (ACID) with beacon codes. The TAIU provides the AMASS with aircraft runway prediction data for arriving aircraft. The AMASS processes this data, in the track management function and correlates it to ASDE-3 derived track data.

6-01.2.2 Functional Components Interface Requirements

AMASS interfaces to existing ATC systems. Telecommunications interfaces are illustrated in **Figure 6-01-1.**

6-01.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

Descriptions of the required interfaces are provided in the paragraphs below. Protocol, transmission and hardware requirements related to the interfaces are summarized in Table 6-01-1.

6-01.3.1 Interfaces

6-01.3.1.1 TAIU to AMASS Cabinet

The TAIU provides AMASS with arrival track positional data, prediction of landing runway, and status information. The telecommunications requirement exists between the TAIU and the AMASS Cabinet at those locations where the Air Traffic Control Tower is remote from the Terminal Radar Approach Control facility.

6-01.3.1.2 ASDE-3 to AMASS Cabinet

The ASDE-3 provides 8 parallel data lines of 4 bit RADAR returns and a 20 bit serial azimuth word to the AMASS Cabinet where it is processed with the ASR-9/SCIP and ARTS FPD (Flight Plan Data). The AMASS Cabinet provides audio and visual alerts to the controller via tower cab loudspeakers and the ASDE-3 Display Processor Unit (DPU) and Operational Display Unit (ODU). The AMASS and the TAIU also provide status information to the ASDE-3 DPU and Remote Monitor Unit (RMU). The AMASS and ASDE-3 cabinets are collocated (Excepting ASDE-3 remote systems where the transmitter/receiver and antenna system control units are located in a remote shelter/tower. The remote ASDE-3 units are connected via high and low speed infrared fiber optic links.)

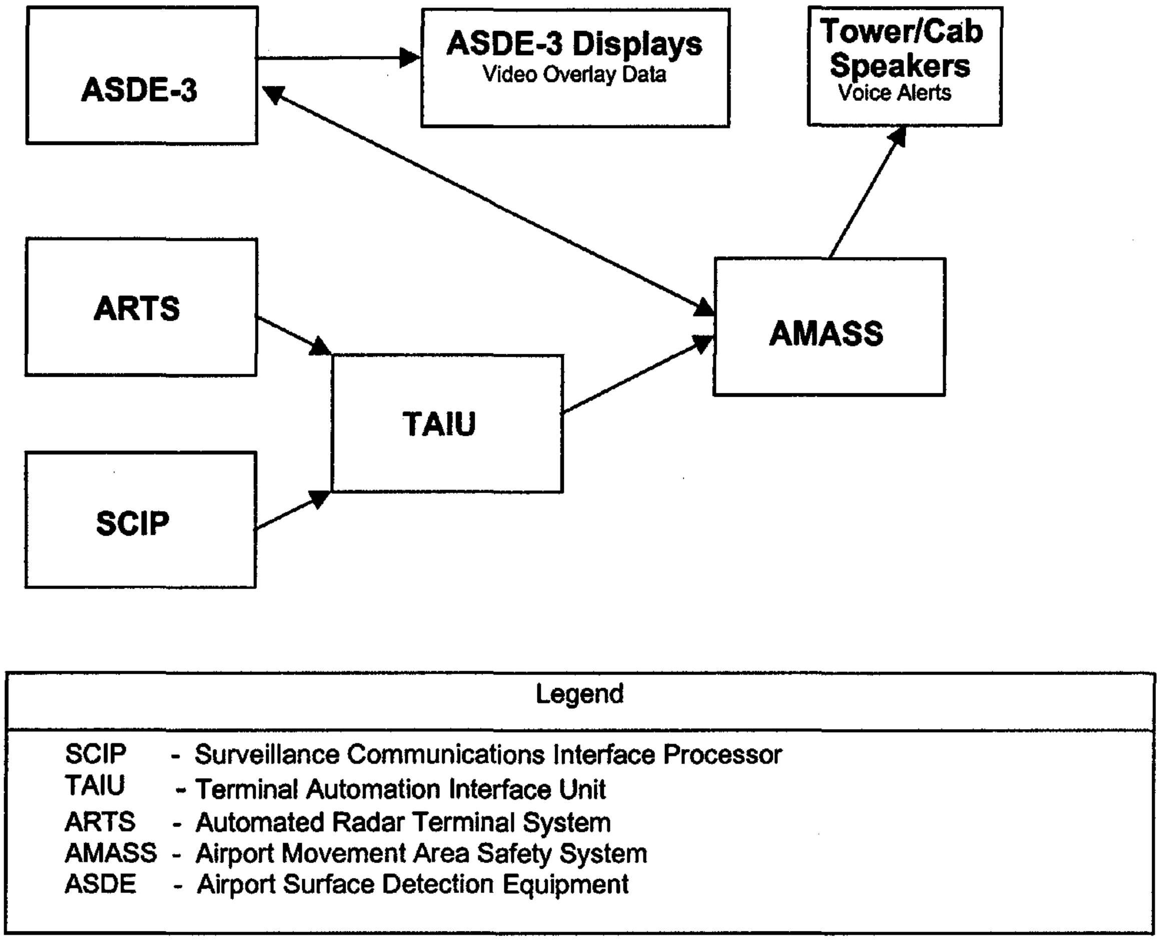

Figure 6-01-1. AMASS Interfaces

6-01.3.1.3 SCIP to TAIU

This interface provides beacon target report information from the ASR-9's SCIP to the TAIU.

6-01.3.2 ARTS to TAIU

This interface provides flight plan information to correlate ACID with beacon code from the SCIP to the TAIU.

Table 6-01-1. AMASS Telecommunications Interface Requirements Summary

SUBSYSTEM INTERFACE		TAIU to AMASS Cabinet	AMASS Cabinet to ASDE-3
INTERFACE CONTROL DOCUMENTATION		12XT-R-0012	12XT-R-0011 Rev. A
PROTOCOL REQUIREMENTS	Network Layer	Not applicable	Not applicable
	Data Link Layer		
	Physical Layer	RS-232	RS-232
	Special Formats/Codes		
TRANSMISSION REQUIREMENTS	No. Channels	1	No more than 6
	Speed (Kbps)	9600bps	
	Simplex Half/Full Duplex	Full Duplex	Full duplex
	Service	Pt. to Pt.	Pt. To Pt.
HARDWARE REQUIREMENTS	Modem	Motorola V.3400	None
	Data Bridge		
	Clock		
	A/B Switch		
	DSC		
	Cable/ Miscellaneous	Either direct line or dedicated leased line.	Direct line
SUBSYSTEM INTERFACE		TAIU to SCIP	TAIU to ARTS
INTERFACE CONTROL DOCUMENTATION		3255-DI08-01	3255-DI08-01
PROTOCOL REQUIREMENTS	Network Layer	Not applicable.	Not applicable.
	Data Link Layer	SE007-4	
	Physical Layer	RS-449 13 bit RS-232 13 bit	30 Bit Parallel – non standard 2 bit parity
	Special Formats/Code	Modified CD2	
TRANSMISSION REQUIREMENTS	No. Channels	3 ea. (SCIP A and SCIP B)	1
	Speed (Kbps)	9600bps	
	Simplex Half/Full Duplex	Half Duplex	
	Service	Pt. to Pt.	Pt. To Pt.
HARDWARE REQUIREMENTS	Modem		
	Data Bridge		
	Clock		
	A/B Switch		
	DSC		
	Cable/ Miscellaneous	Unidirectional, synchronous, serial channels	DI Proprietary Interface HW and Cables

6-01.4 ACQUISITION ISSUES

6-01.4.1 Program Schedule and Status

The contract for Full Scale Development (FSD) of AMASS was awarded in June 1996. A production contract was awarded in January 1997 for concurrent performance with the FSD contract.

Development Testing and Evaluation was completed in March 1999, followed by an Operation Test & Evaluation (OT&E) to assure that the system meets the needs of the National Airspace System (NAS). Resolutions of OT&E recommendations are ongoing, and an OT&E re-test was conducted in June 1999. An In-Service Decision is scheduled for January 2001.

The deployment of AMASS is expected to be completed in September 2002. Last Operational Readiness Test (ORT) is expected in August 2002. Table 6-01-2 shows the Site Preparation Schedule.

Table 6-01-2. Site Preparation Schedule

Region	Prior Yr.	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06	Total
Alaska (AAL)	1								1
Central (ACE)	2								2
Eastern (AEA)	4	5							9
Great Lakes(AGL)	4								4
New England (ANE)	1								1
Northwest MT. (ANM)	2	3							5
Southern (ASO)	2	4							6
Southwest (ASW)	2	3							5
Western Pacific (AWP)	4	1							5
FAA Academy (OK City)	1								1
FAA Tech Ctr (Atlantic City)	1								1
TOTAL	24	16							40

6-01.4.2 Planned Telecommunications Strategies

Table 6-01-3, TAIU/AMASS Cabinet Status lists local and remote telecommunications requirements. Local telecommunications requirements {collocated TRACON and ATCT facilities) are met by FAA cable connecting the TRACON TAIU equipment to the ATCT AMASS equipment. Remote telecommunications requirements (non-collocated equipment to the ATCT facilities) will require using FAA owned or leased communication circuits between the TRACON TAIU equipment and the ATCT AMASS equipment.

Table 6-01-3. TAIU/AMASS Cabinet Status

Tower Site	Current TAIU/AMASS Cabinet Status	Future TAIU/AMASS Cabinet Status	Cable Length Distance	Remarks
Anchorage	Local	Local	60 ft. from ARTS to AMASS	
Kansas City	Local	Local	600 ft.	
St. Louis (new tower)	Remote	Remote	4000 ft.	2000-2001 TRACON relocates to separate location.
Andrews AFB	Local	Remote	300 ft.	2002 TRACON relocates to separate location.
Baltimore	Local	Remote	220 ft.	2002 TRACON relocates to separate location.
Newark	Remote	Remote	52 mi. to NY TRACON	
New York-Kennedy	Remote	Remote	17 mi. to NY TRACON	
New York-LaGuardia	Remote	Remote	22 mi. to NY TRACON	
Philadelphia	Local	Local	270 ft.	
Pittsburgh	Local	Local	390 ft.	
Washington-Dulles	Local	Remote	165 ft.	
Washington-National	Local	Remote	175 ft.	2002 TRACON relocates to separate location.
Chicago	Remote	Remote	30 mi. (TELCO required)	
Cleveland	Local	Local	350 ft. CAB/TRACON 260 ft. ARTS/AMASS	
Detroit	Local	Local	375 ft. CAB/TRACON 250 ft. ARTS/AMASS	
Minneapolis-St. Paul	Local	Local	320 ft. CAB/TRACON 240 ft. ARTS/AMASS	
Boston	Local	Remote	500 ft.	2002 TRACON relocates to Merrimack NH (uses TELCO).
Denver #1	Local	Local	6 mi.	
Denver #2	Local	Local	19248 ft.	
Portland	Local	Local	1920 ft.	
Salt Lake City	Local	Local	820 ft.	
Seattle	Local	Local	600 ft.	
Atlanta	Local	Remote	unknown	1999 - ATL TRACON relocates 30 mi. (uses TELCO)
Charlotte	Local	Local	400 ft.	
Covington- Cincinnati	Local	Local	650 ft.	
Louisville	Local	Local	650 ft.	
Memphis	Local	Local	100 ft.	
Miami	Local	Local	350 ft.	
Dallas/Ft.Worth #1	Local	Local	15000 ft.	
Dallas/Ft.Worth #2	Local	Local	22000 ft.	
Houston #1	Local	Local	1.5 mi.	
Houston #2	Local	Local	1.5 mi.	
New Orleans	Local	Local	430 ft.	
Las Vegas	Local	Local	500 ft.	
Los Angeles #1	Remote	Remote	100 mi. LAX to SCT	
Los Angeles #2	Remote	Remote	100 mi. LAX to SCT	
San Diego	Remote	Remote	30 mi. Lindberg to SCT	
San Francisco	Remote	Remote	8 mi. SFO to Oakland	

6-01.4.3 AMASS Interface Implementation Schedule

The implementation schedule for AMASS interfaces is provided in Table 6-01-4. Implementations after

FY99 reflect scheduled relocations of TRACONs.

Table 6-01-4. AMASS Interface Implementation Schedule

From Tower	To	Diversity Req'mt	System/Rate/Miles	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
Andrews AFB	Potomac TRACON	None	LINCS/9.6 kbps/55	0	0	0	1	0	0	0	0
Atlanta	Atlanta TRACON	None	LINCS/9.6 kbps/30	1	1	0	0	0	0	0	0
Baltimore	Potomac TRACON	None	LINCS/9.6 kbps/65	0	0	0	1	0	0	0	0
Boston	Boston TRACON	None	LINCS/9.6 kbps/52	0	0	0	1	0	0	0	0
Chicago	Chicago TRACON	None	LINCS/9.6 kbps/30	1	0	0	0	0	0	0	0
Los Angeles	So. California TRACON	None	LINCS/9.6 kbps/100	2	0	0	0	0	0	0	0
Newark	New York TRACON	None	LINCS/9.6 kbps/52	1	0	0	0	0	0	0	0
New York - Kennedy	New York TRACON	None	LINCS/9.6 kbps/17	1	0	0	0	0	0	0	0
New York - LaGuardia	New York TRACON	None	LINCS/9.6 kbps/22	1	0	0	0	0	0	0	0
St. Louis	St. Louis TRACON	None	LINCS/9.6 kbps/35	0	1	0	0	0	0	0	0
San Diego	So. California TRACON	None	LINCS/9.6 kbps/22	1	0	0	0	0	0	0	0
San Francisco	No. California TRACON	None	LINCS/9.6 kbps/85	0	0	1	0	0	0	0	0
San Francisco	Bay TRACON	None	LINCS/9.6 kbps/8	1	0	0	0	0	0	0	0
Washington – Dulles	Potomac TRACON	None	LINCS/9.6 kbps/23	0	0	0	1	0	0	0	0
Washington – National	Potomac TRACON	None	LINCS/9.6 kbps/40	0	0	0	1	0	0	0	0

6-01.4.4 Telecommunications Costs

Table 6-01-5 provides estimated projections for Facilities and Equipment (F&E) and Operations telecommunications costs for the AMASS project. Table 6-01-4 was used to calculate the planned schedule outlined in this table.

Table 6-01-5. Cost Summary - AMASS

CIP # S-01	All costs in 000's	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
ATCT/AMASS <---> TRACON/TAIU									
Cost Profile: LINCS VG-8 Circuits with Program-Provided Modems									
Channel Costs									
Channels Added			2	1	5	0	0	0	0
Total Channels		8	10	11	16	16	16	16	16
F&E Funded Channels			10	3	6	5	0	0	0
OPS Funded Channels			0	8	10	11	16	16	16
F&E Non-recurring Channel Costs			**$3**	**$1**	**$5**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs									
F&E Recurring Costs			**$9**	**$3**	**$6**	**$4**	**$0**	**$0**	**$0**
OPS Recurring Costs			**$0**	**$7**	**$9**	**$10**	**$14**	**$14**	**$14**
Hardware Costs			*N/A - Modems provided by the AMASS Program Office*						

		SUMMARY						
F&E Totals	Non-recurring	$3	$1	$5	$0	$0	$0	$0
	Recurring	$9	$3	$6	$4	$0	$0	$0
	F&E Totals	**$12**	**$4**	**$11**	**$4**	**$0**	**$0**	**$0**
OPS Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$0	$7	$9	$10	$14	$14	$14
	OPS Totals	**$0**	**$7**	**$9**	**$10**	**$14**	**$14**	**$14**

CHAPTER 6-02 - SUMMARY SHEET

DIGITAL AIRPORT SURVEILLANCE RADAR (ASR-11)

Program/Project Identifiers:

Project Number(s):	CIP S-03
Related Program(s):	CIP A-04, STARS
New/Replacement/Upgrade?	Replace existing ASR-7 and ASR-8, new systems for new requirements, and DOD takeover facilities.
Responsible Organization:	AND-440
Program Mgr./Project Lead:	Kimberly Gill, AND-440, (202) 267-7836
Fuchsia Book POC:	Nelson Barber, AND-440, (202) 267-9453

Assigned Codes:

PDC(s):	DC, DD
PDC Description:	Terminal primary radar (Primary Path); Terminal secondary radar circuits
Service Code:	TRAD, TSEC

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$37	$331	$368	$221	$294	$294	$294
F&E Recurring	$22	$214	$412	$347	$304	$347	$347
Total F&E	**$58**	**$545**	**$780**	**$568**	**$598**	**$641**	**$641**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$0	$0	$19	$214	$431	$561	$734
Total OPS	**$0**	**$0**	**$19**	**$214**	**$431**	**$561**	**$734**

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CIP Category:
Surveillance

6-02.0 AIRPORT SURVEILLANCE RADAR (ASR-11)

6-02.1 AIRPORT SURVEILLANCE RADAR MODEL 11 (ASR-11) SYSTEM OVERVIEW

6-02.1.1 Purpose of the Airport Surveillance Radar (ASR-11) System

The ASR-11 will replace existing ASR-7 and ASR-8 radar systems and provide enhanced primary and secondary radar surveillance to the NAS. The ASR-7 and ASR-8 radar systems are over 20 years old and experiencing attendant logistics and maintenance problems. The ASR-11 is highly reliable and requires less maintenance and logistics effort compared to the existing systems.

The Enroute Product Team, AND-440, is responsible for the ASR-11 management and development.

6-02.1.2 References

6-02.1.2.1 FAA Aviation System Capitol Investment Plan (CIP), S-03 Terminal Radar (ASR) Program, January 1999.

6-02.1.2.2 NAS Systems Specification, NAS-SS-1000, Volume III, paragraph 2.2.1.1.4, September 1994.

6-02.1.2.3 ASR-11 System Specification, (TBD).

6-02.2 SYSTEM DESCRIPTION

The ASR-11 is comprised of the Primary Surveillance Radar (PSR) and the Monopulse Secondary Surveillance Radar (MSSR). It is 100% solid state, digital, network compliant (10BaseT technology), and operationally compatible with ARTS, STARS, and other ATC systems requiring digital data inputs. Each ASR-11 will interface to the current RMS/MPS system as an interim stage, with a later adaptation, transition, and interconnection with NIMS as that system is deployed.

The ASR-11/PSR is manufactured at Raytheon's Waterloo, Canada facility. The ASR-11/MSSR is manufactured by Cossor, a Raytheon subsidiary located in England. The MSSR can be upgraded to provide Mode-S surveillance capability (selective addressing, only) by inserting additional circuit cards. The ASR-11 is designed to provide a 20-year service life. The entire system will be delivered and installed by Raytheon on a turn-key contract.

6-02.2.1 Program/System Components

6-02.2.1.1 Principal Components

The major components of the ASR-11 from a telecommunications perspective include the following:

- PSR,
- MSSR,
- Two Local Area Networks (LAN),
- Surveillance Data Translator (SDT)/Digital Video Generator (DVG) for ARTS Facilities,
- Operator Maintenance Terminal (OMT),
- System Interface Unit (SIU) for STARS Facilities, and
- Radar Control Panel.

The PSR, MSSR and one LAN are located at the radar site. The second LAN, the SDT/DVG (or SIU), OMT, and the Radar Control Panel are located at the Terminal Radar Approach Control (TRACON) facility. The SDT translates ASR-11 output data from ASTERIX format, to the CD-2 data format required by the Automated Radar Tracking System (ARTS). The DVG converts the digital CD-2 data to reconstituted video for use by the ARTS displays and other ATC equipment including beacon decoders and Digital Bright Radar Indicator Tower Equipment (DBRITE). The SIU provides a similar translation from ASTERIX format to CD-2 format for the Standard Terminal Automation Replacement System (STARS). Additional connectivity provides remote status and control data to the NIMS Manager and surveillance data to other ATC users.

6-02.2.1.2 Functional Component Interface Requirements

The ASR-11 system interfaces provide surveillance data and video as well as control and status to the existing ATC systems located at the TRACON, the Air Traffic Control Tower (ATCT) and the NIMS Manager or MPS facility (See Figure 6-02-1). As shown in Figure 6-02-2 and 6-02-3, the ASR-11 conveys serial data in ASTERIX format from the radar site to the TRACON. At the TRACON and the ATCT, the ASR-11 outputs provide surveillance, status, and control information to the ATC systems as follows:

- Serial output data (CD-2) to ARTS IIE,
- Parallel data (CD-2) to ARTS IIIA/E,
- Serial output data (CD-2) to STARS,
- Reconstituted video to the ATC PPI displays, ARTS-IIE DDAS, ARTS-IIIA/E Beacon Decoders, and the DBRITE System
- Status and control data to the NIMS proxy agent

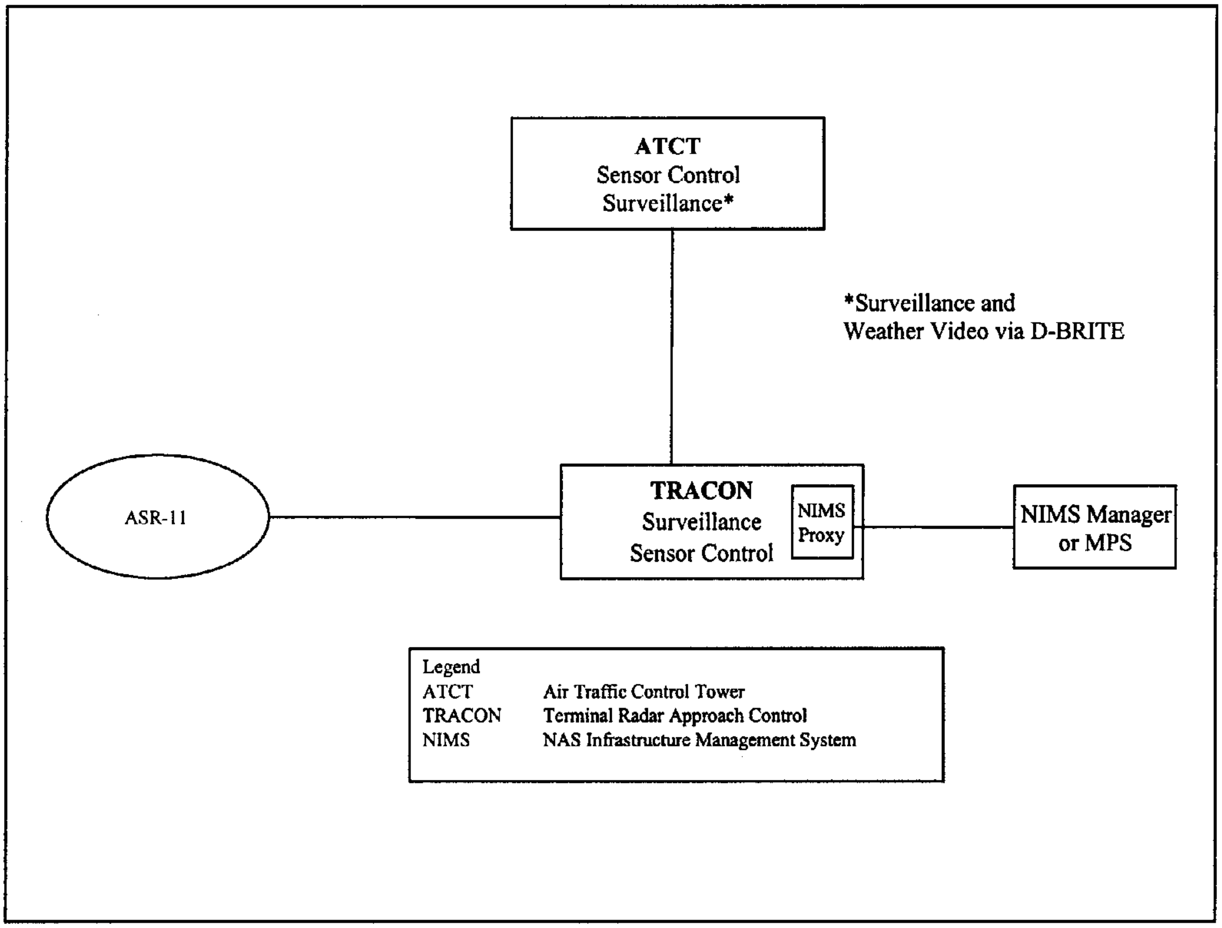


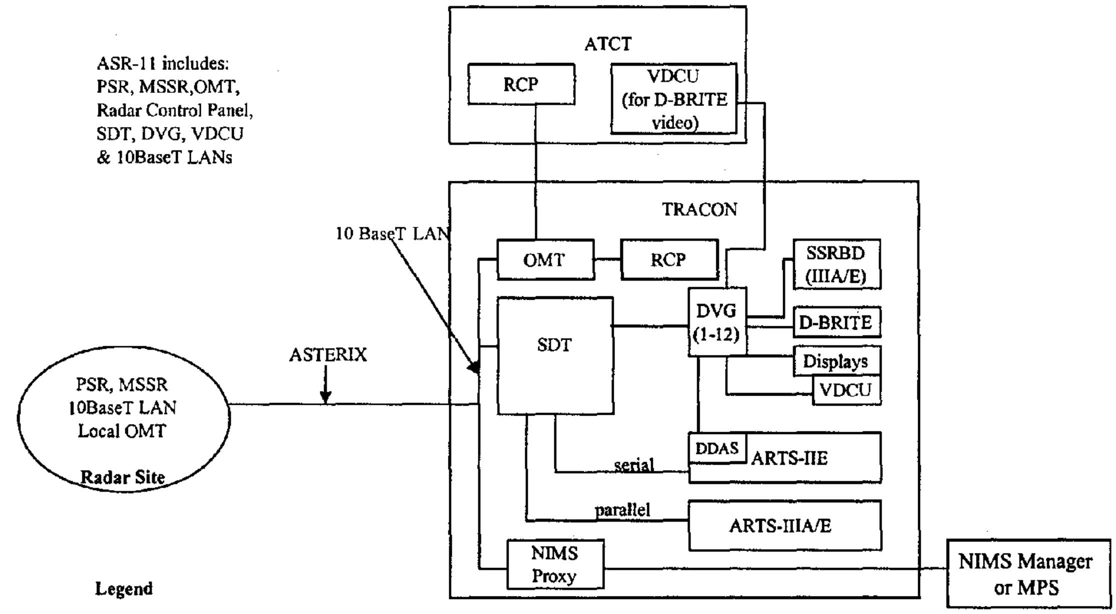
Figure 6-02-1. ASR-11 Interfaces

6-02.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

The ASR-11 has three interfaces at ARTS facilities and two at STARS facilities requiring a combination of contractor furnished telecommunication equipment, and contractor or government supplied communication channels (see Figures 6-02-2 and 6-02-3, respectively).

There are two interfaces connecting equipment that is not part of the ASR-11, to either the ARTS or to the STARS, and to the NIMS proxy agent.

The ASR-11 surveillance data interface follows the diversity guidelines provided in FAA Order 6000.36, Communications Diversity.



10BaseT	10 Mbps, Base Chan, Twisted Pair	LAN	Local Area Network
ARTS	Automated Radar Tracking System	NIMS	NAS Infrastructure Management System
ASTERIX	All Purpose Structured Eurocontrol Radar Information Exchange	RCP	Radar Control Panel
		SDT	Surveillance Data Translator
ATCT	Air Traffic Control Tower	SSRBD	Solid State Radar Beacon Decoders
D-BRITE	Digital Bright Radar Indicator Tower Equipment	TRACON	Terminal Radar Approach Control
		VDCU	Video Display Control Unit
DVG	Digital Video Generator	DDAS	Decoding Data Acquisition Subsystem

Figure 6-02-2. ASR-11 to ARTS IIE or ARTS IIIA/E

6-02.3.1 Telecommunications Interfaces

The ASR-11, from the telecommunications perspective, has four interfaces:

1. From either the SDT/DVG to the ARTS IIE or ARTS IIIA/E and associated ATC equipment to provide surveillance data and reconstituted video to provide surveillance data.
2. From the SIU to STARS to provide surveillance data.
3. From the 10BaseT LAN at the TRACON to the NIMS proxy agent (typically will be located at the TRACON) to provide remote monitoring and maintenance control. (Note that the NIMS Program Office is responsible for the interface from the NIMS proxy agent to the NIMS Manager or MPS facility).
4. From the ASR-11 radar site to the OMT

6-02.3.1.1 The ASR-11 SDT to ARTS IIE or ARTS IIIA/E.

Two channels are provided from the SDT to ARTS IIE. Each channel contains three RS-422 channels that convey surveillance data in CD-2 format. At ARTS IIIA/E sites, two channels, each containing two NTDS-B (32-bit parallel data) channels in SRAP format are provided from the SDT, conveying surveillance data. Up to twelve DVGs, using analog channels, convey reconstituted video, per ICD SE007-4, to the ARTS displays and associated ATC equipment.

6-02.3.1.2 The ASR-11 SIU to STARS.

Two independent channels, each consisting of up to four RS-530 channels and data rates from 9600 bps to 56 Kbps per channel (max aggregation of 56 Kbps per SIU channel), are routed from the SIU to STARS. See Figure 6-02-3.

6-02.3.1.3 ASR-11 10BaseT LAN at the TRACON to the NIMS proxy agent

One of the four Ethernet hub ports located at the TRACON is dedicated to interface with the NIMS proxy agent.

6-02.3.2 Local Interfaces

1. From the ASR-11 radar site to the LAN at the TRACON, providing surveillance data, sensor status and control to the SDT or SIU, OMT, and to the NIMS proxy agent.
2. From the OMT at the TRACON to the radar control panels located at the TRACON and at the ATCT to provide status and control.
3. From the ASR-11 DVG to the Video Display Control Units, controlling how video is presented on the ATC displays at the TRACON and ATCT (this interface is only applicable at ARTS facilities).

6-02.3.2.1 ASR-11 Radar Site to the LAN at the TRACON.

The LAN at the TRACON receives surveillance data from the PSR and MSSR via the LAN at the radar site. Two channels (circuits) of two channels each interconnect the LANs. Each channel complies with the IEEE 802.3 standard (Ethernet) for a 10BaseT LAN (max data rate 10 Mbps). Channel configuration is distance dependent and is structured as shown in Table 6-02-1.

Table 6-02-1. Radar Site to TRACON LAN Interface

Distance	Comm Link Interface	Line Type
0 - 100m	Short Haul Modem	Twisted Pair
100m - 2km	Transceiver	Multimode Fiber Optic
>2km	Transceiver	Single Mode Fiber Optic

6-02.3.2.2 ASR-11 OMT to the ASR-11 Radar Control Panel.

One channel is required; the channel configuration is dependent on the distance between the OMT and the radar control panels. Each channel uses an EIA-232 interface with a data rate of 2400 bps. The communication link interface and line type requirements are listed in Table 6-02-2.

Table 6-02-2. OMT to Radar Control Panel Interface

Distance	Comm Link Interface	Line Type
0 - 15.2m	none	Direct connection
15.2m - 5.5km	Short Haul Modem	Dedicated Channel

6-02.3.2.3 ASR-11 DVG to VDCU interface.

The VDCU is used to control the weather and search video generated by the DVG. Although one channel is used, the channel configuration is dependent on the distance between the DVG located at the TRACON and the VDCU located at either the TRACON or at the ATCT. Each channel is an EIA-232 interface with a data rate of 2400 bps. The communication link interface and line type requirements are listed in Table 6-02-3.

Table 6-02-3. ASR-11 DVG to VDCU Interface

Distance	Comm Link Interface	Line Type
0 - 15.2m	none	Direct connection
15.2m - 5.5km	Short Haul Modem	Dedicated Channel

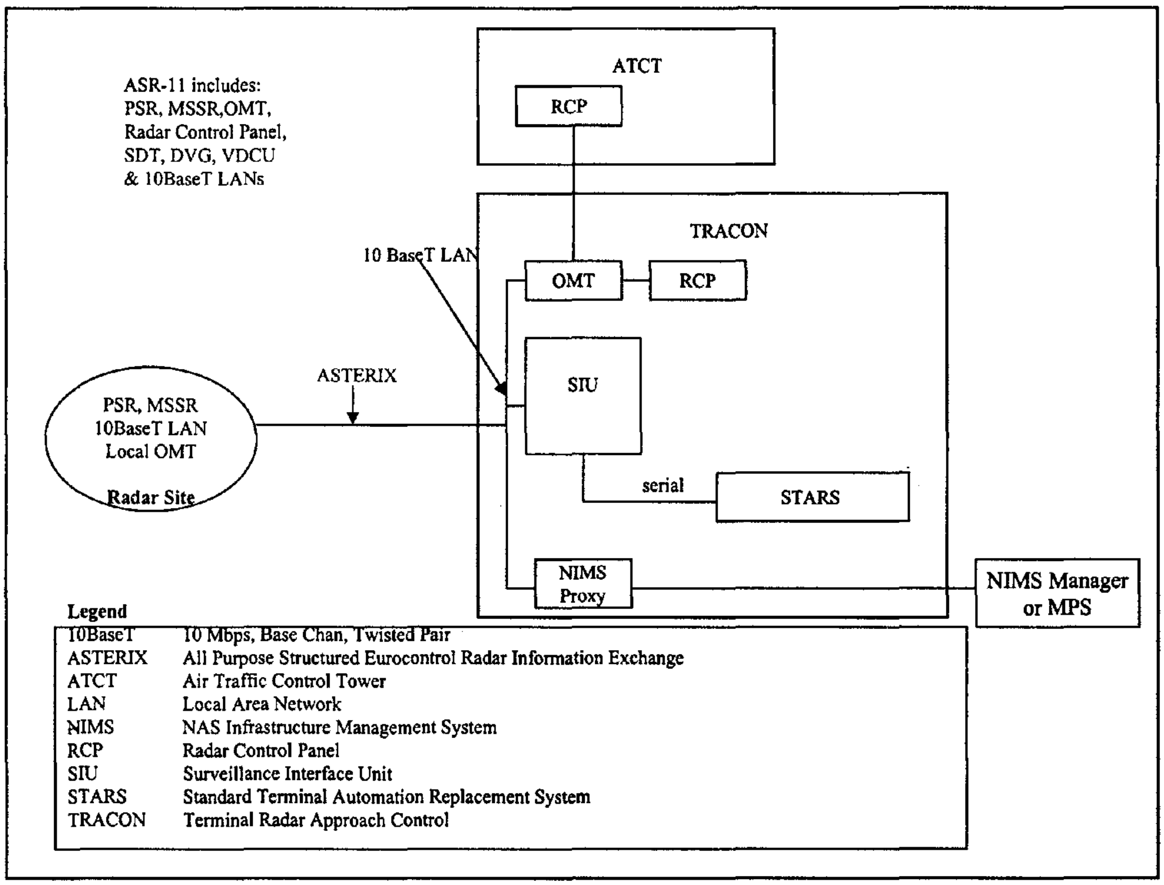


Figure 6-02-3. ASR-11 to STARS

6-02.3.3 ASR-11 Connectivity Requirements

Table 6-02-4 summarizes the Telecommunications interface requirements.

Table 6-02-4. Telecommunications Interface Requirements Summary

SUBSYSTEM INTERFACE		ASR-11 Radar Site to TRACON LAN	ASR-11 DVG to the VDCU	ASR-11 OMT to Radar Control Panel
INTERFACE CONTROL DOCUMENTATION		(TBD)	(TBD)	(TBD)
PROTOCOL REQUIREMENTS	Type Interface:	Local	Local	Local
	Network Layer	IP/ICMP		
	Data Link Layer	HDLC/Ethernet		
	Physical Layer	IEEE 802.3	RS-232	RS-232-C
	Special Formats/ Codes			
TRANSMISSION REQUIREMENTS	No. Channels	1	1	1
	Speed (Kbps)	10 Mbps max	2400 bps	2400 bps
	Simplex Half/Full Duplex	Full Duplex	Half Duplex	Half Duplex
	Service	PT. to Pt.	Pt. to Pt.	Pt. to Pt.
HARDWARE REQUIREMENTS	Modem	a. Short haul b. Transceiver	a. Null b. Short haul	a. Null b. Short Haul
	Data Bridge	10BaseT bridge/router		
	Clock			
	A/B Switch			
	DSC			
	Cable/ Miscellaneous	a. Twisted Pair b. Fiber Optic	a. Direct connection b. Dedicated Line	a. Direct connection b. Dedicated Line

SUBSYSTEM INTERFACE		ASR-11 to ATC (SDT to ARTS)	ASR-11 to ATC (SIU to STARS)	ASR-11 to NIMS
INTERFACE CONTROL DOCUMENTATION		SE007-4 (CD-2 to ARTS)	NAS-IR-34120001 (CD-2 to STARS)	TBD
PROTOCOL REQUIREMENTS	Type Interface:	Telecommunications	Telecommunications	Telecommunications
	Network Layer			TCP/IP
	Data Link Layer			HDLC/Ethernet
	Physical Layer	RS-422 (ARTS IIE), NTDS-B (ARTS IIIA/E)	RS-232-C	EIA-530
	Special Formats/ Codes	Reconstituted video		
TRANSMISSION REQUIREMENTS	No. Channels	1-12	1-4	1
	Speed (kbps)	9.6-64 kbps	56 kbps	10 Base T
	Simplex Half/Full Duplex	Simplex	Simplex	FD
	Service	Pt. to Pt.	Pt. to Pt.	Pt. to Pt.
HARDWARE REQUIREMENTS	Modem			
	Data Bridge	10BaseT Hub		
	Clock			
	A/B Switch			
	DSC			
	Cable/Miscellaneous	DEDICATED LINE	DEDICATED LINE	DEDICATED LINE

6-02.4 ACQUISITION ISSUES

6-02.4.1 Project Schedules and Status

Procurement of the ASR-11 is a joint FAA/DOD effort. The DOD version of the radar will be designated the Digital Airport Surveillance Radar (DASR). The contract was awarded in September 1996 but due to contract protests, actual work did not start until December 1996.

Development and contractor testing phases are scheduled for completion in January 2000, followed by Government OT&E and IOT&E test efforts to assure that the system will meet the needs of the NAS. If OT&E/IOT&E testing is successful, production systems will be ordered starting in FY00.

The ASR-11 deployment/implementation is projected over seven years, to be completed in 2008. Table 6-02-5 shows the schedule for Site Preparation starts.

Table 6-02-5. ASR-11 Site Preparation Schedule. **

Region	Prior Yr.	FY 99	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06	FY 07	Total
Alaska (AAL)				1	1						2
Central (ACE)				1	1		1		1	1	5
Eastern (AEA)				2		2	1	2	2	3	12
Great Lakes (AGL)				2	4	3	4	4	3	5	25
New England (ANE)				2				1			3
Northwest Mountain (ANM)				2	1		2	1		1	7
Southern (ASO)				1	6	3	4	3	4	3	24
Southwest (ASW)				2	3	2	1	1	3	3	15
Western Pacific (AWP)	1#			1	2	2	2	3	2	2	15
FAA Academy (OK City)			1								1
FAA Prog. Supp. Fac. (OK City)				1							1
Mobile System				1	1						2
TOTAL	1		1	16	19	12	15	15	15	18	112

Note: # Stockton, CA - key test site
** Based upon ASR-11 DRAFT Waterfall schedule dated 1/7/00.

6-02.4.2 Planned Telecommunications Strategies

For all ASR-11 remote interfaces, the preferred method for remoting data is vendor-provided fiber optic cable. However, some sites will require leased connectivity or other means of data remoting.

6-02.4.3 Telecommunications Costs

Table 6-02-6 provides a summary of the estimated telecommunications costs for the ASR-11 Program from FY00 to FY06. In accordance with FAA Order 2500.8A, non-recurring charges and recurring charges in the year of installation plus the next full fiscal year are included in the F&E Funded totals. After the second year, the recurring charges for a particular channel are OPS Funded.

The summary table provides a roll-up of the costs for the sites defined in Table 6-02-5. The ASR-11 includes three basic functional interfaces: ASR-11 control (via the OMT), ASR-11 radar data from the radar site to the air traffic control facility, and remote monitoring (ASR-11 to the NIMS Proxy Agent).

The transition from ARTS to STARS will have no telecommunications connectivity impact since the STARS Program will use the connectivity established for the ARTS interface. A splitter device, provided by the STARS Program, will enable STARS to share ASR-11 radar data with the ARTS during the period of parallel operations.

Table 6-02-6. Cost Summary - ASR-11

CIP # S-03 All costs in 000's	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
1. ASR-11 <---> OMT								
Cost Profile: LINCS EUL-B to A / DDS 9.6 kbps Circuits with a Pair of CSU/DSUs per Interface								
Channel Costs								
Channels Added		1	9	10	6	8	8	8
Total Channels	1	1	10	20	26	34	42	50
F&E Funded Channels		1	10	19	16	14	16	16
OPS Funded Channels		0	0	1	10	20	26	34
Non-recurring Channel Costs								
F&E Non-recurring Costs		**$5.9**	**$53.5**	**$59.4**	**$35.6**	**$47.5**	**$47.5**	**$47.5**
Recurring Channel Costs								
F&E Recurring Costs		**$2.6**	**$26.1**	**$49.7**	**$41.8**	**$36.6**	**$41.8**	**$41.8**
OPS Recurring Costs		**$0.0**	**$0.0**	**$2.6**	**$26.1**	**$52.3**	**$68.0**	**$88.9**
Hardware Costs								
Hardware Units Added		2	18	20	12	16	16	16
Total Hardware Units	2	2	20	40	52	68	84	100
F&E Funded HW Units		2	20	38	32	28	32	32
OPS Funded HW Units		0	0	2	20	40	52	68
Non-recurring Hardware Costs								
F&E Non-recurring Costs		**$2.4**	**$21.6**	**$24.0**	**$14.4**	**$19.2**	**$19.2**	**$19.2**
Recurring Hardware Costs								
F&E Recurring Costs		**$0.1**	**$0.6**	**$1.1**	**$1.0**	**$0.8**	**$1.0**	**$1.0**
OPS Recurring Costs		**$0.0**	**$0.0**	**$0.1**	**$0.6**	**$1.2**	**$1.6**	**$2.0**
2. ASR-11 <---> SDT/SIU								
Cost Profile: 2 LINCS EUL-B to A 128 kbps Circuits per Interface								
Channel Costs								
Channels Added		2	18	20	12	16	16	16
Total Channels	2	2	20	40	52	68	84	100
F&E Funded Channels		2	20	38	32	28	32	32
OPS Funded Channels		0	0	2	20	40	52	68
Non-recurring Channel Costs								
F&E Non-recurring Costs		**$18.1**	**$163.0**	**$181.2**	**$108.7**	**$144.9**	**$144.9**	**$144.9**
Recurring Channel Costs								
F&E Recurring Costs		**$15.9**	**$159.1**	**$302.3**	**$254.6**	**$222.8**	**$254.6**	**$254.6**
OPS Recurring Costs		**$0.0**	**$0.0**	**$15.9**	**$159.1**	**$318.2**	**$413.7**	**$541.0**
Hardware Costs		*N/A - Multiplexing Modems Provided by ASR-11 Vendor*						

Table 6-02-6. Cost Summary - ASR-11 (cont.)

CIP # S-03	All costs in 000's	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
3. ASR-11 <---> NIMS Proxy Agent									
a. Dedicated Connectivity									
	Cost Profile: LINCS VG-8 with DMN Codex 3600P Modems								
Channel Costs									
	Channels Added		1	9	10	6	8	8	8
	Total Channels	0	1	9	19	25	33	41	49
	F&E Funded Channels		1	9	19	16	14	16	16
	OPS Funded Channels		0	0	0	9	19	25	33
	Non-recurring Channel Costs								
	F&E Non-recurring Costs		**$3.1**	**$27.5**	**$30.5**	**$18.3**	**$24.4**	**$24.4**	**$24.4**
	Recurring Channel Costs								
	F&E Recurring Costs		**$1.2**	**$11.2**	**$23.6**	**$19.9**	**$17.4**	**$19.9**	**$19.9**
	OPS Recurring Costs		**$0.0**	**$0.0**	**$0.0**	**$11.2**	**$23.6**	**$31.1**	**$41.0**
Hardware Costs									
	Hardware Units Required		2	18	20	12	16	16	16
	Total Hardware Units	0	2	18	38	50	66	82	98
	F&E Funded HW Units		2	18	38	32	28	32	32
	OPS Funded HW Units		0	0	0	18	38	50	66
	Non-recurring Hardware Costs								
	F&E Non-recurring Costs		**$6.0**	**$54.0**	**$60.0**	**$36.0**	**$48.0**	**$48.0**	**$48.0**
	Recurring Hardware Costs								
	F&E Recurring Costs		**$0.1**	**$0.6**	**$1.3**	**$1.1**	**$0.9**	**$1.1**	**$1.1**
	OPS Recurring Costs		**$0.0**	**$0.0**	**$0.0**	**$0.6**	**$1.3**	**$1.7**	**$2.2**
b. DMN Dial Back-up Connectivity									
	Cost Profile: FTS2000/2001 Dial Access to NIMS (Dial Lines Required at the ASR-11 and the NIMS Proxy Agent Site)								
Switched Service Costs									
	Dial Lines Added		2	18	20	12	16	16	16
	Total Dial Lines	0	2	18	38	50	66	82	98
	F&E Funded Lines		2	18	38	32	28	32	32
	OPS Funded Lines		0	0	0	18	38	50	66
	Non-recurring Switched Service Costs								
	F&E Non-recurring Costs		**$1.3**	**$11.3**	**$12.6**	**$7.6**	**$10.1**	**$10.1**	**$10.1**
	Recurring Switched Service Costs								
	F&E Recurring Costs		**$1.8**	**$16.2**	**$34.2**	**$28.8**	**$25.2**	**$28.8**	**$28.8**
	OPS Recurring Costs		**$0.0**	**$0.0**	**$0.0**	**$16.2**	**$34.2**	**$45.0**	**$59.4**

Table 6-02-6. Cost Summary - ASR-11 (cont.)

