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Fact Sheet for the Chairman, Committee on Science, Space, and Technology, House of Representatives

April 1989

AVIATION RESEARCH

Information on FAA's Research, Engineering, and Development Program

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Resources, Community, and
Economic Development Division

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April 12, 1989

The Honorable Robert A. Roe
Chairman, Committee on
Science, Space, and Technology
House of Representatives

Dear Mr. Chairman:

In your August 10, 1988, letter, you requested that we develop information on the Federal Aviation Administration's (FAA) Research, Engineering, and Development (RE&D) Program to assist you in reviewing FAA's RE&D budget request for fiscal year 1990 and in preparing for oversight hearings in April 1989. As agreed, we are providing information on FAA's RE&D program regarding funding, staffing, and scheduling for fiscal years 1987-89 at the subprogram level.[1] Although FAA budget documents contain some of this information, they do not provide information on staffing and scheduling at the subprogram level. In addition, FAA's RE&D budget documents do not allow for comparisons of recent funding levels. We have extracted this information from many diverse sources and assembled it in a format that allows year-to-year comparisons.

The objective of FAA's RE&D program is to improve the nation's air transportation system by increasing its safety, productivity, and capacity to meet the expected air traffic demands of the future. FAA views its RE&D program as a major element for change in the nation's air transportation system as well as a means of applying the latest technology to the safety and security framework that supports the United States aviation community.

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[1]A subprogram is a discrete project or group of projects within a program. A program is a set of related subprograms within a major budget activity. A major budget activity is a generic term used by FAA for the seven groupings of related programs within FAA's RE&D budget.

In summary, FAA has obligated $158 million, $150 million, and an estimated $165 million for RE&D in fiscal years 1987-89, respectively. These amounts represent approximately 2 percent of FAA's total budget. Staffing levels have remained constant at 645 positions. These employees are located primarily at the Technical Center in Pomona, New Jersey, and the Aeronautical Center in Oklahoma City, Oklahoma. However, 70 percent of all RE&D work is contracted out to the private sector, universities, the Department of Transportation's Transportation Systems Center, or other federal entities.

Some general characteristics of FAA's RE&D program that illustrate how it operates are summarized below:

-- To respond to developments in the aviation industry during the course of a fiscal year, FAA maintains the ability to alter the content of its RE&D effort by adding new subprograms and transferring funds among subprograms. For example, in fiscal year 1989, FAA added $3.9 million to create an Aging Aircraft subprogram in response to the Aloha Airlines tragedy and the subsequent FAA-hosted Aging Aircraft Conference. (See section 1.)

-- While FAA's overall RE&D staffing levels have remained constant over the period 1987-89, it has transferred some staff positions from time to time among major RE&D budget activities and subprograms.[2] Details on these transfers and other staffing changes in the fiscal year are not currently available because FAA does not keep staffing records on a monthly basis. This type of personnel transfer explains instances where staffing levels are zero although funds have been obligated (e.g., the Aging Aircraft subprogram). (See section 2.)

-- FAA has established completion dates for most subprograms; however, FAA categorizes some as "continuing," meaning that a completion date has not been set and that a subprogram could be part of a long-term research effort. For example, FAA considers the Aircraft System Fire Safety subprogram to be a continuing effort because FAA believes that a need will exist to

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[2]According to agency officials, the Aviation Medicine budget activity does not list staffing levels below the program level, while the Office of Environment's RE&D projects are staffed through a budget account called Operations Development and Direction.

conduct fire safety research well into the future. (See section 3.)

To assist your office in reviewing FAA's 1990 RE&D budget request, we are providing the information you requested in a format similar to FAA's budget submission. FAA groups programs and subprograms according to seven major budget activities: Air Traffic Control, Advanced Computer, Navigation, Aviation Weather, Aviation Medicine, Aircraft Safety, and Environment. In addition, we have used the program and subprogram nomenclature used by FAA in its RE&D budget submission.

Sections 1, 2, and 3 of this fact sheet provide tabular information on the funding, staffing, and scheduling for FAA's RE&D subprograms, respectively. Subprogram scheduling data are shown in terms of actual or projected start and end dates.