CIP # S-03	All costs in 000's	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
			SUMMARY						
	F&E Totals	Non-recurring	$37	$331	$368	$221	$294	$294	$294
		Recurring	$22	$214	$412	$347	$304	$347	$347
		F&E Totals	**$58**	**$545**	**$780**	**$568**	**$598**	**$641**	**$641**
	OPS Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$19	$214	$431	$561	$734
		OPS Totals	**$0**	**$0**	**$19**	**$214**	**$431**	**$561**	**$734**

CHAPTER 6-03 - SUMMARY SHEET

AIR TRAFFIC CONTROL BEACON INTERROGATOR - 6 (ATCBI-6)

Program/Project Identifiers:

Project Number(s):	CIP S-02
Related Program(s):	CIPs A-03, A-11, A-12, C-15, C-17, C-20, C-22, F-02, F-04, M-07, M-15, S-03, S-04, S-05, S-08, W-01, R,E&D 021-190, 022-110, 031-110, 041-110
New/Replacement/Upgrade?	Replacement
Responsible Organization:	AND-450
Program Mgr./Project Lead:	Wayne Sutler, AND-450, (202) 267-7491
Fuchsia Book POC:	Vince Chu, AND-450, (202) 267-5380

Assigned Codes:

PDC(s):	DI, DK
PDC Description:	Beacon-Only Narrow-Band Radar Circuits (Primary path); Back-up Beacon-Only Narrow-Band Radar Circuits.
Service Code:	BDAT

Cost Estimates:*

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$291	$835	$953	$508	$0	$0	$27
F&E Recurring	$167	$681	$1,068	$835	$282	$1	$5
Total F&E	**$458**	**$1,516**	**$2,021**	**$1,343**	**$282**	**$1**	**$32**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$0	$0	$166	$680	$1,233	$1,514	$1,514
Total OPS	**$0**	**$0**	**$166**	**$680**	**$1,233**	**$1,514**	**$1,514**

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CIP Category:
Surveillance

6-03.0 AIR TRAFFIC CONTROL BEACON INTERROGATOR MODEL 6

6-03.1 ATCBI-6 PROGRAM OVERVIEW

Approximately 124 ATCBI-4/5's will remain operational after commissioning of all "First Buy" Mode Select Beacon Systems (Mode S) and Airport Surveillance Radar Model 11 (ASR-11) integrated monopulse secondary surveillance radars (MSSR). The Air Traffic Control Beacon Interrogator Model 6 (ATCBI-6) will replace remaining ACTBI-4 and -5 secondary surveillance radar systems.

The ATCBI-6 will be delivered in different configurations depending upon site location. Initial deployment will be at beacon only sites (BOS). This configuration will interface to en route automation systems including the Host/Oceanic Computer System Replacement (HOCSR), Direct Access Radar Channel (DARC), and the En route Automated Radar Terminal System (EARTS). This configuration will also interface to terminal automation systems including the Automated Radar Terminal System (ARTS) and the Standard Terminal Automation Replacement System (STARS), as well as the NAS Infrastructure Management System (NIMS). The NIMS interface will use a proxy agent provided by the NIMS program. The ATCBI-6 will also be capable of interfacing to Fixed Radar Surveillance (FPS) systems and Air Route Surveillance Radar System Models 1 and 2 (ARSR-1 and -2) systems via the Common Digitizer Model 2 (CD-2).

The next two planned configurations of the ATCBI-6 are developmental due to the complexity of the radar interface. The first configuration will interface to the Air Route Surveillance Radar System Model 4 (ARSR-4) and the second configuration will interface to the Air Route Surveillance Radar System Model 3 (ARSR-3). The development of these two configurations will be in parallel with the deployment of the initial ATCBI-6 configuration and in the order they were introduced. Both the ARSR-4 and ARSR-3 configurations will also interface to the automation systems mentioned above and, in similar fashion, the NIMS. Deployment of these developmental configurations will start in the same timeframe as the BOS, FPS, and ARSR-1/-2 sites are deployed.

6-03.1.1 Purpose of the ATCBI-6

The ATCBI-6 provides ATCRBS and Mode S functionality with increased positional accuracy via monopulse processing, as well as Selective Interrogation capabilities. This system will be upgradeable to include an integral data link capability. The ATCBI-6 equipment is consistent with the end state architecture outlined in NAS-SS-1000. The ARSR-4 configuration will interface to Mode 4 equipment to provide Mode 4 interrogate and reply capability

6-03.1.2 References

6-03.1.2.1 FAA Capital Investment Plan, Project No. S-02, January 1999.

6-03.1.2.2 FAA-E-2923 FAA Specification for Air Traffic Control Beacon Interrogator Model 6 (ATCBI-6) System, September10, 1997.

6-03.1.2.3 Acquisition Strategy for Air Traffic Control Beacon Interrogator Replacement, Draft 6/12/96.

6-03.1.2.4 NAS-IR-51070000 NAS Infrastructure Management System Manager/Managed Subsystem Interface Requirements Document, May 28, 1997.

6-03.1.2.5 Interface Control Document for the NAS Automation System Interface, G752294, and CDRL Sequence No. ATCBI-6-SE13-002, February 25, 1999

6-03.1.2.6 Interface Control Document for the NIMS Agent, G752296, CDRL Sequence No. ATCBI-6-SE13-003, April 15, 1999

6-03.2 SYSTEM DESCRIPTION

The ATCBI-6 system will provide beacon interrogator functions by replacing existing secondary radars at en route and terminal sites. Improved surveillance accuracy and reduced frequency congestion will be achieved by discrete interrogation of each aircraft and improved processing of aircraft replies. The ATCBI-6 will also interface with the NIMS to provide maintenance information.

ATCBI-6 sensors will communicate with aircraft both to obtain position information and, in the future, to provide data link communications. ATCBI-6 beacon data, combined with data from collocated surveillance radar, will be provided to en route and terminal automation facilities, as determined by coverage requirements.

6-03.2.1 System Components

The major components of the ATCBI-6 are listed in Table-6-03-1.

Table 6-03-1. Major ATCBI-6 Equipment Components

MAJOR ATCBI-6 EQUIPMENT COMPONENTS
MSSR Interrogator Cabinet A
MSSR Interrogator Cabinet B
RF Changeover Unit
Beacon Parrot
Communications Cabinet (SIUs/GPS Clocks/UPS)
ATCBI-6 Junction Box
Local Maintenance Terminal
Remote System Control Terminal
NIMS Agent

6-03.2.1.1 Dual MSSR Interrogator Cabinet

The design of the ATCBI-6 includes a dual channel, redundant transmitter/receiver/processor unit. One channel runs in an on-line configuration, e.g. connected to the antenna, while the other channel runs in a standby configuration. In the event of a failure in the on-line channel, a rapid switchover by the antenna from the on-line channel to the standby channel is possible.

6-03.2.1.2 RF Changeover Unit

The RF Changeover Unit is the switch that provides connectivity of the Sum, Difference, and Omni RF channels to the antenna between the two channels of the MSSR. In the event of a channel failure, it is the RF Changeover unit that will switch the antenna from the failed channel to the standby channel.

6-03.2.1.3 Dual GPS Clocks (P/O Communications Cabinet)

Dual GPS clocks, one per channel, are provided to support time tagging of system events and, in future upgrades, surveillance output messages.

6-03.2.1.4 Local Maintenance Terminal (LMT)

The LMT provides the means to control and monitor the ATCBI-6 at the radar site while performing site maintenance

6-03.2.1.5 Remote System Control Terminal (RSCT)

The RSCT will provide the means to control and monitor up to 8 ATCBI-6 systems remotely. The RSCT will be located at the ARTCC/TRACON.

6-03.2.1.6 Dual System Interface Unit (SIU) (P/O Communications Cabinet)

The SIU provides the interface between each channel of the interrogator and the ATCBI-6 junction box. The SIU accepts surveillance data from the interrogator in CD-2 format and performs a conversion to the electrical characteristics suitable for dissemination over the modems.

6-03.2.1.7 Uninterruptible Power Source (P/O Communications Cabinet)

The UPS is provided as a deterrent to system failures associated with short-term interruptions in commercial power service.

6-03.2.1.8 Beacon Parrot

Each ATCBI-6 includes two beacon parrots for performance monitoring purposes. The two parrots are located remotely from the ATCBI-6 radar site.

6-03.2.1.9 NIMS Agent

The NIMS Agent, when developed, will provide the interface to the NIMS Manager for remote monitoring and control capabilities.

6-03.2.1.10 ATCBI-6 Junction Box (P/O Communications Cabinet)

The ATCBI-6 Junction Box is the demarcation point for all interfaces with equipment located at an ARTCC or TRACON. This equipment includes the RSCT for monitoring and control as well as the HOCSR/EARTS/DARC en route and STARS/ARTS terminal automation systems.

6-03.2.2 Functional Component Interface Requirements

The ATCBI-6 interfaces are shown in Figure 6-03-1

6-03.2.2.1 ATCBI-6 to Remote System Control Terminal

The ATCBI-6 will interface with an RSCT located at the ARTCC or TRACON. This bi-directional interface will provide a capability for remote monitoring and control of the beacon system.

6-03.2.2.2 ATCBI-6 to Automation

The ATCBI-6 will interface to the HOCSR, DARC, EARTS, STARS, or ARTS automation systems. This unidirectional interface will provide search, weather, and beacon data to automation and display systems located at the ARTCC or TRACON.

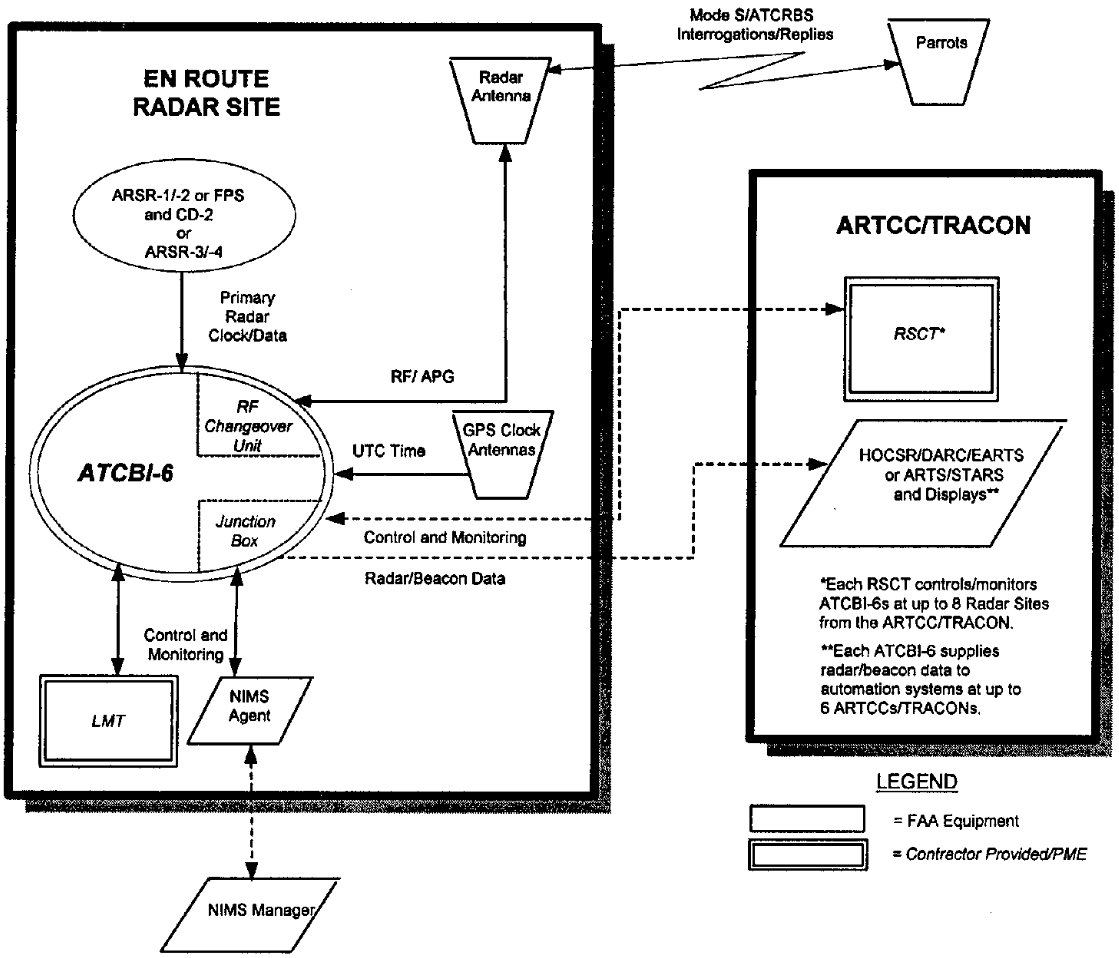
6-03.2.2.3 ATCBI-6 to NAS Infrastructure Management System

The ATCBI-6 will interface to the NIMS via a collocated NIMS Agent when it is developed. This bi-directional interface will provide a capability for control and monitor of the beacon system from a remote location and to perform preventive or corrective maintenance as appropriate.

6-03.2.3 Local Interfaces

6-03.2.3.1 ATCBI-6 to ARSR-1/-2 or FPS and CD-2 or ARSR-3/-4

The ATCBI-6 will interface to the collocated primary radar, via the CD-2 to the ARSR-1/-2 or FPS or directly to the ARSR-3/-4, for search and weather radar data. The ATCBI-6 will provide the data clock to the CD-2 or ARSR, whichever applies. A local cable will provide this connection.



Abbreviations	
APG	Azimuth Pulse Generator
ARSR	Air Route Surveillance Radar
ARTCC	Air Route Traffic Control Center
ARTS	Automated Radar Terminal System
ATCBI	Air Traffic Control Beacon Interrogator
ATCRBS	Air Traffic Control Radar Beacon System
CD	Common Digitizer
DARC	Direct Access Radar Channel
EARTS	En Route Automated Radar Terminal System
FPS	Military Fixed Radar Surveillance
GPS	Global Positioning System
HOCSR	Host/Oceanic Computer System Replacement
LMT	Local Maintenance Terminal
Mode S	Mode Select Beacon System
NIMS	NAS Infrastructure Management System
PME	Prime Mission Equipment
RF	Radio Frequency
RSCT	Remote System Control Terminal
STARS	Standard Terminal Automation Replacement System
TRACON	Terminal Radar Area Control
UTC	Universal Time Code

Figure 6-03-1. ATCBI-6 Functional Interfaces

6-03.2.3.1.1 ATCBI-6 to Radar Antenna

The ATCBI-6 will interface with the radar antenna to accept primary and redundant azimuth pulse generator (APG) data to determine the antenna-pointing angle. The ATCBI-6 will also interface with a beacon antenna, mounted on the existing primary radar antenna, to interrogate and accept replies from Mode S and ATCRBS transponder equipped aircraft. Local cables will provide both of these connections.

6-03.2.3.1.2 ATCBI-6 to Local Maintenance Terminal

The ATCBI-6 will interface with a collocated LMT to provide a capability for local monitoring and control of the beacon system. A local cable will provide this connection.

6-03.2.3.1.3 ATCBI-6 to NAS Infrastructure Management System Agent

In order for the ATCBI-6 to interface with the NIMS, the FAA must develop a NIMS agent that will convert control and monitoring data between the ATCBI-6 and the NIMS into formats that both systems can interpret. When the NIMS agent is available, this connection will be provided via a local cable.

6-03.2.3.1.4 ATCBI-6 to Global Positioning System Antennas

The ATCBI-6 will be equipped with primary and redundant GPS clocks to obtain UTC time for time stamping system events and log files. Each clock will be provided with its own antenna that will be collocated at the radar facility. Local cables will provide the connections to these antennas.

6-03.3 ATCBI-6 TELECOMMUNICATIONS REQUIREMENTS

The protocol, transmission, and hardware requirements for the ATCBI-6 interfaces are summarized in Table 6-03-2. After certification of the ATCBI-6, the current communications equipment and network services supporting the CD-2, ARSR-3, and ARSR-4 to the ARTCC or TRACON will be decommissioned. Tabular data on decommissioning is provided in Tables 6-03-3 and 6-03-4.

Table 6-03-2. ATCBI-6 Interface Requirements Summary

SUBSYSTEM INTERFACE		AUTOMATION	RSCT	NIMS
INTERFACE CONTROL DOCUMENTATION		VENDOR PROVIDED	VENDOR PROVIDED	NAS-IC-51070000
ASSOCIATED CDRL		ATCBI-6-SE13-002	ATCBI-6-SE13-003	
PROTOCOL REQUIREMENTS	NETWORK LAYER			
	DATA LINK LAYER	CD-2	HDLC	SNMPv2
	PHYSICAL LAYER	EIA-232-E/EIA-530	EIA-530	EIA-232-E
	SPECIAL FORMATS/CODE			
TRANSMISSION REQUIREMENTS	NO. CHANNELS	3	1	1
	SPEED (KBPS)	2.4	9.6	9.6
	SIMPLEX, HALF/FULL DUPLEX	SIMPLEX	FULL DUPLEX	FULL DUPLEX
	SERVICE	POINT-TO-POINT	POINT-TO-POINT	POINT-TO-POINT AND AUTO DIAL-UP
HARDWARE REQUIREMENTS	MODEM	GFE	GFE	GFE
	DATA BRIDGE			
	CLOCK			
	A/B SWITCH			
	DSC			
	CABLE/MISC.			

6-03.4 ACQUISITION ISSUES

6-03.4.1 Program Schedule and Status

During FY99 First Article Testing (FAT) commenced, to be followed by Operational Test and Evaluation (OT&E) at the William J. Hughes Technical Center's (WJHTC) Elwood test site and key site testing at Tinker Air Force Base (AFB), Oklahoma City, OK.

The prime mission equipment will be delivered to as many as 3 terminal sites and 121 en route sites as shown in Table 6-03-3 and Table 6-03-4.

Table 6-03-3. Distribution of Prime Equipment - Terminal Sites

	Terminal	Sites	
SSR	GPN	BOS	Total Operational
BI-4	1	1	3
BI-5	1	0	2
Total	**2**	**1**	**3**

Table 6-03-4. Distribution of Prime Equipment – En route Sites

En route Sites							
SSR	ARSR-1	ARSR-2	ARSR-3	ARSR-4	FPS	BOS	Total Operational
BI-4	2	0	0	0	5	1	8
BI-5	20	5	12	42	13	21	113
Total	**22**	**5**	**12**	**42**	**18**	**22**	**121**

6-03.4.1.1 Contract Award

On August 3, 1998 a contract was awarded to Raytheon Company for two First Article ATCBI-6 Systems with contract options for follow-on production systems. The 127 (124 + 3 support) ATCBI-6 systems will be deployed during the period FY99 through FY03 as shown in Table 6-03-5. The Keysite system will be deployed in FY00 with full deployment starting in FY01. Table 6-03-6 shows the Tentative (Draft) Site Installation Schedule by location.

Table 6-03-5. ATCBI - 6 Systems Tentative (Draft) Site Installation Schedule Totals

	Prior Years	**FY 00**	**FY 01**	**FY 02**	**FY 03**	**FY 04**	**FY 05**	**FY 06**
Number of Systems	0	1	25	56	42	0	0	0

Table 6-03-6. ATCBI - 6 Systems Tentative (Draft) Site Installation Schedule - By Location

DELIVERY	LID	SITE	ST	REG	PRIMARY	NEW	ARTCC	ALT. FEEDS
2/11/00	ACYT	TECH CENTER (OT&E)	NJ	AEA				N/A
		ACADEMY (SUPPORT FACILITY)	OK					N/A
		DEPOT (SUPPORT FACILITY)	OK					N/A
2/29/00	OKC	OKLAHOMA CITY (KEY SITE)	OK	ASW	FPS-67B	BI-4	ZFW	ZKC
5/15/01	CY2	PUTNAM	OK	ASW	BOS	BI-5	ZKC	ZAB, ZFW
5/29/01	FK7	GEORGETOWN	BW	ASO	BOS	N/A	ZMA	
6/12/01	HNB	HUNTINGBURG	IN	AGL	BOS	BI-5	ZID	
6/26/01	QYC	SKOWHEGAN	ME	ANE	BOS	BI-5	ZBW	
7/10/01	QPB	SAMBURG	TN	ASO	BOS	BI-5	ZKC	
7/24/01	QHY	HIGBY	WV	AEA	BOS	BI-5	ZID	
8/7/01	CPV-E	COOPERSVILLE	MI	AGL	FPS-66A	BI-5	ZAU	ZOB
8/21/01	QPN	PUU NIANIAU	HI	AWP	BOS	BI-5	ZHN	
9/4/01	DBL	RED TABLE MOUNT	CO	ANM	BOS	BI-5	ZDV	
9/11/01	QJE-E	APPLE VALLEY (MINN)	MN	AGL	ARSR-1E	BI-5	ZMP	
9/18/01	SCC	DEAD HORSE	AK	AAL	BOS	BI-5	ZAN	
9/25/01	SYA	SHEMYA	AK	AAL	BOS	BI-5	ZAN	
10/2/01	EGV	EAGLE RIVER	WI	AGL	BOS	BI-5	ZMP	
10/9/01	DSV-E	DANSVILLE	NY	AEA	ARSR-1E	BI-5	ZBW	ZOB
10/16/01	QHA-E	CUMMINGTON	MA	ANE	FPS-67B	BI-5	ZBW	ZNY
10/23/01	MDO	MIDDLETON ISLAND	AK	AAL	BOS	BI-5	ZAN	
10/30/01	ASE	ASPEN	CO	ANM	BOS	BI-4	ZDV	
11/6/01	CLE-E	BRECKSVILLE (CLEV)	OH	AGL	ARSR-1E	BI-5	ZOB	
11/13/01	HOU-E	HOUSTON, ELLINGT	TX	ASW	ARSR-1E	BI-5	ZHU	
11/20/01	QHO-E	OMAHA	NE	ACE	FPS-66A	BI-4	ZMP	
11/27/01	QHN-E	ASHBURN	GA	ASO	ARSR-1E	BI-5	ZJX	ZTL
12/4/01	SEA-E	SEATTLE, FORT LAWTON	WA	ANM	ARSR-1E	BI-5	ZSE	
12/11/01	PIT-E	OAKDALE, PITTSBU	PA	AEA	FPS-67B	BI-5	ZOB	ZDC, ZID
12/18/01	AEX-E	ALEXANDRIA, ENGL	LA	ASW	FPS-20A	BI-5	ZHU	ZFW
12/25/01	QPC-E	HALEYVILLE	AL	ASO	FPS-67B	BI-5	ZTL	ZME
1/1/02	QSR-E	BORON	CA	AWP	FPS-67B	BI-5	ZLA	SCT
1/8/02	HTI-E	HUTCHINSON	KS	ACE	FPS-66A	BI-4	ZKC	
1/15/02	QYB-E	BYHALIA, MEMPHIS	MS	ASO	ARSR-1	BI-5	ZME	
1/22/02	SAT-E	SAN ANTONIO	TX	ASW	FPS-66A	BI-5	ZHU	

DELIVERY	LID	SITE	ST	REG	PRIMARY	NEW	ARTCC	ALT. FEEDS
1/29/02	QUZ-E	HANNA CITY	IL	AGL	FPS-67B	BI-5	ZKC	
2/5/02	BHF	Freeport	BW	ASO	BOS			
2/12/02	POA	PAHOA	HI	AWP	BOS	BI-5	ZHN	
1/7/02	QLA-E	SAN PEDRO	CA	AWP	ARSR-1E	BI-5	ZLA	SCT
1/14/02	QJQ-E	PICO DEL ESTE	PR	ASO	FPS-67A	BI-5	ZSU	ZMA
1/21/02	QYS-E	ROGERS	TX	ASW	ARSR-1E	BI-5	ZHU	ZFW
1/28/02	QBZ-E	OSKALOOSA	KS	ACE	ARSR-2	BI-5	ZKC	
2/4/02	PHX-E	PHOENIX (HUMBOLT)	AZ	AWP	ARSR-1E	BI-5	ZAB	ZLA
2/11/02	QRM-E	MAIDEN	NC	ASO	ARSR-1	BI-5	ZTL	ZJX, ZDC
2/18/02	QXS-E	ODESSA	TX	ASW	ARSR-1E	BI-5	ZFW	ZAB
2/25/02	QRC-E	BENTON	PA	AEA	FPS-67B	BI-5	ZNY	ZBW
3/4/02	SVC-E	SILVER CITY	NM	ASW	ARSR-2	BI-5	ZAB	ZLA
3/11/02	QOJ-E	JOELTON, NASHVIL	TN	ASO	ARSR-1E	BI-5	ZME	ZID, ZTL
3/18/02	QBN-E	BINNS HALL	VA	AEA	ARSR-3	BI-5	ZDC	
3/25/02	QWO-E	LONDON	OH	AGL	ARSR-1E	BI-5	ZID	ZOB
4/1/02	QRL-E	BENSON	NC	ASO	ARSR-1E	BI-5	ZDC	ZJX,ZTL
4/8/02	QXP-E	SELIGMAN	AZ	AWP	ARSR-3	BI-5	ZLA	ZAB
4/15/02	QCF-E	CLEARFIELD	PA	AEA	ARSR-3	BI-5	ZOB	ZNY
4/22/02	STL-E	ST. LOUIS	MO	ACE	ARSR-1E	BI-5	ZKC	ZAU
4/29/02	QVN-E	FOSSIL (NOTE: Remarks)	OR	ANM	ARSR-3	BI-5	ZSE	
5/6/02	QRI-E	LYNCH	KY	ASO	ARSR-2	BI-5	ZTL	ZID, ZDC
5/13/02	QJO-E	ARLINGTON	IA	ACE	ARSR-3	BI-5	ZMP	ZAU
5/20/02	JLT-E	ELWOOD (Joliet)	IL	AGL	ARSR-3	BI-5	ZAU	
5/27/02	QPL-E	THE PLAINS	VA	AEA	ARSR-3	BI-5	ZDC	ZNY, ZOB
6/3/02	MGM-E	MONTGOMERY	AL	ASO	ARSR-1D	BI-4	ZTL	ZJX
6/10/02	IRK-E	KIRKSVILLE	MO	ACE	ARSR-3	BI-5	ZKC	ZMP, ZAU
6/17/02	QDT-E	DETROIT	MI	AGL	ARSR-1E	BI-5	ZOB	
6/24/02	QNM-E	NEWPORT	MS	ASO	ARSR-3	BI-5	ZME	ZHU
7/1/02	YAK	YAKUTAT	AK	AAL	BOS	BI-5	ZAN	
7/8/02	SNP	ST. PAUL ISLAND	AK	AAL	BOS	BI-5	ZAN	
7/15/02	QHZ-E	HORICON	WI	AGL	ARSR-2	BI-5	ZAU	ZMP
7/22/02	QXU-E	UTICA/REMSEN	NY	AEA	ARSR-4	BI-5	ZOB	
7/29/02	PRB-E	PASO ROBLES	CA	AWP	ARSR-4	BI-5	ZLA	ZOA
8/5/02	QJA-E	EMPIRE	MI	AGL	ARSR-4	BI-5	ZMP	ZAU

DELIVERY	LID	SITE	ST	REG	PRIMARY	NEW	ARTCC	ALT. FEEDS
8/12/02	QRB-E	CITRONELLE	AL	ASO	ARSR-2	BI-5	ZHU	ZME, ZJX, ZTL
8/19/02	QYD	CARIBOU	ME	ANE	ARSR-4	BI-5	ZBW	
8/26/02	QVR-E	OCEANA	VA	AEA	ARSR-4	BI-5	ZDC	ZNY
9/2/02	CTY-E	CROSS CITY	FL	ASO	ARSR-4	BI-5	ZJX	ZMA
9/9/02	BKA	BIORKA ISLAND	AK	AAL	BOS	BI-5	ZAN	
9/16/02	ENA	KENAI	AK	AAL	ARSR-3	BI-5	ZAN	
9/23/02	QZA-E	OILTON	TX	ASW	ARSR-4	BI-5	ZHU	
9/30/02	QNK-E	LINCOLNTON	GA	ASO	ARSR-3	BI-5	ZTL	ZJX
10/7/02	QKA-E	MT. KAALA	HI	AWP	ARSR-4	BI-5	ZHN	
10/14/02	QGV-E	FT. FISHER	NC	ASO	ARSR-4	BI-5	ZJX	ZDC
10/21/02	QLR-E	MT. SANTA ROSA	GU	AWP	ARSR-4	BI-5	ZHN	ZUA
10/28/02	RSG-E	ROCKSPRINGS	TX	ASW	ARSR-4	BI-5	ZHU	ZFW
11/4/02	QFI-E	FINLEY	ND	AGL	ARSR-4	BI-5	ZMP	
11/11/02	QRV	CROSSVILLE	TN	ASO	BOS	BI-5	ZME	ZTL, ZID
11/18/02	QMV-E	MILL VALLEY	CA	AWP	ARSR-4	BI-5	ZOA	
11/25/02	QWA-E	WATFORD CITY	ND	AGL	ARSR-4	BI-5	ZMP	ZLC
12/2/02	QIE-E	GIBBSBORO	NJ	AEA	ARSR-4	BI-5	ZNY	ZDC, ZBW
12/9/02	MLB	MELBOURNE	FL	ASO	ARSR-4	BI-5	ZMA	ZJX
1/6/03	QM8	TAMIAMI	FL	ASO	ARSR-4	BI-5	ZMA	
1/13/03	DMN-E	DEMING, MAGDALEN	NM	ASW	ARSR-4	BI-5	ZAB	
1/20/03	QLS	LAKESIDE	MT	ANM	ARSR-4	BI-5	ZLC	ZSE
1/27/03	QZZ	RAINBOW RIDGE	CA	AWP	ARSR-4	BI-5	ZOA	ZSE
2/3/03	QRJ-E	JEDBURG	SC	ASO	ARSR-4	BI-5	ZJX	
2/10/03	QOM	KING MOUNTAIN	TX	ASW	ARSR-4	BI-5	ZFW	ZHU, ZAB
2/17/03	QVH-E	RIVERHEAD, SUFFO	NY	AEA	ARSR-4	BI-5	ZNY	ZDC, ZBW
2/24/03	QNA-E	MORALES	TX	ASW	ARSR-4	BI-5	ZHU	
3/3/03	QEA-E	NORTH TRURO	MA	ANE	ARSR-4	BI-5	ZBW	ZNY
3/10/03	SLE-E	SALEM	OR	ANM	ARSR-4	BI-5	ZSE	
3/17/03	NQX-E	KEY WEST	FL	ASO	ARSR-4	BI-5	ZMA	
3/24/03	LCH-E	LAKE CHARLES	LA	ASW	ARSR-4	BI-5	ZHU	
3/31/03	AJO	AJO	AZ	AWP	ARSR-4	BI-5	ZLA	ZAB
4/7/03	NEN-E	WHITEHOUSE (JACKSONVILLE)	FL	ASO	ARSR-4	BI-5	ZJX	ZNY
4/14/03	NSD	SAN CLEMENTE	CA	AWP	ARSR-4	BI-5	FACSF AC	
4/21/03	NEW-E	SLIDELL	LA	ASW	ARSR-4	BI-5	ZHU	
4/28/03	NBW	GUANTANAMO BAY - NBW	CU	ASO	ARSR-4		ZMA	

DELIVERY	LID	SITE	ST	REG	PRIMARY	NEW	ARTCC	ALT. FEEDS
5/5/03	QMI-E	MICA PEAK	WA	ANM	ARSR-4	BI-5	ZSE	
5/12/03	QRW-E	MT. LAGUNA	CA	AWP	ARSR-4	BI-5	ZLA	SCT
5/19/03	QNW-E	EAGLE PEAK	TX	ASW	ARSR-4	BI-5	ZAB	
5/26/03	QKW-E	MAKAH	WA	ANM	ARSR-4	BI-5	ZSE	
6/2/03	QJD-E	NASHWAUK	MN	AGL	ARSR-4	BI-5	ZMP	
6/9/03	QYA-E	BUCKS HARBOR	ME	ANE	ARSR-4	BI-5	ROCC	
6/16/03	GFA-E	MALMSTROM AFB (BOOTLEGGER RIDGE/GREAT FALLS)	MT	ANM	ARSR-4	BI-5	ZLC	
6/23/03	PAM-E	TYNDALL AFB	FL	ASO	ARSR-4	BI-5	ZJX	ZHU
6/30/03	FN7	FT. GREEN	FL	ASO	ARSR-4	BI-5	ZME	ZJX, ZHU
7/7/03	QJS	NASSAU	BH	ASO	ASR-8	BI-5	ZMA	
7/14/03	ZLB	BALBOA	CZ	ASO	ASR-8	BI-4		
7/21/03	GDT	GRAND TURK	BW	ASO	BOS	BI-5	ZMA	
7/28/03	QAF	CHELSEA	OK	ASW	BOS	BI-5	ZKC	ZFW, ZME
8/4/03	SAC	SACRAMENTO	CA	AWP	FPS	BI-5	ZOA	
8/11/03	QMO	MONROE	OR	ANM	FPS	BI-4	ZSE	
8/18/03	QSA	WEST MESA	NM	ASW	FPS-66A	BI-5	ZAB	
8/25/03	INDA	INDIANAPOLIS	IN	AGL	ARSR-1E	BI-5	ZID	ZAU
9/1/03	TXK-E	TEXARKANA	AR	ASW	FPS-67	BI-5	ZFW	ZME
9/8/03	ATL-E	MARRIETTA	GA	ASO	ARSR-1E	BI-4	ZTL	
9/15/03	QXR-E	RUSSELLVILLE	AR	ASW	FPS-64A	BI-4	ZME	ZKC, ZFW
9/22/03	FTW-E	KELLER (FT. WORTH)	TX	ASW	ARSR-1D	BI-5	ZFW	
9/29/03	QJN	CROCKER	MO	ACE	BOS	BI-5	ZKC	ZME
10/6/03	QTZ-E	LAGRANGE	IN	AGL	ARSR-1E	BI-5	ZAU	ZOB
10/13/03	QBE-E	BEDFORD	VA	AEA	ARSR-3	BI-5	ZDC	
10/20/03	QOO	ANSON	TX	ASW	BOS	BI-5	ZFW	

6-03.4.2 Planned Telecommunications Strategies

The planned ATCBI-6 will interface with the ARSR-1, ARSR-2, ARSR-3, ARSR-4 and FPS. Approximately four lines will be required for each system, one ATC line, one RSCT line, and two lines for the NIMS interface.

6-03.4.3 Telecommunications Costs*

Table 6-03-7 provides a summary of the estimated telecommunications costs for the ATCBI-6 program. Per FAA Order 2500.8A, leased telecommunications costs (non-recurring and recurring) for the year of activation and one year following are shown in the table as being funded under Facilities and Equipment (F&E) account.

Table 6-03-7. Cost Summary - ATCBI - 6

CIP # S-02 All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
1a. Terminal ATCBI-6 <---> TRACON								
Cost Profile: LINCS DDS-64 with DMN Codex 3600D Multiplexers (see Note)								
Channel Costs								
Channels Added		1	0	0	1	0	0	1
Total Channels	0	1	1	1	2	2	2	3
F&E Funded Channels		1	1	0	1	1	0	1
OPS Funded Channels		0	0	1	1	1	2	2
F&E Non-recurring Channel Costs		**$13**	**$0**	**$0**	**$13**	**$0**	**$0**	**$13**
Recurring Channel Costs								
F&E Recurring Costs		**$4**	**$4**	**$0**	**$4**	**$4**	**$0**	**$4**
OPS Recurring Costs		**$0**	**$0**	**$4**	**$4**	**$4**	**$7**	**$7**
Hardware Costs								
Hardware Units Required		6	0	2	6	0	0	4
Total Hardware Units	0	6	6	8	14	14	14	18
F&E Funded Hardware		6	6	2	8	6	0	4
OPS Funded Hardware		0	0	6	6	8	14	14
F&E Non-recurring Hardware Costs		**$22**	**$0**	**$7**	**$22**	**$0**	**$0**	**$15**
Recurring Hardware Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$1**	**$1**
1b. Terminal ATCBI-6 <---> NIMS								
Cost Profile: FTS2000/2001 Dial Back-up Access to NIMS								
Channel Costs								
Channels Added		1	0	2	1	0	0	0
Total Channels	1	2	2	4	5	5	5	5
F&E Funded Channels		2	2	3	4	2	1	1
OPS Funded Channels		0	0	1	1	3	4	4
F&E Non-recurring Channel Costs		**$2**	**$0**	**$5**	**$2**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$2**	**$2**	**$3**	**$4**	**$2**	**$1**	**$1**
OPS Recurring Costs		**$0**	**$0**	**$1**	**$1**	**$3**	**$4**	**$4**

Table 6-03-7. Cost Summary - ATCBI-6 (Continued)

CIP # S-02	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
2a. En Route ATCBI-6 <---> ARTCC									
	Cost Profile: LINCS DDS-64 with DMN Codex 3600D Multiplexers (see Note)								
Channel Costs									
	Channels Added		15	47	50	25	0	0	0
	Total Channels	0	15	62	112	137	137	137	137
	F&E Funded Channels		15	62	97	75	25	0	0
	OPS Funded Channels		0	0	15	62	112	137	137
	F&E Non-recurring Channel Costs		**$73**	**$230**	**$244**	**$122**	**$0**	**$0**	**$0**
	Recurring Channel Costs								
	F&E Recurring Costs		**$148**	**$611**	**$957**	**$740**	**$247**	**$0**	**$0**
	OPS Recurring Costs		**$0**	**$0**	**$148**	**$611**	**$1,105**	**$1,351**	**$1,351**
Hardware Costs									
	Hardware Units Required		48	160	184	92	0	0	0
	Total Hardware Units	0	48	208	392	484	484	484	484
	F&E Funded Hardware		48	208	344	276	92	0	0
	OPS Funded Hardware		0	0	48	208	392	484	484
	F&E Non-recurring Hardware Costs		**$173**	**$576**	**$662**	**$331**	**$0**	**$0**	**$0**
	Recurring Hardware Costs								
	F&E Recurring Costs		**$2**	**$8**	**$14**	**$11**	**$4**	**$0**	**$0**
	OPS Recurring Costs		**$0**	**$0**	**$2**	**$8**	**$16**	**$19**	**$19**
2b. En Route ATCBI-6 <---> NIMS									
	Cost Profile: FTS2000/2001 Dial Back-up Access to NIMS								
Channel Costs									
	Channels Added		10	40	46	23	0	0	0
	Total Channels	0	10	50	96	119	119	119	119
	F&E Funded Channels		10	50	86	69	23	0	0
	OPS Funded Channels		0	0	10	50	96	119	119
	F&E Non-recurring Channel Costs		**$7**	**$29**	**$34**	**$17**	**$0**	**$0**	**$0**
	Recurring Channel Costs								
	F&E Recurring Costs		**$11**	**$55**	**$95**	**$76**	**$25**	**$0**	**$0**
	OPS Recurring Costs		**$0**	**$0**	**$11**	**$55**	**$106**	**$131**	**$131**

Table 6-03-7. Cost Summary - ATCBI-6 (Concluded)

CIP # S-02	All costs in 000's		Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
				SUMMARY						
	F&E Totals	Non-recurring		$291	$835	$953	$508	$0	$0	$27
		Recurring		$167	$681	$1,068	$835	$282	$1	$5
		F&E Total			**$1,516**	**$2,021**	**$1,343**	**$282**	**$1**	**$32**
	OPS Totals	Non-recurring		$0	$0	$0	$0	$0	$0	$0
		Recurring		$0	$0	$166	$680	$1,233	$1,514	$1,514
		OPS Total			**$0**	**$166**	**$680**	**$1,233**	**$1,514**	**$1,514**

Notes:

1. Channel counts include sites where LINCS provides both the primary and backup paths and sites where LINCS only provides one of the paths.
2. It is assumed that the NIMS interface will be concentrated at the TRACON and then forwarded to the ARTCC.

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CHAPTER 7-01 - SUMMARY SHEET

AUTOMATED WEATHER OBSERVING SYSTEM DATA ACQUISITION SYSTEM (ADAS)

Program/Project Identifiers:

Project Number(s):	CIP, W-01
Related Program(s):	CIPs, A-02, C-03, C-07, C-11, C-15, C-17, C-20, M-15, N-06, N-08, S-02, W-04, W-07
New/Replacement/Upgrade?	New/Upgrade
Responsible Organization:	AUA-430
Program Mgr./Project Lead:	Cynthia Schauland, AUA-430, (202) 366-5439
Fuchsia Book POC:	Jerry Kranz, AUA-430 / OTS, (202) 366-4196

Assigned Codes:

PDC(s):	BU, MG
PDC Description:	Dedicated Weather Circuits (WCP, RWP, WMSCR, WMP, WARP); Dedicated Weather Network Circuits (ADAS).
Service Code:	AWOS, ASOS

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$271	$607	$677	$0	$0	$0	$0
F&E Recurring	$1777	$428	$492	$4	$0	$0	$0
Total F&E	**$2048**	**$1,034**	**$1,169**	**$4**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$1592	$3,195	$3,384	$3,619	$3,876	$3,876	$3,876
Total OPS	**$1592**	**$3,195**	**$3,384**	**$3,619**	**$3,876**	**$3,876**	**$3,876**

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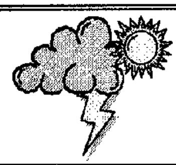
CIP Category: Weather



7-01.0 AUTOMATED WEATHER OBSERVING SYSTEM DATA ACQUISITION SYSTEM

7-01.1 PROGRAM OVERVIEW

7-01.1.1 Purpose of the Automated Weather Observing System Data Acquisition System

The Automated Weather Observing System Data Acquisition System (ADAS) collects, archives, processes, and disseminates data acquired from the Automated Weather Observing System (AWOS), the Automated Surface Observing System (ASOS) and the Automated Weather Sensor System (AWSS) in the NAS. The ADAS supports data collection, processing, storage, and maintenance functions.

NAS Change Proposal (NCP) 16133 added the additional capability for the ADAS to accept and process lightning data. The processed lightning information is transmitted to ASOS/AWOS/AWSS locations for inclusion in the observation. The cost for acquiring this data starting in FY1998 is included in this plan.

The Weather Sensors Products Team, AUA-430, manages the ADAS Project.

7-01.1.2 References

7-01.1.2.1 National Airspace System Architecture Version 4.0, January 1999, Chapter 26 Aviation Weather.

7-01.1.2.2 AWOS Data Acquisition System (ADAS) System Requirements Review (SRR), Sensors and Surveillance Division, Transportation Systems Center, Cambridge, MA 02142, Sections D, B, P, and Q.

7-01.1.2.3 AWOS Data Acquisition System (ADAS) Specification, FAA-E-2804D, July 1995, currently in Configuration Management Review.

7-01.1.2.4 FAA Aviation System Capital Investment Plan (CIP) Project W-01, January 1999. (Formerly identified as CIP Project 23-09.)

7-01.2 SYSTEM DESCRIPTION

The ADAS is the data collection and concentration point for approximately 174 FAA AWOS and 569 FAA ASOS locations and, in the future, AWSS locations and possibly 285 National Weather Service (NWS) ASOS sites. An ADAS system is located in each of the 21 Air Route Traffic Control Centers/Area Control Facilities (ARTCCs/ACFs) and the Honolulu CERAP. Each ADAS acquires surface weather observation data from up to 137 ASOS/AWOS sites within the ADAS local area and, via communications links, collects, processes, and disseminates the data to Data Link Processors (DLPs), Weather and Radar Processors (WARPs), the Integrated Terminal Weather System (ITWS), and to the Weather Message Switching Center Replacement (WMSCR). The ADAS uses the Automated Lightning Detection and Reporting System (ALDARS) to acquire lightning flash data from the National Lightning Detection Network (NLDN) and to generate and transmit lightning activity data (LAD) messages to AWOS and ASOS. The NWS acquires AWOS/ASOS data via the WMSCR. There are two additional ADAS implementations: one at the William J. Hughes Technical Center (FAATC) for software support and one at the FAA Academy for maintenance training.

7-01.2.1 System Components

The ADAS is a single component from a telecommunications perspective. It collects, archives, reformats, processes, and disseminates data from AWOS/ASOS sites in its geographic area. Up to 137 AWOS/ASOS systems may be connected to one ADAS. A total of 48 data ports will be provided on each ADAS.

7-01.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

7-01.3.1 Functional Requirements

7-01.3.1.1 Data Collection

The ADAS collects automated surface weather observations from AWOS and ASOS sites.

7-01.3.1.2 Data Processing

The ADAS processes the data collected from federal AWOSs to generate the surface observations. The ADAS processes National Lightning Detection Network data for both AWOS and ASOS.

7-01.3.1.3 Database

The ADAS maintains an adaptive database, containing such information as site location (e.g., latitude, longitude) and site identifiers for each Automated Weather Reporting System assigned to the ADAS. In addition, the ADAS maintains parameters and characteristics for processors interfacing with the ADAS.

7-01.3.1.4 Dissemination

The ADAS disseminates surface observations to WARP, DLP, and WMSCR.

7-01.3.1.5 Maintenance Data

The ADAS provides maintenance status data (e.g., alarms, alerts, and state changes) to the Maintenance Processor Subsystem (MPS) as requested.

7-01.3.1.6 Standard Time Reference

The ADAS receives and maintains system timing synchronized to Coordinated Universal Time (UTC) to support archiving, database maintenance, and dissemination.

7-01.3.2 Performance Requirements

There are no diversity requirements for this program.

7-01.3.2.1 Collection Frequency

Table 7-01-1 shows the subsystems from which the ADAS accepts data and their maximum data acceptance rates.

Table 7-01-1. AWOS Data Acquisition System Data Collection Frequency

Subsystem	Maximum Frequency
FAA AWOS	One AWOS format weather message per minute per site.
FAA and NWS ASOS	Once per minute per site, plus hourly and special observations in Aviation Routine Weather Report (METAR) format.
NLDN	1124 Lightning Detection Data (LDD) messages per minute, each message being data on a single lightning strike. (Data rate 1200 bps)

7-01.3.2.2 Sites

Each ADAS site accepts data from up to 137 AWOS/ASOS sites.

7-01.3.2.3 Format Conversion

The ADAS converts AWOS formatted messages to produce routine aviation weather reports (METAR) containing surface observations collected from FAA AWOSs. The ADAS performs reasonableness checks on the incoming AWOS data.

7-01.3.2.4 Dissemination Processing

As shown in Table 7-01-2, the ADAS disseminates surface observations and lightning data to the listed subsystems with the specified rates and message structures. At the present time, the information is disseminated minute-by-minute, hourly, and all specials.

Table 7-01-2. AWOS Data Acquisition System Dissemination Processing

Subsystem	Rate	Format	References
WARP (RWP)	Current (AWOS/ASOS)	AWOS	26.5.3, 102.5.3
DLP	Current (AWOS/ASOS)	AWOS	28.4.2.2, 28.5.3, 102.5.4
WMSCR	Hourly, Specials	METAR	27.4.2.2, 102.4.2
ITWS	Current (AWOS/ASOS) (Every five seconds)	AWOS (Lightning Data)	
AWOS/ASOS	Once per minute	Lightning Activity Data	

7-01.3.2.5 Throughput Processing

The ADAS disseminates products as follows: specials within 5 seconds of receipt of data and current/hourly observations within 10 seconds of receipt of data.

7-01.3.2.6 Maintenance Reporting Performance

The ADAS generates and transmits maintenance data in accordance with response times specified in Volume V of NAS-SS-1000.

7-01.3.2.7 Standard Time Reference

The ADAS system time shall be maintained within plus or minus 1 second of UTC while the Coded Time Source (CTS) signal is available to the ADAS.

7-01.3.3 Functional/Physical Interface Requirements

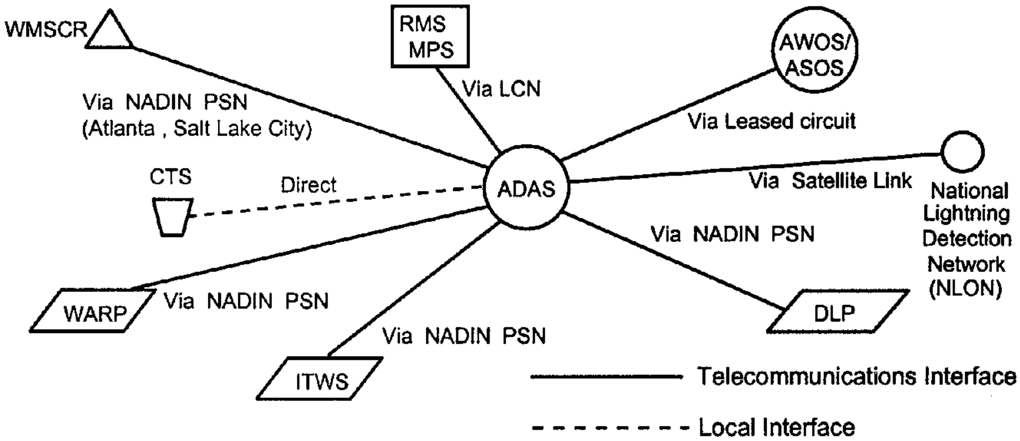
The AWOS/ASOS systems use leased voice grade data circuits to link to their respective ADAS. These and other interfaces are illustrated in Figure 7-01-1.

7-01.3.4 Diversity Requirements

There are no diversity requirements for this program.

7-01.3.5 Telecommunications Interfaces

A summary of ADAS interfaces is presented in Table 7-01-3.



ABBREVIATIONS			
ADAS	- AWOS Data Acquisition System	MPS	- Maintenance Processor Subsystem
ASOS	- Automated Surface Observing System	NADIN	- National Airspace Data Interchange Network
AWOS	- Automated Weather Observing System	PSN	- Packet Switched Network
CTS	- Coded Time Source	RMS	- Remote Maintenance Monitoring System
DLP	- Data Link Processor	WARP	- Weather and Radar Processor
ITWS	- Intergrated Terminal Weather System	WMSCR	- Weather Message Switching Center Replacement
LCN	- Local Communications Network		

Figure 7-01-1. AWOS Data Acquisition System Interfaces

7-01.3.5.1 AWOS Data Acquisition System to Automated Weather Observing System / Automated Surface Observing System

ADAS to AWOS/ASOS communications is over leased circuits. Each ADAS can communicate with a maximum of 137 AWOS/ASOS sites, with no more than 10 AWOS/ASOS sites per ADAS port. Additional information can be found in NAS-IC-25083101-02 (AWOS/ADAS ICD).

7-01.3.5.2 Local and Other Telecommunications Interfaces

Other connectivity to the ADAS is provided locally as follows.

1. AWOS Data Acquisition System to Remote Monitoring System/Maintenance Processor Subsystem

2. AWOS Data Acquisition System to Coded Time Source (CTS)

3. AWOS Data Acquisition System to Weather and Radar Processor

4. AWOS Data Acquisition System to Data Link Processor

5. AWOS Data Acquisition System to Lightning Detection Network

Table 7-01-3. AWOS Data Acquisition System Interface Requirements Summary

ADAS INTERFACES		AWOS/ASOS	WMSCR	RMS	CTS
INTERFACE CONTROL DOCUMENTATION		NAS-IC-25083101 AWOS/ASOS ICD	NAR-IRD 25082507, Section 12.2.2.4 NAS-ICD 25082507	NAS-IRD 51030002	
PROTOCOL REQUIREMENT	Network Layer				
	Data Link Layer	HDLC			
	Physical Layer		See above cited IRD/ICD		
	Special Formats/ Codes				
TRANSMISSION REQUIREMENT	No. of Channels	1/ 10 AWOS/ASOS per ADAS port			
	Speed (kbps)	2.4			
	Simplex Half/Full Duplex	FD Synchronous	See above cited IRD/ICD		
	Service	Point-to-point, multipoint			
HARDWARE REQUIREMENT	MODEM	GFE W/ clock EIA -530 FED STD 1005	See above cited IRD/ICD		
	Cable/ Miscellaneous				Direct cable connection

ADAS INTERFACES		WARP	DLP	Lightning Detection Network	ITWS
INTERFACE CONTROL DOCUMENTATION		NAS-IRD 25082501 ICD 25082501			NAS-IC-250825014
PROTOCOL REQUIREMENT	Network Layer				
	Data Link Layer	Via NADIN PSN Node	Via NADIN PSN Node	Via Satellite	Via NADIN PSN Node
	Physical Layer		May be replaced by DLP to LCN interface		
	Special Formats/ Codes		Long Island ADAS info is received at adjacent NY DLP		
TRANSMISSION REQUIREMENT	No. of Channels	1			
	Speed (kbps)				
	Simplex Half/Full Duplex				
	Service				
HARDWARE REQUIREMENT	MODEM				
	Cable/ Miscellaneous				

7-01.4 ACQUISITION ISSUES

7-01.4.1 Program Schedule and Status

The ADAS contract was awarded to Communications & Power Engineers, Inc. on September 8, 1989; all 25 systems have been installed. The first ADAS was commissioned at the Boston ARTCC in 1996. All 22 systems are operational and have been commissioned. All AWOS/ASOS communicating with the GS-200 have been transitioned to the ADAS as of March 1999.

The implementation schedule for ADAS to AWOS/ASOS multi-point circuits is provided in Table 7-01-4.

Table 7-01-4. ADAS Interface Implementation Schedule

From	To	System		Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
ADAS	**ASOS**	LINCS Multipoints	No. sites	115	2	8	8	0	0	0	0
(ARTCC)			No. ckts	46	1	2	2	0	0	0	0
		LINCS point-to-point	No. sites	90	2	18	20	0	0	0	0
			No. ckts	90	2	18	20	0	0	0	0
		RCL w/ LINCS tail circuit	No. sites	52	2	8	10	0	0	0	0
			No. ckts	52	2	8	10	0	0	0	0
		LINCS point-to-point connect to existing DMN	No. sites	75	2	28	30	0	0	0	0
			No. ckts	75	2	28	30	0	0	0	0
		Local cable connect to existing DMN	No. sites	235	2	68	70	0	0	0	0
			No. ckts	235	2	68	70	0	0	0	0
		Total sites added		567	10	130	138	0	0	0	0
		Total circuits added		502	9	143	132	0	0	0	0
AWOS	**GS-200**	GTE (LABS) service (to be replaced by FTS2000 svc)	No. sites	0	0	0	0	0	0	0	0
			No. ckts	0	0	0	0	0	0	0	0
ADAS (ARTCC)	**AWOS**	FTS2000 service (replaces LABS circuits)	No. sites	126	0	0	0	0	0	0	0
			No ckts	20	0	0	0	0	0	0	0
AWOS (Alaska)	**GS-200 (Alaska)**	GTE (LABS) service	No. sites	2	(2)	0	0	0	0	0	0
			No. ckts	2	(2)	0	0	0	0	0	0
AWOS (Alaska)	**ADAS (Alaska)**	ANICS with tail circuits	No. sites	43	2	0	0	0	0	0	0
			No. ckts	43	2	0	0	0	0	0	0
ARTCC	**GS-200/ WMSCR**	LINCS (DMN) -- (to migrate to NADIN II)	No. ckts	0	0	0	0	0	0	0	0

Note: Costs associated with shaded areas in the above table are captured in Table 70-02-5
* FY 00, 01, and 02 include 278 NWS ASOS sites that may be connected to the ADAS.

7-01.4.2 Planned Telecommunications Strategies

7-01.4.2.1 AWOS Data Acquisition Systemto Automated Surface Observing System

Five types of circuits can be used to provide connectivity from ASOS sites to the ADAS at the ARTCCs: LINCS multipoint circuits; LINCS point-to-point circuits; DMN using RCL transmission media with LINCS multipoint "tail circuits"; LINCS point-to-point connected to existing DMN modem locations (LINCS); local cable connect to existing DMN modems. In addition, some Alaskan Region ASOS sites are connected to the ADAS using ANICS (see chapter on ANICS).

7-01.4.2.2 AWOS Data Acquisition System to Automated Weather Observing System

The AWOS to ADAS connection is via FTS2000 multipoint circuits. Twenty FTS2000 multipoint circuits are required to connect the 131 AWOS sites with ADAS, located at ARTCCs. In addition, some Alaskan Region AWOS sites are connected to the ADAS using ANICS (see chapter ANICS).

7-01.4.3 Telecommunications Costs

The projected leased telecommunications costs associated with the ADAS program are summarized in Table 7-01-5 for fiscal years 2000 through 2006. As depicted by the shaded region in Table 7-01-4, ADAS picked up the costs associated with the ADAS-to-ASOS interface from the AWOS/ASOS Program in FY99.

In accordance with FAA Order 2500.8A, leased telecommunications costs (non-recurring and recurring) for the year of activation and one year following are shown in the table as being funded under Facilities and Equipment (F&E) account - except for the ADAS (ARTCC) to AWOS FTS2000 circuits which replaced the GTE LABS circuits and are therefore funded under the OPS account.

Table 7-01-5. Cost Summary - ADAS

CIP # W-01	All costs in 000's	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
1. ADAS (ARTCC) <---> ASOS									
	Cost Profile: LINCS Multi-point Circuits or RCL with LINCS Multi-point "Tail" Circuits or LINCS Point-to-Point Circuits								
Channel Costs									
	ASOS Sites Added		10	130	138	0	0	0	0
	Total ASOS Sites	567	577	697	835	835	835	835	835
	Channels added		7	56	62	0	0	0	0
	Total Channels	263	270	319	381	381	381	381	381
	F&E Funded Channels	48	129	104	118	62	0	0	0
	OPS Funded Channels		141	215	263	319	381	381	381
	F&E Non-recurring Channel Costs		**$240**	**$364**	**$410**	**$0**	**$0**	**$0**	**$0**
	Recurring Channel Costs								
	F&E Recurring Costs		**$1,772**	**$421**	**$485**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$1,224**	**$2,830**	**$3,019**	**$3,251**	**$3,504**	**$3,504**	**$3,504**
Hardware Costs									
	Cost Profile: Codex 3600 Modems								
	Hardware Units Added		10	80	88	0	0	0	0
	Total Hardware Units	379	577	459	547	547	547	547	547
	F&E Funded HW Units		129	90	168	88	0	0	0
	OPS Funded HW Units		448	369	379	459	547	547	547
	F&E Non-recurring Hardware Costs		**$31**	**$243**	**$267**	**$0**	**$0**	**$0**	**$0**
	Recurring Hardware Costs								
	F&E Recurring Costs		**$5**	**$7**	**$7**	**$4**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$18**	**$15**	**$15**	**$19**	**$22**	**$22**	**$22**
2. ADAS (ARTCC) <---> AWOS									
	Cost Profile: FTS2000/2001 Multi-point Circuits								
Channel Cost									
	Sites Added/Served by Multi-point		0	0	0	0	0	0	0
	Total Multi-point Sites	129	129	129	129	129	129	129	129
	Total Channels	20	20	20	20	20	20	20	20
	F&E Funded Channels		0	0	0	0	0	0	0
	OPS Funded Channels		0	0	0	0	0	0	0
	Non-recurring F&E Channel Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring Channel Costs								
	F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$350**	**$350**	**$350**	**$350**	**$350**	**$350**	**$350**

			SUMMARY						
	F&E Totals	Non-recurring	$271	$607	$677	$0	$0	$0	$0
		Recurring	$1777	$428	$492	$4	$0	$0	$0
		F&E Totals	**$2048**	**$1,034**	**$1,169**	**$4**	**$0**	**$0**	**$0**
	OPS Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$1592	$3,195	$3,384	$3,619	$3,876	$3,876	$3,876
		OPS Totals	**$1592**	**$3,195**	**$3,384**	**$3,619**	**$3,876**	**$3,876**	**$3,876**

Note: Costs in FY00 for the ADAS to ASOS interface picked up from the AWOS/ASOS Program.

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CHAPTER 7-02 - SUMMARY SHEET

AUTOMATED WEATHER OBSERVING SYSTEM/AUTOMATED SURFACE OBSERVING SYSTEM (AWOS/ASOS)

Program/Project Identifiers:

Project Number(s):	CIP W-01
Related Program(s):	CIPs A-02, C-03, C-07, C-11, C-15, C-17, C-20, M-15, N-06, N-08, S-02, W-07
New/Replacement/Upgrade?	New
Responsible Organization:	AUA-430
Program Mgr./Project Lead:	Cynthia Schauland, AUA-430, (202) 366-5439
Fuchsia Book POC:	Jerry Kranz, AUA-430 / OTS, (202) 366-4196

Assigned Codes:

PDC(s):	BU, FW, ME, MG, FX, MH
PDC Description:	AWOS Dedicated Weather Network Circuits, NAVAID Broadcast AWOS Circuits, Dial Up AWOS Circuits, ASOS Dedicated Weather Network Circuits, NAVAID Broadcast ASOS Circuits, Dial Up ASOS Circuits
Service Code:	AWOS, ASOS

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$2,324	$2,682	$2,951	TBD	TBD	TBD	TBD
Total OPS	**$2,324**	**$2,682**	**$2,951**	**TBD**	**TBD**	**TBD**	**TBD**

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CIP Category:
Weather

7-02.0 AUTOMATED WEATHER OBSERVING SYSTEM/AUTOMATED SURFACE OBSERVING SYSTEM (AWOS/ASOS)

7-02.1 PROGRAM OVERVIEW

The Automated Weather Observing System (AWOS) and the Automated Surface Observing System (ASOS) collect and disseminate meteorological data at selected airports and heliports. Both systems collect meteorological observations from a complement of automatic sensors and format the information for distribution to other systems. AWOS has been operated by the FAA for about ten years. The Automated Surface Observing Systems (ASOS) were acquired under the National Weather Service (NWS) ASOS program.

There are technical differences between AWOS and ASOS. For example, the systems cannot share the same multipoint circuit. Similarly, the AWOS employs built-in modems, while external modems must be provided for ASOS sites. In the following paragraphs, AWOS and ASOS are addressed together except in those instances where it is appropriate to note the differences. Due to the age of AWOS and ASOS hardware, they are no longer manufactures. The Automated Weather Sensor System (AWSS) is now used instead.

7-02.1.1 Purpose of the Automated Weather Systems

Both AWOS and ASOS are part of the weather-sensing sub-element of the NAS Ground-to-Air (G/A) element. They automatically collect, measure, process, and disseminate surface weather observation data. The AWOS/ASOS project is managed by the Weather Sensors Product Team, AUA-430.

7-02.1.2 References

7-02.1.2.1 FAA Aviation System Capital Investment Plan (CIP), Project W-01, January 1999.

7-02.1.2.2 NAS Level I Design Document (NAS-DD-1000E), October 1992.

7-02.1.2.3 Advisory Circular No. 150/5220-16, June 12,1990, Automated Weather Observing Systems (AWOS) for Non-Federal Applications.

7-02.1.2.4 NAS-SS-1000, Volume III, Paragraph 3.2.1.2.1, December 1986.

7-02.1.2.5 FAA/National Weather Service Memorandum of Agreement, 1988.

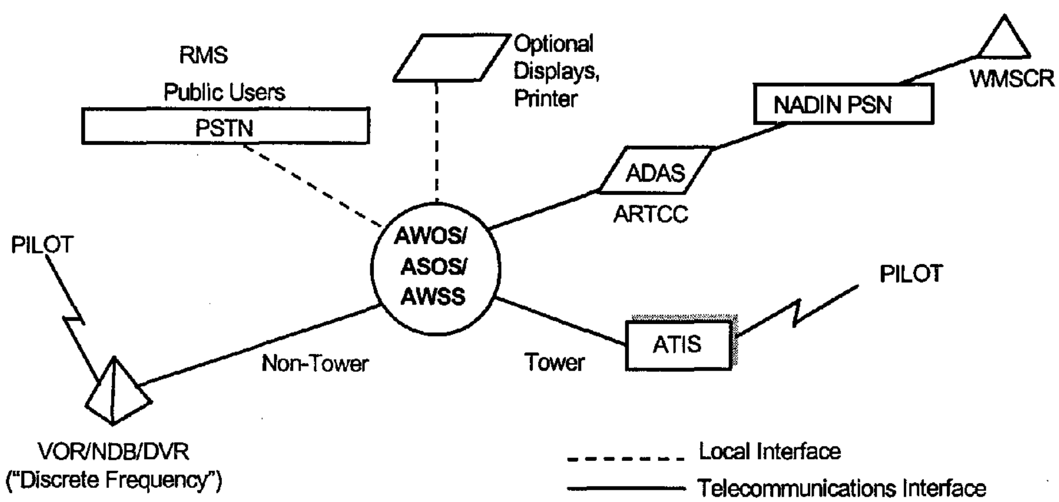
7-02.2 SYSTEM DESCRIPTION

The AWOS and ASOS are designed to gather and disseminate meteorological data at selected airports and heliports. Each system collects meteorological data from a complement of automatic sensors and certified weather observer remarks and formats the data for distribution to other systems and users. These sensors monitor such weather parameters as wind speed and direction, temperature, dew point, barometric pressure, cloud height and amount, visibility, and precipitation.

Weather observations are collected by the AWOS/ASOS Data Acquisition System (ADAS) for further processing and then sent to the Weather Message Switching Center Replacement (WMSCR) for distribution (see Chapter on ADAS). Each AWOS/ASOS is connected to the ADAS using a combination of leased and FAA-owned telecommunications paths. In addition, both AWOS and ASOS provide a computer-generated voice message available to pilots via a PSTN dial-in telephone port and via a broadcast message transmitted over either (1) the voice output of a Non-Directional Beacon (NDB), (2) a discrete VHF Omnidirectional Range (VOR), or (3) a dedicated VHF transmitter.

7-02.2.1 Principal Components

The AWOS/ASOS is treated as a single component from the telecommunications perspective. The AWOS/ASOS functional requirements are to accept, process, and disseminate weather data acquired from the meteorological sensor suite.



ABBREVIATIONS	
ADAS - AWOS Data Acquisition System	NDB - Non-Directional Beacon
ARTCC - Air Route Traffic Control Center	PSN - Packet Switched Network
ATIS - Automatic Terminal Information System	PSTN - Public Switched Telephone Network
AWOS - Automated Weather Observing System	RMS - Remote Monitoring System
DVR - Discrete VHF Radio	VHF - Very High Frequency
FSS - Flight Service Station	VOR - VHF Omnidirectional Range
NADIN PSN - NAS Data Interchange Network	WMSCR - Weather Message Switching Center Replacement

Figure 7-02-1. AWOS/ASOS Interface Diagram

7-02.2.2 Functional Component Interface Requirements

7-02.2.2.1 AWOS/ASOS to Display Devices and Printer

This interface provides for local distribution of weather observation data via operator displays, printers, and user displays. The operator display allows a certified weather observer to edit the automated weather observation before it is distributed.

7-02.2.2.2 AWOS/ASOS to Public Switched Telephone Network (PSTN)

This interface allows public user dial-in access to computer-generated voice weather messages and allows dial-in remote monitoring subsystem access.

7-02.2.2.3 AWOS/ASOS to AWOS/ASOS Data Acquisition System (ADAS)

This interface provides a link to the ADAS for collection and subsequent dissemination of AWOS/ASOS weather observation data. This interface also allows the ADAS to transmit lightning data to the AWOS/ASOS for inclusion into the weather observation.

7-02.2.2.4 AWOS/ASOS to Discrete VHF Radio (DVR)

Most of the AWOS/ASOS sites at non-towered locations will be connected to a dedicated VHF radio to provide a ground-to-air broadcast of the weather observation.

7-02.2.2.5 AWOS/ASOS to VHF Omnidirectional Range/Non-Directional Beacon

Some of the AWOS/ASOS sites at non-towered locations will be connected to a nearby VOR or NDB to provide a ground-to-air broadcast of the weather observation.

7-02.2.2.6 AWOS/ASOS to Automatic Terminal Information Service (ATIS)

At airports with towers, the AWOS/ASOS will be used for operational ATIS messages. At part-time towers, the AWOS/ASOS will be manually switched to broadcast over the ATIS frequency during non-operational hours. During staffed hours, the ATIS broadcast will be manually recorded.

7-02.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

Protocol, transmission, and hardware requirements related to the AWOS/ASOS interfaces are summarized in Table 7-02-1. There are no diversity requirements for any of the AWOS/ASOS interfaces.

7-02.3.1 Telecommunications Interfaces

7-02.3.1.1 AWOS/ASOS to Display Devices and Printer

The connectivity between the AWOS/ASOS and the various display devices and printer is a full-duplex voice grade 9.6 kbps circuit. This connection may be implemented by a direct connection or via modems and a leased voice grade (VG-6) circuit. Approximately one-half of the 567 ASOS and 65 of the AWOS locations require connection of a display device or printer.

7-02.3.1.2 AWOS/ASOS to Public Switched Telephone Network (PSTN)

Each ASOS has three dial-up commercial circuits. Two are used for remote maintenance monitoring functions and one is dedicated to provide computer-generated voice weather messages to public users. The AWOS uses a single dial-up circuit to provide both remote maintenance monitoring functions and a computer-generated voice weather message.

7-02.3.1.3 AWOS/ASOS to AWOS/ASOS Data Acquisition System (ADAS)

The AWOS/ASOS to ADAS connection requires a full-duplex voice grade 2.4 kbps circuit. AWOSs are currently connected to the ADAS at the appropriate ARTCC via leased FTS2000 multipoint circuits. AWOSs in Alaska are connected to the ADAS using the Alaskan NAS Interfacility Communications System (ANICS) with point-to-point tail circuits from the remote ANICS earth station. The AWOS data is collected and processed by the ADAS and transmitted to the WMSCR via the NADIN PSN.

ASOSs are connected to the ADAS at the appropriate ARTCC using a variety of circuit configurations, including Leased Interfacility NAS Communications System (LINCS) point-to-point and multipoint circuits, RCL channels with LINCS point-to-point and multipoint tail circuits, and to existing DMN services using local cable or LINCS point-to-point tail circuits. ASOSs in Alaska are connected to the ADAS using ANICS with point-to-point tail circuits from the remote ANICS earth station. The ADAS collects the ASOS data and transmits it to the WMSCR via the NADIN PSN.

The ASOS sites sponsored by the NWS are provided with data communications service to the NWS Telecommunications Gateway via the NWSs Automation of Field Operations and Services (AFOS) or Advanced Weather Interactive Processing System (AWIPS) networks. An interface between the NWS Telecommunications Gateway and WMSCR allows the exchange of ASOS data between the FAA and the NWS.

7-02.3.1.4 AWOS/ASOS to VHF Omnidirectional Range/Non-Directional Beacon

At locations where AWOS/ASOS voice uses a VOR for voice transmission, the connection must first go via a Flight Service Station (FSS) control point. Interface hardware developed by National Airways Systems Engineering Division (AOS-200) will permit a direct connection to the VOR. Connectivity for continuous, computer-generated voice transmissions requires a full-period, simplex, voice grade circuit, either an existing VOR/NDB circuit or a dedicated leased line will be required. There are no protocol requirements. All interface hardware is provided by the AWOS project, with the exception of VOR interface hardware.

7-02.3.1.5 AWOS/ASOS to ASOS to Automatic Terminal Information Service (ATIS)

The connectivity will be provided by FAA-owned cable at most locations and leased voice grade circuits at others, depending on local conditions. Implementation at approximately 300 ASOS locations began in CY99.

7-02.3.2 Local Interfaces

The AWOS/ASOS will be directly connected to the collocated discrete VHF radio. Approximately 400 of the 567 ASOS and 180 of the 198 AWOS sites currently have VHF radios installed.

Table 7-02-1. AWOS/ASOS System Interface Requirements Summary

SUBSYSTEM INTERFACE		AWOS/ASOS to VOR/NDB	AWOS/ASOS to PSTN	AWOS/ASOS to ADAS
INTERFACE CONTROL DOCUMENTATION			RS-496	NAS-IC-25083101 Revision F
PROTOCOL REQUIREMENTS	Network Layer			
	Data Link Layer			HDLC
	Physical Layer		RS-496	RS-232
	Special Formats/ Codes	None	None	None
TRANSMISSION REQUIREMENTS	No. Channels	1	1	1
	Speed (kbps)	VG	VG	2.4 kbps
	Simplex Half/Full Duplex	Simplex	FD	FD Synchronous
	Service	Point-to-Point	Dial-up	Point-to-Point and Multipoint
HARDWARE REQUIREMENTS	Modem		Local	Racal-Milgo LSI 24 (AWOS) or Codex 3600 (ASOS)
	Cable/Misc.			

7-02.4 ACQUISITION ISSUES

The FAA has procured and installed 198 AWOS and 567 ASOS units. The NWS has installed 315 ASOS units. The FAA procured approximately 30 additional automated surface weather observing systems in FY99.

7-02.4.1 Program Schedule and Status

The AWOS procurement strategy was to obtain 198 (174 with leased connectivity requirements) commercial AWOS systems to meet FAA needs. The first AWOS delivery occurred in May 1989, with 567 ASOS systems procured through the NWS ASOS program. The NWS also deployed 315 ASOS. The delivery of NWS ASOS systems began in August 1991. An additional 30 automated surface weather observing systems were purchased in FY99. The AWOS/ASOS Site Installation Schedule is provided in Table 7-02-2. The implementation schedule for AWOS/ASOS interfaces is provided in Table 7-02-3.

7-02.4.1 Telecommunications Strategies

7-02.4.1.1 AWOS/ASOS to ADAS/GS-200

One FTS2000 multi-point data circuit is required between every six AWOS locations and the ARTCC. The AWOS data is then connected to the ADAS at the ARTCC. Circuits for AWOS in Alaska connect the AWOS location to the ADAS in Anchorage using both leased circuits and ANICS.

Five different types of circuits provide connectivity from ASOS sites to the ARTCCs: LINCS multipoint circuits; LINCS point-to-point circuits; DMN using RCL transmission media with LINCS tail circuits; LINCS point-to-point connected to existing DMN (LINCS); local cable connect to existing DMN (LINCS). The cost summary in Table 7-02-4 rolls up the individual categories into one overall summary.

7-02.4.1.2 AWOS/ASOS to PSTN

One dial-up line (used for both AWOS voice output and RMS) will be provided at each AWOS and three (one used for ASOS voice output and two for RMS and data access) at each ASOS location for user dial access.

7-02.4.2 Telecommunications Costs

Leased communications costs for FY00 to FY06 are listed in Table 7-02-4. The Cost Summary reflects the costs associated with the shaded areas in the interface implementation schedule outlined in Table 7-02-3, until such costs are captured under the ADAS program as noted.

All leased circuits and hardware costs are based on corresponding unit costs and are shown below their respective channel and hardware quantities. In accordance with FAA Order 2500.8A, leased telecommunications costs (non-recurring and recurring) for the year of activation and one year following are shown in the table as being funded under Facilities and Equipment (F&E) account. The costs for ASOS to PSTN circuits have been transferred from the NWS to the FAA and are paid using OPS funds.

Table 7-02-2. AWOS/ASOS Site Installation Schedule

Installation	Regions	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
AWOS (FAA sites)		198	(18)	0	0	0	0	0	0
Total AWOS Sites*		**198**	**(18)**	**0**	**0**	**0**	**0**	**0**	**0**
ASOS (FAA sites)		567	0	0	0	0	0	0	0
ASOS (NWS sites)		315	0	0	0	0	0	0	0
Total ASOS Sites		**882**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Additional automated systems (AWSS)		0	30	0	0	0	0	0	0
Total Additional automated sites		**0**	**30**	**0**	**0**	**0**	**0**	**0**	**0**

*Note: Includes 174 with leased communications connectivity in Prior Years reduced to 156 in FY00.

Table 7-02-3. AWOS/ASOS Interface Implementation Schedule

From	To	System		Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05
ADAS	ASOS	LINCS Multipoints	No. sites	115	2	8	8	0	0	0
(ARTCC)			No. ckts	46	1	2	2	0	0	0
		LINCS point-to-point	No. sites	90	2	18	20	0	0	0
			No. ckts	90	2	18	20	0	0	0
		RCL w/ LINCS tail circuit	No. sites	52	2	8	10	0	0	0
			No. ckts	52	2	8	10	0	0	0
		LINCS point-to-point connect to existing DMN	No. sites	75	2	28	30	0	0	0
			No. ckts	75	2	28	30	0	0	0
		Local cable connect to existing DMN	No. sites	235	2	68	70	0	0	0
			No. ckts	235	2	68	70	0	0	0
		Total sites added		567	10	130	138	0	0	0
		Total circuits added		502	9	143	132	0	0	0
ASOS	PSTN	Voice dial-up: # of ASOS ckts		1981	0	0	0	0	0	0
AWOS	PSTN	Voice dial-up: # of AWOS ckts		190	0	0	0	0	0	0
(ASOS Billing transferred to FAA)		**Total AWOS/ASOS dial-up ckts added**		2171	0	0	0	0	0	0
AWOS	GS-200	GTE (LABS) service (to be replaced by FTS2000 svc)	No. sites	0	0	0	0	0	0	0
			No. ckts	0	0	0	0	0	0	0
ADAS (ARTCC)	AWOS	FTS2000 service (replaces LABS circuits)	No. sites	126	0	0	0	0	0	0
			No ckts	20	0	0	0	0	0	0
AWOS (Alaska)	GS-200 (Alaska)	GTE (LABS) service	No. sites	2	(2)	0	0	0	0	0
			No. ckts	2	(2)	0	0	0	0	0
AWOS (Alaska)	ADAS (Alaska)	ANICS with tail circuits	No. sites	43	2	0	0	0	0	0
			No. ckts	43	2	0	0	0	0	0
ARTCC	GS-200/ WMSCR	LINCS (DMN) -- (to migrate to NADIN II)	No. ckts	0	0	0	0	0	0	0

Note: Costs associated with shaded areas in the above table are captured in Table 7-01-5
* FY 00, 01, and 02 include 278 NWS ASOS sites that may be connected to the ADAS.

Table 7-02-4. Cost Summary - AWOS/ASOS

CIP # W-01 All costs in 000's	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
1. AWOS/ASOS <---> PSTN								
Cost Profile: 1.2 kbps Dial-up Service via the PSTN. (Service Coordinated and Billed by NWS)								
Channel Costs								
Channels Added		0	0	0	0	0	0	0
Total Channels	2171	2171	2171	2171	2171	2171	2171	2171
NWS Reimbursement								
OPS Recurring Costs		**$2,324**	**$2,682**	**$2,951**	**TBD**	**TBD**	**TBD**	**TBD**
2. AWOS <---> GS-200/WMSCR								
a. CONUS Sites								
Cost Profile: GTE Multi-point (LABS) to be Replaced by FTS2000/2001 Multi-point (ADAS)								
b. Alaskan Sites								
Cost Profile: GTE LABS (Replaced by AIS in FY99)								
Channel Cost								
Sites Added/Served by Multi-point		0	0	0	0	0	0	0
Total Multi-point Sites	45	0	0	0	0	0	0	0
Total Channels	14	0	0	0	0	0	0	0
F&E Funded Channels		0	0	0	0	0	0	0
OPS Funded Channels		0	0	0	0	0	0	0
Non-recurring Channel Costs								
F&E Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

Table 7-02-4. Cost Summary - AWOS/ASOS (concluded)

CIP # W-01 All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
3. ARTCC <---> GS-200/WMSCR								
Cost Profile: LINCS VG-8 Circuits with DMN 3600 Modems (to Transition to NADIN II under ADAS)								
Channel Costs								
Channels added		0	0	0	0	0	0	0
Total channels	18	0	0	0	0	0	0	0
F&E Funded Channels		0	0	0	0	0	0	0
OPS Funded Channels		0	0	0	0	0	0	0
Non-recurring Channel Costs								
F&E Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Hardware Costs								
Cost Profile: Codex 3600 Modems								
Hardware Units Added		0	0	0	0	0	0	0
Total Hardware Units	36	0	0	0	0	0	0	0
F&E Funded HW Units		0	0	0	0	0	0	0
OPS Funded HW Units		0	0	0	0	0	0	0
Non-recurring Hardware Costs								
F&E Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Hardware Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

SUMMARY

		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
F&E Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$0	$0	$0	$0	$0	$0	$0
	F&E Total	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$2,324	$2,682	$2,951	TBD	TBD	TBD	TBD
	OPS Total	**$2,324**	**$2,682**	**$2,951**	**TBD**	**TBD**	**TBD**	**TBD**

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CHAPTER 7-03 - SUMMARY SHEET

INTEGRATED TERMINAL WEATHER SYSTEM (ITWS)

Program/Project Identifiers:

Project Number(s):	CIP W-07
Related Program(s):	CIPs A-02, A-04, A-11, C-11, C-15, F-02, M-07, S-03, W-01, W-02, W-03, W-05, W-09, R,E&Ds 021-230, 031-110, 041-110, 042-110
New/Replacement/Upgrade?	New
Responsible Organization:	AUA-460
Program Mgr./Project Lead:	Kevin Young, AUA-460, (202) 366-9207
Fuchsia Book POC:	Maureen Cedro, AUA-460, (202) 493-0228

Assigned Codes:

PDC(s):	BX
PDC Description:	Weather Service facilities (WSO, WSFO) data circuits
Service Code:	METI

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$28	$45	$992	$236	$16	$0	$0
F&E Recurring	$43	$275	$1,929	$1,884	$233	$0	$0
Total F&E	**$70**	**$321**	**$2,920**	**$2,119**	**$250**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$0	$0	$27	$311	$1,961	$2,196	$2,196
Total OPS	**$0**	**$0**	**$27**	**$311**	**$1,961**	**$2,196**	**$2,196**

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CIP Category: Weather

7-03.0 INTEGRATED TERMINAL WEATHER SYSTEM

7-03.1 INTEGRATED TERMINAL WEATHER SYSTEM OVERVIEW

The Integrated Terminal Weather System (ITWS) will combine and process data from FAA, the National Weather Service (NWS), and other weather sensing systems to provide a set of integrated weather information products to increase user efficiency and enhance safety thereby supporting air traffic management and planning.

7-03.1.1 Purpose of the Integrated Terminal Weather System

The purpose of the ITWS will integrate weather information from several sources and provide timely and accurate terminal area weather products in a format of immediate benefit to the user. These products will improve user efficiency, reduce delays, and aid in traffic management and airport capacity planning.

7-03.1.2 References

7-03.1.2.1 FAA Capital Investment Plan (CIP), Project Number W-07, January 1999.

7-03.1.2.2 NAS System Specification, Functional and Performance Requirements for the National Airspace System General, NAS-SS-1000, Volume I, December 1986 (with changes through May 1993, SCN-21), DOT/FAA.

7-03.1.2.3 Operational Requirements Document (ORD) for ITWS, February 1995.

7-03.1.2.4 ITWS NCP-17331: ITWS Case File.

7-03.1.2.5 TWIP 005A-002: Terminal Weather Information for Pilots (TWIP), Enhancement to the TDWR/NADIN Interface Control Document (ICD).

7-03.1.2.6 NAS-IR-31052514: TDWR/ITWS Interface Requirements Document (IRD).

7-03.1.2.7 NAS-IC-25082514: ADAS/ITWS Interface Control Document (ICD).

7-03.1.2.8 NEXRAD PUP ICD: NEXRAD/ITWS Interface Control Document (ICD) (2620001A).

7-03.1.2.9 NAS-IR- 34032514: ASR-9/ITWS Interface Requirements Document (IRD).

7-03.1.2.10 NAS-MD-793A: Remote Maintenance Monitoring System Remote Monitoring Subsystem Requirements.

7-03.1.2.11 NAS-MD-790 with SCN-1: Remote Maintenance Monitoring System Interface Control Document (ICD).

7-03.1.2.12 NAS-IC-31053102: LLWAS/TDWR Interface Control Document (ICD).

7-03.1.2.13 NAS-IC-43020001: NADIN-PSN Interface Control Document (ICD).

7-03.1.2.14 NAS-IR-61002514: ARTCC/ITWS Facility Interface Requirements Document (IRD).

7-03.1.2.15 NAS-IR-63002514: ATCT-TRACON/ITWS Facility Interface Requirements Document (IRD).

7-03.1.2.16 NAS-IR-94142514: FAA Bulk Weather Telecommunications Gateway (FBWTG)/ITWS Interface Requirements Document (IRD).

7-03.2 SYSTEM DESCRIPTION

7-03.2.1 System Components

The ITWS will use data from several weather systems to produce useful weather products. The initial operational capability (IOC) design architecture uses a "typical" airport being considered as an ITWS site. A typical airport will have the meteorological systems listed below within the operational area for producing the ITWS products.

- Terminal Doppler Weather Radar (TDWR)
- Low Level Wind Shear Alert System (LLWAS)
- Airport Surveillance Radar - 9 (ASR-9)
- Next Generation Weather Radar (NEXRAD)
- Automated Surface Observing System/Automated Weather Observing System (ASOS/AWOS) and National Lightning Detection Network data via AWOS Data Acquisition System (ADAS)
- Meteorological Data Collection and Reporting Service (MDCRS) and National Weather Service Rapid Update Cycle (RUC) data from the NWS

The ITWS will provide output data to ITWS-provided display(s) in the Airport Traffic Control Tower (ATCT), Terminal Radar Approach Control (TRACON), Air Route Traffic Control Centers (ARTCCs), Air Traffic Control System Command Center (ATCSCC), and airline dispatcher offices. It will provide data for Datalink users to provide the appropriate messages to requesting pilots.

7-03.2.1.1 Principal Components

The main components of the ITWS will be Product Generator (PG), Situation Display (SD), National Weather Service Filter Unit (NFU) and associated Ribbon Display Terminal (RBDT). The PG is the main processor that receives the weather data, generates the products, and provides output products to the users. The SDs control and display the PG products in graphical and textual format. The RBDTs display textual information to air traffic controllers. The NFU is a front-end processor that filters NWS data for distribution to all ITWS PGs.

7-03.2.1.1.1 Basic Functions.

ITWS will have five basic functions:

- Data and product acquisition,
- Generation of terminal weather products,
- Dissemination of products to users (who will access these products in order to carry out various FAA flight planning and control tasks),
- Display and computer/user interface, and
- System control/support function.

The control function will coordinate and maintain status of input and output sources, as well as monitor the internal activity of the ITWS. These functions, and the weather products generated or passed through, are shown in Figure 7-03-1.

7-03.2.1.1.2 Description of Basic Functions

7-03.2.1.1.2.1 Data and Product Acquisition

The Data and Product Acquisition function will automatically receive data and products from external systems and certain end-users. Sub-functions may include, but are not limited to, establishing and managing data communications links, converting data formats, and converting coordinate systems.

7-03.2.1.1.2.2 Product Generation

The Product Generation function will automatically process acquired data and products and produce the ITWS products.

7-03.2.1.1.2.3 Display and CHI

The Display and CHI function will be responsible for the visual presentation (graphical and textual) on situation displays (SDs) and ribbon display terminals (RBDTs) and for the audio presentation (audible alarm) on RBDTs for ITWS products to selected users. It will also accept user input for display tailoring and control, product selection, and generation of operations-specific products.

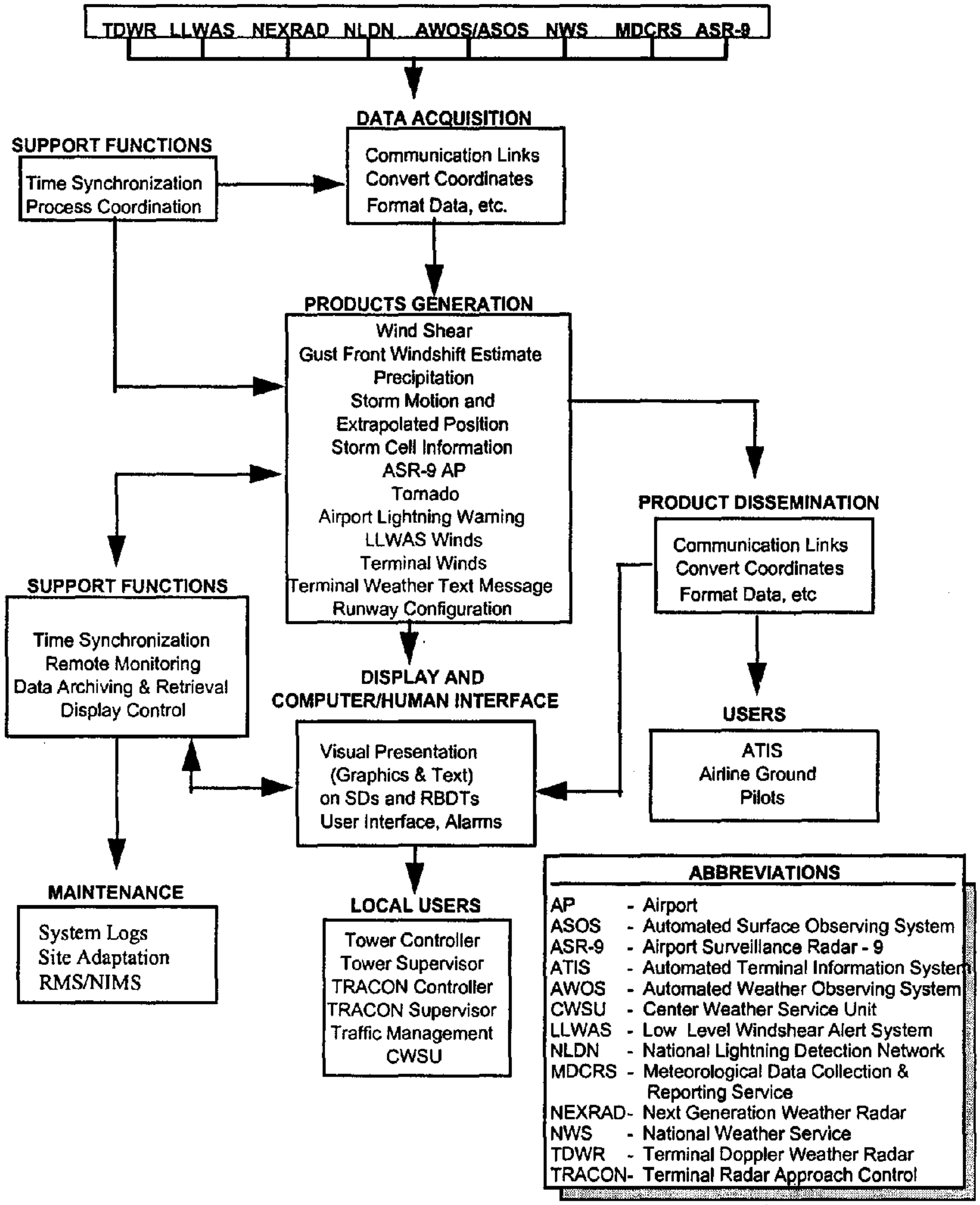


Figure 7-03-1. Integrated Terminal Weather System Functional Flow

7-03.2.1.1.2.4 <u>Product Dissemination</u>

The Product Dissemination function will be responsible for automatically exporting ITWS products to external systems. Sub-functions may include, but are not limited to, establishing and managing output communications links, converting data formats, and converting coordinate systems.