To prepare this fact sheet, we obtained documentation from numerous sources, including FAA RE&D budget submissions, program files, reports, and subprogram summaries. We extracted funding, staffing, and scheduling information from these documents and created an automated data base. From this data base, we developed the tables shown in sections 1, 2, and 3.

We obtained additional information on how the program functions from interviews with FAA budget staff, RE&D management, and subprogram managers. Because much of the data we used to create our data base came from published FAA budget submissions and other official FAA documentation, and because of your need for this information before oversight hearings, we did not trace FAA's data back to working documents in order to validate the data's accuracy. We conducted our work from August 1988 to March 1989.

As agreed, unless you publicly announce its contents earlier, we plan no further distribution of this fact sheet until 7 days from the date of this letter. At that time, we will provide copies to the Secretary of Transportation, the FAA Administrator, and other interested parties. If you have questions about this fact sheet, please contact me at (202) 275-1000.

Major contributors to this fact sheet are listed in appendix I.

Sincerely yours,

Kenneth M. Mead
Director, Transportation Issues

CONTENTS

ABBREVIATIONS

AAS	Advanced Automation System
ACF	Area Control Facility
ADL	Office of Development and Logistics
ADM	Office of Advanced Design and Management Control
ADS	Automatic Dependent Surveillance
AERA	Automated Enroute Air Traffic Control
ARTS	Automated Radar Terminal Systems
ASA	Advanced System Aquisition Service
ATC	Air Traffic Control
CWP	Central Weather Processor
FAA	Federal Aviation Administration
GAO	General Accounting Office
GPS	Global Positioning System
IFR	Instrument Flight Rules
LLWAS	Low Level Windshear Alert System
MLS	Microwave Landing System
NADIN	National Aviation Data Interchange Network

NAS	National Airspace System
NASA	National Aeronautics and Space Administration
NDI	Non Destructive Inspection
NEXRAD	Next Generation Weather Radar
RE&D	Research, Engineering, and Development
TERPS	Terminal Instrument Procedures
TCAS	Traffic Alert and Collision Avoidance System
VSCS	Voice Switch and Control System
WX	Weather

SECTION 1

FUNDING INFORMATION ON FAA'S RE&D SUBPROGRAMS

Table 1.1: Budget Requests and Obligations for Air Traffic Control Subprograms, Fiscal Years 1987-89

Program	Subprogram	Fiscal Years					
		Budget 1987	Obligated 1987	Budget 1988	Obligated 1988	Budget 1989	Obligated[a] 1989
(Dollars in Thousands)							
Aircraft Separation Assurance	TCAS III Implementation	$ 0	$ 3,073	$ 0	$ 3,430	$11,272	$11,450
	TCAS II Development	481	714	746	1,394	245	320
	TCAS II Implementation	1,192	1,070	1,776	1,479	790	967
	TCAS III Development	2,051	1,787	0	2,750	1,837	2,332
	Rotorcraft TCAS	607	31	0	0	0	0
	Passive TCAS I	0	0	0	380	0	0
ATC Requirement Studies	ADM Support	0	0	0	40	0	1,668
Beacon	Low-Altitude Surveillance	56	0	268	263	727	327
	Special Surveillance System	0	0	0	1,004	0	1,484
	Surface Traffic Surveillance	0	0	862	143	2,758	258
	Mode S Integrated Tracker	0	0	0	0	814	814
Communications	Future System Requirements	0	0	62	0	0	0
	Aeronautical Data Link	777	2,363	3,162	4,948	3,408	11,980

(Continue)

Program	Subprogram	Fiscal Years					
		Budget 1987	Obligated 1987	Budget 1988	Obligated 1988	Budget 1989	Obligated[a] 1989
(Dollars in Thousands)							
	Data Link Technical Development	$ 0	$ 0	$ 2,014	$ 2,772	$ 8,572	$ 0
	NADIN/NADIN II	1,352	1,047	1,524	1,307	161	215
	Network Management Control	0	0	360	58	593	513
	Communications and Planning Design	0	0	0	78	758	758
	VSCS	33,910	58,720	36,042	50,044	1,575	1,537
Enroute Control	Conflict Alert Resolution	837	906	0	0	0	0
	Enroute Metering	0	250	0	412	0	0
Flight Service Stations	Direct User Access	1,548	1,032	0	191	0	0
Human Systems and Operations	Information Transfer and Management	113	178	1,161	264	514	514
	Flight Crew Certification Requirements	0	0	61	374	2,033	1,208
	Human Factors and Regulatory Support	0	0	0	500	564	564
	Intelligent Machine Interface	0	0	288	111	0	0
	Causal Factors in Accidents/Incidents	65	0	312	703	414	764
	Controller Human Factors	0	0	319	11	238	238