7-03.2.1.1.2.5 System Control and Support

The System Control and Support function will be responsible for system functions not allocated to Data and Product Acquisition, Product Generation, Product Dissemination, or Product Display and CHI. Sub-functions may include: recording of acquired input data and products, archiving of generated products, playback of input data and products, playback of archived products, logging of system operations, management of system time reference, management of site adaptation data, and Remote Monitoring Subsystem (RMS) functions.

7-03.2.1.2 Functional Component Interface Requirements

Some airports being considered for an ITWS will be served by Large Consolidated TRACON facilities. Other airports will have a combined TRACON, which will serve multiple airports. As far as the ITWS is concerned, these airports will have a slightly different architecture although the type of input subsystems will remain the same. The variations are based on the number of interfaces and the extent of the coverage area.

Figure 7-03-2 shows an overview of the ITWS system. The paragraphs that follow describe the ITWS functional components and their interface requirements.

- The ITWS will acquire data from external systems, which provide radar, sensor and NWS data. Specified data sets from NWS will be acquired by the ITWS-NFU and transmitted to the other ITWS PG sites via government furnished communications. The ITWS will merge and process the acquired data sets and provide weather products on displays for ATC personnel. The ITWS will also provide products at designated output ports for access by aircraft via Datalink and transmission to external users. Inter-facility communications will use the National Airspace Data Interchange Network Packet Switched Network (NADIN PSN) or dedicated terrestrial communications channels.

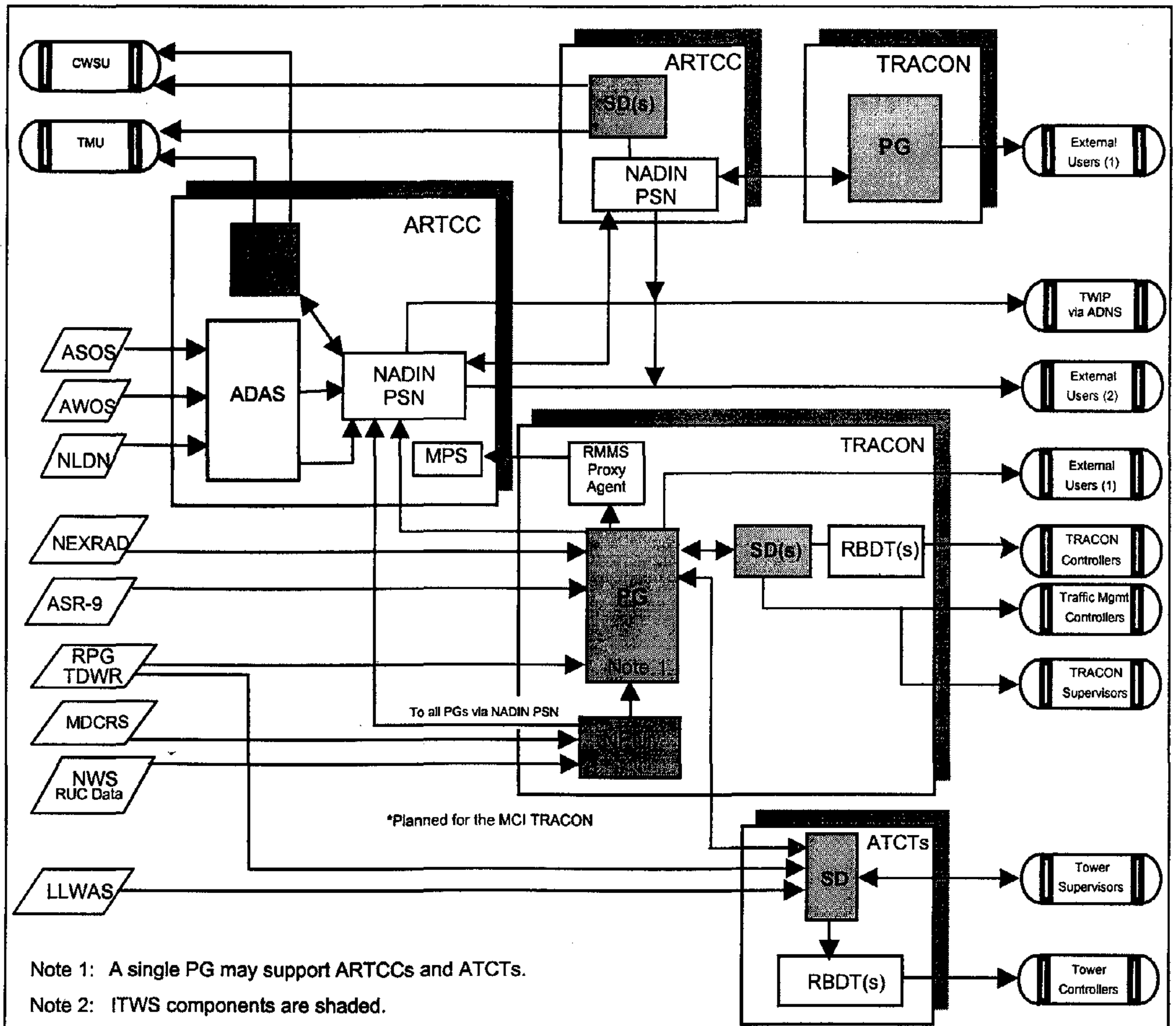
The PG, to be located in 34 TRACONs, the William J. Hughes Technical Center (WJHTC), the Program Support Facility (PSF), and the Mike Monroney Aeronautical Center (ARCTR), will consist of the processing equipment which executes GFE weather product algorithms. The PG interfaces to internal systems, the NFU, and the SD.

- The SD will be a color graphics and alphanumeric display used to display the weather products. The SD will replace the Terminal Doppler Weather Radar (TDWR) Geographic Situation Display (GSD). SDs will be located at the following operational sites:

    - 48 ATCTs,
    - 38 TRACONs,
    - 18 ARTCCs, and
    - 1 CERAP at San Juan
    - ATCSCC
    - Airline dispatcher offices (as required)

  SDs will also be provided to 3 support sites (i.e., WJHTC, PSF, and FAAAC). The RBDT will be a GFE alphanumeric display used to display weather products received from the SD. The SDs located in the TRACON operational area will support the TRACON supervisors and Traffic Management personnel, while the SD located in the ATCT operational area will support the ATCT supervisor. The RBDTs located in the TRACON and ATCT operational areas will support the TRACON and ATCT controllers, respectively. The SDs located in the ARTCC operational area will support the Traffic Management Unit (TMU) and CWSU personnel.

- The ITWS will have backup configurations to prevent data loss from the PG to the SDs. These backup configurations will allow some SDs to receive data from the TDWR and Low Level Wind Shear Alert System (LLWAS) directly. If data from the ITWS PG is lost, the SD will use TDWR as the backup system, while if both the ITWS PG and TDWR data are lost, the LLWAS will provide the the source data. When ITWS is using TDWR as the backup system, only SDs at the ATCT and TRACON supervisor and traffic management positions will acquire TDWR data, and both the SDs and RBDTs will display TDWR data (this includes LLWAS products). When ITWS is using LLWAS as the backup system, only SDs at the ATCT supervisor positions supported by LLWAS will acquire LLWAS data, and both the SDs and RBDTs will display the LLWAS data.



ABBREVIATIONS

ADAS	AWOS Data Acquisition System	NLDN	National Lightning Detection Network
ADNS	ARINC Data Network Service	NWS	National Weather Service
ARTCC	Air Route Traffic Control Center	PG	Product Generator
ASOS	Automated Surface Observing System	PSN	Packet Switched Network
ASR-9	Airport Surveillance Radar Model 9	RBDT	Ribbon Display Terminal
ATCT	Air Traffic Control Tower	RPG	Radar Product Generator
AWOS	Automated Weather Observing System	RUC	Rapid Update Cycle
CWSU	Center Weather Service Unit	SD	Situation Display
DLP	Datalink Processor	TDWR	Terminal Doppler Weather Radar
LLWAS	Low Level Wind Shear Alert System	TMU	Traffic Management Unit
MDCRS	Meteorological Data Collection and Reporting System	TRACON	Terminal Radar Approach Control Facility
NADIN PSN	National Airspace Data Interchange Network	TWIP	Terminal Weather Information for Pilots
NEXRAD	Next Generation Weather Radar	RMMS	Remote Maintenance Monitoring System
NFU	NWS Filter Unit	MPS	Maintenance Processor System

Figure 7-03-2. Integrated Terminal Weather System Interface Diagram

7-03.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

Processors located at selected TRACONs will perform ITWS data acquisition and products generation functions. The processor(s) will receive data from other subsystems in the local facility, other NAS subsystems, other ITWS elements in towers, the adjacent ARTCC, and the NWS via the FAA Bulk Weather Telecommunications Gateway (FBWTG). It will access weather sensor and atmospheric model data for use in the conduct of its tasks. The ITWS PG will transmit product data from its resident location to ATCT and TRACON supervisors and controllers, traffic management personnel, the ARTCC TMU and CWSU, airline ground operations, and pilots via DATALINK processors. The communications resources for this purpose will support full duplex operation.

Each ITWS interface requirement will be unique and depend upon the relationships between the TRACON, ATCT and ARTCC for the exact configuration. The program will use an X.25 NADIN PSN connection to reach systems that use NADIN, will receive broadcast NWS weather products from the national network prepared for that use, and use dedicated channels when this is not possible.

The ITWS Contractor is responsible for acquiring NADIN PSN and NEXRAD interface certifications from WJHTC and NEXRAD OSF, accordingly. The ITWS Contractor is also responsible for connecting intra-facility communications, such as ITWS-PG to ITWS-SD in collocated ATCT and TRACON facilities.

The telecommunications interfaces, ITWS to NEXRAD are depicted in Figure 7-03-2. The applicable protocol, transmission, and hardware requirements for each of the interfaces are summarized below in Table 7-03-1.

7-03.3.1 Telecommunications Interfaces

7-03.3.1.1 Product Generator (PG) to Situation Display (SD)

The PG automatically processes acquired data and products and produces the ITWS products. The PG will be located in 34 specified TRACONs, William J. Hughes Technical Center (WJHTC), the Program Support Facility (PSF), and the Mike Monroney Aeronautical Center (ARCTR). It consists of the processing equipment, which executes Government Furnished (GF) weather product algorithms. The PG internally interfaces to the Situation Display (SD), a color graphics and alphanumeric display used to display the weather products.

7-03.3.1.2 Product Generator (PG) to National Weather Service Filter Unit (NFU)

The PG interfaces to the National Weather Service Filter Unit (NFU) with specified data sets from the NWS acquired at one designated ITWS site (Kansas City). The NFU extracts portions of NWS data for each ITWS and transmits the filtered data to the other ITWS PG sites via leased or owned channels.

7-03.3.1.3 Terminal Doppler Weather Radar (TDWR) Interface

Up to four TDWRs will provide base data and wind shear products and forward LLWAS wind data to an ITWS Product Generator. This interface is defined in NAS-Interface Requirement (IR)-31052514. The TDWR will also provide a backup capability for windshear, storm motion, and precipitation products in case of ITWS failure.

7-03.3.1.4 AWOS Data Acquisition System (ADAS)

Up to three per PG. ADASs will provide data from the Lightning Position and Tracking System (LPATS) and surface observation data from AWOS/ASOS. This interface is defined in NAS-IR-25082514.

7-03.3.1.5 FAA Bulk Weather Telecommunications Gateway (FBWTG)

One interface will provide Rapid Update Cycle (RUC) and Meteorological Data Collection and Reporting System (MDCRS) data from the NWS. The direct interface to ITWS is defined in FBWTG/ITWS IRD NAS-IR-94142514.

7-03.3.1.6 Airport Surveillance Radar - 9 (ASR-9) Interface

Up to six ASR-9s will provide 6-level reflectivity covering the TRACON areas. This interface is defined in NAS-IR-3402514.

7-03.3.1.7 Next Generation Weather Radar (NEXRAD)

Up to two interfaces will supply NEXRAD products to the ITWS. The physical construction of this interface shall be in accordance with the NEXRAD/Associated Principal User Processor (PUP) Interface Control Document (ICD) 2620001A.

7-03.3.1.8 Low-Level Windshear Alert System (LLWAS)

LLWAS-3 will provide runway-oriented winds and windshear data for instrumented ITWS airports. These interfaces are defined in TDWR/LLWAS-3 ICD (Build #5) NAS-IC-31053102. LLWAS-2 Center Field Wind or ASOS (local one-minute update) will provide airport winds for non-LLWAS-3 airports.

7-03.3.1.9 Situation Display (SD) Interface

For display of ITWS products, the ITWS will use SDs functionally similar to those used by the TDWR GSD. SDs will be located in the associated ITWS TRACONs and towers. In addition, an ITWS Situational Display will be located in the parent ARTCC

7-03.3.1.10 Datalink User (DLU)

This interface will provide for the transfer of ITWS products to the pilot "Terminal Weather Information for Pilots (TWIP)" via National Airspace Data Interchange Network (NADIN) connection to ARINC broadcasts. Interface requirements are defined in NAS-IR-25142513.

7-03.3.1.11 External Users 1 and 2

This interface will provide output ports for use by external users (e.g., airlines, NWS) in order for them to access ITWS products. (Ref Spec. Dated 7/95) External Users Port 1 is allocated for the Center/TRACON Automation System (CTAS). External Users Port 2 is allocated for all other users. As part of the ITWS

Technology Refresh in late 2001, the ITWS system will incorporate a TCP/IP port to utilize with external users such as the airlines.

7-03.3.1.12 Remote Maintenance Monitoring Capability (RMMS)

The RMMS will remotely control and monitor the status of ITWS. Functional requirements for the RMMS are specified in NAS-MD-793.

7-03.3.1.13 National Weather Service Filter Unit (NFU) to External ITWS PGs

Specified data sets from NWS will be acquired by the ITWS-NFU and transmitted to the other ITWS PG sites via government furnished equipment (GFE) communications. This interface is specified in NAS-IC-43020001.

Table 7-03-1. ITWS Interface Requirements Summary Table

SUBSYSTEM INTERFACE		ASR-9	ATCT/TRACON & ARTCC	RMMS	LLWAS-3
INTERFACE CONTROL DOCUMENTATION		NAS-IR-34032514	NAS-IR-63002514 NAS-IR-61002514 (Facility IRDs)	NAS-MD-790 (With SCN-1) NAS-MD-793A	NAS-IC-31053102-00 (Rev. 02)
PROTOCOL REQUIREMENTS	**Network Layer**	N/A	N/A	X.25/IP	N/A
	Datalink Layer	Common Digitizer (CD) Format	N/A	LAP-B	As in ICD
	Physical Layer	EIA-530	N/A	EIA-530	EIA-530 To RS-232C
	Special Formats/ Codes	CD Format	N/A	None	As in ICD
TRANSMISSION REQUIREMENTS	**No. Channels**	55	N/A	35	9
	Speed (Kbps)	9.6-19.2	N/A	2.4 - 19.2	9.6
	Simplex Half/Full Duplex	Simplex	N/A	Full Duplex	TBD
	Service	Pt. to Pt.	N/A	-PSN	Pt. to Pt.
HARDWARE REQUIREMENTS	**Modem**	Codex 3600	N/A	TBD	TBD
	Cable/ Miscellaneous	TBD	N/A	TBD	TBD

SUBSYSTEM INTERFACE		TDWR Radar Product Generator	TDWR Situation Displays	ADAS	FBWTG/ITWS-NFU
INTERFACE CONTROL DOCUMENTATION		NAS-IR-31052514 (Part 1)	NAS-IR-31052514 (Part 2)	NAS-IC-25082514	NAS-IR 94142514
PROTOCOL REQUIREMENTS	Network Layer	RFC-791(IP)	N/A	X.25	IP
	Datalink Layer	ISO 8802-2	HDLC	LAP-B	HDLC
	Physical Layer	ISO 8802-3	EIA-530	EIA-530	EIA-530
	Special Formats/ Codes	N/A	N/A	none	none
TRANSMISSION REQUIREMENTS	No. Channels	45	7	50	2
	Speed (Kbps)	T-1	9.6	9.6	T-1
	Simplex Half/Full Duplex	Simplex	Full Duplex	Full duplex	Full Duplex
	Service	Pt. to Pt.	Pt. to Pt.	PSN/SVC	Pt. to Pt.
HARDWARE REQUIREMENTS	Modem	DDC Platform	TBD	TBD	TBD
	Cable/ Miscellaneous	TBD	TBD	TBD	TBD

SUBSYSTEM INTERFACE		DATALINK User	NEXRAD	External User 1 (CTAS)	External User 2
INTERFACE CONTROL DOCUMENTATION		NAS-IC-25142513	2620001A PUP ICD	NAS-IC-43020001	NAS-IC-43020001
PROTOCOL REQUIREMENTS	Network Layer	X.25	X.25	X.25	X.25
	Datalink Layer	LAP-B	LAP-B	LAP-B	LAP-B
	Physical Layer	RS-232E	RE-449/RS-232	EIA-530	EIA-530
	Special Formats/ Codes	none	none	none	none
TRANSMISSION REQUIREMENTS	No. Channels	35	39	35	37
	Speed (Kbps)	1.2-	14.4	512	64kbs
	Simplex Half/Full Duplex	Full duplex	Full duplex	Full Duplex	Full Duplex
	Service	PSN/SVC	Pt. to Pt.	SVC	PSN/SVC
HARDWARE REQUIREMENTS	Modem	TBD	TBD	TBD	TBD
	Cable/ Miscellaneous	TBD	TBD	TBD	TBD

SUBSYSTEM INTERFACE		PG to SD	PG to Remote SD	ITWS NFU/ ITWS PG	
INTERFACE CONTROL DOCUMENTATION		N/A	N/A	NAS-IC-43020001	
PROTOCOL REQUIREMENTS	Network Layer	TBD	TBD	X.25	
	Datalink Layer	TBD	TBD	LAP-B	
	Physical Layer	TBD	TBD	EIA-530	
	Special Formats/ Codes	TBD	TBD	TBD	
TRANSMISSION REQUIREMENTS	No. Channels	91	64	34	
	Speed (kbps)	64	64	128	
	Simplex Half/Full Duplex	TBD	TBD	Full Duplex	
	Service	TBD	TBD	PSN/SVC	
HARDWARE REQUIREMENTS	Modem	TBD	TBD	TBD	
	Cable/ Miscellaneous	TBD	TBD	TBD	

7-03.3.1.14 Connectivity Requirements

The ITWS connectivity includes 3 support sites (WJHTC, FAA Academy, and ITWS PSF). Some ITWSs require multiple TDWR, ASR-9, and NEXRAD radar inputs and/or require connection with multiple ADASs to cover multiple airports. For example, DFW ITWS primarily covers DFW and Dallas Love airports. In this case, ITWS will be connected to two (2) TDWRs and four (4) ASR-9s and will display its graphical and textual output to the situation displays (SDs) at three (3) DFW towers, DFW TRACON and Dallas Love Tower. Charlotte ITWS will need to receive AWOS/ASOS and NLDN data from three (3) surrounding ARTCCs in order to meet ITWS operational requirements.

The Chicago (possibly New York) ITWS requires weather data from two (2) NEXRADs, and, in a few cases, more than one ITWS will require the weather data from a single NEXRAD, as shown in Table 7-03-2 and Table 7-03-3. Table 7-03-4 shows the remote ASR-9 to ITWS interfaces.

Table 7-03-2. Multiple ITWS to Single NEXRAD Interface Requirements

	NEXRAD	ITWS
1	Philadelphia	WJHTC Philadelphia New York
2	Oklahoma City	PSF FAA Academy Oklahoma City
3	Cincinnati-Dayton	Cincinnati Columbus Dayton

Table 7-03-3. Multiple NEXRADs to Single ITWS Interface Requirements

	NEXRAD	ITWS
1	Chicago Milwaukee	Chicago
2	New York Philadelphia	New York

The TMU and CWSU SDs are capable of accepting the products from five different ITWSs. These SDs are capable of displaying a maximum of four ITWS-PG outputs simultaneously. For example, ARTCC SDs at Indianapolis will accept the ITWS products from Cincinnati, Indianapolis, Columbus, Dayton, and Louisville TRACONs. A summary of the ARTCC/CERAP to ITWS TRACON connectivity is provided in Table 7-03-5.

Table 7-03-4. Remote ASR-9 to ITWS Interfaces

	ASR-9	Remote Feed
1	Philadelphia	WJHTC New York
2	Oklahoma City	PSF FAA Academy
3	Milwaukee	Chicago
4	Ft. Lauderdale	West Palm Beach
5	Washington National* Baltimore Washington Int'l* Andrews AFB* Washington Dulles*	Washington, DC
6	Islip* John F Kennedy* Newark* White Plains* Newburg-Steward*	New York TRACON
7	Houston Hobby*	Houston Intercontinental

*NOTE: May already exist or be in the Metroplex (when in place)

Table 7-03-5. ARTCC/CERAP to ITWS TRACON Connectivity

ARTCC	TRACON [Number ITWS(s)]
ZAB Albuquerque ARTCC	Phoenix TRACON [1 ITWS]
ZAU Chicago ARTCC	Chicago TRACON [1 ITWS]
ZBW Boston ARTCC	Boston TRACON [1 ITWS]
ZDC Washington ARTCC	Dulles, Raleigh-Durham TRACONs [2 ITWSs]
ZDV Denver ARTCC	Denver TRACON [1 ITWS]
ZFW Fort Worth ARTCC	Dallas/Fort Worth, Tulsa, Oklahoma City TRACONs [3 ITWSs]
ZHU Houston ARTCC	Houston, New Orleans TRACONs [2 ITWSs]
ZID Indianapolis ARTCC	Cincinnati, Indianapolis, Columbus, Dayton, Louisville TRACONs [5 ITWSs]
ZJX Jacksonville ARTCC	Charlotte, Orlando TRACONs [2 ITWSs]
ZKC Kansas City ARTCC	St. Louis, Wichita, Kansas City, Tulsa, Oklahoma City TRACONs [5 ITWSs]
ZLA Los Angeles ARTCC	Las Vegas TRACON [1 ITWS]
ZLC Salt Lake City ARTCC	Salt Lake City TRACON [1 ITWS]
ZMA Miami ARTCC	Miami, Orlando TRACONs, San Juan CERAP [3 ITWSs]
ZME Memphis ARTCC	Memphis, Nashville TRACONs [2 ITWSs]
ZMP Minneapolis ARTCC	Minneapolis TRACON [1 ITWS]
ZNY New York ARTCC	Philadelphia, Dulles, New York TRACONs [3 ITWSs]
ZOB Cleveland ARTCC	Pittsburgh, Detroit, Cleveland TRACONs [3 ITWSs]
ZSU San Juan CERAP	The CERAP acts as a TRACON [1 ITWS]
ZTL Atlanta ARTCC	Atlanta, Charlotte TRACONs [2 ITWSs]

7-03.3.1.15 Traffic Characteristics

Message delivery time within the local facility should not exceed 150 milliseconds and, typically, should be on the order of 100 milliseconds. Message delivery times between facilities (ARTCC to ARTCC and ARTCC to TRACON) shall not exceed 5 seconds. Message delivery times will be measured from the sending unit's application initiation of transmission to completion of the reception of the message in the receiving unit. ITWS intra-facility and inter-facility data rates are shown in Table 7-03-6.

Table 7-03-6. ITWS Communications Data Rates

Interface	Data Rate Requirement	Data Type (Refer to IRDs/ICDs for Data Size and Frequency)
ADAS	9.6 Kbps	National lightning detection data & ASOS/AWOS One minute observation data (via NADIN PSN)
DATALINK User	1.2 Kbps	ITWS character graphics and textual message to pilots (via NADIN PSN)
TDWR (Part-1)	T1 (1.544 Mbps)	TDWR radar base data
TDWR (Part-2) Situation Displays	9.6 Kbps	TDWR RPG products (backup feature - most of these communications links already exist)
LLWAS	9.6 Kbps	For LLWAS-III - Communications links already exist
NEXRAD	14.4 Kbps	NEXRAD RPG products (data) (Build 10)
ASR-9	9.6 Kbps	Digital 6 level precipitation data (plus back-up) Communications links already exists, except for those sites listed in Table 7-03-2.
NIMS	4.8 Kbps	Frequency and volume of data depend on situation
FBWTG/ITWS-NFU	T1-1544	Only one operational NFU located at Kansas City (MCI) TRACON
ITWS-NFU/NADIN	128 Kbps	Filtered NWS (RUC) data eta (Puerto Rico only) for 34 ITWS sites
NADIN/ITWS-PG	64 Kbps-512 Kbps	Each ITWS-PG gets its NWS (RUC) data via local NADIN MDCARS, ITWS SDs at ARTCCs, AWOS/ASOS, NLDS333
Ext. User 1 (CTAS)	512 Kbps	ITWS provides local data to CTAS
Ext. User 2	64 Kbps	via NADIN PSN, future via TCP/IP Network
ITWS- SD	64 Kbps	For remote ARTCCs, TRACONs and ATCTs
ITWS -SD	64 Kbps	ITWS-PG output to local ATCT and TRACON SDs

7-03.4 ACQUISITION ISSUES

7-03.4.1 Project Schedules and Status

The NAS Change Proposal (NCP) has been approved, with the intention to have initial deployment beginning November 2000 followed by deployment of the remainder of the sites within 2 years. A listing of the sites is found in Table 7-03-7. Table 7-03-8 provides the ITWS Site Installation Schedule. The

ITWS Interface Implementation Schedule is presented in Table 7-03-9. All ITWS schedule information is based upon the JRC-proposed schedule, with approval pending.

Table 7-03-7. ITWS Prospective Locations

REGION	SITES
Western Pacific (2)	Phoenix, Las Vegas
Eastern (4)	Dulles (Andrews AFB, National, Dulles, Baltimore), Pittsburgh, New York Lg. TRACON (Kennedy, La Guardia, & Newark), Philadelphia
Northwest (2)	Denver Lg. TRACON (Denver), Salt Lake City
Southwest (5)	Dallas Lg. TRACON (Dallas Fort Worth & Dallas Love), New Orleans, Oklahoma City, Houston TRACON (Houston Hobby & Houston Intercontinental), Tulsa
Central (3)	Kansas City, St. Louis, Wichita
Great Lakes (7)	Chicago Lg. TRACON (O'Hare, Midway, and Milwaukee), Cleveland, Columbus, Dayton, Detroit, Indianapolis, Minneapolis
New England (1)	Boston
Southern (10)	Central Florida Lg. TRACON (Orlando & Tampa), Atlanta, Charlotte, Cincinnati, Louisville, Memphis, Nashville, Raleigh/Durham, San Juan, Miami TRACON (Miami, Fort Lauderdale & West Palm Beach)

Table 7-03-8. ITWS Site Installation Schedule

Site Installation	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
Western Pacific	0	0	0	2	0	0	0	0
Eastern	0	0	1	4	0	0	0	0
Northwest	0	0	0	1	1	0	0	0
Southwest	0	0	2	4	1	0	0	0
Central	0	0	1	1	1	0	0	0
Great Lakes	0	0	0	3	4	0	0	0
New England	0	0	0	1	0	0	0	0
Southern	0	0	0	8	2	0	0	0
Total: ITWS (34 operational, 3 support sites)	0	0	4	24	9	0	0	0

Table 7-03-9. ITWS Interface Implementation Schedule

Interface Installation	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
ASR-9 to PG	0	1	4	41	10	0	0	0
PGs to ATCT SDs (all)	0	1	5	37	9	0	0	0
PGs to ATCT SDs (Non-Collocated)	0	0	1	11	0	0	0	0
PG to TRACON SDs (all)	0	1	1	28	9	0	0	0
PG to TRACON SDs (Non-Collocated)	0	0	0	5	0	0	0	0
TDWR to PG	0	1	4	33	9	0	0	0
NEXRAD to PG	0	2	2	26	9 (1)	0	0	0
PG to ARTCC SDs (ADAS, DATALINK User)	0	2	2	25	10	0	0	0
FBWTG to WJHTC	1	0	0	0	0	0	0	0
TDWR to ITWS SDs	0	4	5	66	18	0	0	0
DLU to TWIP	0	1	5	27	4	0	0	0
FBWTG to NFU	0	1	5	24	4	0	0	0
PG to External User (CTAS)	0	1	5	24	4	0	0	0
RMMS to PG	0	1	4	24	5	0	0	0
PG to NFU	0	1	0	0	0	0	0	0
ITWS to LLWAS III	0	0	0	8	0	0	0	0

NOTE: The quantities per fiscal year, as shown in Table 7-03-9, reflect the lead time for activiating telecommunications services prior to the ITWS system installation dates implied by Table 7-03-8.

7-03.4.2 Telecommunications Costs

The Interface Implementation Schedule provided the basis for the computation of annual costs summarized in Table 7-03-10. In accordance with FAA Order 2500.8A, leased telecommunications costs (non-recurring and recurring) for the year of activation and one year following are shown in the table as being funded under Facilities and Equipment (F&E) account.

Table 7-03-10. Cost Summary - ITWS

CIP # W-07 All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
1. ARTCC <---> TDWR								
Channel Costs								
Cost Profile: LINCS DDC T-1 Circuits								
Channels Added		1	4	33	9	0	0	0
Total Channels	0	1	5	38	47	47	47	47
F&E Funded Channels		1	5	37	42	9	0	0
OPS Funded Channels		0	0	1	5	38	47	47
F&E Non-recurring Channel Costs		**$5**	**$20**	**$170**	**$46**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$19**	**$97**	**$756**	**$858**	**$184**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$0**	**$20**	**$102**	**$777**	**$960**	**$960**
Hardware Costs								
Cost Profile: 1 Pair of FT100 CSU/DSUs per Circuit								
Hardware Units Added		2	8	66	18	0	0	0
Total Hardware Units	0	2	10	76	94	94	94	94
F&E Funded HW Units		2	10	74	84	18	0	0
OPS Funded HW Units		0	0	2	10	76	94	94
F&E Non-recurring Hardware Costs		**$4**	**$16**	**$132**	**$36**	**$0**	**$0**	**$0**
Recurring Hardware Costs								
F&E Recurring Costs		**$0**	**$1**	**$5**	**$1**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$0**	**$0**	**$1**	**$5**	**$7**	**$7**
2. TRACON <---> NEXRAD								
Channel Costs								
Cost Profile: LINCS VG-8 Circuits								
Channels Added		2	2	26	9 (1)	0	0	0
Total Channels	0	2	4	30	39	38	38	38
F&E Funded Channels		2	4	29	35	9	0	0
OPS Funded Channels		0	0	1	4	29	38	38
F&E Non-recurring Channel Costs		**$3**	**$7**	**$53**	**$64**	**$16**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$5**	**$8**	**$47**	**$56**	**$14**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$0**	**$2**	**$6**	**$45**	**$59**	**$59**
Hardware Costs		*N/A - Codex 3261s Provided by the ITWS Program Office*						
3. ITWS PG (in TRACONs) <---> ITWS Remote SD (in TRACONs and ATCTs)								
Channel Costs								
Cost Profile: LINCS DDC-64 Circuits								
Channels Added		0	1	15	0	0	0	0
Total Channels	0	0	1	16	16	16	16	16
F&E Funded Channels		0	1	16	15	0	0	0
OPS Funded Channels		0	0	0	1	16	16	16
F&E Non-recurring Channel Costs		**$0**	**$3**	**$44**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$0**	**$5**	**$79**	**$74**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$0**	**$0**	**$5**	**$79**	**$79**	**$79**
Hardware Costs		*Captured under the TRACON-to-ARTCC Interface*						

Table 7-03-10. Cost Summary – ITWS (Concluded)

CIP # W-07 All costs in 000's	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
4. TRACON <---> ARTCC								
Channel Costs								
Cost Profile: LINCS DDC Circuits								
Total Channels Added per FY		1	0	24	9	0	0	0
DDC-128	0	1	0	17	9	0	0	0
DDC-256	0	0	0	6	0	0	0	0
DDC-512	0	0	0	1	0	0	0	0
Total Channels (Installed)	**0**	**1**	**1**	**25**	**34**	**34**	**34**	**34**
F&E Funded Channels		1	1	24	33	9	0	0
OPS Funded Channels		0	0	1	1	25	34	34
F&E Non-recurring Channel Costs		**$3**	**$0**	**$72**	**$27**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$4**	**$4**	**$131**	**$166**	**$36**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$0**	**$4**	**$4**	**$135**	**$170**	**$170**
Hardware Costs								
Cost Profile: 1 DDC Platform and Spare per TRACON End of Circuit								
Hardware Units Added		1	0	24	9	0	0	0
Total Hardware Units	0	1	1	25	34	34	34	34
F&E Funded HW Units		1	1	25	34	34	34	34
OPS Funded HW Units		0	0	1	25	34	34	34
F&E Non-recurring HW Costs		**$7**	**$0**	**$166**	**$62**	**$0**	**$0**	**$0**
Recurring Hardware Costs								
F&E Recurring Costs		**$1**	**$0**	**$24**	**$9**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$0**	**$1**	**$24**	**$33**	**$33**	**$33**
5. NADIN Backbone Usage								
Channel Costs								
Cost Profile: LINCS DDC-256 Circuits and Inside Wiring								
Channels Added		0	0	37	0	0	0	0
Total Channels	0	0	0	37	37	37	37	37
F&E Funded Channels		0	0	37	37	0	0	0
OPS Funded Channels		0	0	0	0	37	37	37
F&E Non-recurring Channel Costs		**$0**	**$0**	**$272**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$0**	**$0**	**$719**	**$719**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$719**	**$719**	**$719**
Hardware Costs								
Cost Profile: High Speed Cluster Cards								
F&E Non-recurring Costs		**$0**	**$0**	**$82**	**$0**	**$0**	**$0**	**$0**

Table 7-03-10. Cost Summary – ITWS (Concluded)

CIP # W-07 All costs in 000's	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
6a. FAA Bulk Weather Telecomm Gateway (ATCSCC) <---> NFU (MCI TRACON)								
Channel Costs								
Cost Profile: LINCS DDC DS-1 Circuit								
Channels Added		1	0	0	0	0	0	0
Total Channels	0	1	1	1	1	1	1	1
F&E Funded Channels		1	1	0	0	0	0	0
OPS Funded Channels		0	0	1	1	1	1	1
F&E Non-recurring Channel Costs		**$3**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$13**	**$150**	**$158**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$0**	**$0**	**$158**	**$158**	**$158**	**$158**
Hardware Costs - Sunk at ATCSCC, Captured under Interface 4 for MCI TRACON								
Cost Profile: DDC Platform and Spare per Circuit Endpoint								
6b. NFU (MCI TRACON) <---> NADIN PSN (ZKC ARTCC)								
Channel Costs								
Cost Profile: LINCS DDC-256 Circuit								
Channels Added		1	0	0	0	0	0	0
Total Channels	0	1	1	1	1	1	1	1
F&E Funded Channels		1	1	0	0	0	0	0
OPS Funded Channels		0	0	1	1	1	1	1
F&E Non-recurring Channel Costs		**$3**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$1**	**$11**	**$12**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$0**	**$0**	**$12**	**$12**	**$12**	**$12**
Hardware Costs - Captured under Interface 4								
Cost Profile: DDC Platform and Spare per Circuit Endpoint								

SUMMARY

		FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Totals	Non-recurring	$28	$45	$992	$236	$16	$0	$0
	Recurring	$43	$275	$1,929	$1,884	$233	$0	$0
	F&E Total	**$70**	**$321**	**$2,920**	**$2,119**	**$250**	**$0**	**$0**
OPS Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$0	$0	$27	$311	$1,961	$2,196	$2,196
	OPS Total	**$0**	**$0**	**$27**	**$311**	**$1,961**	**$2,196**	**$2,196**

CHAPTER 7-04 - SUMMARY SHEET

METEOROLOGICAL DATA COLLECTION AND REPORTING SERVICE (MDCRS)

Program/Project Identifiers:

Project Number(s):	BIIP-982012
Related Program(s):	ARINC
New/Replacement/Upgrade?	
Responsible Organization:	ARW-100
Program Mgr./Project Lead:	Sandra Schmidt, ARW-100, (202) 366-4437
Fuchsia Book POC:	same

Assigned Codes:

PDC(s):	WB
PDC Description:	ARINC Meteorological Data Collection and Reporting Service
Service Code:	ARIN

Cost Estimates*:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$175	$200	$200	$200	$200	$200	$200
Total OPS	**$175**	$200	$200	$200	$200	$200	$200

*Cost data provided by the Program Office.

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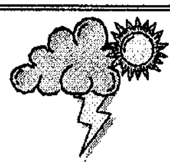
CIP Category: Weather



7-04.0 METEOROLOGICAL DATA COLLECTION AND REPORTING SERVICE

7-04.1 PROGRAM OVERVIEW

The ARINC Meteorological Data Collection and Reporting Service (MDCRS) collects and disseminates real-time upper-air weather observations from participating airlines and forwards them to the National Weather Service (NWS).

These observations are currently the only means of obtaining important weather information from the aircraft operating environment and include positional, operational and weather information. Observations over North America are called Pilot Reports (PIREPS) and are received in the form of messages downlinked from the aircraft via the Aircraft Communications and Reporting System (ACARS) and then transmitted through the ARINC Packet Network (APN) and the ARINC Data Network Service (ADNS) to MDCRS.

7-04.1.1 Purpose of the Meteorological Data Collection and Reporting Service

The Meteorological Data Collection and Reporting Service (MDCRS) is a service for collecting, translating into common format, and disseminating real-time upper altitude weather observations from participating airlines and forwarding them to the NWS.

7-04.1.2 References

7-04.1.2.1 Department of Transportation and Related Agencies Appropriations Act, 1989 (House Report 100-691, pages 48 and 49).

7-04.1.2.2 Contract No. DTFA01-94-C-0004, Aeronautical Radio, Inc. (ARINC).

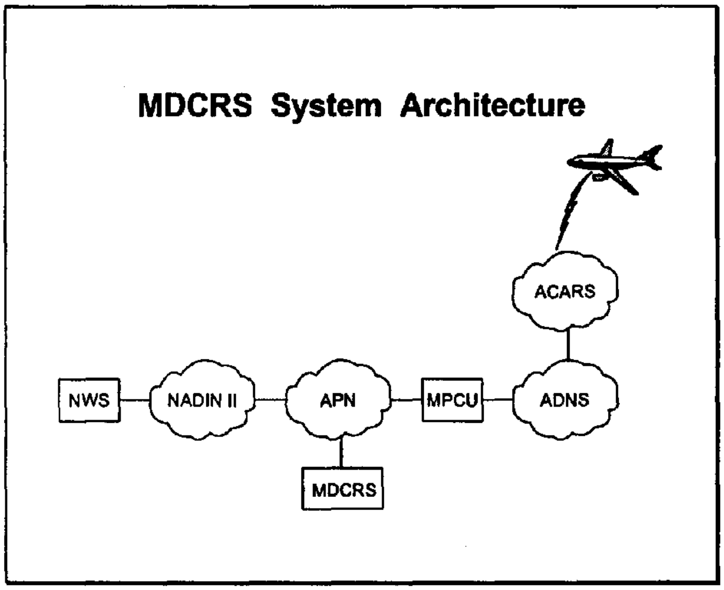
7-04.1.2.3 ATS Server System/Segment Specifications, Appendix E, April 18, 1997, Doc. No. 16666 Rev. A.

7-04.1.2.4 MDCRS Interface Control Document, April 22, 1997, Doc. No. 15506 Rev. A.

7-04.2 SYSTEM DESCRIPTION

In 1989, FAA contracted with ARINC to develop and implement the MDCRS (a 24-hour/day, 7-day/week, year-round system with a 95% end-to-end system availability) which translates and relays aircraft reports containing meteorological data between aircraft and the NWS.

The Aviation Weather Division, ARW-100, is responsible for coordinating the MDCRS program. Figure 7-04-1 shows the MDCR System Architecture.



ACARS	Aircraft Communications Addressing and Reporting System	NWS	National Weather Service
ADNS	ARINC Data Network Services	NADIN II	(PSN) National Airspace Data Packet Swtiched Network
APN	ARINC Packet Network		
MDCRS	Meteorological Data Collection and Reporting System		

Figure 7-04-1. MDCRS System Architecture

7-04.2.1 Program/System Components

A data processing platform performs decoding, reformatting, report batching, and transmission of MDCRS reports.

7-04.2.2 Functional Component Interface Requirements

The functional component interface requirements of the MDCRS are as follows:

- MDCRS reports are delivered in batches to the NWS within 5 minutes of receipt at the MDCRS Processor.
- The system mean-time-to-restore (MTTR) is not to exceed 4 hours.

- Basic MDCRS is defined as a 24-hour/day, 7-day/week, year-round system with a 95% end-to-end system availability, which relays aircraft reports containing meteorological data between aircraft and the NWS. The specific functions of the basic MDCRS are to:
  - Collect real-time aircraft reports containing meteorological information, called PIREPs, from the ARINC Data Network System (ADNS) and transmit them to the MDCRS processor;
  - Extract the meteorological observations from these reports;
  - Reformat the observations from airline-unique formats into the Binary Universal Format Representation (BUFR) format; and
  - Transmit batched observations in BUFR format to the Office of System Operations of the NWS within 5 minutes of receipt at the MDCRS processor.

7-04.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

7-04.3.1 Telecommunications Interfaces

Services include communications lines to receive MDCRS reports from the ADNS to APN to X.25 line to transmit the batched reports to NWS via NADIN PSN (X.25).

7-04.3.2 Functional Requirements

The Meteorological Data Collection and Reporting Service (MDCRS) collects, reformats, organizes into a database, and disseminates automated aircraft reports to the NWS.

7-04.3.3 Functional/Physical Interface Requirements

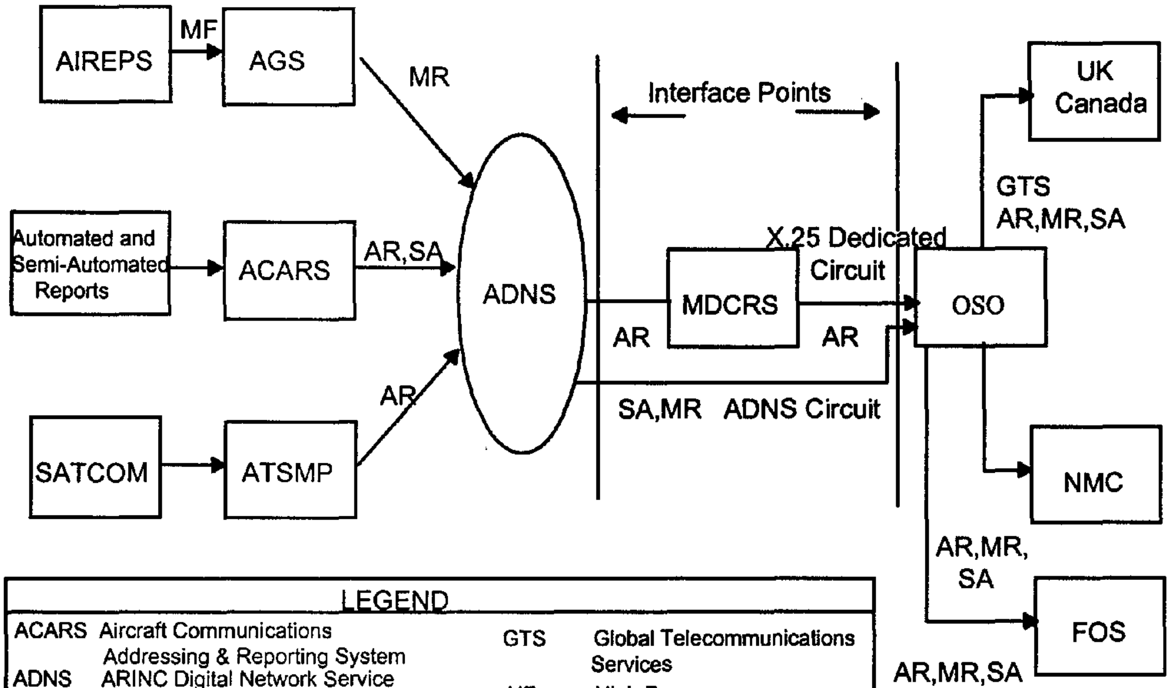
The Meteorological Data Collection and Reporting Service functional and physical interface requirements are depicted in Figure 7-04-2.

7-04.3.4 Local Interfaces

Not applicable.

7-04.3.5 Diversity Requirements

The MDCRS has no diversity requirements.



LEGEND

ACARS	Aircraft Communications Addressing & Reporting System	GTS	Global Telecommunications Services
ADNS	ARINC Digital Network Service	HF	High Frequency
AFEPS	ACARS Front End Processing System	MDCRS	Meterological Data Collection and Reporting Service
AGS	Air Ground System	MR	Manual Report
AIREPS	Air Reports	NMC	National Meteorological Center
AR	Automated Reports	OSO	Office of System Operations
ARINC	Aeronautical Radio, Incorporated	SA	Semi-Automated Report
ATSMP	Air Traffic Services Message Processing	UK	United Kingdom
FOS	Family of Services		
SATCOM	Satellite Communications		

Figure 7-04-2. MDCRS Functional/Physical Interface Diagram

7-04.4 ACQUISITION ISSUES

7-04.4.1 Project Schedule and Status

The system came into use in January 1992, with three participating airlines--Delta, NorthWest and United. In July 1997, the system was transferred to a new processor and two additional airlines were added - UPS and American. The FAA/ARINC contract covers MDCRS in an operating sense, even though there is no operating budget identified. The monthly operating cost of approximately $20K/month since the service became operational was absorbed by ASU until October 1997. Since then, MDCRS has been funded by AOP pending establishment of an operations budget for the activity.

7-04.4.2 Planned Telecommunications Strategies

The cost of MDCRS for 1998 was fixed at $300K. The NWS and the FAA share the cost 50/50. Therefore, the FAA share was $150K. Due to new pricing rates approved by DCAA and asset recovery cost for the MDCRS processing software, the cost to increased in 1999 to $322k. The cost is estimated to increase to $400k for the out years, based on a new contract to be awarded in January 2001.

7-04.4.3 Telecommunications Costs

Table 7-04-1 provides a summary of the estimated telecommunications costs for the MDCRS as provided by the program manager. As shown in the table, all costs are OPS Funded.

Table 7-04-1. Cost Summary - MDCRS

CIP # None	All costs in 000's	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
1. Telecommunications Costs									
	Cost Profile: FAA's Share of FAA/ARINC Fixed Price Contract								
Non-recurring Costs									
	F&E Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Non-recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Costs									
	F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$175**	**$200**	**$200**	**$200**	**$200**	**$200**	**$200**
			SUMMARY						
F&E Totals		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$0	$0	$0	$0	$0	$0	$0
		F&E Totals	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Totals		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$175	$200	$200	$200	$200	$200	$200
		OPS Totals	**$175**	**$200**	**$200**	**$200**	**$200**	**$200**	**$200**

Note:

1. Cost data provided by the Program Manager.

CHAPTER 7-05 - SUMMARY SHEET

TERMINAL DOPPLER WEATHER RADAR (TDWR)

Program/Project Identifiers:

Project Number(s):	CIP W-03
Related Program(s):	CIPs A-04,C-11, C-14, F-02, M-07, M-15, W-02, W-05, W-09, R,E&D 042-110
New/Replacement/Upgrade?	New
Responsible Organization:	AND-420
Program Mgr./Project Lead:	Theodore H. Weyrauch, AND-420, (202) 267-9443
Fuchsia Book POC:	Same

Assigned Codes:

PDC(s):	WC, WE
PDC Description:	TDWR Circuits; TDWR Dial Backup Circuits
Service Code:	TDWR

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$36	$0	$0	$0	$0	$0	$0
F&E Recurring	$17	$5	$0	$0	$0	$0	$0
Total F&E	**$53**	**$5**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$109	$120	$126	$126	$126	$126	$126
Total OPS	**$109**	**$120**	**$126**	**$126**	**$126**	**$126**	**$126**

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CIP Category: Weather

7-05.0 TERMINAL DOPPLER WEATHER RADAR

7-05.1 TERMINAL DOPPLER WEATHER RADAR OVERVIEW

7-05.1.1 Purpose of the Terminal Doppler Weather Radar

The TDWR provides radar data on weather phenomena that might impact terminal operations. The primary mission of the TDWR is to enhance the safety of air travel through timely detection and reporting of hazardous wind shear in and near an airport's terminal approach and departure zone by detecting microbursts and gust fronts. A secondary mission of the TDWR is to improve the management of air traffic in the terminal area through TDWR-derived forecasts of gust front-induced wind shifts and precipitation.

Program Management for the TDWR is provided by the Wind Shear Product Team, AND-420.

An upgrade to the TDWR called Terminal Weather Information for Pilots (TWIP) was completed in 1998. This upgrade allows the TDWR data to be data-linked to pilots.

Program Management for the TDWR TWIP upgrade is provided by the Aeronautical Data Link Product Team, AND-720.

7-05.1.2 References

7-05.1.2.1 FAA Aviation System Capital Investment Plan, W-03, January 1999.

7-05.1.2.2 NAS-SS-1000, Volume III, Paragraph 3.2.1.2.5, December 1986.

7-05.2 SYSTEM DESCRIPTION

The TDWR product information is displayed to Air Traffic Specialists (i.e., controllers and controllers' supervisors) on TDWR displays. In the future, the TDWR product information may be sent to the National Weather Service, Airline Dispatch Offices, and non-FAA government agencies.

The TDWR TWIP upgrade allows the Display Function Unit (DFU) to generate text and character graphic messages which are sent via the NADIN PSN to a service provider where they can be requested by pilots, dispatchers, etc.

7-05.2.1 Components

The TDWR weather data acquisition and distribution system is comprised of the components described below.

7-05.2.1.1 Radar Data Acquisition (RDA)

The RDA provides the acquisition and signal processing of base data, clutter suppression, control, monitoring, and base data error detection and signal processing equipment.

7-05.2.1.2 Radar Product Generator (RPG)

The RPG provides the control command generation and real-time product generation. The RPG provides the intelligence that allows the TDWR system to perform its tasks automatically.

7-05.2.1.3 Remote Monitoring Subsystem (RMS)

The RMS provides automatic fault detection and fault isolation. The RMS is also the entry port for maintenance command and control and for entering site-adaptable data. The RMS provides maintenance-related data and control functions to FAA maintenance specialists. The RMS is functionally independent of the major TDWR system functions.

7-05.2.1.4 Display Function Unit (DFU)

A DFU displays the TDWR output to controllers and supervisors. The TDWR DFU consists of controller's alphanumeric (ribbon) displays and supervisor's situation displays. The DFU and the RPG communicate via government-furnished communications circuits. The ribbon display is an alphanumeric display with audio and visual alarms used at the Airport Traffic Control Tower (ATCT) and the Terminal Radar Approach Control (TRACON) facility. The ribbon display presents hazardous weather warnings, which are read verbatim to affected pilots. The situation display depicts area-wide TDWR weather information to assist the ATCT and TRACON supervisors in making strategic decisions regarding airport configuration, traffic flow, etc.

The TDWR TWIP DFU software upgrade allows the DFU to generate text and character graphic messages based on the TDWR weather information. The DFU sends the TWIP messages via the NADIN PSN to a service provider who will provide them when requested by pilots, dispatchers, etc.

7-05.2.1.5 Tower Control Computer Complex (TCCC)

The TCCC will display the TDWR output to controllers and supervisors. The TCCC and RPG will communicate via government-furnished communication circuits. The display will be similar to that provided by the DFU and its display.

7-05.2.1.6 Low Level Wind Shear Alert System (LLWAS)

The LLWAS provides additional weather information that the RPG integrates with the normal TDWR data.

7-05.2.1.7 NADIN PSN

The NADIN PSN is used to send TWIP messages to a service provider for further distribution.

7-05.2.2 Functional Component Interface Requirements

Final TDWR interfaces are shown in Figure 7-05-1. There are no diversity requirements for this program.

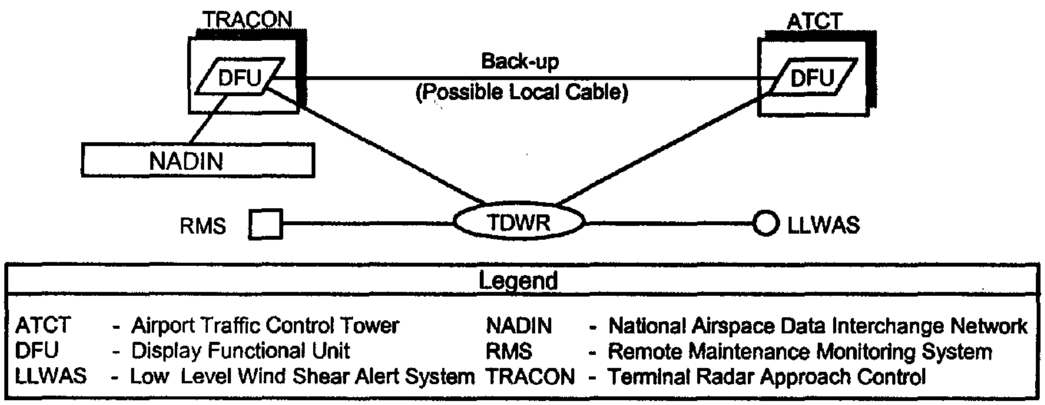

Figure 7-05-1. Final Terminal Doppler Weather Radar Interfaces

7-05.2.2.1 Functional Requirements

The TDWR disseminates weather products and alert messages and has the capacity for growth and flexibility in order to disseminate these messages and products to additional subsystems and to support future interfaces.

7-05.2.2.2 Performance Requirements

7-05.2.2.2.1 Frequency

The TDWR operates in the 5.60 to 5.65 GigaHertz (GHz) frequency band.

7-05.2.2.2.2 Update Rate

The TDWR updates displayed hazardous weather data once per minute and non-hazardous weather data once every 5 minutes.

The TWIP text message is updated once per minute in hazardous weather and once every ten minutes in non-hazardous weather. The character graphic message is updated once every five minutes in hazardous weather and once every ten minutes in non-hazardous weather.

7-05.2.2.2.3 Data Destinations

The TDWR disseminates data to the (maximum) destinations shown in Table 7-05-1.

Table 7-05-1. Terminal Doppler Weather Radar Data Destinations

Destination	Number of locations	Remarks
Maintenance Processor Subsystem (MPS)/Remote Monitoring Subsystem Concentrator (RMSC)	1	Connection to MPS/RMSC is site-dependent.
TDWR-Tower Control Computer Complex (TCCC)	1-2	
Low Level Wind Shear Alert System (LLWAS)	1	Site-dependent; 2 if TDWR is covering two airports.
TDWR-National Airspace Data Interchange Network (NADIN PSN)	1	Connection to TRACON DFU or ATCT DFU is site dependent

7-05.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

Descriptions of the required interfaces are provided in the paragraphs that follow. Protocol, transmission, and hardware requirements related to the interfaces are summarized in Table 7-05-2. There are no diversity requirements for this program.

7-05.3.1 TDWR to DFU

The TDWR interfaces with the ATCT and the TRACON through the DFU. This interface satisfies the display/control requirements for ATC personnel.

7-05.3.2 TDWR to Remote Monitoring Subsystem (RMS)

The TDWR interfaces with the RMS for the transmission of maintenance data and messages and for the receipt of commands and messages.

7-05.3.3 DFU to DFU

The DFU to DFU interface allows the remoting of TDWR data in the event of a line failure between a DFU and TDWR. Implementation is site dependent (requires ATCT and TRACON to be collocated).

7-05.3.4 TDWR to TCCC

The TDWR interfaces with the TCCC through the Tower Processor. This interface satisfies the display/control requirements for ATC personnel.

Table 7-05-2. TDWR Interface Requirements Summary

SUBSYSTEM INTERFACE		DFU to DFU	LLWAS to TDWR	DFU to NADIN PSN
INTERFACE CONTROL DOCUMENTATION		TBD	NAS-IC 31053102	NADIN PSN General X.25 ICD
PROTOCOL REQUIRE-MENTS	Network Layer			CCITT X.25 1994
	Data Link Layer	Ethernet Compliant		
	Physical Layer	TBD	EIA-530	RS-232-C
	Special Formats/Codes			
TRANSMISSION REQUIRE-MENTS	No. Channels	TBD	1	1
	Speed (kbps)		9.6 or 1.2	4.8
	Simplex Half/Full Duplex	Dedicated	Full Duplex Dedicated 4-wire Asynchronous	Full Duplex Dedicated
	Service		99.97% Avail.	99.97% Avail.
HARDWARE REQUIRE-MENTS	Modem	TBD	9600 or 1200 Baud EIA-530 Compliant	GFE
	Cable/Misc.	Coaxial		
SUBSYSTEM INTERFACE		TDWR to DFU	TDWR to RMS	TDWR to TCCC
INTERFACE CONTROL DOCUMENTATION			NAS-IC 31055103	NAS-IC 31052201
PROTOCOL REQUIRE-MENTS	Network Layer			
	Data Link Layer			
	Physical Layer	RS-232-C	EIA-530	EIA-530
	Special Formats/Codes			
TRANSMISSION REQUIRE-MENTS	No. Channels	1	1	1
	Speed (kbps)	9.6	2.4	9.6
	Simplex Half/Full Duplex	Full Duplex Dedicated 4-wire Asynchronous	Full Duplex Dedicated 4-wire Synchronous	Full Duplex Dedicated 4-wire Asynchronous
	Service	99.97% Avail.	99.97% Avail	99.97% Avail.
HARDWARE REQUIRE-MENTS	Modem	9600 Baud RS-232-C Compliant	Provides Clocking	9600 Baud EIA-530 Compliant
	Cable/Misc.			

7-05.3.5 LLWAS to TDWR

The LLWAS to TDWR interface provides additional weather information that the RPG integrates with the normal TDWR data.

7-05.3.6 DFU to NADIN II

The DFU to NADIN PSN interface provides TWIP messages to a service provider for distribution.

7-05.4 ACQUISITION ISSUES

The TDWR project provides for the acquisition and implementation of 47 systems, 45 operational airports, and two support sites. Other than a NADIN PSN connection at one of the support sites, these two sites have no interfacility communication costs.

7-05.4.1 Project Schedule and Status

The TDWR Site Installation Schedule is presented in Table 7-05-3. The Interface Implementation Schedule is presented in Table 7-05-4.

Table 7-05-3. TDWR Site Installation Schedule

Site Installation	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
TDWR	42	0	0	0	0	0	0	0
TWIP Upgrade	0	0	0	0	0	0	0	0

Table 7-05-4. TDWR Interface Implementation Schedule

Interface Implementation	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
TDWR to DFU	44	0	0	0	0	0	0	0
TDWR to RMS	25	0	0	0	0	0	0	0
LLWAS to TDWR	8	0	0	0	0	0	0	0
TDWR to TCCC	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD
DFU to DFU	44	0	0	0	0	0	0	0
DFU to NADIN PSN	47	0	0	0	0	0	0	0

7-05.4.2 Planned Telecommunications Strategies

The interfaces will remain the same as the implementation proceeds (as presented in Table 7-05-4). The planned telecommunications acquisition strategy is outlined below.

7-05.4.2.1 TDWR to Display Function Unit

These interfaces will be provided by leased circuits. Modems will be purchased to support the interfaces.

7-05.4.2.2 TDWR to Remote Monitoring System

It is expected that these interfaces will be provided by leased circuits. Modems will be purchased to support the interfaces.

7-05.4.2.3 Display Function Unit to Display Function Unit

DFU to DFU only occurs in cases where the ATCT and TRACON are collocated. Modems will be purchased to support the interfaces, which will be via local cable.

7-05.4.2.4 Display Function Unit to NADIN PSN

It is anticipated that this interface will be provided by DMN.

7-05.4.3 Telecommunications Costs

The Interface Implementation Schedule is used to derive the planned telecommunication costs shown in Table 7-05-5. Only costs for inter-facility circuit requirements and associated hardware are included. Connectivity requirements are met using either one DDS-56 or two VG-8 circuits. Costs are based on the number of sites using each connectivity configuration, including the additional circuits required for sites that are homed to more than one air traffic facility. In accordance with FAA Order 2500.8A, leased telecommunications costs (nonrecurring and recurring) for the year of activation and one year following are shown in the table as being funded under the Facilities and Equipment (F&E) account.

NOTE: Table 7-05-5 only shows leased telecommunication costs for 45 of the 47 TDWR's. No costs are included for the training system at the FAA academy or the program support facility in Oklahoma City.

Table 7-05-5. Cost Summary - TDWR

CIP # W-03	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
TDWR <---> DFU / RMM / LLWAS									
Configuration A: One DDS-56 Circuit with a Pair of Codex 3600D Multiplexers									
	Sites Added		0	0	0	0	0	0	0
	Sites Dual-homed		0	0	0	0	0	0	0
Circuit Costs									
	Circuits Added		0	0	0	0	0	0	0
	Total Circuits	34	34	34	34	34	34	34	34
	F&E Funded Circuits		5	0	0	0	0	0	0
	OPS Funded Circuits		29	34	34	34	34	34	34
	F&E Non-recurring Circuit Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring Circuit Costs								
	F&E Recurring Costs		**$12**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$67**	**$78**	**$78**	**$78**	**$78**	**$78**	**$78**
Hardware Costs									
	Hardware Units Added		0	0	0	0	0	0	0
	Total Hardware Units	68	68	68	68	68	68	68	68
	F&E Funded Units		10	0	0	0	0	0	0
	OPS Funded Units		58	68	68	68	68	68	68
	F&E Non-recurring HW Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring Hardware Costs								
	F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$2**	**$2**	**$2**	**$2**	**$2**	**$2**	**$2**

Table 7-05-5. Cost Summary - TDWR (Concluded)

CIP # W-03	All costs in 000's	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
Configuration B: Two VG-8 Circuits Each with a Pair of Codex 3600P Multiplexers									
	Sites Added		2	0	0	0	0	0	0
	Sites Dual-homed		0	0	0	0	0	0	0
Circuit Costs									
	Circuits Added		4	0	0	0	0	0	0
	Total Circuits	29	33	33	33	33	33	33	33
	F&E Funded Circuits		4	4	0	0	0	0	0
	OPS Funded Circuits		29	29	33	33	33	33	33
	F&E Non-recurring Circuit Costs		**$12**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring Circuit Costs								
	F&E Recurring Costs		**$5**	**$5**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$38**	**$38**	**$43**	**$43**	**$43**	**$43**	**$43**
Hardware Costs									
	Hardware Units Added		8	0	0	0	0	0	0
	Total Hardware Units	58	66	66	66	66	66	66	66
	F&E Funded Units		8	8	0	0	0	0	0
	OPS Funded Units		58	58	66	66	66	66	66
	F&E Non-recurring HW Costs		**$24**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring Hardware Costs								
	F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$2**	**$2**	**$2**	**$2**	**$2**	**$2**	**$2**

SUMMARY

		FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
F&E Totals	Non-recurring	$36	$0	$0	$0	$0	$0	$0
	Recurring	$17	$5	$0	$0	$0	$0	$0
	F&E Total	**$54**	**$5**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Totals	Non-recurring	$0	$0	$0	$0	$0	$0	$0
	Recurring	$109	$120	$126	$126	$126	$126	$126
	OPS Total	**$109**	**$120**	**$126**	**$126**	**$126**	**$126**	**$126**

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CHAPTER 7-06 - SUMMARY SHEET

WORLD AREA FORECAST SYSTEM (WAFS)

Program/Project Identifiers:

Project Number(s):	BIIP-991024
Related Program(s):	None Identified
New/Replacement/Upgrade?	New
Responsible Organization:	ARW-100
Program Mgr./Project Lead:	Rick Heuwinkel ARW-100, (202) 366-0304
Fuchsia Book POC:	Kevin Browne, ARW-100, (202) 366-1066

Assigned Codes:

PDC(s):	WF
PDC Description:	World Area Forecast System NWS/Interagency Agreement
Service Code:	METI

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$2	$139	$0	$0	$0	$0	$0
OPS Recurring	$1,400	$1,400	$1,847	$1,847	$1,847	$1,847	$1,847
Total OPS	**$1,402**	**$1,539**	**$1,847**	**$1,847**	**$1,847**	**$1,847**	**$1,847**

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CIP Category: Weather

7-06.0 WORLD AREA FORECAST SYSTEM

7-06.1 PROGRAM OVERVIEW

The World Area Forecast System (WAFS) is a worldwide satellite communications system managed and operated by the National Weather Service (NWS) on behalf of the FAA.

7-06.1.1 Purpose

The purpose of WAFS is to improve the distribution of required aviation weather products as well as relieve congestion on traditional telecommunications networks. This is a mature program and is designed to meet United States (U.S.) treaty obligations to the international community.

7-06.1.2 References

National Weather Service/FAA Interagency Agreement, May 5, 1991.

7-06.2 SYSTEM DESCRIPTION

The U.S. communications component of WAFS consists of two satellite space segments, their associated terrestrial communications links and three ground stations. The three ground stations are used by the NWS to monitor the satellite transmissions in the Atlantic and Pacific regions. The terrestrial communications and two space segments are used to transmit aviation weather products and are a FAA responsibility. The system is managed, operated and maintained by the NWS, with the FAA being responsible for communications costs.

7-06.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

The FAA, acting as the responsible U.S. Agency, supports WAFS through the funding of two satellite space segments and the associated terrestrial communications links. There are no diversity requirements identified for this service.

7-06.4 ACQUISITION ISSUES

7-06.4.1 Project Schedule and Status

Implementation is completed. All equipment has been purchased and installed.

7-06.4.2 Telecommunications Costs

FAA funding for the U.S. responsible telecommunications support of WAFS is based on two 38.4 bps INTELSAT satellite space segments and the associated terrestrial communications links that are estimated to cost $700,000 each. The annual recurring costs increased from $680,000 due to an increase in service costs. Costs for WAFS are summarized in Table 7-06-1. The large increases in program costs are related to the recompetition of the contract in FY01.

Table 7-06-1. Cost Summary - WAFS

CIP # None	All costs in 000's	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
Satellite Space Segment									
Channel Costs									
Channels Added			0	0	0	0	0	0	0
Total Channels		2	2	2	2	2	2	2	2
F&E Funded Channels			0	0	0	0	0	0	0
OPS Funded Channels			2	2	2	2	2	2	2
Non-recurring Channel Costs									
F&E Non-recurring Costs			**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring Costs			**$2**	**$139**	**$2**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs									
F&E Recurring Costs			**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs			**$1,400**	**$1,400**	**$1,847**	**$1,847**	**$1,847**	**$1,847**	**$1,847**
			SUMMARY						
F&E Totals	Non-recurring		$0	$0	$0	$0	$0	$0	$0
	Recurring		$0	$0	$0	$0	$0	$0	$0
	F&E Total		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Totals	Non-recurring		$2	$139	$0	$0	$0	$0	$0
	Recurring		$1,400	$1,400	$1,847	$1,847	$1,847	$1,847	$1,847
	OPS Total		**$1,402**	**$1,539**	**$1,847**	**$1,847**	**$1,847**	**$1,847**	**$1,847**

Note:
Costs provided by the Program Office

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CHAPTER 7-07 – SUMMARY SHEET

WEATHER AND RADAR PROCESSOR (WARP)

Program/Project Identifiers:

Project Number(s):	CIP W-04
Related Program(s):	CIPs A-01, A-05, A-08, A-10, C-03, C-15, C-20, F-02, M-03, M-07, M-27, W-01, W-02, W-07
New/Replacement/Upgrade?	Replaced the Meteorological Weather Processor (MWP)
Responsible Organization:	AUA-460
Program Mgr./Project Lead:	Kevin Young, AUA-460, (202) 366-9207
Fuchsia Book POC:	Maureen Cedro, AUA-460, (202) 493-0228

Assigned Codes:

PDC(s):	BU, EU
PDC Description:	Dedicated Weather Network Circuits (ADAS); WARP Equipment
Service Code:	AWOS, METI

Cost Estimates *:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$647	$869	$0	$0	$0	$0	$0
F&E Recurring	$455	$3,368	$2, 987	$0	$0	$0	$0
Total F&E	**$1,102**	**$4,237**	**$2,987**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$185	$0	$0	$0	$0	$0	$0
OPS Recurring	$83	$766	$1,493	$4,486	$4, 522	$4, 559	$4,599
Total OPS	**$268**	**$766**	**$1,493**	**$4486**	**$4,522**	**$4,559**	**$4,599**

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CIP Category:
Weather

7-07.0 WEATHER AND RADAR PROCESSOR

7-07.1 WEATHER AND RADAR PROCESSOR OVERVIEW

7-07.1.1 Purpose of the Weather and Radar Processor (WARP)

WARP is a weather-processing sub-element of the National Airspace System (NAS) Air Traffic Control (ATC) element. WARP provides the Center Weather Service Unit (CWSU) meteorologists with processing tools and a single, integrated workstation to receive and consolidate weather data from multiple sources into a single database. WARP enables the meteorologists to analyze the data and generate specialized value-added aviation weather products that are displayed to support air traffic control operations. WARP also provides weather-briefing terminals at the Traffic Management Unit (TMU) and area supervisors' consoles. In addition, WARP makes Next Generation Radar (NEXRAD) information available to the Display Replacement System (DSR). WARP will eventually become the common source for weather information in the en route environment.

7-07.1.2 References

7-07.1.2.1 FAA Capital Investment Plan (CIP) Weather and Radar Project, CIP # W-04, January 1999.

7-07.1.2.2 FAA Intra Agency Letter of Agreement (LOA) between WARP Lead (AUA-460) and NIMS Lead (AND-130), March 1997.

7-07.1.2.3 Unisys 1208304J--WSR-88D RPG/Associated PUP ICD, March 1, 1996.

7-07.1.2.4 NAS-IR-92020000--CTS/User Systems IRD, Rev. F, May 1, 1996.

7-07.1.2.5 NAS-IC-25152104--WARP/DSR ICD, July 14, 1995.

7-07.1.2.6 FAATSAT Functional System Specification, RFP DCA200-93-R-0036, June 1995, as amended 0026.

7-07.1.2.7 NAS-IC-43020001--NADIN PSN X.25 Packet Mode Users, April 4, 1996.

7-07.1.2.8 NWSTG to FBWTG IRD, NAS-IR-90029414.

7-07.1.2.9 FBWTG to ITWS IRD, NAS-IR-94142514.

7-07.2 SYSTEM DESCRIPTION

WARP is being fielded in three overlapping stages: Stage 0, Stage 1/2, and Stage 3. WARP Stage 0 is being procured as a turn-key leased service that includes the weather products, the distribution system, and the display systems. WARP Stage 0 became operational in October 1997 and provides enhanced weather information to air traffic controllers, traffic management specialists, area supervisors, and the meteorologists who support them.

Deployment of WARP Stage 1/2 will be completed in FY01 and will provide Weather Surveillance Radar 88 Doppler (WSR-88D) products for display on en route controllers' consoles via the Display System Replacement (DSR), replacing long range surveillance radar weather data with more accurate information. WARP Stage 1/2 will be an FAA-owned system drawing data from a possible combination of commercial and other government sources.

WARP Stage 3 begins in FY01 and will provide critical operational changes and additional interfaces to facilitate a common situational awareness in the en route environment. A key to supporting additional interfaces will be the Weather Information Network Server (WINS) that will be added to the WARP configuration at ARTCCs during Stage 3. The initial use of WINS will be to make the Rapid Update Cycle (RUC) data available to the User Request Evaluation Tool/Core Capability Limited Deployment (URET/CCLD).

The FAA Bulk Weather Telecommunications Gateway (FBWTG) is a major subsystem of WARP located at the Air Traffic Control System Command Center (ATCSCC). The FBWTG will provide high-resolution gridded weather data (e.g., RUC and Eta Forecast Model (Eta)) and airborne observations (e.g., Meteorological Data Collection and Reporting System (MDCRS)) from the National Weather Service Telecommunications Gateway (NWSTG) to WARP and other FAA systems.

7-07.2.1 <u>System Components</u>

The principal system components are identified in this section along with their interface requirements. Interfaces described here include the interfaces between WARP components and the interfaces with other NAS and non-NAS systems. This section and the remainder of the chapter focus upon WARP Stage 1/2 and beyond.

7-07.2.1.1 <u>Principal Components</u>

The principal components of the WARP system include the Communications, Meteorologist Workstation, Server, and Briefing Terminals Subsystems.

- The communications subsystem contains an Ethernet switching hub for LAN communications, radar data processors, intelligent communications controllers, and "patching" and cabling.

- The meteorologist workstation subsystem is a single-user computer and peripherals with three large color displays and a color printer (two at the ATCSCC).

- The server subsystem is a departmental server-class computer with no display, a small ASCII terminal, and peripherals.

- The briefing terminals subsystem at an ARTCC includes up to 15 personal computers and peripherals and a shared network color printer. (up to 52 at ATCSCC).

- Upon successfully completing testing at the WJHTC, the WINS server will be deployed at the seven ARTCCs slated to receive URET/CCLD. Ultimately, it may be added to all WARP installations as other users are identified.

7-07.2.1.2 <u>Functional Component Interface Requirements</u>

WARP has numerous interface requirements among its subsystems and components. In addition, WARP interfaces with other NAS systems and other government sources of weather data and products. Figure 7-07-1 identifies the functional interfaces of a typical WARP installation at an ARTCC. The ATCSCC WARP has similar requirements as those shown in the figure, except that it does not interface with the DSR, ADAS, WMSCR, and WSR-88D.

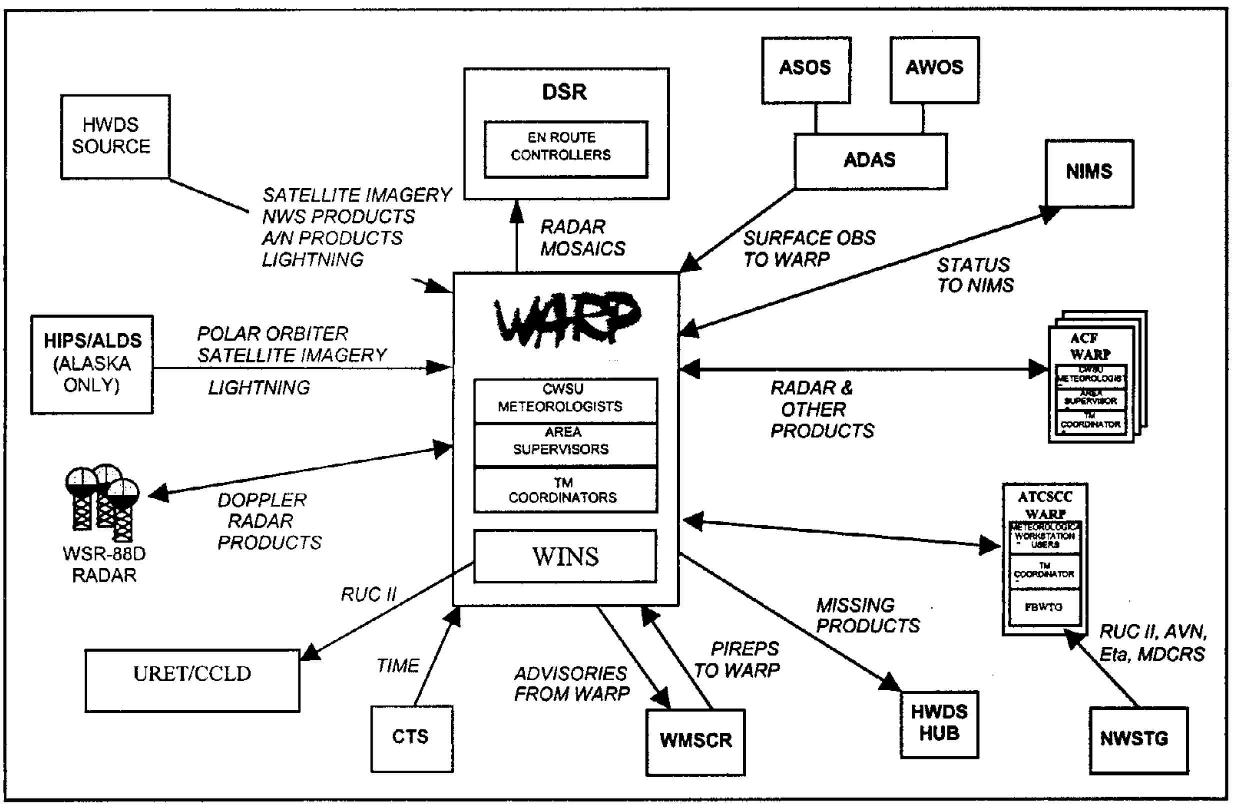

Figure 7-07-1. WARP Interfaces

7-07.2.1.3 Telecommunications Interfaces

7-07.2.1.3.1 WARP-to-WARP

There are three basic interfaces among the WARPs:

- Dissemination of the National Mosaic from the WARP installation at the ATCSCC to the WARP installations at the ARTCCs (same image sent to each ARTCC);
- Dissemination of the Regional Mosaics from the WARP installations at the ARTCCs to the WARP installation at the ATCSCC; and
- The sharing of WSR-88D data among WARP installations at adjacent ARTCCs.

7-07.2.1.3.2 WARP to CWSU and TMU Briefing Terminals

WARP generates weather products such as lightning, satellite, weather graphics, alphanumeric, Gridded binary analysis, contour and vertical cross section analysis and thermodynamic analysis products. WARP forwards these products to briefing terminals in the CWSU and TMU areas.

7-07.2.1.3.3 FBWTG to ARTCC WARP

The FBWTG subsystem of WARP at the ATCSCC provides Rapid Update Cycle (RUC), Eta, Aviation (AVN), and MDCRS data to WARP installations at the ARTCCs.

7-07.2.1.3.4 WARP to Harris Weather Data System (HWDS)

WARP receives a broadcast of weather products that are accumulated at the Vendor Hub prior to transmission to WARP installations. The weather products include:

- Public Product Service (alphanumerics);
- AFOS Graphics Service;
- Domestic Data Service (alphanumerics);
- International Data Service;
- High Resolution Service;
- GOES East and West;
- Lightening;
- Meteosat; and
- Geostationary Meteorological Satellite.

If a WARP does not receive all of the expected products, it will be capable of requesting a database refresh to obtain the missing/incomplete products.

7-07.2.1.3.5 ARTCC WARP to Weather Surveillance Radar (WSR-88D)

Each WARP system at an ARTCC interfaces with multiple WSR-88D sites for the collection of weather radar products. WARP will be able to send requests to the WSR-88D for specific weather radar data in addition to receiving a default product set.

7-07.2.1.3.6 WARP to WMSCR

WARP interfaces with WMSCR for the collection and dissemination of alphanumeric weather products.

7-07.2.1.3.7 WARP to ADAS

ADAS provides WARP systems at the ARTCCs with the one-minute binary observation data from ASOS and AWOS.

7-07.2.1.3.8 WARP to NIMS

WARP interfaces with NIMS to transmit WARP failure alarm/alert messages and system/subsystem status reports in response to NIMS requests.

7-07.2.1.3.9 WARP to Coded Time Source (CTS)

The WARP interfaces with CTS to receive synchronized coded time data.

7-07.2.1.3.10 ARTCC WARP to Display System Replacement (DSR)

WARP installations at the ARTCCs interface with the collocated DSR to provide NEXRAD weather radar products to the en route air traffic controllers.

7-07.2.1.3.11 WARP (FBWTG) to National Weather Service Telecommunications Gateway (NWSTG)

WARP's FBWTG subsystem at the ATCSCC interfaces with NWSTG to receive high-resolution gridded weather forecast data (e.g., Eta, Aviation (AVN) and RUC) and airborne observations (e.g., MDCRS).

7-07.2.1.3.12 WARP (FBWTG) to ITWS

The FBWTG subsystem of WARP interfaces with the ITWS NWS Filter Unit (to be located in an FAA facility) to provide RUC and MDCRS data from the NWSTG for use in ITWS product algorithms.

7-07.2.1.3.13 WARP (WINS) to Other NAS Systems

The WINS subsystem of WARP interfaces with other NAS systems such as URET/CCLD to provide RUC data and other raw and processed data.

7-07.2.1.3.14 WARP to Other Services

WARP obtains High-resolution Image Processing System (HIPS) and Automated Lightning Detection System (ALDS) via the WARP installation in Anchorage, Alaska. In addition, WARP may interface with the NCEP Gridded Binary Data Service, the National Environmental Satellite and Data Information Service (NESDIS), the National Lightning Detection Network, commercial services, and other services.

7-07.3 TELECOMMUNICATIONS INTERFACE REQUIREMENTS

The WARP telecommunications interfaces are described in the following sections and summarized in Table 7-07-1. The descriptions of the interfaces include the facilities involved and the type of connectivity required in terms of the bandwidth, quantity, protocol, and physical interface.

7-07.3.1 Telecommunications Interfaces

7-07.3.1.1 WARP to WARP Interfaces

This section describes the telecommunications interface requirements between WARP systems in ARTCCs and other WARP systems at the ARTCCs and the ATCSCC. All require an X.25 interface and so they are expected to be satisfied by the NADIN PSN.

7-07.3.1.1.1 Protocol Requirements

Network, data link, and physical layer will be in accordance with CCITT Recommendation X.25 (1984) as specified in the NADIN PSN X.25 Packet Mode Users ICD.

7-07.3.1.1.2 Transmission Requirements

The dissemination of the Regional Mosaics requires a synchronous serial mode 512 kbps full duplex PVC between each ARTCC and the ATCSCC. The size of a typical Regional Mosaic is expected to be 42 kilobytes and the nominal cycle rate will be once every five minutes.

The dissemination of the National Mosaic requires a synchronous serial mode 512 kbps full duplex PVC from the ATCSCC to each ARTCC. The size of the National Mosaic is expected to be 35 kilobytes and the nominal cycle rate will be once every five minutes.

The sharing of NEXRAD products between adjacent ARTCCs, referred to as NEXRAD indirects, will require a pair of synchronous serial mode full duplex PVCs. The individual data rate per NEXRAD indirect is 14.4 kbps, but the aggregate data rate for the PVC is dependent upon the number of NEXRAD indirects. The specific data rate for each full duplex PVC will be determined by the NADIN PSN Program Office based upon the requirements for NEXRAD indirects identified by the WARP Program Office. Note: The WARP Program is funding the overall upgrade to the NADIN PSN and all PVC requirements are included in that cost.

7-07.3.1.1.3 Hardware Requirements

As part of the upgrade to the NADIN PSN, high speed cluster cards (HSCCs) are required at each NADIN PSN node to provide WARP with the required ports and access to the T-1 trunks. The specific number of HSCCs at each NADIN PSN node will be determined by the NADIN PSN Program Office based upon the requirements defined by the WARP Program. To connect WARP to the NADIN PSN, two physical cables are required. Cable connectors will be in accordance with EIA-530 with male contacts and a female shell (WARP end).

Table 7-07-1. WARP System Interface Requirements Summary

SUBSYSTEM INTERFACE		WARP to WSR-88D	WARP to CTS	ARTCC WARP to DSR
INTERFACE CONTROL DOCUMENTATION		Unisys 12083041	NAS-IR-92020000	WARP/DSR ICD
PROTOCOL REQUIREMENTS	Network Layer			IP RFC 791
	Data Link Layer			CSMA/CD Ethernet V.2
	Physical Layer	Direct	Direct	Ethernet, 50 0hm Coax
	Special Formats/ Codes			TCP RFC 793
TRANSMISSION REQUIREMENTS	No. Channels	1	1	1
	Speed (Kbps)	14.4 Kbps	14.4 Kbps	10 Mbps
	Simplex Half/Full Duplex	FD	Asynchronous	
	Service			
HARDWARE REQUIREMENTS	Modem	V.32 bis		
	Cable/ Miscellaneous	RS-232 Termination	One cable with RS-232-C termination	One cable with ISO 8802-3 AUI Termination
SUBSYSTEM INTERFACE		HWDS to WARP	WARP to WARP (National Mosaic)	WARP to WARP (Regional Mosaics)
INTERFACE CONTROL DOCUMENTATION		FAATSAT Functional Spec	NAS-IC- 43020001	NAS-IC-43020001
PROTOCOL REQUIREMENTS	Network Layer		PLP X.25	PLP X.25
	Data Link Layer		LAPB X.25	LAPB X.25
	Physical Layer	Direct Digital Connect (DDC)	EIA-530	EIA-530
	Special Formats/ Codes			
TRANSMISSION REQUIREMENTS	No. Channels		1	20
	Speed (Kbps)	512Kbps.	512Kbps.	512Kbps.
	Simplex Half/Full Duplex	Synchronous	Full Duplex	Full Duplex
	Service	1		
HARDWARE REQUIREMENTS	Modem			
	Cable/ Miscellaneous	Pair of cables with RS-449 termination	One cable with EIA-530 termination	One cable with EIA-530 Termination

Table 7-07-1. WARP System Interface Requirements Summary (Continued)

SUBSYSTEM INTERFACE		WARP to WARP (Indirect NEXRAD Data)	ADAS to WARP	WMSCR to WARP
INTERFACE CONTROL DOCUMENTATION		NAS-IC 4302001	NAS-IR-25082501 ICD 25082501 NAS-IR-25152508	NAS-IC-25082501
PROTOCOL REQUIREMENTS	Network Layer	EIA-530	Via NADIN Node (PLP X.25)	HDLC
	Data Link Layer	PLP X.25	Via NADIN Node (LAPB X.25)	X.21 bis
	Physical Layer	LAPB X.25	Via NADIN Node (EIA-530)	
	Special Formats/Codes			
TRANSMISSION REQUIREMENTS	No. Channels	21	1	1
	Speed (Kbps)	512 Kbps	Via NADIN Node (9.6 kbps)	9.6 kbps
	Simplex Half/Full Duplex	Full Duplex	Via NADIN node (Full Duplex)	Duplex
	Service			
HARDWARE REQUIREMENTS	Modem			
	Cable/ Miscellaneous	One Cable w/BIA 520 Termination		
SUBSYSTEM INTERFACE		**WARP to NIMS**	**WARP (FBWTG) to NWSTG**	**WARP to MBL (Dial-up/Dial-back Ckt.)**
INTERFACE CONTROL DOCUMENTATION		TBD	NAS-IR-90029414	
PROTOCOL REQUIREMENTS	Network Layer		IP	
	Data Link Layer		CISCO HDLC	
	Physical Layer		EIA-530	TBD
	Special Formats/Codes			
TRANSMISSION REQUIREMENTS	No. Channels			
	Speed (Kbps)		T-1	LINCS
	Simplex Half/Full Duplex		Full Duplex	
	Service			
HARDWARE REQUIREMENTS	Modem		CISCO Router	
	Cable/ Miscellaneous			

Table 7-07-1. WARP System Interface Requirements Summary (Concluded)

SUBSYSTEM INTERFACE		Palm Bay to ZJX Database Refresh	ZJX NADIN Node to all ARTCC's Database Refresh	WARP (WINS) to URET/CCLD
INTERFACE CONTROL DOCUMENTATION		LINCS	NAS IC 43020001	NAS IC 22132515
PROTOCOL REQUIREMENTS	Network Layer		PLP X.25	IP IAB STD-5 (RFC 791)
	Data Link Layer		LAPB X.25	Ethernet II
	Physical Layer	EIA-530	EIA-530	10/100 BaseT
	Special Formats/Codes			
TRANSMISSION REQUIREMENTS	No. Channels	1	20	1
	Speed (Kbps)	512 Kbps	512 Kbps	10/100 Mbps
	Simplex Half/Full Duplex	Full duplex	Full Duplex	Full Duplex
	Service			
HARDWARE REQUIREMENTS	Modem			
	Cable/ Miscellaneous	One cable with EIA-530 interface	512 Kbps HSC port	Ethernet Card

7-07.3.2 WARP to Other System Interfaces

The following sections describe the interface requirements between WARP and other systems.

7-07.3.2.1 ARTCC WARP to NEXRAD Weather Surveillance Radar (WSR-88D)

The WARP installations at the ARTCCs are directly connected to NEXRADs to collect weather radar products and generate display products including the regional mosaics. There are a total of 142 NEXRAD sites in the continental United States (CONUS) and 7 in Alaska. Each NEXRAD is "homed" to a single ARTCC and then the WARP can forward the data to other WARPs as described in Section 7-08.2.1.3.1. The number of NEXRADs directly connected to an ARTCC ranges from 4 to 13.