(Continue)

Program	Subprogram	Fiscal Years Budget 1987	Obligated 1987	Budget 1988	Obligated 1988	Budget 1989	Obligated[a] 1989
(Dollars in Thousands)							
	Automated Radar Training	$ 0	$ 0	$ 0	$ 457	$ 1,161	$ 1,061
	Control & Display Technology	0	0	0	0	333	333
	Human Performance Assessment and Improvement	0	0	0	0	0	475
Rotorcraft	Rotorcraft IFR Operations Evaluation	1,388	875	1,473	1,418	804	2,709
	Rotorcraft Obstruction Avoidance	0	0	131	89	329	584
	Heliport/Vertiport Design and Planning	0	0	0	30	100	775
	Rotorcraft Separation Standards	0	0	0	14	146	146
	Rotorcraft Communications	313	10	324	115	0	0
	Rotorcraft ATC Procedures	0	0	131	151	1,603	1,683
	Rotorcraft TERPS	156	1,330	552	403	0	0
	Rotorcraft Simulator Studies	0	0	437	55	200	452
	Rotorcraft Display and Control Studies	0	0	131	46	264	324
Support	FAA/NASA Cooperative Program	689	714	895	812	938	938

(Continue)

Program	Subprogram	Fiscal Years					
		Budget 1987	Obligated 1987	Budget 1988	Obligated 1988	Budget 1989	Obligated[a] 1989
(Dollars in Thousands)							
	Frequency Spectrum Management	$ 0	$ 0	$ 0	$ -10	$ 0	$ 0
	ASA Program Support	568	635	1,076	590	1,200	661
	Small Business Innovative Research	540	1,092	1,000	823	900	900
	Transportation Research Board	0	0	0	0	200	200
	ADL Management Initiatives	0	230	200	1	619	1,495
	Joint University Program	0	0	0	200	200	164
System	RE&D Plan	0	0	0	325	0	1,241
	System Requirements	1,972	1,533	1,703	1,817	1,860	826
	Management and Control Process	0	0	0	0	0	1,031
	Future System Definition	0	0	0	114	500	100
	Systems Engineering Management	169	129	413	99	339	254
	NAS Development Studies	0	2,179	2,725	745	1,742	501
	Systems Concept Definition	0	0	0	60	0	5,255
	National Airspace System Performance Analysis Capability	0	0	0	0	1,800	0

(Continue)

Program	Subprogram	Fiscal Years Budget 1987	Obligated 1987	Budget 1988	Obligated 1988	Budget 1989	Obligated[a] 1989
(Dollars in Thousands)							
System Capacity and Airports	Separation Standards	$ 3,018	$ 3,012	$ 2,951	$ 2,257	$ 3,557	$ 3,997
	Airport Capacity Task Force Studies	545	6,123	925	969	513	913
	Implementation Planning for Task Force Studies	0	0	0	0	0	800
	Cockpit Display Evaluation	0	0	0	0	0	200
	Wake Vortex Avoidance/Advisory System	0	0	972	355	799	1,699
	Precision Runway Monitor Back-to-Back Antenna	0	2,253	0	2,170	3,097	2,947
	Precision Runway Monitor-High Data Rate	0	0	0	8,832	5,400	2,998
	Simulation and Model Development	0	0	0	764	868	1,568
	Airport Safety Planning	68	0	197	421	602	502
	Terminal Airspace Application	0	0	0	0	0	400
	Terminal/Landside Traffic Modeling	0	0	0	0	350	350
	Airport Safety Support System	69	4	140	188	356	356
	Airport Surface Visual Control	543	387	713	850	677	677
	Capacity Enhancement Planning	0	0	0	199	635	1,035

(Continue)