7-07.3.2.1.1 Protocol Requirements

Application, network, and data link layer protocols will be as described in the interface control document for RPG/Associated PUP (Unisys 12083041).

7-07.3.2.1.2 Transmission Requirements

The interface between the WARP installation at the ARTCC and each NEXRAD requires a single full-duplex analog line (VG-8). The line must be capable of supporting a sustained data rate of 14.4 kbps.

7-07.3.2.1.3 Hardware Requirements

Each radar interface will consist of one dedicated circuit using International Telecommunication Union (ITU) Recommendation V.32 bis modems with RS-232-C termination.

7-07.3.2.2 WARP to WMSCR

WARP interfaces with WMSCR for the collection and dissemination of alphanumeric weather products. This interface is expected to be satisfied over the NADIN PSN.

7-07.3.2.2.1 Protocol Requirements

Network, data link, and physical layer will be in accordance with CCITT Recommendation X.25 (1984) as specified in the NADIN PSN X.25 Packet Mode Users ICD.

7-07.3.2.2.2 Transmission Requirements

The maximum data rate for this interface is 9.6 kbps.

7-07.3.2.2.3 Hardware Requirements

No additional hardware is required to support this interface.

7-07.3.2.3 WARP to ADAS

WARP interfaces with the ADAS to collect ASOS and AWOS data. This interface is expected to be satisfied over the NADIN PSN.

7-07.3.2.3.1 Protocol Requirements

Network, data link, and physical layer will be in accordance with CCITT Recommendation X.25 (1984) as specified in the NADIN PSN X.25 Packet Mode Users ICD. The interface also uses the Transport Layer in accordance with ISO 8073 (1986).

7-07.3.2.3.2 Transmission Requirements

The maximum data rate for this interface is 9.6 kbps.

7-07.3.2.3.3 Hardware Requirements

No additional hardware is required to support this interface.

7-07.3.2.4 WARP to Harris Weather Data System (HWDS)

WARP receives a broadcast of weather products that are accumulated at the Vendor Hub prior to transmission to WARP installations.

7-07.3.2.4.1 Protocol Requirements

The interface at the physical layer is a V.35 direct digital connect (DDC).

7-07.3.2.4.2 Transmission Requirements

The data rate for this interface is a one-directional 512 kbps broadcast.

7-07.3.2.4.3 Hardware Requirements

Cables with an RS-449 termination are required at each WARP site to support this interface.

7-07.3.2.5 WARP to HWDS Data Base Refresh

In the event that an incomplete transmission is received from the HWDS (described in the preceding section), each WARP interfaces with a Database Refresh Server located at the Ascent Facility in Palm Bay, Florida. The WARP can request missing products and they will be provided by the Database Refresh Server.

The path between WARP and the Database Refresh Server is provided by the NADIN PSN. The Database Refresh Server ties into the NADIN PSN node at the ZJX ARTCC via a LINCS landline.

7-07.3.2.5.1 Protocol Requirements

For the NADIN PSN portion of the path, the network, data link, and physical layer will be in accordance with CCITT Recommendation X.25 (1984) as specified in the NADIN PSN X.25 Packet Mode Users ICD.

For the landline connection between Ascent and the ZJX ARTCC, the interface at the physical layer is a V.35 direct digital connect (DDC).

7-07.3.2.5.2 Transmission Requirements

The connection between Database Refresh Server to NADIN PSN node at the ZJX ARTCC is a single 512 kbps full-duplex direct digital connect (DDC) circuit. To meet the latency requirements, the data rates for the PVC connections between the ZJX ARTCC and the WARP installation sites are 128 kbps. The bandwidth required to request a Database Refresh is nominal given that the size of a request is expected to be no more than 1 kilobyte. The average size of Database Refresh messages is expected to be 20 kilobytes. Once per hour, the Database Refresh Server will send each WARP a copy of the HWDS Transmission Log. The size of the transmission log is expected to be 290 kilobytes.

The exact sizing of the PVCs required on the NADIN PSN to support these data exchange requirements will be determined by the NADIN PSN Program Office. The nominal rate between the Database Refresh Server and each WARP must be approximately 128 kbps to meet the latency requirements.

7-07.3.2.5.3 Hardware Requirements

A DDC platform is required at the ZJX ARTCC and the Ascent facility to support the tail circuit from the Database Refresh Server to the NADIN PSN node. One cable with an EIA-530 interface is required at the ZJX ARTCC is required to cross-connect the tail circuit to the NADIN PSN. One 512 kbps port is required on a NADIN PSN high speed cluster card at the ZJX ARTCC.

7-07.3.2.6 WARP to NIMS

WARP will interface with NIMS to transmit WARP failure alarm/alert messages and system/subsystem status reports in response to NIMS requests. The exact implementation of this interface is to be determined (TBD).

7-07.3.2.7 WARP (FBWTG) to NWSTG

The WARP will interface with NWSTG to receive high-resolution gridded weather forecast data (e.g., Eta, Aviation (AVN) and RUC) and airborne observations (e.g., MDCRS).

7-07.3.2.7.1 Protocol Requirements

Network, data link, and physical layer will be in accordance with the NWSTG to FBWTG IRD, NAS-IR-90029414.

7-07.3.2.7.2 Transmission Requirements

One full duplex T-1 circuit is required.

7-07.3.2.7.3 Hardware Requirements

A DDC platform is required at the ATCSCC in Herndon, Virginia and the NWSTG in Silver Spring, Maryland to support this interface.

7-07.3.2.8 ATCSCC WARP to Harris (dial-up/dial-back circuit)

The ATCSCC WARP will interface to the Harris facility in Melbourne (MBL) in order to provide dial-up/dial-back capabilities.

7-07.3.2.8.1 Protocol Requirements

TBD

7-07.3.2.8.2 Transmission Requirements

TBD

7-07.3.2.8.3 Hardware Requirements

TBD

7-07.3.2.9 WARP to Other Services

WARP will interface with other services when available. These other services might include commercial services, NCEP Gridded Binary Data Service, etc. WARP will connect to other services via FAATSAT, NADIN PSN or other appropriate networks. The High-resolution Image Processing System (HIPS) and Automated Lightning Detection System (ALDS) data will be provided via a local interface at the Alaska ARTCC to the NWS regional office.

7-07.3.3 Local Interfaces

This section identifies interfaces to WARP that do not require interfacility leased lines and so they are designated as "local."

7-07.3.3.1 WARP to Coded Time Source (CTS)

The WARP will interface with CTS to receive coded time data.

7-07.3.3.1.1 Protocol Requirements

The interface is a direct physical layer interface.

7-07.3.3.1.2 Transmission Requirements

One asynchronous transmission circuit operating at 14.4 Kbps is required.

7-07.3.3.1.3 Hardware Requirements

One physical cable is required. Cable connectors will be in accordance with RS-232-C with male contacts and a female shell (WARP end).

7-07.3.3.2 ARTCC WARP to Display System Replacement (DSR)

The WARP will interface with the collocated DSR for the dissemination of radar mosaic products. The WARP will interface with up to 4 DSRs via a dedicated Ethernet local area network.

7-07.3.3.2.1 Protocol Requirements

The transport layer will be in accordance with the Transmission Control Protocol (TCP) - RFC-793. The network layer will be in accordance with the Internet Protocol (IP) - RFC-791 and the Internet Control

Message Protocol (ICMP) - RFC-792, and the data link layer will be in accordance with the Carrier Sense Multiple Access/Collision Detection (CSMA/CD) access method - Ethernet V.2.

7-07.3.3.2.2 Transmission Requirements

This interface will operate at a signal rate of 10 Mbps.

7-07.3.3.2.3 Hardware Requirements

Connectors for the WARP/DSR interface will be in accordance with the Attachment Unit Interface (AUI) of ISO 8802-3. The WARP will provide the Media Access Unit (MAU), coaxial cable, 50-ohm terminator, and BNC connectors for the cable run from WARP to the DSR Rack Distribution Panel. The DSR will provide the coaxial cable, BNC connectors and a 50-ohm termination and ground for the DSR DTE to the DSR Rack Distribution Panel.

7-07.3.4 Traffic Characteristics

A summary of the traffic characteristics for the WARP system is provided in Table 7-07-2.

Table 7-07-2. WARP System Traffic Characteristics Summary

Messages between WARP and:	Average Message Size or Data Rate	Frequency
Other WARPs		
- National Mosaic	35 kilobytes	once every 5 minutes
- Regional Mosaic	42 kilobytes	once every 5 minutes
- NEXRAD Indirects		
Routine	from 1.1 to 36 kilobytes	function of scan volume
Requested	from 1.1 to 36 kilobytes	up to 5 per hour
WSR-88D (NEXRAD Direct Connects)	14.4 kbps	continuous
CTS	14.4 Kbps	continuous
DSR	10 Mbps	continuous
HWDS	512 Kbps	continuous
NWSTG	1.544 Mbps	continuous
MLB (Dial-up/Dial-back)	TBD	TBD
Data Base Refresh		
Request from ARTCC	1 kilobyte	4.4 per hour
Request from ATCSCC	1 kilobyte	39.6 per hour
Products to ARTCC	20 kilobytes	4.4 per hour
Products to ATCSCC	20 kilobytes	39.6 per hour
Transmission Log	290 kilobytes	1 per hour
WMSCR	256 kbps (peak)	intermittent
URET/CCLD	Variable File Size 10 Mbps (peak data rate)	once per hour
NIMS		TBD

7-07.4 ACQUISITION ISSUES

7-07.4.1 Project Schedule and Status

Stage 0 of the WARP Program has been implemented and it is operational at all 21 ARTCCs and the ATCSCC. Stage 0 is a turn-key vendor solution and does not require the use of any FAA-leased or -owned telecommunications resources.

With respect to Stage 1/2, a WARP system has been installed at ZSE ARTCC which is the OT&E site. Pending successful completion of OT&E and a favorable In-Service Decision (ISD), WARP Stage 1/2 will be installed at the remaining 20 ARTCCs and the ATCSCC. The Operational Readiness Date (ORD) for the first full production system is scheduled for October 2000 and the last ORD is scheduled for February 2001. To support these ORD dates, all WARP Stage 1/2 full production systems will be installed in FY00 as indicated in Table 7-07-3.

Table 7-07-3. Weather and Radar Processor Site Installation Schedule

WARP Site Installation	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
ARTCCs	1	20	0	0	0	0	0	0
ATCSCC	0	1	0	0	0	0	0	0

NOTE: The quantities per fiscal year, as shown in Table 7-07.4, reflect the lead time between WARP installation and the scheduled ORD dates.

The WINS implementation schedule (shown in Table 7-07-4) calls for First Article testing at the WJHTC in November of 2000 and operational deployment at the seven ARTCCs between April and July of 2001.

Table 7-07-4. WINS Site Installation Schedule

WARP Site Installation	Prior Years	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
WJHTC	0	0	1	0	0	0	0	0
ARTCCs	0	0	7	TBD	TBD	TBD	TBD	TBD

7-07.4.2 Planned Telecommunications Strategies

WARP's interface requirements are expected to be satisfied by a combination of FAA-leased and -owned telecommunications resources. A majority of the WARP-to-WARP interfaces are expected to be carried on the NADIN PSN. To accommodate the WARP traffic, the NADIN PSN will have to be upgraded so that the trunk capacity is at least equivalent to a T-1, and two high-speed cluster cards will have to be added to each NADIN PSN node to provide two ports with a combined throughput of up to 660 kbps in both directions. The NADIN PSN will also support WARP interfaces with systems that are already connected to it such as ADAS and WMSCR.

The WARP-to-NEXRAD interface will be supported by dedicated point-to-point circuits. In Alaska, the Alaskan NAS Interfacilty Communication System (ANICS) is being used to connect the ZAN ARTCC to the NEXRADs throughout the state. In the CONUS, the dedicated point-to-point circuits are expected to be provided by the Leased Interfacility NAS Communications System (LINCS).

The products form the Harris Weather Data Service (HWDS) currently being received as part of WARP Stage 0. It is expected that the FAA will continue to acquire the weather products from the HWDS during Stage 1/2 of WARP, but that FAATSAT will be used as the primary means of distribution to the WARP installations.

Table 7-07-5 lists the WARP interfaces that have been implemented to support WARP Stage 1/2 OT&E. If the connectivity is temporary an entry is made in parentheses () to indicate when it is expected to be removed. Otherwise, the connectivities will remain in place to support WARP Stage 1/2 operations.

Table 7-07-5. Weather and Radar Processor Interfaces Implemented to Support Stage 1/2 OT&E

From	To	Diversity	System/ Rate	Prior Yrs.	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
HWDS	ARTCC WARP	No	HWDS	21	0	(21)	0	0	0	0	0
HWDS	ATCSCC WARP	No	HWDS	1	0	(1)					
HWDS Database Refresh (Ascent)	ZJX ARTCC	No	LINCS 512 Kbps	1	0	0	0	0	0	0	0
Database Refresh (Requests and Products)	ARTCC and ATCSCC WARPs	No	NADIN PSN	22	0	0	0	0	0	0	0
WARP (FBWTG)	NWSTG	No	T-1 (1.544 Mbps)	1	0	0	0	0	0	0	0
ATCSCC WARP	Harris Melbourne	No	Dial Back-up via POTS	1	0	0	0	0	0	0	0
NEXRAD	ZSE ARTCC	No	LINCS VG-8	6	0	0	0	0	0	0	0
NEXRAD	ZAN ARTCC	No	LEC/ANICS	7	0	0	0	0	0	0	0

Note: Circuits from ZOA NEXRADs to Harris were required for test purposes and they have already been disconnected.

Table 7-07-6 lists the WARP interfaces to be implemented during the full production phase of Stage 1/2. The implementation schedule incorporates the required lead time in each case so that the connectivity is in place prior to support the site readiness review (SRR) at each site.

Table 7-07-6. Weather and Radar Processor Interfaces to be Implemented Under Stage 1/2

From	To	Diversity	System/ Rate	Prior Yrs.	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06
ARTCC WARP (Regional Mosaic)	ATCSCC WARP	No	NADIN PSN	0	21	0	0	0	0	0	0
ATCSCC WARP (National Mosaic)	ARTCC WARP	No	NADIN PSN	0	21	0	0	0	0	0	0
WARP ARTCC (NEXRAD Indirects)	WARP ARTCC	No	NADIN PSN	0	21	0	0	0	0	0	0
NEXRAD	Primary ARTCC WARP	No	LINCS 14.4 kbps	0	142	0	0	0	0	0	0
HWDS	ATCSCC	No	LINCS 512 kbps	0	1	0	0	0	0	0	0
WARP (FBWTG)	NWSTG (See Note 1)	No	T-1 (1.544 Mbps)	1	0	0	0	0	0	0	0
ATCSCC (See Note 2)	ARTCC WARPs (20)	No	FAATSAT 1.544 Mbps broadcast	0	1	0	0	0	0	0	0
ZSE ARTCC	ZAN ARTCC	No	ANICS 512 Kbps (Relay of HWDS)	0	1	0	0	0	0	0	0
ATCSCC WARP (See Note 1)	Harris Melbourne	No	Dial Back-up via POTS	1	0	0	0	0	0	0	0
ARTCC WARP	Harris Melbourne	No	Dial Back-up via POTS	0	21	0	0	0	0	0	0

Notes:

1. Implemented to support Stage 1/2 OT&E – included in this table for completeness.
2. T-1 broadcast from ATCSCC includes RUC data required by WINS.

7-07.4.3 Telecommunications Costs

Table 7-07-7 provides cost estimates for the planned strategy for FY00 to FY06. The costs are based on the installation schedules provided in Table 7-07-3 and 7-08-4 and the interface implementation schedules in Table 7-07-5 and 7-08-6.

The costs are based upon the current JRC baseline for WARP Program. In accordance with FAA Order 2500.8A, leased telecommunications costs (non-recurring and recurring) are shown in the table as being funded under the Facilities and Equipment (F&E) account from the year of activation through one year following system commissioning.

Table 7-07-7. Cost Summary - WARP

CIP # W-04 All costs in 000's	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
1. HWDS (Database Refresh Server) <---> ZJX ARTCC (NADIN PSN)								
Cost Profile: LINCS DDC 512 kbps Circuit with DDC Platform/Spare at HWDS Only								
Channel Costs								
Channels Added		0	0	0	0	0	0	0
Total Channels	1	1	1	1	1	1	1	1
F&E Funded Channels		0	0	0	0	0	0	0
OPS Funded Channels		1	1	1	1	1	1	1
F&E Non-recurring Channel Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$37**	**$37**	**$38**	**$38**	**$38**	**$38**	**$38**
Hardware Costs		*Included in Channel Cost*						
2. WARP (FBWTG) <---> NWSTG								
Cost Profile: LINCS DDC T-1 Circuit								
Channel Costs								
Channels Added		0	0	0	0	0	0	0
Total Channels	1	1	1	1	1	1	1	1
F&E Funded Channels		1	0	0	0	0	0	0
OPS Funded Channels		0	1	1	1	1	1	1
F&E Non-recurring Channel Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Channel Costs								
F&E Recurring Costs		**$8**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$8**	**$9**	**$9**	**$9**	**$9**	**$9**
Hardware Costs								
Cost Profile: DDC Platform and Spare (at NWSTG Only)								
Hardware Units Added		0	0	0	0	0	0	0
Total Hardware Units	1	1	1	1	1	1	1	1
F&E Funded HW Units		1	0	0	0	0	0	0
OPS Funded HW Units		0	1	1	1	1	1	1
F&E Non-recurring HW Costs		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Recurring Hardware Costs								
F&E Recurring Costs		**$1**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Recurring Costs		**$0**	**$1**	**$1**	**$1**	**$1**	**$1**	**$1**

Table 7-07-8. Cost Summary - WARP (Cont.)

SIP # W-04 All costs in 000's	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
3. NEXRADs <---> ZAN ARTCC								
Cost Profile: LEC Access and ANICS Satellite Transmission to ZAN ARTCC (Modems Included) (Based upon Premium Service)								
Channel Costs								
Channels Added		0	0	0	0	0	0	0
Total Channels	7	7	7	7	7	7	7	7
F&E Funded Channels		0	0	0	0	0	0	0
OPS Funded Channels		7	7	7	7	7	7	7
F&E Non-recurring Channel Costs		$0	$0	$0	$0	$0	$0	$0
Recurring Channel Costs								
F&E Recurring Costs		$0	$0	$0	$0	$0	$0	$0
OPS Recurring Costs		$33	$33	$33	$33	$33	$33	$33
Hardware Costs		*N/A - Included in Channel Costs*						
4. NEXRADs <---> WARP (ARTCCs)								
Cost Profile: LINCS VG-8 Circuits with NEXRAD Provided Modems (Includes Responders and 13 Test Circuits)								
Channel Costs								
Channels Added		18	(13)124	0	0	0	0	0
Total Channels	11	29	140	140	140	140	140	140
F&E Funded Channels		24	129	111	0	0	0	0
OPS Funded Channels		5	11	29	140	140	140	140
Non-recurring Channel Costs								
F&E Non-recurring Costs		$59	$475	$0	$0	$0	$0	$0
OPS Non-recurring Costs		$0	$0	$0	$0	$0	$0	$0
Recurring Channel Costs								
F&E Recurring Costs		$346	$651	$634	$0	$0	$0	$0
OPS Recurring Costs		$31	$31	$78	$716	$716	$716	$716
Hardware Costs		*N/A - Provided as Part of the NEXRAD Program*						
5. Upgrade of NADIN PSN Backbone								
Channel Costs								
Cost Profile: LINCS DDC T-1 Circuits, Inside Wiring, and Digital Patch Panels								
Channels Added		10	21	0	0	0	0	0
Total Channels	6	16	37	37	37	37	37	37
F&E Funded Channels		14	31	21	0	0	0	0
OPS Funded Channels		2	6	16	37	37	37	37
F&E Non-recurring Channel Costs		$126	$190	$0	$0	$0	$0	$0
Recurring Channel Costs								
F&E Recurring Costs		$856	$2,991	$2,242	$0	$0	$0	$0
OPS Recurring Costs		$1,160	$1,160	$2,117	$4,359	$4,359	$4,359	$4,359
Hardware Costs		*N/A - Cluster Cards Provided by WARP Program Office*						

Table 7-07-8. Cost Summary - WARP (Cont.)

CIP # W-04	All costs in 000's	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
6. HWDS <---> ATCSCC									
	Cost Profile: LINCS DDC 512 kbps Circuit								
Channel Costs									
	Channels Added		1	0	0	0	0	0	0
	Total Channels	0	1	1	1	1	1	1	1
	F&E Funded Channels		1	1	0	0	0	0	0
	OPS Funded Channels		0	0	1	1	1	1	1
	F&E Non-recurring Channel Costs		**$4**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring Channel Costs								
	F&E Recurring Costs		**$137**	**$137**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$0**	**$0**	**$144**	**$144**	**$144**	**$144**	**$144**
Hardware Costs			*N/A - Uses Existing Platforms*						
7a. ATCSCC <---> ARTCC WARPs (Broadcast of HWDS Data)									
	Cost Profile: FAATSAT DDC 512 kbps Broadcast to CONUS ARTCCs (20) and FAATC								
Channel Costs									
	Channels Added		1	0	0	0	0	0	0
	Total Channels	0	1	1	1	1	1	1	1
	F&E Funded Channels		1	1	0	0	0	0	0
	OPS Funded Channels		0	0	1	1	1	1	1
	F&E Non-recurring Channel Costs		**$736**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring Channel Costs								
	F&E Recurring Costs		**$191**	**$191**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$0**	**$0**	**$191**	**$191**	**$191**	**$191**	**$191**
Hardware Costs			*N/A - Uses Existing Stations*						
7b. ZSE ARTCC <---> ZAN ARTCC									
	Cost Profile: ANICS 512 kbps Relay of HWDS Broadcast								
Channel Costs									
	Channels Added		1	0	0	0	0	0	0
	Total Channels	0	1	1	1	1	1	1	1
	F&E Funded Channels		1	1	0	0	0	0	0
	OPS Funded Channels		0	0	1	1	1	1	1
	F&E Non-recurring Channel Costs		**$10**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring Channel Costs								
	F&E Recurring Costs		**$49**	**$49**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$0**	**$0**	**$49**	**$49**	**$49**	**$49**	**$49**
Hardware Costs			*N/A - Uses Existing Stations*						
8a. ATCSCC <---> ARTCC WARPs (Broadcast of FBWTG Data)									
	Cost Profile: FAATSAT DDC 1.544 Mbps Broadcast to CONUS ARTCCs (20) and MLB ASR								
Channel Costs									
	Channels Added		0	1	0	0	0	0	0
	Total Channels	0	0	1	1	1	1	1	1
	F&E Funded Channels		0	1	1	0	0	0	0
	OPS Funded Channels		0	0	0	1	1	1	1
	F&E Non-recurring Channel Costs		**$0**	**$736**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring Channel Costs								
	F&E Recurring Costs		**$0**	**$307**	**$307**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$0**	**$0**	**$0**	**$307**	**$307**	**$307**	**$307**
Hardware Costs			*N/A - Uses Existing Stations*						

Table 7-07-8. Cost Summary - WARP (Concl.)

CIP # W-04	All costs in 000's	Prior Years	FY00	FY01	FY02	FY03	FY04	FY05	FY06
8b. ZSE ARTCC <---> ZAN ARTCC									
	Cost Profile: ANICS 1.544 Mbps Relay of FBTWG Broadcast								
Channel Costs									
	Channels Added		1	0	0	0	0	0	0
	Total Channels	0	1	1	1	1	1	1	1
	F&E Funded Channels		1	1	0	0	0	0	0
	OPS Funded Channels		0	0	1	1	1	1	1
	F&E Non-recurring Channel Costs		**$10**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring Channel Costs								
	F&E Recurring Costs		**$148**	**$148**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$0**	**$0**	**$148**	**$148**	**$148**	**$148**	**$148**
Hardware Costs			*N/A - Uses Existing Stations*						
9. MLB ARSR <---> MLB CORP (Harris Corp)									
	Cost Profile: LINCS DDC 512 kbps Circuit								
Channel Costs									
	Channels Added		1	0	0	0	0	0	0
	Total Channels	0	1	1	1	1	1	1	1
	F&E Funded Channels		1	1	0	0	0	0	0
	OPS Funded Channels		0	0	1	1	1	1	1
	F&E Non-recurring Channel Costs		**$4**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring Channel Costs								
	F&E Recurring Costs		**$8**	**$8**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$0**	**$0**	**$9**	**$9**	**$9**	**$9**	**$9**
Hardware Costs			*N/A - Uses Existing Platforms*						
10. ZJX ARTCC <---> ZMA ARTCC									
	Cost Profile: LINCS DDC 512 kbps Circuit								
Channel Costs									
	Channels Added		1	0	0	0	0	0	0
	Total Channels	0	1	1	1	1	1	1	1
	F&E Funded Channels		1	1	0	0	0	0	0
	OPS Funded Channels		0	0	1	1	1	1	1
	F&E Non-recurring Channel Costs		**$3**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	Recurring Channel Costs								
	F&E Recurring Costs		**$45**	**$45**	**$0**	**$0**	**$0**	**$0**	**$0**
	OPS Recurring Costs		**$0**	**$0**	**$47**	**$47**	**$47**	**$47**	**$47**
Hardware Costs			*N/A - Uses Existing Platforms*						
			SUMMARY						
F&E Totals		Non-recurring	$952	$1,401	$0	$0	$0	$0	$0
		Recurring	$1,789	$4,528	$3,183	$0	$0	$0	$0
		F&E Total	**$2,742**	**$5,929**	**$3,183**	**$0**	**$0**	**$0**	**$0**
OPS Totals		Non-recurring	$0	$0	$0	$0	$0	$0	$0
		Recurring	$1,260	$1,270	$2,863	$6,051	$6,051	$6,051	$6,051
		OPS Total	**$1,260**	**$1,270**	**$2,863**	**$6,051**	**$6,051**	**$6,051**	**$6,051**

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CHAPTER 7-08 - SUMMARY SHEET

WEATHER SYSTEMS PROCESSOR (WSP)

Program/Project Identifiers:

Project Number(s):	W-09/64-13
Related Program(s):	
New/Replacement/Upgrade?	New
Responsible Organization:	AND-420
Program Mgr./Project Lead:	Jim Pette, AND-420 PT Lead, (202)-267-9381
Fuchsia Book POC:	John Farr, AND-420 Technical Officer, (202)-267-7244

Assigned Codes:

PDC(s):	
PDC Description:	
Service Code:	

Cost Estimates:

Costs in $000:	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Non-recurring	$0	$0	$0	$0	$0	$0	$0
F&E Recurring	$0	$0	$0	$0	$0	$0	$0
Total F&E	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OPS Non-recurring	$0	$0	$0	$0	$0	$0	$0
OPS Recurring	$0	$0	$0	$0	$0	$0	$0
Total OPS	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

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CIP Category: Navigation & Landing 	**7-08.0 WEATHER SYSTEMS PROCESSOR**

7-08.1 WEATHER SYSTEMS PROCESSOR OVERVIEW

The Weather Systems Processor (WSP) primary mission is to enhance the safety of air travel through the timely detection and reporting of hazardous wind shear in and near the terminal approach and departure zones of an airport.

7-08.1.1 Purpose of the Weather Systems Processor

The purpose of WSP is to identify sources of hazardous wind shear. Sources detected are microbursts and gust fronts. Other missions to be met by the WSP are to improve the management of air traffic in the terminal area, through the forecast of gust front induced wind shifts at the airport, and detection and tracking of precipitation.

The currently defined National Airspace System (NAS) weather sensing projects satisfy most Federal Aviation Administration (FAA) hazardous weather detection requirements. However, there remain some hazardous weather conditions that will go undetected in the critical flight areas of the terminal environment. The most significant of these are low-level wind shears due to microburst and gust fronts. The WSP provides the detection, processing, and communication of hazardous weather information to controllers. The WSP will perform these functions at medium density terminals, which are exposed to hazardous wind outflows.

7-08.1.2 References

7-08.1.2.1 FAA Specification: FAA-C-1217, Electrical Work, Interior

7-08.1.2.2 FAA Specification: FAA-E-2786, Data Multiplexing Network Equipment

7-08.1.2.3 FAA Specification: FAA-E-2911, NAS Infrastructure Management System (NIMS) Managed Subsystems

7-08.1.2.4 FAA Specification: FAA-E-2917a, Performance Specification, Weather Systems Processor (WSP)

7-08.1.2.5 FAA Specification: FAA-G-2100F, FAA Electronic Equipment General Requirements

7-08.1.2.6 FAA-STD-019; Lightning Protection, Grounding, Bonding and Shielding Requirements for Facilities

7-08.1.2.7 FAA-STD-020; Grounding, Transient Protection and Shielding Requirements for Equipment

7-08.1.2.8 FAA Order 6000.30B, Policy for Maintenance of the National Airspace System (NAS) Through the Year 2000

7-08.1.2.9 NAS-IC-31078503; Interface Control Document, NAS Infrastructure Management System (NIMS) Manager/Managed Subsystems

7-08.1.2.10 NAS-IC-31073403; Interface Control Document, Weather Systems Processor (WSP) to Airport Surveillance Radar (ASR-9)

7-08.1.2.11 NAS-IC-31063107; Interface Control Document, Automated Surface Observing System (ASOS) to Weather Systems Processor (WSP)

7-08.1.2.12 NAS-IC-31023107; Interface Control Document, Low Level Wind Shear Alert System (LLWAS) to Weather Systems Processor (WSP)

7-08.1.2.13 ATC-255; ASR-9 Weather Systems Processor Signal Processing Algorithms, MIT/Lincoln Laboratory Technical Report

7-08.1.2.14 ATC-259; A Description of the Interfaces between the Weather Systems Processor (WSP) and the Airport Surveillance Radar (ASR-9)

7-08.1.2.15 National Telecommunication and Information Administration (NTIA) Manual of Regulations and Procedures for Federal Radio Frequency Management

7-08.1.2.16 Electronic Industries Association (EIA), EIA-530, High Speed 25-Position Interface for Data Terminal Equipment and Data Circuit-Termination Equipment

7-08.1.2.17 Electronic Industries Association (EIA), RS-232 Interface Between Data Terminal Equipment and Data Communication Equipment Employing Serial Binary Data Interchange

7-08.1.2.18 ANSI/IEEE STD 802.3; Local and Metropolitan Area Networks, Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications

7-08.1.2.19 ANSI/IEEE STD 1014-1987; IEEE Standard for a Versatile Backplane Bus: VMEBus

7-08.1.2.20 NAS-IC-31070001; Interface Control Document, Weather Systems Processor (WSP) to External Users

7-08.1.2.21 NAS-IC-31074302; Interface Control Document, Weather Systems Processor (WSP) to National Airspace Data Interchange Network (NADIN) Packet Switched Network (PSN)

7-08.2 SYSTEM DESCRIPTION

The WSP will generate a set of weather products automatically from radar base data. Base data consists of estimates of reflectivity, Doppler velocity, spectrum width, and signal-to-noise ratio (SNR). Status data produced by processing the received signals and collateral information derived from the host Airport Surveillance Radar (ASR-9) are elements of base data as well. The WSP will be provided with site specific adaptation information when the system is installed. Examples of site adaptation information include: protected airport runway location(s), warning message format, etc. Other parameters, e.g., clutter maps, and roadway locations will be updated by maintenance personnel at regular intervals.

The end-users of WSP outputs are local controllers, their supervisors, and traffic management unit specialists. Air carrier operations personnel and airport operators would also benefit from the information provided by WSP.

7-08.2.1 Components of the Weather Systems Processor

The components of the Weather System Processor are illustrated in Figure 7-08-1. From the perspective of interfacility communications, there is a need to provide connectivity for processing equipment at the radar site with the display equipment located at the supported TRACON and ATCT.

7-08.2.2 Weather Systems Processor Functional Requirements

WSP requirements are divided into the following major functional areas:

- Radar Data Acquisition (RDA).
- Radar Data Processor (RDP).
- Display Function (DF).
- Remote Monitoring Function (RMF).

7-08.2.2.1 RDA Function

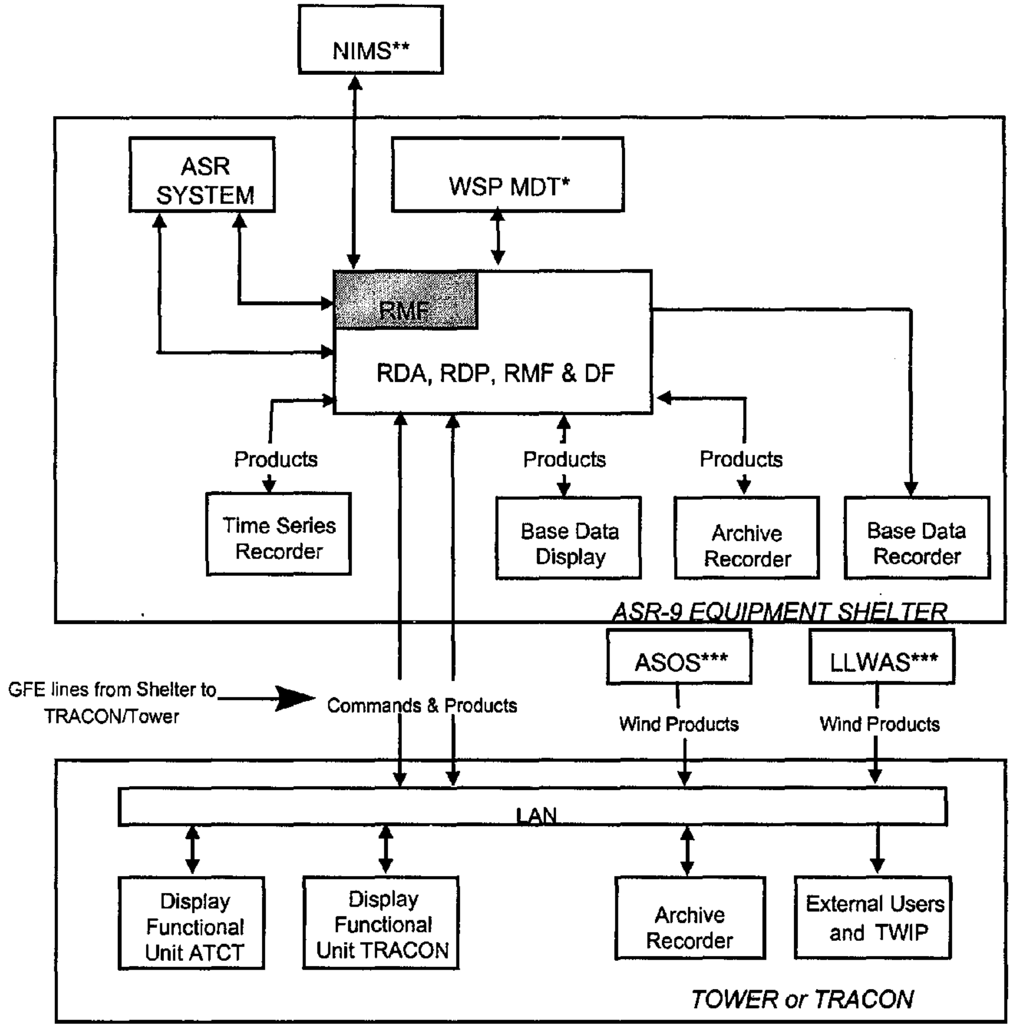
The RDA consists of microwave and digital interfaces to the ASR-9, including a high-dynamic range receive chain that provides input quadrature samples to the WSP data processor. The RDA acquires and digitizes microwave signals from the ASR-9, as well as associated timing, reference and radar state data. The RDA performs certain control functions for waveguide switches, coaxial switches, and Sensitivity Time Control (STC)/Automatic Gain Control (AGC) attenuators within the WSP system and the ASR-9. In addition, the RDA controls the routing of radio frequency (RF) signals to the WSP in order to acquire active channel high and low beam signals on an alternating scan basis.

7-08.2.2.2 RDP Function

The RDP is a commercial off-the-shelf (COTS) data processor that performs data accumulation, clutter suppression, base data generation, product generation and data archiving using Government supplied software. In addition, the RDP provides contractor defined hardware and software to feed back WSP-generated six-level weather data to the ASR-9 system for display on radar controllers' displays.

7-08.2.2.3 Display Function

The DF is hosted in COTS processors at the Airport Traffic Control Tower (ATCT) and Terminal Radar Control (TRACON) remote from the ASR-9 radar site and performs display and control. The DF and RDP communicate via specified communication circuits.



Notes: * This Interface permits on site maintenance by providing an Interface port for use by the maintenance data terminal (MDT)
** This Interface provides system performance and status data to the NIMS
*** WSP will Interface to a single source (ASOS of LLWAS) for wind products. WSP will provide an Interface port to accept the wind data

Legend			
ATCT	-Airport Traffic Control Center	TWIP	-Terminal Weather Information for Pilots
ASOS	-Automated Surface Observing System	NIMS	-NAS Infrastructure Management System
ASR	-Airport Surveillance Radar	RDA	-Radar Data Acquisition
DF	-Display Function	RDP	-Radar Data Processor
LAN	-Local Area Network	RMF	-Remote Monitoring Function
LLWAS	-Low Level Windshear Alert System	TRACON	-Terminal Radar Approach Control
MDT	-Maintenance Data Terminal	WSP	-Weather Systems Processor

Figure 7-08-1. WSP Interfaces

7-08.2.2.4 RMF Function

WSP will contain a capability for system status monitoring, reporting, maintenance alert and alarm processing, and fault isolation. The RMF function is provided for automatic fault detection and location. The RMF is also the entry port for maintenance commands and control and for entering site adaptable data. The RMF will provide maintenance-related data and control functions to FAA maintenance specialists.

7-08.2.3 Products

The main products are microburst detection, gust front detection, wind shift prediction, and precipitation detection and tracking.

7-08.2.4 Maintenance Concept

Maintenance will be accomplished per FAA Order 6000.30B, Policy for Maintenance of the National Airspace System (NAS) through the Year 2000. System specialists will accomplish periodic and corrective maintenance, with site visits occurring no more frequently than four times per year. Routine measurements and adjustments will be accomplished remotely through the RMF. In the event of a failure, built-in test/built-in test equipment (BIT/BITE) will identify the probable location of the fault so that the maintenance specialist can bring the appropriate Line Replaceable Units (LRUs) to the site. The same BIT/BITE used to identify the fault will also be used to verify the system repair. Defective LRUs will be sent to a central Government depot for repair or replacement.

7-08.3 TELECOMMUNICATION INTERFACE REQUIREMENTS

The following WSP communications ports are to be defined. The required data rates for these interfaces, based on current planning, are listed in Table 7-08-1.

- RDP to Display Functional Unit (DFU)
- LLWAS-2 Center Field Wind Speed and Direction
- ASOS Center Field Wind Speed and Direction
- NIMS Interface
- External DFU Ports
- NADIN PSN Interface

A summary of the currently planned protocol, transmission, and hardware requirements is provided in Table 7-08-2.

7-08.3.1 Interface Requirements

7-08.3.1.1 Radar Data Processor to ATCT/TRACON Displays

This interface provides communications between the Radar Data Processor (RDP) at the WSP equipment shelter to the DFUs located at the supported ATCT or TRACON. Diversity is a requirement for this interface; therefore, two physically independent paths are required as illustrated in Figure 7-08-1. The WSP will use either two digital telecommunication lines or one digital telecommunication line and a line-of-sight microwave link. In the case of the LOS, it will serve as the backup path. Data communication will require a bandwidth capability of 128 Kbps or greater. Connectivity will vary depending on whether or not the interface is local or remote. The WSP shall provide Ethernet bridges and modems as required to support the Tower and TRACON Display Functional Units.

The Regions shall provide backup communication between the ASR-9 shelter and the ATCT equipment room. This backup system shall be automatically used if the primary communications link is faulty.

Table 7-08-1. WSP Communications Data Rates (Current Planning)

Interface	Required Bit Rate	Data Type
RDP to DFU	128K	Graphical weather products and alphanumeric text. Data transferred from modem to DFU via TCP/IP network. ATCT and TRACON will receive data via network.
LLWAS-2	1200	Wind speed and direction via asynchronous bit serial transmission.
ASOS	1200	Wind speed and direction via asynchronous bit serial transmission.
NIMS	2400 baud	Logical unit & data point status and commands via UDP/IP protocol.
External DFU Ports	19.2 Kbaud	Nine available ports to be provided with asynchronous bit serial broadcast protocol for weather products data transmission.
NADIN PSN	TBD	Graphical weather products messages in text ADNS format for transmission over the ARINC data network to TWIP users.

Table 7-08-2. WSP Interface Requirements Summary Table

NAS INTERFACE		LLWAS	ASOS	NIMS	External DFU Ports	NADIN PSN
INTERFACE CONTROL DOCUMENTATION		NAS-IC-31023107	NAS-IC-31063107	NAS-IC-31078503	NAS-IC-31070001	NAS-IC-31074302
	Network Layer	N/A	N/A	TBD	N/A	X.25
PROTOCOL	**Data Link Layer**	N/A	N/A	TBD	EuDataRelay	LAPB
REQUIREMENTS	**Physical Layer**	20 ma Loop	EIA-530	RS-232	RS-232	EIA-530
	Special Formats/ Codes	As in ICD	As in ICD	As in ICD	As in ICD	As in ICD
	No. Channels	34-36**	34-36**	34-36	TBD	34-36
	Speed (Kbps)	1.2	1.2	2.4	19.2	TBD
TRANSMISSION REQUIREMENTS	**Simplex Half/Full Duplex**	Simplex	Simplex	Full Duplex	Simplex	Simplex
	Service	Pt. To Pt.	Pt. To Pt.	Pt. To Pt.	Pt. To Pt.	
HARDWARE	**Modem**	Provided by WSP program	Provided by WSP program	Provided by WSP program	Provided by User	Provided by WSP program
REQUIREMENTS	**Cable/Misc.**	TBD	TBD	TBD	TBD	TBD

** At any one airport, the WSP will interface with either ASOS or LLWAS, but not both. Thus, there will be a total of 34-36 channels required for the wind sensor interface

7-08.3.1.2 When TRACON is Collocated With ATCT

The WSP product data will be supplied to the TRACON Display Functional Units via a local area network (LAN). The RDP will port data to the LAN through a WSP Communications Cabinet located in the tower equipment room.

7-08.3.1.3 When TRACON Is Not Collocated With ATCT

The WSP will use two digital telecommunication lines, primary and backup, to the remote TRACON. Data communication will require a bandwidth capability of 128k baud or greater. The transmission means are to be determined locally. Table 7-08-3 identifies the sites where the TRACON is not collocated with the ATCT and gives the name and location identifier of the TRACON serving each site.

Table 7-08-3. WSP Locations with Remote TRACONs

WSP Locations	State	LOCID		Remote TRACON Locations	LOCID
Los Angeles (South)	CA	LAX		Southern California	SCT
Sarasota/Bradenton	FL	SRQ		Tampa	TPA
Ontario	CA	ONT		Southern California	SCT
Portland	OR	PDX		*	P80
Tucson	AZ	TUS		*	U90
Seattle	WA	SEA		*	S46
White Plains	NY	HPN		New York	N90
Windsor Locks (Hartford)	CT	BDL		*	Y90
Islip/Long Island	NY	ISP		New York	N90
* TRACON is at the airport but not co-located with the ATCT					

7-08.3.1.4 WSP - NAS Interfaces

The physical-level protocol for the hardware-to-hardware interfaces between the WSP and other NAS subsystems are as follows:

- 20 ma. current loop
- RS-232
- EIA-530

7-08.3.1.5 Weather Systems Processor to LLWAS/ASOS Equipment

The WSP requires center field wind speed and direction data which is obtained from either the existing ASOS or LLWAS at an airport. This data is utilized by WSP in the processing and display software. WSP accepts input of this data at a Government approved location in the general area of the airport tower equipment room. The data will be ported to the LAN via the WSP Communications Cabinet located in the tower equipment room.

LLWAS is being used as a source of this data on an interim basis. LLWAS at WSP locations will be deactivated after commissioning of the WSP. An alternative center field wind speed and direction source will be incorporated at that time.

The use of ASOS, as a source of center field wind speed and direction, will be dependent on the location of the sensor in relation to center field.

7-08.3.1.6 Radar Data Processor to RMF/NIMS Interface

This interface provides WSP system performance and status data to the NIMS. The RDP will interface to NIMS via its Remote Monitoring Function (RMF). At Mode S sites, this connectivity will be via the WSP MDT/GSD located in the Radar Shelter to a NIMS port similar to that used for Mode S. At non-Mode S sites, The connectivity will be from the remote MDT/GSD in the tower equipment room to a NIMS port in the tower equipment room.