Program	Subprogram	Fiscal Years Budget 1987	Obligated 1987	Budget 1988	Obligated 1988	Budget 1989	Obligated[a] 1989
(Dollars in Thousands)							
	Handicapped Passenger Assistance	$ 0	$ 0	$ 0	$ 36	$ 0	$ 214
	Reduced Runway Occupancy Time	1,238	431	1,108	805	534	534
	All Weather Taxiway Guidance	0	0	562	0	0	0
	Airport Pavement	670	1,084	862	422	813	1,123
	Airport Design, Configuration and Capacity	0	0	431	159	770	913
	Capacity Development	1,152	1,239	3,399	730	1,808	1,808
	Terminal Airspace Assessment	0	0	0	0	0	1,200
Technology	Satellite Applications	1,270	1,673	2,081	121	1,577	2,308
	ATC Applications of ADS	280	634	2,038	3,969	7,611	5,586
	Advance Computer Science Applications	369	254	0	0	0	0
Terminal Tower Control	Terminal System (ARTS II/IIA)	56	62	685	-23	300	0
	Sustain ARTS III/IIIA	56	34	685	0	300	0
	Mode S Terminal Interface	170	100	0	0	0	0
Tiltrotor	Tiltrotor Certification Support	$ 0	$ 0	$ 0	$ 154	$ 0	$ 75
Total		$58,288	$97,188	$77,897	$104,388	$83,078	$92,222

[a]Estimated.

Table 1.2: Budget Requests and Obligations for Advanced Computer Subprograms, Fiscal Years 1987-89

Subprogram	Fiscal Years					
	Budget 1987	Obligated 1987	Budget 1988	Obligated 1988	Budget 1989	Obligated[a] 1989
(Dollars in Thousands)						
AERA 1	$ 7,800	$ 0	$ 0	$ 0	$ 0	$ 0
AERA 2	0	1,063	0	0	0	0
AAS	22,895	16,763	7,743	6,245	7,578	7,379
Advanced Traffic Management	1,880	2,146	3,037	2,649	5,489	5,339
AERA 3	4,003	418	7,011	674	3,977	77
Terminal ATC Automation	0	0	1,868	1,996	4,077	4,270
Airport Surface Traffic Automation	0	0	437	64	2,157	1,896
Dynamic Special Use Airspace	0	0	438	37	739	839
Total	$36,578	$20,390	$20,534	$11,665	$24,017	$19,800

[a]Estimate.

Table 1.3: Budget Requests and Obligations for Navigation Subprograms, Fiscal Years 1987-89

Subprogram	Fiscal Years					
	Budget 1987	Obligated 1987	Budget 1988	Obligated 1988	Budget 1989	Obligated[a] 1989
(Dollars in Thousands)						
GPS Utilization	$ 0	$ 0	$ 524	$ 448	$1,000	$1,000
Navigation Systems Development	335	217	237	213	477	502
Navigation Systems Engineering	1,956	1,690	2,142	574	1,152	1,252
MLS ATC Integration	0	0	0	64	614	389
MLS Step Program	0	4	0	0	0	0
MLS Displays	999	384	0	0	0	0
Instrument Approach Improvements	650	240	462	416	232	232
Flight Crew Performance	56	339	0	0	0	0
Total	$3,996	$2,874	$3,365	$1,715	$3,475	$3,375

[a]Estimate.

Table 1.4: Budget Requests and Obligations for Aviation Weather Subprograms, Fiscal Years 1987-89

Subprogram	Fiscal Years					
	Budget 1987	Obligated 1987	Budget 1988	Obligated 1988	Budget 1989	Obligated[a] 1989
(Dollars in Thousands)						
CWP Future Interface Development	$ 0	$ 0	$ 3,124	$ 199	$ 1,434	$ 734
ACF Data Link Services	0	0	0	135	0	0
Central Weather Processing	1,053	1,532	11,567	5,990	7,573	11,044
Airborne Wind Shear Detection and Avoidance	1,056	1,215	1,062	1,054	1,064	1,814
Advance Windshear Sensor Development	0	0	519	11	77	77
Expanded LLWAS	0	0	0	243	1,458	558
ATC/Aircraft Wind Shear Information Transfer	0	0	0	20	232	232
LLWAS Voice Synthesis	0	0	0	251	787	387

(Continue)

Subprogram	Fiscal Years					
	Budget 1987	Obligated 1987	Budget 1988	Obligated 1988	Budget 1989	Obligated[a] 1989
(Dollars in Thousands)						
Terminal Weather Radar	$2,339	$2,154	$ 1,223	$ 510	$ 1,422	$ 1,338
Weather Radar (NEXRAD)	2,197	1,769	1,906	431	1,010	1,010
Advanced WX Devices and Sensors	626	843	886	0	0	0
Weather Radar Processing and Display	555	195	0	0	0	0
Total	$7,826	$7,708	$20,287	$8,844	$15,057	$17,194

[a]Estimate.