7-08.3.1.7 Weather Systems Processor to External Users

This interface provides nine (9) dedicated ports on the WSP Communications Cabinet that can be used to provide the weather products to other users of the data. This interface is one-way, transmit only, to a DFU at the user's location that would be supplied by the user. The FAA will provide the processing software to enable the same displays as seen by the FAA personnel at the ATCT or TRACON. The transmission path between the tower equipment room and the user's site is also the responsibility of the user.

7-08.3.1.8 Weather Systems Processor to NADIN PSN

This interface provides graphical weather products in a text format for transmission over the NADIN PSN to the ARINC data network for further transmission to aircraft via the Terminal Weather Information for Pilots (TWIP) system. The capability for multiple switched virtual circuits (SVC) is available on this interface.

7-08.4 ACQUISITION ISSUES

The sites currently identified for WSP implementations are identified in Table 7-08-4.

Table 7-08-4. WSP Site Implementation Schedule

Regions	Site Location	Site Code	Office Name	Line Speed Required	Estimated Install Date
Central - ACE	Cedar Rapids. IA	CID	ACE	128 Kbps	July 2002
	Des Moines, IA	DSM	ACE-01	128 Kbps	March 2002
Eastern - AEA	Albany, NY	ALB	AEA-01	128 Kbps	June 2002
	Buffalo, NY	BUF		128 Kbps	February 2002
	Harrisburg, PA	MDT		128 Kbps	November 2001
	Islip/Long Island, NY	ISP	AEA-	128 Kbps	July 2002
	Norfolk, VA	ORF		128 Kbps	March 2001
	Richmond, VA	RIC	AEA-21	128 Kbps	July 2001
	Rochester, NY	ROC	AEA-23	128 Kbps	September 2001
	Syracuse, NY	SYR	AEA-	128 Kbps	May 2001
	White Plains, NY	HPN	AEA-	128 Kbps	April 2002
Great Lakes - AGL	Fort Wayne, IN	FWA	AGL-	128 Kbps	January 2002
	Grand Rapids, MI	GRR	AGL-09	128 Kbps	April 2001
	Madison, WI	MSN	AGL-	128 Kbps	August 2001
	Toledo, OH	TOL	AGL-	128 Kbps	May 2002
New England ANE	Windsor Locks, CT	BDL	ANE-03	128 Kbps	June 2002
Northwest Mountain - ANM	Renton-Seattle, WA	SEA	ANM-01	128 Kbps	March 2002
	Hillsboro, OR	PDX	ANM-09	128 Kbps	October 2001
Southern - ASO	Birmingham, AL	BHM	ASO-09	128 Kbps	November 2001
	Charleston, SC	CHS	ASO-	128 Kbps	September 2001
	Greensboro, NC	GSO	ASO-	128 Kbps	February 2002
	Huntsville, AL	HSV	ASO-	128 Kbps	July 2001
	Jacksonville, FL	JAX	ASO-16	128 Kbps	March 2001
	Knoxville, TN	TYS	ASO-	128 Kbps	April 2002
	Sarasota, FL	SRQ	ASO-	128 Kbps	May 2001
Southwest - ASW	Albuquerque, NM	ABQ	ASW-01	128 Kbps	July 1998
	Austin, TX	BSM	ASW-	128 Kbps	November 1998
	El Paso, TX	ELP	ASW-	128 Kbps	June 2001
	Lubbock, TX	LBB	ASW-13	128 Kbps	October 2001
	San Antonio, TX	SAT	ASW-17	128 Kbps	June 2001
Western-Pacific - AWP	Honolulu, HI	HNL	AWP-13	128 Kbps	May 2002
	Los Angeles, CA	LAX	AWP-23	128 Kbps	April 2001
	Ontario, CA	ONT	AWP-	128 Kbps	August 2001
	Tucson, AZ	TUS	AWP-	128 Kbps	January 2002
Support Facilities	Oklahoma City, OK	MMAC		128 Kbps	December 1999
	Atlantic City, NJ	WJHTC		128 Kbps	February 2000

7-08.4.1 Telecommunications Strategy

Resource requirements for the interfaces will vary depending on site-specific details. Current plans are for the Government to furnish all dedicated communications lines and all dial-up communication lines. Where available, existing on-base cable and fiber optic systems will be utilized.

The contractor shall furnish RDP to DFU, DFU to DFU, and RMF to NIMS modems, as required. These modems will conform to FAA-E-2786 and EIA-530. (Note: Any standards applicable to communications circuits effective on the date of the contract shall also apply and take precedence.)

7-08.4.2 Telecommunications Costs

The implementation schedule given in Table 7-08-4 is the current planning schedule and is tentative at this time.

Weather Systems Processor (WSP) uses existing telecommunications circuits where possible. It will provide service up to the output port on the WSP cabinet. Users who desire to connect to the service will be required to provide their own modems and communications lines. Most circuits go from the ASR-9 equipment to the TRACON, which is often co-located with the airport tower. Due to the short distance and existing infrastructure, no new circuits are required.

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APPENDIX A
GLOSSARY OF ABBREVIATIONS

A

A&M	Aeronautical and Meteorological
A/G	Air-to-Ground
AAAS	Automated Airport Advisory System
AAIRS	Airport/Air Carrier Information Reporting System
AAIS	Automated Airport Information Systems
AAP	Advanced Automation Program
AAR	Airport Acceptance Rate
AARMP	Airman and Aircraft Registry Modernization Program
AAS	Advanced Automation System
AATS	Advanced Automation Training System
ABA	AAD Business Plan
ABA	Office of Financial Services
ABDIS	Automatic Data Interchange System Service B
ABM	Asynchronous Balanced Mode
ACAIS	Air Carrier Activity Information System
ACARS	ARINC Communications Addressing and Reporting System
ACC	ACE Controller Cabinet
ACCC	Area Control Computer Complex
ACCTS	Aviation Coordinating Committee for Telecommunications Services
ACD	Automatic Call Distributor
ACE	ASOS Controller Equipment
ACF	Area Control Facility
ACIP	Airport Capital Improvement Program
ACO	Aircraft Certification Office
ACOS	Aircraft Certification Office Subsystem
ACQUIRE	FAA Acquisition Management System
ACRA	Airman Certification and Rating Application Subsystem
ACS	Aircraft Certification System
ACSEP	Aircraft Certification Systems Evaluation Program
ACU	ASOS Collection Unit
ADAP	Aviation Drug Abatement Program
ADAS	AWOS Data Acquisition System
ADCCP	Advanced Data Communication Control Process
ADCOM	Aerospace Defense Command
ADF	Automatic Direction Finder
ADIZ	Air Defense Identification Zones
ADL	Aeronautical Data Link
ADLP	Aeronautical Data Link Program
ADMIN	Administrative Staff Offices
ADNS	ARINC Digital Network Service
ADO	Airline Dispatch Offices/Airport District Office
ADP	Automated Data Processing
ADPE	Automated Data Processing Equipment
ADS	Automatic Dependent Surveillance/Airworthiness Directive Subsystem
ADSP	Automatic Dependent Surveillance Panel
ADTN	Administrative Data Transmission Network
ADTN2000	Agency Data Telecommunications Network 2000
AEE	Aviation Environment and Energy
AEEC	Airlines Electronic Engineering Committee
AERA	Automated En Route Air Traffic Control
AES	Automatic Exemption Subsystem
AF	Airway Facilities
AFARS	Automated Federal Aviation Regulations Subsystem
AFCIMS	Airway Facilities Corporate Information Management System
AFDO	Airways Facilities District Office
AFEPS	ACARS Front End Processing System
AFIS	Automated Flight Inspection System
AFM	Automated Frequency Manager
AFO	FAA Office at Flight Operations Center
AFO	Airport Field Office
AFOS	Automation of Field Operations and Services
AFS	Aeronautical Fixed Services
AFSECT	Airway Facility Sector Field Office

AFSK	Asynchronous Frequency Shift Keying
AFSO	Airways Facilities Sector Office
AFSS	Automated Flight Service Station
AFSSWS	Automated Flight Service Station Work Station
AFTIL	Airway Facilities Tower Integration Laboratory
AFTN	Aeronautical Fixed Telecommunications Network
AGC	Automatic Gain Control
AGS	Air Ground System
AI	Artificial Intelligence
AIM	Airmen's Information Manual
AIP	Airport Improvement Program
AIRDISPOFF	Airline Dispatch Office
AIRMET	Airmen's Meteorological Information
AIREPS	Air Reports
AIS	Aeronautical Information System
AIS	Aircraft Information System
AIS	Airman's Information System
ALDS	Automated Lightning Detection System
ALE	Automatic Link Establishment
ALS	Approach Lighting System/Ambient Light Sensor
ALSF	Approach Lighting System with Sequence Flasher
ALSIP	Approach Lighting System Improvement Program
ALTRV	Altitude Reservation
AM	Amplitude Modulation
AMASS	Airport Movement Area Surveillance System
AMCC	ARTCC Maintenance Control Center
AMCS	Aeromedical Certification Subsystem
AMCS	Aeronautical Mobile Communications System
AME	Aviation Medical Examiner
AMIS	Aircraft Management Information System
AM®S	Aeronautical Mobile® Service
AMSC	American Mobile Satellite Corporation
AMSS	Aeronautical Mobile Satellite Service
AMSSP	Aeronautical Mobile Satellite Service Panel
ANCC	ANICS Network Control Center
ANICS	Alaskan NAS Interfacility Communications System
ANMC	Automated Network Management Control
ANMS	Automated Network Monitoring System
ANPIRG	Asia/Pacific Air Navigation Planning and Implementation Regional Group
ANS	Automated Notification System
ANSI	American National Standards Institute
AOAS	Advanced Oceanic Automation System
AOC	Aeronautical Operational Control
APD	Air Crew Program Designee
API	Application Program Interface
APME	Associate Program Manager for Engineering
APN	ARINC Packet Network
APS	Airway Planning Standard
AR	Automated Reports
ARA	Associate Administrator for Research and Acquisitions
ARC	Annual Recurring Costs
ARF	Airport Reservation Function/Aviation Route Forecast
ARINC	Aeronautical Radio, Incorporated
ARM	Asynchronous Response Mode
ARMS	Airport Remote Monitoring System
ARO	Airport Reservations Office
ARP	Office of Airport Systems
ARQ	Automatic Repeat Request
ARSR	Air Route Surveillance Radar
ARTCC	Air Route Traffic Control Center
ARTS	Automated Radar Terminal System
AS	Antenna Site
ASAS	Aviation Safety Analysis System
ASCII	American Standard Code for Information Interchange
ASD	Aircraft Situation Display
ASDE	Airport Surface Detection Equipment
ASDS	Airport Safety Data System
ASOS	Automated Surface Observing System
ASPP	Aeronautical Fixed Service Systems Planning for Data Interchange Panel
ASR	Digital Airport Surveillance Radar
ASR-DG	Airport Short Range Radar
ASRS	Airport Surface Radar Surveillance/Aviation Safety Reporting System
ASTA	Airport Surface Traffic Automation

ASU	Airspace for Special Use
AT	Air Traffic
AT&T	American Telephone and Telegraph
ATARS	Automatic Traffic Advisory & Resolution Service
ATC	Air Traffic Control
ATCBI	Air Traffic Control Beacon Interrogator
ATCCC	Air Traffic Control Command Center
ATCF	Air Traffic Control Facility
ATCFTM	DOD/FAA Air Traffic Control Facility Transfer Modernization
ATCRBS	Air Traffic Control Radar Beacon System
ATCS	Air Traffic Control Specialist
ATCSCC	Air Traffic Control System Command Center
ATCT	Airport Traffic Control Tower
ATE	Automatic Test Equipment
ATIS	Automated Terminal Information Service
ATM	Air Traffic Management
ATM	Asynchronous Transfer Mode
ATMS	Advanced Traffic Management System
ATN	Aeronautical Telecommunications Network
ATOMS	Air Traffic Operations Management System
ATR	Air Traffic Requirements
ATRAP	Air Traffic Report Automation Project
ATS	Air Traffic Services
ATS	Administrative Telephone System
ATS	Aviation Technology System
ATSC	Air Traffic Services Cell
ATSMP	Air Traffic Services Message Processing
AUA	Office of Air Traffic Systems Development
AUI	Attachment Unit Interface
AUTODIN	Automatic Digital Network
AUTOVON	Automatic Voice Network
AVARS	Automated Voice Airport Reservation System
AVD	ACE Video Display
AVG	Average
AVG	Automatic Voice Generator
AVN	Aviation System Standards
AVR	Associate Administration for Regulation and Certification
AVTDL	Audio Visual Teleconferencing and Distant Learning
AWANS	Aviation Weather and NOTAM System
AWIPS	Advanced Weather Interactive Processing System
AWIS	Airport Weather Information System
AWN	Aviation Weather Network
AWOS	Automated Weather Observing System
AWP	Aviation Weather Processor/FAA Western-Pacific Region
AWS	Air Weather Service
AWSS	Automated Weather Sensor System
AZ	Azimuth

B

BASOPS	Base Operations (Flight)
BB	Baseband
BCF	Batch Control File
BCN	Backup Communications Network
BCS	Buoy Communications System
BDAT	Beacon Data
BER	Bit-Error-Rate
BERMS	Beacon/Environmental Monitoring Subsystem
BI	Beacon Interrogator
BIT	Built in test
BITE	Built in test equipment
bps	bits per second
BR	Radar Reinforced Beacon Target Return
BRITE	Bright Radar Indicator Tower Equipment
BTD	Beacon Target Detector
BTES	Budget Training and Enforcement Schedule
BUEC	Backup Emergency Communications
BUFR	Binary Universal Format Representation
BWM	Bandwidth Manager

C

CA	Conflict Alert/Common Answer
CAA	Civil Aviation Agency
CAATS	Canadian Automated Air Traffic Systems
CAD	Computer Aided Design
CAEG	Computer Aided Engineering Graphics
CADIZ	Canadian Air Defense Identification Zone

CAEGS	Computer Aided Engineering Graphics Systems
CAI	Computer Aided Instruction
CAIS	Comprehensive Airman Information Subsystem
CARF	Central Altitude Reservation Function
CAS	Collision Avoidance System
CAS	Commercially Available Software
CASFO	Civil Aviation Security Field Office
CASFU	Civilian Aviation Security Field Unit
CASIS	Civil Aviation Security Information System
CAT	Control Category
CBI	Computer Based Instruction
CBMS	Computer Based Message System
CCC	Central Computer Complex
CCD	Consolidated Cab Display
CCIR	International Radio Consultative Committee
CCITT	International Telephone and Telegraph Consultative Committee
CCMIS	Certification and Compliance Management Information System
CCP	Communications and Control Processor/Contingency Command Post
CCU	Central Control Unit
CD	Common Digitizer/Clearance Delivery/Controller Display
CDC	Computer Display Channel
CDI	Course Deviation Indicator
CDM	Collaborative Decision Making
CDR	Critical Design Review
CDRL	Contract Data Requirements List
CDS	Central Dispatch System
CDT	Controlled/Calculated Departure Time
CDU	Cockpit Display Unit
CDV	Compressed Digital Video
CENRAP	Center Radar ARTS Presentation
CERAP	Combined Center Radar Approach Control
CFAF	Central Flow Automation Facility
CFC	Central Flow Control
CFCC	Central Flow Computer Complex
CFCF	Central Flow Control Facility
CFCF	Central Flow Control Function
CFDPS	Compact Flight Data Processing System
CFE&N	Communications Facility Expansion and Networking
CFO	Chief Financial Officer
CFW	Center Field Wind
CFWP	Central Flow Weather Processor
CFWSU	Central Flow Weather Service Unit
CGDN	U.S. Coast Guard Data Network
CHI	Computer Human Interface
CID	Controlled Impact Demonstration
CIMS	Corporate Information Management System
CIP	Capital Investment Plan
CIR	Corporate Information Repository
CIRUS	CSR Interactive Retrieval and Update System
CIS	Confederation of Independent States
CLIN	Contract Line Item Number
CLNP	Connectionless Network Protocol
CLNS	Connectionless Network Service
CM	Configuration Management
CMA	Context Management
CMCC	Contractor Maintenance Control Center
CMDN	Consolidated Management Data Notification
CMN	Control Motion Noise
CMO	Certificate Management Office
CNS	Consolidated NOTAM System/Communications Navigation and Surveillance
CNSP	Consolidated NOTAM System Processor
CO	Central Office
CO	Contracting Officer
COCESNA	Corporacion Centroamericana de Servicios de Navegacion Aerea
CODD	Central Office Dispatch Drop
CODEC	Coder/Decoder
COMLO	Compass Locator
COMSEC	Communications Security
CONS	Connection Oriented Network Service
CONUS	Continental, Contiguous, or Conterminous United States
COPS	CORN Order Processing System
CORN	Computer Resources Nucleus
COTC	Computer Operator Terminal Console
COTR	Contracting Officer's Technical Representative
COTS	Commercial Off-the-Shelf/Connection Oriented Transport Service

CPDLC	Controller-Pilot Data Link Communications
CPDSS	Covered Position Decision Support Subsystem
CPE	Customer Premise Equipment
CPM	Consolidated Project Master
CPMIS	Consolidated Personnel Management Information System
CPU	Central Processing Unit/Control Processor Unit
CRF	Central Repair Facility
CRT	Cathode Ray Tube
CRU	Circuit Routing Unit
CSMA/CD	Carrier Sense Multiple Access/Collision Detection
CSP	Communications Service Provider
CSR	Communications Service Request
CSU	Channel Service Unit
CTAS	Center/TRACON Automation System
CTR	Center
CTS	Coded Time Source
CUPS	Consolidated Uniform Payroll System
CVRS	Computerized Voice Reservation System
CWA	Central Weather Advisory
CWP	Central Weather Processor
CWPWS	Central Weather Processor Work Station
CWSU	Center Weather Service Unit
CY	Calendar Year

D

D/L	Data Link
DA	Direct Access
DA	Descent Advisor
DACS	Digital Access and Cross-Connect System
DAFIS	Departmental Accounting Financial Information System
DAMA	Demand Assigned Multiple Access
DAMIS	Drug and Alcohol Abatement Management Information System
DAR	Designated Airworthiness Representative
DARC	Direct Access Radar Channel
DAS	Designated Alternation Station
DASI	Digital Altimeter Setting Indicator
DASR	Digital Airport Surveillance Radar
DATIS	Digital Automated Terminal Information System
DB	Database
dB	Decibel
DBMS	Database Management System
DBRITE	Digital Bright Radar Indicator Tower Equipment
DC	Direct Current
DCC	Display Channel Complex
DCE	Data Circuit-Terminating Equipment
DCT	Detached Console Training
DDC	LINCS Direct Digital Connectivity
DDD	Direct Distance Dialing
DDN	Defense Data Network
DELPHI	Department of Transportation's Financial Management Systems
DEMARC	Demarcation point between carrier equipment and user equipment
DEN	Denver TRACON
DER	Designated Engineering Representative
DES	Data Encryption System
DEWIZ	Distant Early Warning Identification Zone
DF	Direction Finder
DF	Display Function
DFI	Direction Finding Indicator
DFU	Display Function Unit
DFW	Dallas/Ft Worth TRACON
DIP	Drop-and-Insert Point
DITCO	Defense Information Technology Contracting Office
DL	Distance Learning
DLAP	Data Link Applications Processor
DLIS	Defense Logistics Information System
DLP	Data Link Processor
DM	Data Multiplexer
DMA	Defense Mapping Agency
DMAAC	Defense Mapping Agency Aerospace Center
DMANMS	Data Multiplex Automatic Network Management Subsystem
DME	Distance Measuring Equipment
DME/N	Distance Measuring Equipment/Narrow Spectrum
DME/P	Precision Distance Measuring Equipment
DMIR	Designated Manufacturing Inspection Representative
DMIS	Directives Management Information System
DMN	Data Multiplexing Network
DMS	Designees Management Subsystem

DNA	Digital Network Architecture
DOD	Department of Defense
DOS	Department of State
DOT	Department of Transportation
DOTS	Dynamic Ocean Tracking System
DPS	Data Processing System
DPU	Data Processing Unit
DRR	Deployment Readiness Review
DSC	Digital Scan Converter
DSC	Diverse Switching Capability
DSN	Defense Switched Network
DSP	Digital Signal Processor/Departure Sequencing Program
DSR	Display System Replacement
DSRCE	Down-scoped Radio Control Equipment
DSS	Data System Staff/Documentation Support System
DSS	Decision Support System
DSU	Data Service Unit
DT&E	Development, Test and Evaluation
DTDM	Deterministic Time Division Multiplexing
DTE	Data Terminal Equipment
DTL	Direct-to-Line
DTMF	Dual-tone Multi-Frequency
DTS	Dedicated Transmission Service
DUATS	Direct User Access Terminal Service
DVC	DBRITE Video Compression
DVFR	Defense Visual Flight Rules
DVOR	Doppler Very High Frequency Omnidirectional Range
DVR	Discrete VHF Radio
DW	Data Warehouse
DYSIM	Dynamic Simulation

E

EARTS	En Route Automated Radar Tracking System
EBCDIC	Extended Binary Coded Decimal Interchange Code
ECARWG	East Caribbean Working Group
ECS	Electronic Certification Services
ECS	Emergency Communications Systems
EDARC	Enhanced Direct Access Radar Channel
EDCT	Estimated Departure Clearance Time
EDI	Electronic Data Interchange
EDP	Expedite Departure Path
EDS	Electronic Data Systems
EDS	Electronic Documentation System
EEM	Electronic Equipment Modification
EFAS	En Route Flight Advisory Service
EGATS	Electronically Generated and Transmitted SF52 System
EIA	Electronic Industry Association
EIS	Enforcement Information System
EIS	Executive Information System
EL	Elevation
ELM	Extended Length Messages
ELT	Emergency Locator Transmitter
EMC	Electromagnetic Compatibility
EMERS	Energy Management and Reporting System
EMI	Electromagnetic Interface
EMP	Electromagnetic Pulse
EMPS	En Route Maintenance Processor Subsystem
EOF	Emergency Operations Facility
EPS	Engineering Performance Standard
ER	Extended Range
ERAS	En Route Automation System
ERDAS	Eastern Region Daily Alert System
ERM	En Route Metering
ES	Earth Station, End Systems
ESMMC	Enhanced System Maintenance Monitor Console
ESS	Electronic Switching System
ESV	Expanded Service Volume
ETABS	Electronic Tabular Display System
ETAMS	Electronic Time and Attendance Management System
ETG	Enhanced Target Generator
ETMCC	Enhanced Traffic Management Computer Complex
ETMS	Enhanced Traffic Management System
ETVS	Enhanced Terminal Voice Switch
EUL	End User Location
EXCOM	Executive Committee

F

F&E	Facilities and Equipment
FE&D	Facilities, Engineering, and Development
FA	Final Approach
FAA	Federal Aviation Administration
FAAA	FAA Academy
FAAAC	FAA Aeronautical Center
FAACIS	FAA Communications Information System
FAACNET	FAA Collaborative Network
FAAHQ	FAA Headquarters

FAALC	FAA Logistics Center
FAALS	FAA Logistics System
FAATC	FAA Technical Center, Atlantic City, NJ
FAATSAT	FAA Telecommunications Satellite System
FACSFAC	Fleet Area Control and Surveillance Facility
FANS	Future Air Navigation Systems
FAR	Federal Aviation Regulation
FASMT	Federal Air Surgeon Management Team
FAST	Final Approach Spacing Tool
FAT	First Article Test
Fax	Facsimile
FBO	Fixed Based Operator
FBWTG	FAA Bulk Weather Telecommunications Gateway
FCPU	Facility Central Processing Unit
FD	Fault Detection
FDAD	Full Digital ARTS Display
FDC	Flight Data Center
FDDI	Fiber Data Distribution Interface
FDE	Flight Data Entry
FDEP	Flight Data Entry and Printout
FDIO	Flight Data Input/Output
FDM	Frequency Division Multiplexer
FDP	Flight Data Processing
FED	Federal
FED-STD	Federal Standard
FEP	Front end Processor
FFM	Far Field Monitor
FI	Fault Isolation
FIAO	Flight Inspection Area Office
FICS-21	FAA Integrated Communications System for the 21st Century
FIFO	Flight Inspection Field Office
FIPS PUB	Federal Information Processing Standard Publication
FIR	Flight Information Region
FIRMR	Federal Information Resources Management Regulation
FIRS	Facility Information Reporting System
FIS	Flight Information Service
FL	Flight Level
FLAPS	FAA LINCS Automated Pricing System
FM	Frequency Modulation
FMIS	Facility Management System
FMS	Flight Management System
FOC	Full Operating Capability
FOIA	Freedom of Information Tracking System
FOMS	FAA-Owned Microwave
FOS	Family of Services
FP	Flight Plan
FPCM	Financial Planning and Control Module
FPS	Military Primary Radar
FRP	Federal Radio Navigation Plan
FRS	Frame Relay System
FS	Flight Service
FSAS	Flight Service Automation System
FSCM	Federal Supply Code for Manufacturers
FSDO	Flight Standards District Office
FSDPS	Flight Service Data Processing System
FSEP	Facilities, Services, and Equipment Profiles
FSIS	Flight Standards Information Systems
FSM	Federal Security Manager
FSP	Financial Systems Program
FSP	Flight Strip Printer
FSS	Flight Service Station
FSTN	Federal Secure Telephone Network
FSTS	Federal Secure Telephone System
FT-1	Fractional T-1, less than 1.544 Mbps
FTA	Terminal Forecast
FTS	Federal Telephone System
FVS	Functional Verification System
FWCS	Flight Watch Control Station
FX	Foreign Exchange
FY	Fiscal Year

G

G/A	Ground-to-Air
G/G	Ground-to-Ground
GA	General Aviation
GASP	General Aviation Safety Panel
GB	Gigabyte
GCS	Geostationary Communication Segment
GDC	Global Data Center
GEM	General Edit Module
GEO	Geosynchronous Earth Orbit
GES	Ground Earth Station
GES	Ground Entry Station
GETS	Government Emergency Telephone Service
GFE	Government-furnished Equipment

GGDC	Ground to Ground Data Communications
GHz	GigaHertz
GIB	Ground Integrity Broadcast
GIM	General Information Message
GIS	Geographical Information System
GMCC	GNAS Maintenance Control Center
GMT	Greenwich Mean Time
GNAS	General NAS Sector Office/General National Airspace System
GOES	Geostationary Operational Environmental Satellite
GOMEX/CNS	Gulf of Mexico/Communication Navigation Surveillance
GOSIP	Government Open Systems Interconnection Profile
GPO/GPI	General Purpose Output/General Purpose Input
GPRA	Government Performance and Results Act
GPS	Global Positioning Satellite
GREPECAS	Caribbean/South American Air Navigation Planning and Implementation Regional Group
GS	Glide Slope
GSA	General Services Administration
GSD	Geographic Situation Display
GTS	Global Telecommunications Services
GUI	Graphic User Interface
GUS	GEO Uplink Subsystem
GWCA	Graphical Weather Compression Algorithm
GWDS	Graphic Weather Display System
GWS	Graphical Weather Service

H

HARS	High Altitude Reporting System
HASP	Houston Automatic Spooling Program
HCDS	High Capacity Digital Service
HCI	Human-computer interface
HCS	Host Computer System
HDL	Host Data Link
HDLC	High Level Data Link Control
HDN	Headquarters Data Network
HDR	Hardware Discrepancy Report
HEMP	High-altitude Electromagnetic Pulse
HF	High Frequency
HFDL	High Frequency Data Link
HF/SSB	High Frequency/Single Sideband
HH	Homing Radio Beacon-High Power
HID	Host Interface Device
HI-EFAS	High-Altitude En Route Flight Advisory Service
HIP	High-resolution Image Processing System
HIWAS	Hazardous In-flight Weather Advisory Service
HOST	Host Computer System
HP	Hewlett Packard
HPDC	High Performance Data Conditioning
HNL	HID/NAS LAN
HQ	Headquarters
HR	Human Resource
HSTDM	High-Speed Time Division Multiplexer
HUD	Head-up Display
HVAC	Heating, Ventilating, and Air Conditioning
Hz	Hertz
HZW	Hazardous Weather Area Outline

I

I/F	Interface
I/O	Input/Output
IA	Indirect Access
IA	Interagency Agreement
IACL	Intercaribbean Aeronautical Communications LTD
IAD	Dulles International Airport
IAIDS	Improved Accident Incident Database System
IAO	Instrument Flight Rules Area Outline
IAP	Internet Access Point
IAPA	Instrument Approach Procedures Automation
IC	Implementation Center
IC	Initial Contact
IC	Intercom
ICAO	International Civil Aviation Organization
ICC	Individual Control Cabinet
ICD	Interface Control Document
ICMLS	Interim Contractor Maintenance Logistics Support
ICMP	Internet Control Message Protocol
ICP	Initial Conflict Probe
ICS	Interfacility Communications System
ICSS	Integrated Communication Switching System
ICWG	Interface Control Working Group
IDCU	Information Display and Control Unit

IDIQ	Indefinite Delivery Indefinite Quantity
IDNX	Integrated Digital Network Exchange
IDS	Information Display System
IEEE	Institute of Electrical and Electronic Engineers
IFCN	Interfacility Flow Control Network
IFCN	Interfacility Communications Network
IFM	Integrated Flow Management
IFMS	Integrated Financial Management System
IFO	International Field Office
IFQA	Integrated Flight Quality Assurance
IFR	Instrument Flight Rules
IFSS	International Flight Service Station
IGIA	Interagency Group on International Aviation
IGWDS	Interim Graphic Weather Display System
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
IMCS	Interim Maintenance and Control Software
IMM	Integrated Material Management
IMS	International Mobile Service
INMARSAT	International Maritime Satellite
INTELSAT	International Telecommunications Satellite Consortium
IOC	Initial Operating Capability
IOT	Input-Output Terminal
IOT&E	Initial Operational Test & Evaluation
IP	Interphone/Internet Protocol
IPS	Internet Packet Exchange
IPPS	Integrated Personnel and Payroll System
IPT	Integrated Product Team
IPX	Internet Packet Exchange
IRD	Integrated Receiver Decoder
IRD	Interface Requirements Document
IRP	Individual Radar Processor
IS	Intermediate System
ISC	Integrated Services Contractor
ISD	Interim Situation Display
ISDN	Integrated Services Digital Network
ISIS	Integrated Safety Information Subsystem
ISO	International Organization for Standards
ISP	Internet Service Provider
ISSS	Initial Sector Suite System
IT	Information Technology
ITS	International Telecommunications Systems
ITU	International Telecommunications Union
ITWS	Integrated Terminal Weather System
IVT	Interactive Video Teletraining
IWAAS	Initial WAAS

J

JAWOP	Joint Automated Weather Observation Program
JAWS	Joint Airport Weather Studies
JCAB	Japanese Civil Aviation Bureau
JRPG	Joint Radar Planning Group
JSPO	Joint Special Project Office
JSS	Joint Surveillance System
JTA	Job Task Analysis

K

K	Thousand
KAWN	"K" Aviation Weather Network
kb	Kilobyte
kbps	Kilobits per second
KDP	Key Decision Point
KHz	KiloHertz
Km	Kilometer
KVA	Kilovoltampere
KVM	Kilovolt-meter
KW	Kilowatt
KWh	Kilowatt-hour

L

LABS	Leased A/B System
LAD	Lighting Activity Data
LAM	LORAN C Aviation Monitor
LAN	Local Area Network
LAPB	Link Access Protocol B
LAT/LON	Latitude/Longitude
LATA	Local Access Transport Area
LCC	Life Cycle Cost
LCF	Local Control Facility
LCFF	LORAN C Flight Following
LCN	Local Communications Network
LCU	Link Control Unit
LDA	Localizer Directional Approach Aid
LDD	Lightning Detection Data
LDIN	Lead-In Lighting System
LDOCF	Long Distance Operational Control Facility
LDRCL	Low Density Radio Communications Link

LDS	Labor Distribution System
LEC	Local Exchange Carrier
LF	Low Frequency
LHA	Lamp Housing Assembly
LIA	Link Interface Adapter
LIDD	Level I Design Document
LINCS	Leased Interfacility NAS Communications Systems
LIS	Logistics and Inventory System/Logistics Information System
LIU	LCN Interface Unit
LL	Lincoln Laboratories
LLWAS	Low Level Wind Shear Alert System
LMIS	Logistic Management Information System
LMMC	Local Maintenance Monitor and Control
LOA	Letter of Agreement
LOC	Localizer
LORAN	Long Range Aid to Navigation
LOS	Line of Sight Microwave Link
LPDME	Low Power Distance Measuring Equipment
LQA	Link Quality Analysis
LRC	Longitudinal Redundancy Check
LRIP	Low Rate of Initial Production
LRR	Long Range Radar
LRS	Legal Recording System
LRU	Line Replaceable Unit

M

M&OS	Maintenance and Operations Support
MAN	Metropolitan Area Network
M/S	Main/Standby
M1FC	Model One Full Capacity (FSAS, Stage 2)
MAE	MIDO Automation Effort
MALS	Medium-intensity Approach Lighting System
MALSR	Medium-intensity Approach Lighting System with Runway Alignment Indicator Lights
MAMS	Military Airspace Management System
MAP	Maintenance Automation Processor
MAR	Minimally Attended Radar
MASS	Maintenance Automation System Software
MAU	Media Access Unit
MAX	Maximum
MB	Marker Beacon
MBO	Military Base Operation
MBO	Military Base Operator
Mbps	Megabits per second
MCAFS	Mobile Communications for Airways Facilities Specialists
MCC	Maintenance Control Center
MCCW	Monitor and Control Console Workstation
MCE	Monitor and Control Equipment/Management Control Equipment
MCF`	Metroplex Control Facility
MCS	Maintenance Control Software/Maintenance Control System/Monitor and Control Software
MCU	Multiple Control Unit
MCV	Mobile Communications Van
MDCRS	Meteorological Data Collection and Reporting Service
MDFM	Material Delivery Forecast Module
MDS	Multiple Dimension Database
MDT	Maintenance Data Terminal/Mean Down Time
MEA	Minimum En Route Altitude
METAR	Aviation Routine Weather Report
MEVA	Mejoras al Enlace de Voz del ATS
MFD	Multifunction Display
MHz	MegaHertz
MICNET	MLS Intercommunications Network
Micro-EARTS	Microprocessor En Route Automated Radar Tracking System
MIDO	Manufacturing Inspection District Office
MIL	Military
MIMIS	Manufacturing Inspection Management Information System
MIP	Million Instruction Per Second
MIR	Management Information Reporting
MIS	Meteorological Impact Statement
MIST	Microburst and Severe Thunderstorm
MIT	Massachusetts Institute of Technology
MLDT	Metering List Display Terminal
MLF	Medium Low Frequency
MLS	Microwave Landing System
mm	Millimeter
MMAC	Mike Monroney Aeronautical Center
MMC	Maintenance Monitor Console
MMELS	Master Minimum Equipment List Subsystem

MMI	Man/Machine Interface
MMS	Maintenance Management System
MNPS	Minimum Navigation Performance Standards
MNS	Mission Needs Statement
Mode C	Altitude Reporting Mode of Secondary Radar
Mode S	Mode Select Beacon Sensor System
Model 1	FSAS, Stage One
Modem	Modulator-demodulator
MOPS	Minimum Operational Performance Standard
MDS	Master Demarcation System
MDT	Harrisburg, PA
MOS	Military Operations Specialist
MOT	Maintenance Operators Terminal
MPS	Maintenance Processor Subsystem
MPSEN	Maintenance Processor Subsystem Executive Node
MR	Manual Report
MRB	Martinsburg, WV
MRTI	Microprocessor-controlled Radio Telephone Interface
MRTI	Mobile Radio Telephone Interconnect
MRU	Military Radar Unit
MSA	Major System Acquisition
MSL	Mean Sea Level
MSN	Message Switching Network
MSSR	Monopulse Secondary Surveillance Radar
MST	Mean Switchover Time
MTBCF	Mean Time Between Catastrophic Failures
MTBF	Mean Time Between Failures
MTBMA	Mean Time Between Maintenance Actions
MTBO	Mean Time Between Outages
MTD	Moving Target Detector
MTI	Moving Target Indicator
MTTR	Mean Time To Repair
MUX	Multiplexer
MVFR	Marginal Visual Flight Rules
MWARA	Major World Air Route Area
MWP	Meteorologist Weather Processor

N

N/A	Not Applicable
N/L	Navigation and Landing
NACCS	National Automated Credit Card System
NADIN	National Airspace Data Interchange Network
NAFTA	North Atlantic Free Trade Agreement
NAGIS	National Airport Grants Information System
NAILS	National Airspace Integrated Logistics Support
NAPRS	National Airspace Performance Reporting System
NAR	National Airspace Review
NARACS	National Radio Communications System
NARIS	National Aircraft Registration Information Subsystem
NAS	National Airspace System
NASA	National Aeronautical and Space Administration
NASNET	National Airspace System Network
NASP	National Airport System Plan
NASPAS	National Airspace System Performance Analysis System
NASSRS	NAS System Requirements Specification
NAST21	NAS Telecommunications for the 21st Century
NATS	National Automated Travel System
NATSPG	North Atlantic Systems Planning Group
NAV	Navigation
NAVAID	Navigational Aid
NAVSTAR	Global Positioning System Code Name
NAWP	National Aviation Weather Processing
NAWPF	National Aviation Weather Processing Facility
NBP	New Bedford Panoramex
NBS	National Bureau of Standards
NCA	National Command Authority
NCC	Network Control Center
NCDB	Network Configuration Data Base
NCEP	National Center for Environmental Prediction
NCP	NAS Change Proposal
NCP	Network Control Point
NCS	National Communications Systems
NCT	Northern California TRACON
NDB	Non-directional Beacon
NDBC	National Data Buoy Center
NDI	Non-developmental Items

NEOF	National Emergency Operations Facility
NESDIS	National Environmental Satellite Data and Information Service
NESS	National Environmental Satellite Service
NEXCOM	Next Generation Air-to-Ground
NEXRAD	Next Generation Weather Radar
NFDC	National Flight Data Center
NFDD	National Flight Data Digest
NFIS	NAS Facilities Information System
NFSS	National Field Support System
NFU	NWS Filter Unit
NG/AG	Next Generation/Air Ground
NI	Network Interface
NICS	NAS Interfacility Communications System
NIMAAC	National Imagery and Mapping Agency Aerospace Center
NIMS	NAS Infrastructure Management System
NISC	NAS Implementation Support Contractor
NIST	National Institute of Standards and Technology
NLDN	National Lighting Detection Network
NM/nmi	Nautical Mile
NMC	Network Management Center
NMC	Network and Management Control
NMC	National Meteorological Center
NMCC	National Maintenance Coordination Center
NMCC	Network Management and Control Center
NMCE	Network Monitor and Control Equipment
NMCS	Network Monitoring and Controlling System
NME	Network Management Equipment
NMO&C	Network Management Operations, and Control Facility
NMPS	National MPS
NMS	Network Management System
NNCC	National Network Control Center
NPG	National Program Guidelines
NOAA	National Oceanic and Atmospheric Administration
NOCCs	National Operations Control Centers
NOM	NAS Operations Manager
NONUSFAC	Non US ATC Facility
NOPAC	North Pacific
NOPSS	National Operations Specification Subsystem
NORAD	North American Aerospace Defense Command
NOS	National Ocean Service
NOTAM	Notice to Airmen
NOTAM D	Notice to Airmen(Distant)
NOTAM L	Notice to Airmen(Local)
NOVA	DAFIS Natural On-Line Visual Architecture
NPIAS	National Plan of Integrated Airport Systems
NPPS	New Personnel and Payroll System
NPR	National Performance Review
NPTR	National Program Tracking and Reporting Subsystem
NRC	Non-recurring Costs
NRCS	National Radio Communications System
NRM	Normal Response Mode
NS	Nanosecond
NSF	National Science Foundation
NSM	Network System Manager
NSOC	NAS Support Operations Center
NSP	National Simulator Program
NSSF	NAS Simulation Support Facility
NSSFC	National Severe Storms Forecast Center
NSTB	National Satellite Test Bed
NTIA	National Telecommunications Information Agency
NTSB	National Transportation Safety Board
NVIS	National Vital Information Subsystem
NWID	NWSTG WMSCR Interface Device
NWS	National Weather Service
NWSTG	National Weather Service Telecommunications Gateway

O

O&M	Operations and Maintenance
OADS	Oceanic Automatic Dependent Surveillance
OAP	Oceanic Automation Program
OAS	Oceanic Automation System
OASIS	On-line Aviation Safety Inspection System
OASIS	Operational and Supportability Implementation System
OCC	Operational Command Center
OCC(s)	Operational Control Center(s)

OCS	ODAPS Communications System
OCS	Offshore Computer System
ODALS	Omnidirectional Airport Lighting System
ODAPS	Oceanic Display and Planning System
ODF	Oceanic Development Facility
ODL	Oceanic Data Link
ODMS	Operational Data Management System
OE/AAA	Obstruction Evaluation/Airport Airspace Analysis
OFDPS	Offshore Flight Data Processing System
OID	Operator Input Device
OIRIS	Overall Integrated Resource Information Subsystem
OLAP	On-line Analytical Program
OLPT	On-line Transaction Processing
OM	Outer Marker
OMT	Operator Maintenance Terminal
OPS	Operations
OPSNET	Operations Network
OPSS	Operations Specification System
PX	Off-premise Extensions
ORD	Operational Readiness Demonstration
ORD	Operational Requirements Document
OSF	Operational Support Facility
OSI	Open Systems Interconnection
OSO	Office of System Operations
OSTS	Operational Support Telephone System
OT&E	Operational Test and Evaluation
OTA	Oceanic Tracking Advisory
OTH	Over the Horizon
OTMS	Oceanic Traffic Management System
OTPS	Oceanic Traffic Planning System
OTRS	Ocean Traffic Reporting System

P

P3I	Pre-planned Product Improvement
PA	Proxy Agent
PABX	Private Automated Branch Exchange
PAD	Packet Assembler Disassembler
PAM	Peripheral Adapter Module
PAMA	Permanently Assigned Multiple Access
PAMRI	Peripheral Adapter Module Replacement Item
PAPI	Precision Approach Path Indicator
PAS	Procurement Automated System
PATWAS	Pilots Automatic Telephone Weather Answering Service
PBX	Private Branch Exchange
PC	Personal Computer
PC/PAD	Protocol Converter/Packet Assembler/Disassembler
PCA	Power and Control Assembly
POM	Pre-defined Controller Message
PCS	Permanent Change of Station
PCT	Personnel Certification and Training
PCU	Printer Control Unit
PDC	Program Description Code/Pre-departure Clearance
PDN	Public Data Network
PDS	Packet Data Switch
PENS	Performance Enhancement System
PFC	Passenger Facility Charges
PFE	Path Following Error
PG	Product Generator
PIDP	Programmable Indicator Data Processor
PIP	Project Implementation Plan
PIR	Portable ILS Receiver
PIREP	Pilot Report
PLC	Programmable Logic Controllers
PMDT	Portable Maintenance Data Terminal
POSAT	Polar Orbit Satellite
PPI	Planned Product Improvement
PPIMS	Personal Property Information Management System
PPIUMS	Personal Property In Use Management System
PPP	Point-to-Point Protocol
PRM	Personnel Resource Module
PRM	Precision Runway Monitor
PRN	Pseudo-Random Noise
PS	Policy Subsystem
PSF	Programming Support Facility
PSN	Packet Switched Network
PSR	Primary Surveillance Radar
PSS	Packet Switched Services
PSTN	Public Switched Telephone Network
PTN	Public Telephone Network
PTR	Program Technical Report
PTT	Push-to-Talk
PUP	Principal User Processor
PVC	Permanent Virtual Circuit
PVD	Plan View Display
PYT	Payroll Technician

R

R&D	Research and Development

R&M	Reliability & Maintainability
RADS	Radar Alphanumeric Display System
RAIL	Runway Alignment Indicator Lights
RANK	Replacement Alphanumeric Keyboard
RAPCON	Radar Approach Control
RATCF	Radar Air Traffic Control Facility
RBCS	Remote Center Air/Ground Communications Facility Buoy Communications System
RBDT	Ribbon Display Terminal
RCAG	Remote Center Air/Ground Communications Facility
RCCC	Regional Communications Control Center
RCDR	Recorder
RCE	Radio Control Equipment
RCF	Remote Communications Facility
RCIU	Radar Communications Interface Unit
RCIU	Remote Control Interface Unit
RCL	Radio Communications Link
RCMS	Runway Configuration Management System
RCO	Remote Communications Outlet
RCOM	NAS Recovery Communications
RCP	Remote Control Panel
RCR	Routing and Circuit Restoral System
RCS	Resident Contractor System
RCSU	Remote Control and Status Unit
RCU	Remote Control Units
RDA	Radar Data Acquisition
RDARA	Regional and Domestic Air Route Area
RDAT	Radar Data
RDCC	Research & Development Computer Complex
RDL	Research & Development Laboratory
RDP	Radar Data Processing
RDVS	Rapid Deployment Voice Switch
RE	Recording Equipment
REC	Remote Electronics Chassis
R,E&D	Research, Engineering and Development
REIL	Runway End Identification Lights
RF	Radio Frequency
RFI	Radio Frequency Interference
RFP	Request for Proposal
RFSP(E)	Remote Flight Strip Printer (En Route)
RFSP(T)	Remote Flight Strip Printer (Terminal)
RGMS	Regional Grant Management System
RICE	Remote Indicator and Control Equipment
RID	Review Item Discrepancy
RJE	Remote Job Entry
RL	Radio Link
RLIM	Runway Light Intensity Monitor
RMA	Reliability, Maintainability and Availability
RMC-C	Remote Monitor and Control - Work Center
RMC-F	Remote Monitor and Control Equipment-flight Service Station
RMF	Remote Monitoring Function
RML	Radar Microwave Link
RMM	Remote Maintenance Monitoring
RMMC	Remote Maintenance Monitor and Control Unit
RMMS	Remote Maintenance Monitoring System
RMP	Radar Mosaic Processor
RMS	Remote Monitoring Subsystem
RMSC	Remote Monitoring Subsystem Concentrator
RMVC	Remote Maintenance VORTAC Concentrator
RNAV	Area Navigation
RNP	Required Navigation Performance
RO	Regional Office
ROC	Regional Operations Center
ROS	Remote Operating System
RPG	Radar Products Generator
RPMS	Regional Project Management System
RRCS	Remote Radio Control System
RRWDS	Radar Remote Weather Display System
RSCE	Remote Status Communications Equipment
RSIU	Remote Status and Interlock Unit
RSPC	Remote Serial PC
RTCA	Radio Technical Commission for Aeronautics
RTIS	Resource Tracking Information System
RTN	Return-to-Normal
RTP	Regional Tracking Program
RTR	Remote Transmitter/Receiver
RTRD	Remote Tower Radio Display
RTS	Resource Tracking System
RTU	Remote Terminal Unit
RTZ	Return to Zero

RUC	Rapid Update Cycle
RVR	Runway Visual Range
RVV	Runway Visibility Value
RWP	Real-time Weather Processor
R/W	Runway
RX	Receive/Receiver

S

S/N	Signal-to-Noise
SA	Semi-automated
SAIDS	System Atlanta Information Display System
SAM	System Area Monitor
SAM	System for Acquisition Management Program
SAMS	Special Use Airspace Management System
SAO	Surface Aviation Observation
SAR	System Analysis Recorder
SARMS	Small Airport RMS
SARPS	Standards and Recommended Practices
SATCOM	Satellite Communications
SC	Service Category
SCAT	Staffing and Cost Analysis Tool
SCATANA	Security Control of Air Traffic and Air Navigation Aids
SCIP	Surveillance and Communication Interface Processor
SCR	System Change Request
SCSC	STARTS Central Support Complex
SD	Situation Display
SDIS	Switched Digital Integrated Service
SDLC	Synchronous Data Link Control
SDM	Snow Depth Monitor
SDP	Service Delivery Point
SDR	Site Data Report
SDR	Service Difficulty Reporting
SDS	Surveillance Data Selector
SDT	Surveillance Data Translator
SE&D	System Engineering & Design
SEI	System Engineering and Integration
SEIC	System Engineering and Integration Contractor
Service A	Weather Data
Service B	Flight Plan Data
SET	System Embedded Training
SFO	Sector Field Office Number
SGV	Second Generation VORTAC
SIAP	Standard Instrument Approach Procedure
SICASP	Secondary Improvement and Collision Avoidance Systems Panel
SIE	Sensor Interface Electronics
SIESS	Simulator Inventory and Evaluation Scheduling Subsystem
SIGMET	Significant Meteorological Information
SIRS	Security Information Reference System
SITA	Societe International de Telecommunications Aeronautique
SLO	Security Liaison Office
SLS	System Level Specification
SMA	Surface Movement Advisor
SMC	System Management Center
SMCC	System Monitoring and Coordination Center
SMF	Surface Measurements Facility
SMMC	System Maintenance Monitor Console
SMO	System Maintenance Office
SMS	Netrix Security Management System
SMT	System Management Terminal
SNA	Standard Network Architecture
SNR	Signal-to-Noise Ratio
SOC	Service Operational Channels
SOC	Service Operations Center
SOCC	Sector Operations Coordinating Center
SOIT	Satellite Operational Implementation Team
SONET	Synchronous Optical Network
SOW	Statement of Work
SPAS	Safety Performance Analysis Subsystem
SPI	Special Position Identifier
SPS	Standard Positioning Service
SRAP	Sensor Receiver and Processor
SRR	System Requirements Review
SSA	Special Satellite Application (Now FAATSAT)
SSALF	Simplified Short Approach Light Facility
SSALR	Simplified Short Approach Lighting System with Runway Alignment Indicator Lights
SSALS	Simplified Short Approach Light System
SSB	Single Sideband
SSC	System Support Center
SSCC	System Support Computer Complex
SSF	System Support Facility

SSL	System Support Laboratory
SSR	Secondary Surveillance Radar
SSV	Standard Service Volume
STARS	Standard Terminal Automation Replacement System
STATMUX	Statistical Multiplexer
STC	Sensitivity Time Control
STD	Standard
STDM	Statistical Time Division Multiplexing
STEP	Service Test and Evaluation Program
STF	System Test Facility
STT	Staffing to Traffic
STU-II	Secure Telephone Unit II
STU-III	Secure Telephone Unit III
STVS	Small Tower Voice Switch
STVS	Small Terminal Voice Switch
SU	Standby Unit
SUA	Special Use Airspace
SUPS	Suspected Unapproved Parts Subsystem
SVSR	Server
SWIFT	Selections Within Faster Times
SWOP	Severe Weather Operations
SWPR	Satellite Way Point Position Report

T

T-1	T-1 carrier, 24 channels, 1.544 Mbps
T&A	Time and Attendance
T&E	Test and Evaluation
TA	Track Advisory
TAA	Terminal Advanced Automation
TAAS	Terminal Advanced Automation System
TACAN	Tactical Air Navigation
TAMSCO	Technical and Management Services Corporation
TAP	Tower Automation Platform
TAS	Travel accountability System
TATCA	Terminal ATC Automation
TBD	To Be Determined
TC21	NAS Telecommunications for the 21st Century
TCA	Terminal Control Area/Terminal Conflict Alert
TCAS	Traffic Alert and Collision Avoidance System
TCC	Terminal Cluster Concentrators
TCCC	Tower Control Computer Complex
TCE	Tone Control Equipment
TCF	Tower Control Facility
TCOM	Terminal Communications
TCP	Transmission Control Protocol
TCS	TRACON Computer System
TD	Time Difference
TD&D	Technical Data & Documentation
TDL	Terminal Data Link
TDLS	Tower Data Link Services
TDM	Time Division Multiplexer
TDMA	Time Division Multiple Access
TDU	Tower Display Unit
TDWR	Terminal Doppler Weather Radar
TDWs	Tower Display Work Stations
TE	Transmission Equipment
TEC	Test Equipment Tracking and Calibration
TED	Touch Entry Display
TELCO	Telephone Company
TELECOM	Telecommunications Facility
TELMS	Telecommunications Management System
TERMFAC	Terminal Facilities
TERMS	TCCC Equipment for Remote Monitor Site
TERPS	Terminal Instrument Procedures
TFM	Traffic Flow Management
TIBS	Terminal Information Briefing Service
TIDS	Terminal Information Display System
TIMS	Telecommunications Information Management System
TIPT	Telecommunications Integrated Product Team
TIU	TATCA Interface Unit
TLP	Transmission Level Point
TM	Traffic Management
TMA	Traffic Management Advisor
TM&O	Telecommunications Management & Operations
TMC	Traffic Management Coordinator
TMCC	Traffic Management Computer Complex
TMD	Traffic Monitoring Display
TMIS	Training Management Information System
TML	Television Microwave Link
TMP	Traffic Management Processor
TMS	Traffic Management System
TMU	Traffic Management Unit
TMVS	Traffic Management Voice Switch
TNAV	Terminal Navigational Aid Service
TNS-II	Tandem Non-Stop II Computer
TOC	Transfer of Communications

TP	Telecommunication Processor
TPD	Traffic Planning Display
TPDS	Third Party Draft System
TPX	Military Beacon System
TPX-642	Radar Beacon Decoder
TR-ATL	TRACON, Atlanta
TR-NOCAL	TRACON, Northern California
TR-PCT	TRACON, Potomac
TRACAB	Terminal Radar Approach Control in the Tower Cab
TRACON	Terminal Radar Approach Control
TRIMATE	Automated Training Management System
TRMM	Telecommunications Remote Maintenance Monitoring Program
TRR	Text Readiness Review
TSC	DOT Transportation System Center
TSM	Telecommunications Service Management
TSO	Technical Standard Order
TSP	Telecommunications Strategic Plan
TSSC	Technical Support Services Contract
TSSF	Terminal System Support Facility
TSU	Traffic Simulation Unit
TTMA	Terminal Traffic Management Advisor
TTY	Teletype
TVCN	TeleVideo Conference Network
TVSR	Terminal Voice Switch Replacement Program
TW	Tower Workstation
TWDL	Two Way Data Link
TWEB	Transcribed Weather Broadcast
TWIP	Terminal Weather Information for Pilots
TWS	See TDLS
TX	Transmitter
TX-RX	Transmit/Receive

U

UAN	User Access Network
UBI	User Benefits Infrastructure
UDP	User Display Processor
UHF	Ultrahigh Frequency
UPR	User Preferred Routing
UPS	Uninterruptable Power Supply
URET	User Request Evaluation Tool
USAF	United States Air Force
USCG	United States Coast Guard
USCS	US Custom Service
USD	Utilization Screening and Disposition
USFAC	United States Air Traffic Control Facilities
USGS	US Geological Survey
USIST	US International Telecommunications
USNOF	US NOTAM Office
USNS	US NOTAM System
UTC	Coordinated Universal Time

V

VAC	VORTAC Concentrator
VASI	Visual Approach Slope Indicator
VCE	VSCS Console Equipment
VCS	Voice Communications System
VCU	Video Compression Unit
VDF	Direction Finder, VHF
VDL	VHF Digital Link
VDS	Visual Display System
VEARS	VSCS Emergency Access Radio System
VEM	Voucher Examination Module
VERN	VHF Extended Range Network
VF	Voice Frequency
VFR	Visual Flight Rules
VG	Voice Grade
VHF	Very High Frequency
VLF	Very Low Frequency
VMC	Visual Meteorological Conditions
VME	Versa Module Eurocard
VNTSC	Volpe National Transportation Systems Center
VOLMET	High Frequency Broadcast of Meteorological Information
VON	Virtual On Net
VOR	VHF Omnidirectional Range
VOR/DME	Collocated VOR and DME
VORTAC	VHF Omnidirectional Range/Tactical Air Navigation
VOT	VHF Omnidirectional Range Test
VRS	Viewer Response System
VRS	Voice Retrieval System
VTN	Voice Telecommunications Network
VS	Visibility Sensor
VSAT	Very Small Aperture Terminal
VSBP	Voice Switch By-Pass
VSCS	Voice Switching and Control System
VTABS	VSCS Training and Backup Switch
VTC	VORTAC Concentrator
VTCON	VORTAC Concentrator
VTS	FAA Voice Telecommunications Network
VWS	Vertical Wind Shear

W

WAA	WINGS Administrative Assistants
WAAS	Wide-Area Augmentation System
WAFC	World Area Forecast Center
WAFS	World Area Forecast System
WAGPS	Wide-area Global Positioning System
WAN	Wide Area Network
WARP	Weather and Radar Processor
WATS	Wide-Area Telecommunications Service
WC	Work Center
WCP	Weather Communications Processor
WD	Windshear Advisory
WFMU	Weather Fixed Map Unit
WIN	Wide-area Integrity Monitor
WINGS	Workforce Information Next Generation System
WKS	Work Station
WMO	World Meteorological Organization
WMS	Wide-area Master Station
WMSC	Weather Message Switching Center
WMSCR	Weather Message Switching Center Replacement
WRS	Wide-area Reference Station
WS	Work Station
WSA	Wind Shear Alert
WJHTC	William J. Hughes Technical Center
WSM	Wide-area System Monitor
WSP	Weather Systems Processor
WSR	Weather Service Radar
WX	Weather
WXA	Weather and Aeronautical

X

X.25	Interface between data terminal equipment and data circuit terminating equipment for terminals operating in the packet mode on data networks

Z

ZAB	ARTCC at Albuquerque, NM
ZAN	ARTCC at Anchorage, AK
ZAU	ARTCC at Chicago, IL
ZBW	ARTCC at Boston MA
ZDC	ARTCC at Washington, DC
ZDV	ARTCC at Denver, CO
ZFW	ARTCC at Ft. Worth, TX
ZHN	ARTCC at Honolulu, HI
ZHU	ARTCC at Houston, TX
ZID	ARTCC at Indianapolis, IN
ZJX	ARTCC at Jacksonville, FL
ZKC	ARTCC at Kansas City, MO
ZLA	ARTCC at Los Angeles, CA
ZLC	ARTCC at Salt Lake City, UT
ZMA	ARTCC at Miami, FL
ZME	ARTCC at Memphis, TN
ZMP	ARTCC at Minneapolis, MN
ZNY	ARTCC at New York, NY
ZOA	ARTCC at Oakland, CA
ZOB	ARTCC at Cleveland, OH
ZSE	ARTCC at Seattle, WA
ZTL	ARTCC at Atlanta, GA

APPENDIX B
PROGRAM RELATED DETAILS

Acronym	Ch No	Title	CIP/BIIP	Product Lead/PM Tel No./Org.	Point of Contact Tel No./Org.
ACQUIRE	4-01	(FAA) Acquisition Management System (Replaces SAM)	M-08	Jack Rogers 267-7382/ASU-510	Simone Winchester 267-7987/ASU-510
ADAS	7-01	Automated Weather Observing System Data Acquisition System	W-01	Cynthia Schauland 366-5439/AUA-430	Jerry Kranz 366-4196/OTS
ADL	2-01	Aeronautical Data Link	C-20	James H. Williams 267-9562/AND-720	Doris Rinkus 493-4706/AND-720
ADTN 2000	2-02	FAA Agency Data Telecommunications Network 2000	C-BIIP 982001	Doug Kay 493-5955/AOP-500	Gil Carlson 479-6915
AFCIMS	4-02	Airway Facilities Corporate Information Management System	M-05 M-26	Rick Ford 267-8970/AF-60	Mike Kruger 493-4068/AF-60
ALSF-2	5-01	High Intensity Approach Lighting System w/Sequenced Flashing Lights	N-04	Manuel Vega 267-7795/AND-740	Fred Scheeren 488-9740 x125/SRC
AMASS	6-01	Airport Movement Area Safety System	S-01	Maria Tavenner 267-9653/AND-410	Jack Lisiecki 267-9522/AND-410
ANICS	2-04	Alaskan NAS Interfacility Communications System	C-17	Mel Banks 493-5931/AOP-500	same
ARP	4-03	Office of Airport System	M-BIIP 982002	Tim Booth 267-8796/ARP-10	same
ASR-11	6-02	Digital Airport Surveillance Radar	S-03	Kimberly Gill 267-7836/AND-440	Nelson Barber 267-9453/AND-440
ATCBI-6	6-03	Air Traffic Control Beacon Interrogator – 6	S-02	Wayne Sutler 267-7491/AND-450	Vince Chu 267-5380/AND-450
ATCFTM	3-01	(DOD/FAA) Air Traffic Control Facility Transfer Modernization	F-04	Nancy Hurmence 267-3903/ANS-500	same
ATCSCC	3-02	Air Traffic Control System Command Center	BIIP-982003	Tim Grovac 703-904-4402/ATO-200	same
ATOMS	4-04	Air Traffic Operations Management Systems	M-29	Larry Silvious 267-3029/ATX-400	Diana L. Jones 267-8294/ATX-400
AVR	1-04	Regulation and Certification Information System	A-17, A-18, A-19, A-20	Clint Turnipseed 405-954-7065/AFS-650	Clint Turnipseed 405-954-7065/AFS-650
AWOS/ ASOS	7-02	Automated Weather Observing System/Automated Surface Observing System	W-01	Cynthia Schauland 366-5439/AUA-430	Jerry Krantz 366-4196/OTS
BUEC	2-05	Backup Emergency Communications	C-09	Dieter Thigpen 493-4822/AND-340	Ed Wilhelm 301-577-3200 x239
BWM	1-05	Bandwidth Manager	A-BIIP 981004	Derek Bigelow 493-5950/TIPT	Hong Soi Cho 301-577-3200 x223
CAEG	3-03	Computer Aided Engineering Graphics	F-17	Steve Kalabokes 267-7411/ANS-110	John Gellios 646-5436/ANS-110
CAPSTONE	1-03	Air Traffic Management Systems	M-36	Patrick Poe 907-271-5645/AAL-1	Randy Kuehler 907-271-1375
CFE	2-06	Communications Facility Expansion	C-06	George O'Neill 493-4821/AND-340	Steve McMahon 479-4832 x237
DBRITE/ DVC	1-06	Digital Bright Radar Indicator Tower Equipment Video Compression	A-13	Malcom Andrews 264-3565/AUA-320	Chuck Toomer 314-1320/TRW
DELPHI	4-05	Departmental Accounting Financial Information System	M-BIIP 982006	Keith Burlison 405-954-0763/AMI-500	same
DL	4-06	Distance Learning	M-10	Linda Fennell 405-954-6323/AMA-300	same
DMN-III	2-07	Data Multiplexing Network Phase III	C-11	Derek Bigelow 493-5950/TIPT	Arthur Smith 863-7352
DVTS	4-07	Digital Video Teleconferencing System	M-BIIP 981007	Dani Levenson 267-9973/AIT-300	same
ENET	4-08	ENET (Enterprise Network) Internet Telecommunications Services	M-BIIP 991015	Melody Hamilton 493-4544/AIT-300	Alan Hayes 267.7357

Acronym	Ch No	Title	CIP/BIIP	Product Lead/PM Tel No./Org.	Point of Contact Tel No./Org.
ERAP	1-07	En Route Automation Program	A-01	Nancy Chapman 493-0027/AUA-200	Gary Burke (202) 366-4614
FAA Skylinks	2-03	FAA Skylinks (Aeronautical Mobile Communication System)	C-24	Mel Banks 493-5931/AOP-500	John L. Thomas 554-1680
FAATSAT	2-08	FAA Telecommunications Satellite System	C-15	Mike Sullivan 493-5956/AOP-400	Terry Makinen 314-5935
FFP1	1-02	Free Flight Phase 1	A-05	Robert Voss AOZ-2/220-3300	same
FOMS	2-09	FAA Owned-Microwave System	C-12	Tom Loftus 493-5952/AOP-400	Ray Wagaman 863-8260
FSAS	1-08	Flight Service Automation System	A-07	Rudolph Watkins 366-4751/AUA-420	Alfred Moosakhanian 493-0043/AUA-420
FSP	4-09	Financial Systems Program	M-BIIP 991017	Tim Lawler 267-9778/ABA-20	Gary Brill 267-8942
FTI	2-10	FAA telecommunications Infrastructure	C-26	Dave Joyce 493-5933/AOP-500	Michelle Brune 493-5941/AOP-500
FTS2000	2-11	Federal Telecommunications System - FTS2000	C-BIIP 98210	Dan Vilardo 493-5936/AOP-500	Frankie Brooks 554-1680/AOP-500
GOMEX-CNS	2-12	Gulf of Mexico-Communications Navigation Surveillance	C-22	Dean Resch 493-4711/AND-520	same
ILS CAT I/II/III	5-02	Instrument Landing System Category I/II/III	N-03	Manuel Vega 267-7795/AND-740	Fred Scheeren 488-9740 x125
IPPS	4-10	Integrated Personnel and Payroll System	M-BIIP 991018	Carol Bach 366-6309/SVC-162	same
ITWS	7-03	Integrated Terminal Weather System	W-07	Kevin Young 366-9207/AUA-460	Maureen Cedro 493-0228
LINCS	2-13	Leased Interfacility NAS Communications System	C-BIIP 991019	Mike Sullivan 493-5956/AOP-400	Terry Makinen 314-5935
M-EARTS	1-09	Microprocessor Enroute Automated Radar Tracking System	A-10	Jack Neuberger 366-5152/AUA-600	Chris Blackshear
MALSR	5-03	Medium Intensity Approach Lighting System w/Runway Alignment Indicator Lights	N-04	Manuel Vega 267-7795/AND-740	Fred Scheeren 488-9740 x125
MAN	4-11	HDN Headquarters Metropolitan Area Network	M-BIIP 981011	Eric Chatmon 267-9949/ASU-520	same
MCAFS	4-12	Mobile Communications for Airways Facilities Specialists	M-07	Dave Joyce 493-5933/AOP-500	George Kaloudelis 267-8289/AOP-30
MDCRS	7-04	ARINC Meteorological Data Collection & Reporting System	W-BIIP 982012	Sandra Schmidt 366-4437/ARW-100	same
NADIN	2-14	National Airspace Data Interchange Network	C-BIIP 991020	Tom Loftus 493-5952/AOP-400	Howard Harrell 314-4514/AOP-400
NASR	1-11	NAS Resources	A-08	Ken O'Brien 267-7463/AIT-200	Chuck Eng 267-3364/AIT-200
NEXCOM	2-15	Next Generation Air-to-Ground	C-21	Michael Shveda 267-8898/AND-130	same
NIMS	4-13	NAS Infrastructure Management System [Includes RMMS]	M-07	Richard Simmons 703-925-3045/AOP-10	Ken Clark 493-5125
NPPS	4-14	New Personnel/Payroll System	M-BIIP 991021		
OAP	1-10	Oceanic Automation Program	A-10	Nancy Graham 366-5316/AUA-600	Mervin Davis 863-2175/AUA-610
OATMS	1-12	Oceanic Air Traffic Management System	A-10	Nancy Graham 366-5316/AUA-600	Steve Holliday 493-0479/AUA-610
PAPI	5-04	Precision Approach Path Indicator System	N-04	Manuel Vega 267-7795/AND-740	Fred Scheeren 488-9740 x125
RCOM	2-16	NAS Recovery Communications	C-18	Michael Shveda 267-8898/AND-130	Dave Kuraner 493-4817/AND-340
REIL	5-05	Runway-End Identifier Lights	N-04	Manuel Vega 267-7795/AND-740	Fred Scheeren 488-9740 x125

Acronym	Ch No	Title	CIP/BIIP	Product Lead/PM Tel No./Org.	Point of Contact Tel No./Org.
RVR	5-06	New Generation Runway Visual Range System	N-08	Manuel Vega 267-7795/AND-740	Fred Scheeren 488-9740 x125
SAMS	4-15	Special Use Airspace Management System	M-BIIP 991026	Steve Dukes 267-9327/ATO-130	
STARS	1-13	Standard Terminal Automation Replacement System	A-04	Alan Feinberg 264-3545/AUA-310	Ralph Allen 314-1455/AUATAC
TDLS	2-17	Tower Data Link Services System	C-20	Sonja Whitson 493-4716/AND-370	Doris Rinkus 493-4732/AND-370
TDWR	7-05	Terminal Doppler Weather Radar	W-03	Ted Weyrauch 267-9443/AND-420	same
TFM	1-01	Traffic Flow Management	A-05	Dan Gutwein 366-1753/AUA-500	same
TR-ATL	3-04	TRACON, Atlanta (ATL)	F-02	Kim Newman 267-3847/ANS-220	Bill Gregg 314-5984/FTSC
TR-NOCAL	3-05	TRACON, Northern California (NCT)	F-02	Tim Dyer 493-4488/ANS-220	Sampath Krishnan 863-7325/AOP-400
TR-PCT	3-06	TRACON, Potomac Consolidated TRACON (PCT)	F-02	Arnold Stewart 267-3122/ANS-220	Jack Robson 314-5983
TRMM	4-16	Telecommunications Remote Maintenance Monitoring (TRMM) Program	M-BIIP 991022	Howard Frey 801-320-2166/ZLCAFS	Don Fong 863-7321/FTSC
TVSR	2-18	Terminal Voice Switch Replacement System Program	C-05	Jim Little 493-4651/AND-320	Kent Cheung 554-4530 x118
USITS	2-19	U.S. International Telecommunications Systems	C-BIIP 991023	Dulce Roses 493-5917/AOP-600	Don Rickerson 863.7323/FTSC
WAAS	5-07	Wide-Area Augmentation System	N-12	David Roth 493-4622/AND-730	Gary Solom 703-841-2668
WAFS	7-06	World Area Forecast System	W-BIIP 991024	Rick Heuwinkel 366-0304/ARW-100	Kevin Browne 366-1066/ARW-100
WARP	7-07	Weather and Radar Processor	W-04	Kevin Young 366-9207/AUA-460	Maureen Cedro 493-0228
WSP	7-08	Weather Systems Processor	W-09	James Pette 267-9381/AND-420	John Farr 267-7244/AND-420

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APPENDIX C

FINANCIAL INFORMATION IN THE FUTURE TELECOMMUNICATIONS PLAN

C.1 INTRODUCTION

The Future Telecommunications Plan provides cost estimates for new systems and facilities as well as systems and facilities that are being upgraded, replaced, relocated, or consolidated. All of these programs represent future funding requirements.

Projections are presented in each chapter's (program's) Cost Summary. The planning horizon covers seven years, including the current fiscal year. The cost summaries include estimates of non-recurring and recurring costs of leased channels and associated telecommunications equipment that are funded by the program. The costs are allocated to the Facilities and Equipment (F&E) and Operations (OPS) accounts. Guidance on the assignment of requirements to the F&E and OPS accounts is found in FAA Order 2500.8A, "Funding Criteria for Operations, Facilities and Equipment (F&E), and Research, Engineering and Development (R,E&D) Accounts," April 9, 1993. (See paragraph C.2 below.)

The cost summary, developed as a Microsoft Excel spreadsheet, provides the estimated cost for the interfaces identified by the program manager/product lead (PM/PL). The audit trail for each interface included in the cost summary begins in the logical connectivity diagram provided in the chapter's program/system description, and continues through the interface requirements summary table and the interface implementation schedule. Complete traceability of the requirement provides visibility over all interface parameters with the potential for cost impact. As requirements mature, the estimates of the funding requirements are refined to reflect the most current program needs.

The cost estimates are not automatically included in the budget; however, they are used to assist in the preparation of budget requests. AOP uses them to identify the additional funding required to maintain the expanding NAS telecommunications infrastructure. Program offices/product leads use the information in projecting their non-recurring and recurring F&E funding requirements for submission as part of the FAA annual budget formulation process. Thus, the cost estimates presented in the summary tables are to support the program managers and projects leads in preparing their program budgets. Similarly, they support AOP in projecting funding requirements that will eventually be handed off from the F&E to the OPS account.

Actual funding is subject to review by FAA and Department of Transportation, Office of management and Budget (OMB), Congressional, and the Presidential Review. Eventually, as FAA priorities are set, some requirements will be funded, others will not.

C.2 FAA ORDER 2500.8A

Criteria for the use of F&E funds or operations funds for leased telecommunications identified in each chapter's Cost Summary Table is found in Paragraph 10k of the Order.

> "k. Leased Telecommunications. Costs of the Telecommunications Management and Operations programs are to be funded in the Operations account. All leased operational and administrative telecommunications costs are to be funded in the Operations account, with the exception of:

(1) The F&E account is to fund non-recurring site preparation and facility-end connection costs associated with leased circuits that are required for the fielding of new F&E equipment. *Funding is to be included in the relevant project cost estimates. (Italics added)*

(2) F&E may fund recurring leased telecommunications costs for new F&E equipment coming into the system for up to one full fiscal year beyond the year of commissioning/operation. *Funding is to be included in the relevant project cost estimates." (Italics added)*

C.3 PREPARATION OF THE COST SUMMARY TABLES

Cost projections are based on the program offices'/product leads' acquisition strategies, resource allocations, and implementation schedules. The accuracy of the cost estimates depends on the information available to support the costing process. There are two basic types of cost estimates:

(1) a rough order of magnitude cost estimate based on generic requirements and average cost factors; and

(2) detailed costs estimates based on specific telecommunications planning and engineering.

The level of detail is a function of the maturity of a program. As programs begin their detailed planning and requirements are better defined the information required for the detailed cost estimate becomes available. The rough estimate provides the first look at the costs and serves until the detailed estimates are completed. Typically, the Telecommunications Integrated Product Team's Telecommunications Cost Team works in conjunction with the program offices/product leads to develop the estimates and ensures the appropriate level of detail as well as the consistency and accuracy of the cost factors.

C.3.1 Rough Order of Magnitude Cost Estimates

The basic methodology for preparing this estimate is to analyze the technical requirements, determine the number of channels to be installed each fiscal year, calculate an average distance between the facilities, determine the required throughput, and make the initial allocation of the requirements to resources.

The estimates resulting from the application of this methodology are considered to be a rough order of magnitude because facilities are identified by type rather than specific end point locations, and schedules are projected by fiscal year rather than assigning specific dates for specific connectivities. These cost estimates are submitted to the proponent program managers/product leads for review and approval before the official Fuchsia Book publication.

C.3.2 Detailed Cost Estimates

A detailed telecommunications cost estimate is prepared as more specific information, e.g., site locations, schedules, etc. becomes available. After a thorough analysis of the specific requirements, a detailed cost estimate is developed based upon the actual cost factors for channels and telecommunications equipment given the specific location of the installation sites, the specific configuration and sizing requirements, and implementation schedule. The telecommunications costs are (1) summarized in the chapter cost summary and (2) reflected in the Program Manager's/Program Lead's

(PM's/PL's) telecommunication plan. Program offices/product leads with established funding requirements generally submit their chapter cost summary directly to AOP-400 as part of their Fuchsia Book update.

As the PMs/PLs develop their program implementation plan and associated site implementation plans, they are able to provide more comprehensive information to AOP-400 related to their telecommunications requirements. The detailed cost summaries developed by AOP-400 engineers and Special Projects personnel in conjunction with the PMs/PLs, provide the most accurate summation of leased telecommunications costs because they are based on a more rigorous examination of the program's total requirements and technical alternatives.

The information regarding each interface to be included in the chapter's cost estimate is summarized in the Interface Implementation Schedule. This is where the facilities to be connected, the service to be provided, the number of channels required, and the schedule for their implementation are identified. An example of the Interface Implementation Schedule is shown in Figure C-1.

From	**To**	**System/Rate/ Miles**	**Prior Years**	**FY 00**	**FY 01**	**FY 02**	**FY 03**	**FY 04**	**FY 05**	**FY 06**
Facility 1	Facility 2	LINCS/56 kbps/ 100 miles	0	0	1	1	0	0	0	0

Figure C-1. Example of an Interface Implementation Table

Figure C-2 provides an example of how the information contained in the Interface Implementation Schedule is used in developing the estimates. In the cost summary note that the parameters required calculating a rough order of magnitude estimate are found in the cost profile. The flow of the information in the table is sequential beginning with the calculation of non-recurring costs and followed by the recurring costs. Note in particular the way recurring costs are initially the responsibility of the Program Office (F&E) and, over time, how the responsibility for recurring costs transitions to AOP for OPS funding.

In Figure C-2 the shaded areas depict the information typically found in the Cost Summary Tables.

All costs in 000's	FY00	FY01	FY02	FY03	FY04	FY05	FY06

In the first part of the cost summary the interface being costed and the information required to do the costing are identified.

FAA Facility 1 <---> FAA Facility 2

Cost Profile: Channels/56 kbps/100 miles. (Unit costs: NRC - $2/ARC - $1.5)

The Channels Added row identifies the number of channels to be established each year.
The Total Channels row is a cumulative count of the channels being implemented.

	FY00	FY01	FY02	FY03	FY04	FY05	FY06
Channels Added	0	0	1	1	0	0	0
Total Channels	0	0	1	2	2	2	2

The Channels Added count is used to develop non-recurring costs.
The number of channels added in FY99 (1) and FY00 (1) are multiplied by the non-recurring unit cost ($2).
Note: In limited cases, OPS funds may be used for non-recurring costs. It is approved on a case-by-case basis.

	FY00	FY01	FY02	FY03	FY04	FY05	FY06
Non-recurring (F&E) Costs	$0	$0	$2	$2	$0	$0	$0

The total number of channels is used when estimating recurring costs. The first step is to identify for each year the number of channels that are to be funded by the F&E account and the number to be funded by the OPS account. This is done in accordance with FAA Order 2500.8A.

As depicted in the following table the recurring costs are charged to the F&E account for the year of implementation plus one additional year. Specifically, note that the channel implemented in FY99 is F&E funded for FY99 and FY00, and the channel implemented in FY00 is F&E funded for FY00 and FY01. After the second year of F&E funding the requirement is "handed off" to the OPS account.

Recurring Costs	FY00	FY01	FY02	FY03	FY04	FY05	FY06
No. of Channels to F&E funded	0	0	1	2	1	0	0
No. of Channels to be OPS funded	0	0	0	0	1	2	2

The number of channels to be funded by each account multiplied by the unit cost provides the recurring costs estimates for the two accounts. When specific dates are available, costs are adjusted to reflect actual usage.

	FY00	FY01	FY02	FY03	FY04	FY05	FY06
F&E Recurring Costs	$0	$0	$1.5	$3	$1.5	$0	$0
OPS Recurring Costs	$0	$0	$0	$0	$1.5	$3	$3

Figure C-2. Example of a Cost Estimate

APPENDIX D
SUPPLEMENTARY INDEX

D.1 INTRODUCTION

The following table provides a cross reference for systems, subsystems, projects, and programs that are mentioned in one or more chapters of this plan, but are not the major topic of a chapter themselves. In the event that a system/project is referenced in more than one chapter, each chapter is identified in the table. Page number(s) associated with some of the most significant references to the system/project are indicated; however, in some cases, the system may be mentioned (to a limited extent) in many different locations in a chapter.

Acronym	Title	Chapter Name	Chapter Number	Page Number(s)
A				
AAIRS	Airport/Air Carrier Information Reporting System	AVR	1-04	7
AARMP	Airman & Aircraft Registry Modernization Program	ADTN2000	2-02	8
ACAIS	Air Carrier Activity Information System	ARP	4-03	3, 4, 5
ACARS	Aeronautical Radio Inc. (ARINC) Aircraft Communications Addressing and Reporting System	TDLS MDCRS OAP	2-17 7-04 1-10	3 3 4
ACIP	Airport Capital Improvement Plan	ARP	4-03	3-6
ACS	Aircraft Certification System	ADTN2000 AVR	2-02 1-04	8 7, 9-11
ACSEP	Aircraft Certification Systems Evaluation Program	AVR	1-04	6
ADCCP	Advanced Data Communication Control Process	FSAS RVR	1-08 5-06	7 6
ADNS	Aeronautical Radio Inc. (ARINC) Data Network Service	ITWS MDCRS TDLS WSP	7-03 7-04 2-17 7-08	9 3,5 5, 8, 9 8
AFM	Automated Frequency Management	ADTN2000	2-02	8
AFS	Aeronautical Fixed Services	USITS	2-19	3
AFSS	Automated Flight Service Station	ADTN2000 ANICS CAPSTONE DMN ERAP FAATSAT FSAS LINCS NIMS TR-PCT	2-02 2-04 2-03 2-07 1-07 2-08 1-08 2-13 4-13 3-06	5 4-7 5, 7 4, 5, 9 6-8 5, 6 1, 3-8, 12-18 5 9 4
AFTN	Aeronautical Fixed Telecommunications Network	ERAP NADIN OAP TFM TRMM USITS	1-07 2-14 1-10 1-01 4-16 2-19	8 5 7, 11 7 3 1, 3-10, 14

Acronym	Title	Chapter Name	Chapter Number	Page Number(s)
AIDC	Air Traffic Interfacility Communications System	NADIN OAP USITS	2-14 1-10 2-19	5 3, 7, 11, 12 6, 14
AIP	Airport Improvement Program	ARP	4-03	3-6
AIS	Aeronautical Information System	AWOS/ASOS ERAP NADIN NASR	7-02 1-07 2-14 1-11	11 6, 7, 9 5, 17 3
AIS	Aircraft Information System	ADTN2000	2-02	2-02-8
ALDS	Automatic Lightning Detection System	WARP	7-07	7, 15
ALS	Ambient Light Sensor	ALSF-2 RVR	5-01 5-06	4 3, 4
AMASS	Airport Movement Area Surveillance System	STARS	1-13	6
ANMS	Automated Network Management System	DMN	2-07	6
ANMS	Automated Network Monitoring System	DMN FOMS	2-07 2-09	6 5, 10
ANS	Automated Notification System	RCOM	2-16	3, 8-10 ,13-15
APN	Aeronautical Radio, Inc. (ARINC) Packet Network	NADIN MDCRS	2-14 7-04	7 3, 5
ARTS	Automated Radar Terminal System	AMASS ASR-11 ATCBI-6 ATCFTM ERAP FFP1 FOMS µEARTS STARS TR-NOCAL TR-PCT	6-01 6-02 6-03 3-01 1-07 1-02 2-09 1-09 1-13 3-05 3-06	1, 3-6, 8 3-7, 9, 11 3, 6, 7 4 6, 7 5, 7, 8, 11 13 4, 5 3, 5, 7, 8, 10 4, 7, 9 4, 8
ASAP	Aviation Safety/Accident Prevention	AVR	1-04	6
ASAS	Aviation Safety Analysis System	ADTN2000 AVR	2-02 1-04	8 3
ASDE	Airport Surface Detection Equipment	AMASS NIMS	6-01 4-13	1, 3, 4, 6 13, 22
ASDS	Airport Safety Data System	ARP	4-03	3-5
ASMS	Air Safety Management System	AVR	1-04	6
ATIS	Automated Terminal Information Service	AWOS/ASOS FAA Skylinks TDLS	7-02 2-03 2-17	5, 6 1 1, 3-8
ATMS	Advanced Traffic Management System	TFM	1-01	3
ATN	Aeronautical Telecommunications Network	ADL FAA-Skylinks NADIN NEXCOM OAP USITS	2-01 2-03 2-14 2-15 1-10 2-19	3-5 4, 6 5 6 4 3-6, 8, 14
AWP	Aviation Weather Processor	ERAP FSAS NADIN	1-07 1-08 2-14	7, 8 3, 4 5

Acronym	Title	Chapter Name	Chapter Number	Page Number(s)
AWSS	Automated Weather Sensor System	ADAS AWOS/ASOS	7-01 7-02	3 3, 4, 8
B				
BCS	Buoy Communications System	GOMEX-CNS	2-12	3-8
BOSS	Budget Oversight Status System	AVR	1-04	6
C				
CARF	Central Altitude Reservation Facility	ATCSCC SAMS TFM	3-02 4-15 1-01	3 3, 4 3-7, 9
CASIS	Civil Aviation Security Information System	AVR	1-04	7
CBI	Air Traffic Computer Based Instruction	ADTN2000 ANICS CAPSTONE DMN	2-02 2-04 1-03 2-07	8 4, 5 5 1, 5, 8, 9
CCCS	Capstone Communication Control Server	CAPSTONE	1-03	10, 11
CCLD	Core Capability Limited Deployment	FFP1	1-02	5
CCMIS	Certification and Compliance Management Information System	ARP	4-03	3, 5
CDC	Computer Display Channel	ERAP	1-07	3, 4, 7, 9
CFCF	Central Flow Control Function	ATCSCC TFM	3-02 1-01	3, 16 5
CPDLC	Controller-Pilot Data Link Communications	ADL ERAP NADIN OAP	2-01 1-07 2-14 1-10	3-6 9 5 13
CPDSS	Covered Position Decision Support Subsystem	AVR	1-04	7
CPMIS	Consolidated Personnel Management Information System	ADTN2000 IPPS NPPS	2-02 4-10 4-14	8 3 1, 3, 4, 6
CST	Contingency Support Team	RCOM	2-16	3, 4, 6, 13
CTAS	Center/TRACON Automation System	ADL ERAP FAATSAT FFP1 ITWS STARS TFM TR-PCT	2-01 1-07 2-08 1-02 7-06 1-13 1-01 3-06	5 7-9, 11 6 1 11, 13, 16, 18 6, 7 1 7
CTIS	Command Tactical Information System	OAP	1-10	10
CVRS	Computerized Voice Reservation System	ATCSCC TFM	3-02 1-01	3 1, 2, 4-9
D				
DACS	Digital Access and Cross-Connect System	FTS2000	2-11	5
DAFIS	Departmental Accounting Financial Information System	ADTN2000 AVR DELPHI FSP	2-02 1-04 4-05 4-09	8, 9 6 3, 9, 13-15 1, 3, 4
DAMA	Demand Assigned Multiple Access	USITS	2-19	10, 11

Acronym	Title	Chapter Name	Chapter Number	Page Number(s)
DAMIS	Drug and Alcohol Abatement Management Information Subsystem	AVR	1-04	7
DARC	Direct Access Radar Channel	ATCBI ERAP	6-03 1-07	3, 6, 7 3, 4, 7, 9
DASR	Digital Airport Surveillance Radar	ASR-11 STARS	6-02 1-13	10 3, 8
D-ATIS	Digital Automatic Terminal Information Service	TDLS	2-17	3, 7
DA	Descent Advisor	FFP1	1-02	6
DCCR	Display Channel Complex Rehost	ERAP	1-07	3, 4, 9
DDC	Direct Digital Connectivity (service)	DMN FFP1 FSAS ITWS LINCS NADIN STARS TFM WAAS WARP	2-07 1-02 1-08 7-03 2-13 2-14 1-13 1-01 5-07 7-07	5, 11 20 13 13, 20-22 6-9 14, 20 11-13 12 12-14 9, 13, 14, 20-23
DDS	Data Display System (same as IDS-4)	TR-NOCAL	3-05	4
DIN	Designee Information Network	AVR	1-04	6
DL	Data Library	AVR	1-04	6
DLAP	Data Link Applications Processor	ADL	2-01	5-11
DLP	Data Link Processor	ADAS ITWS	7-01 7-03	4, 5, 8 9
DME	Distance Measuring Equipment	NIMS	4-13	8, 13, 14
DOTS	Dynamic Ocean Track System	NADIN OATMS TFM USITS	2-14 1-12 1-01 2-19	5, 7 3 6 1
DS/DSR	Display System/Display System Replacement	ADL ERAP FFP1 WARP	2-01 1-07 1-02 7-07	4 3-5, 7 5 4, 7, 15
DSN	Defense Switched Network	TVSR	2-18	9
DSSC	DSR System Support Center	ERAP	1-07	5, 7
DTDM	Deterministic Time Division Multiplexing Modems (network)	DMN	2-07	4, 5, 7, 10, 11
E				
ECAR Digital Network	East Caribbean Digital Network Program	BWM USITS	1-05 2-19	1, 3, 6 9, 12, 13
ECS	Emergency Communications Systems	TR-NOCAL TR-PCT	3-05 3-06	4 6
EDP	Expedite Departure Path Tool	FFP1	1-02	4, 6
ERMS	Environmental Remote Monitoring Subsystems	NIMS TVSR	4-13 2-18	13, 22 4, 10
ETMCC	Enhanced Traffic Management Computer Complex	ATCSCC ERAP TFM	3-02 1-07 1-01	4 7, 8, 10 5-7, 10-13

Acronym	Title	Chapter Name	Chapter Number	Page Number(s)
TIMS	Telecommunications Management Information System	ADTN2000	2-02	8
TMA	Traffic Management Advisory	FFP1	1-02	3, 4, 6, 8, 9, 11, 13
TMIS	Training Management Information System	ADTN2000	2-02	8
TML	Television Microwave Link	DBRITE FOMS	1-06 2-09	1, 3 1, 3, 12-14
TPDS	Third Party Draft System	FSP	4-09	3
TRIMATES	Training Management System	IPPS	4-10	3
TVCN	Tele Video Conference Network	DVTS	4-07	6-8
U				
URET	User Request Evaluation Tool	ERAP FFP1 NADIN WARP	1-07 1-02 2-14 7-07	3, 5, 7, 9, 10 1-6, 10-13, 16, 17 6, 12 4, 5, 7, 11, 16
USNS	United States Notice to Airman (NOTAM) System	ATCSCC FSAS NADIN NASR	3-02 1-08 2-14 1-11	3 9 6 3
V				
VDL	VHF Digital Link	ADL NEXCOM	2-01 2-15	3 4
VERN	VHF Extended Range Network	GOMEX-CNS	2-12	3, 4
VFR	Virtual Flight Rule	CAPSTONE	1-03	3,6
VOR/NDB	VHF Omnidirectional Range/ Non-Directional Beacon	AWOS/ASOS	7-02	6, 7
VS	Visibility Sensor(s)	RVR	5-06	3, 4
VSBP	Voice Switch By-Pass	TVSR	2-18	3
VTABS	VSCS Training and Backup Switch	ERAP	1-07	5
W				
WMS	Wide-area Master Station	WAAS	5-07	3-6, 9-11
WRS	Wide-area Reference Station	WAAS	5-07	3-6, 10, 11
WSR-88D	Weather Surveillance Radar	WARP	7-07	3-6, 9, 11, 16

 ☆U.S. GOVERNMENT PRINTING OFFICE:2000-461-456/34502