Table 1.5: Budget Requests and Obligations for Aviation Medicine Subprograms, Fiscal Years 1987-89

Subprogram	Fiscal Years					
	Budget 1987	Obligated 1987	Budget 1988	Obligated 1988	Budget 1989	Obligated[a] 1989
(Dollars in Thousands)						
Aeromedical Program Support	$ 200	$ 312	$ 552	$ 381	$ 732	$ 799
Protection and Survival	3,567	4,190	1,606	1,395	2,014	2,674
Workforce Optimization Research	0	0	1,413	1,329	1,395	2,280
Human Performance Research	0	0	721	661	740	1,329
Total	$3,767	$4,502	$4,292	$3,766	$4,881	$7,082

[a]Estimate.

Table 1.6: Budget Requests and Obligations for Aircraft Safety Subprograms

Subprogram	Fiscal Years					
	Budget 1987	Obligated 1987	Budget 1988	Obligated 1988	Budget 1989	Obligated[a] 1989
(Dollars in Thousands)						
Safety Fuel Evaluation	$ 124	$ 0	$ 92	$ 0	$ 0	$ 0
Aircraft Systems Fire Safety	3,031	3,892	3,521	3,544	4,573	4,321
Regulatory Development Support Activities	400	0	0	0	1,696	496
Propulsion/Fuel Systems	2,350	1,894	2,213	1,755	2,137	2,022
Crashworthiness/ Airworthiness	1,963	1,979	2,252	1,680	2,582	2,432
Aging Aircraft NDI	0	0	0	0	0	3,858
Flight Safety/ Atmospheric Hazards	1,866	1,582	2,399	2,055	2,351	2,226
Explosive Sabotage Detection	12,711	14,458	10,961	9,565	9,041	8,389
Total	$22,445	$23,805	$21,438	$18,599	$22,380	$23,744

[a]Estimate.

Table 1.7 Budget Requests and Obligation for Environment Subprograms, Fiscal Years 1987-89

Subprogram	Fiscal Years					
	Budget 1987	Obligated 1987	Budget 1988	Obligated 1988	Budget 1989	Obligated[a] 1989
(Dollars in Thousands)						
Aircraft Engine Emissions Reduction and Control	$ 250	$ 190	$ 354	$ 513	$ 354	$ 354
Fuel Shortage Contingency Planning	0	0	83	182	83	83
Fuel Conservation	0	60	300	235	229	229
Aircraft Noise Reduction	1,350	1,391	1,450	570	1,446	1,576
Total	$1,600	$1,641	$2,187	$1,500	$2,112	$2,242

[a]Estimate.

SECTION 2

STAFFING INFORMATION ON FAA'S RE&D SUBPROGRAMS

Table 2.1: Staffing Levels for Air Traffic Control Subprograms, Fiscal Years 1987-89

Program	Subprogram	1987	1988	1989
Aircraft Separation Assurance	TCAS III Implementation	0	0	9
	TCAS II Development	1	8	2
	TCAS II Implementation	13	18	4
	TCAS III Development	12	0	7
	Rotorcraft TCAS	5	0	0
	Passive TCAS I	0	0	0
ATC Requirement Studies	ADM Support	0	0	0
Beacon	Low-Altitude Surveillance	1	0	1
	Special Surveillance System	0	0	0
	Surface Traffic Surveillance	0	1	4
	Mode S Integrated Tracker	0	0	1
Communications	Future System Requirements	0	1	0
	Aeronautical Data Link	15	20	11
	Data Link Technical Development	0	14	27
	NADIN/NADIN II	8	2	2
	Network Management and Control	0	2	3
	Communications, Planning and Design	0	0	4
	VSCS	12	23	20
Enroute Control	Conflict Alert Resolution	7	0	0
	Enroute Metering	0	0	0
Flight Service Stations	Direct User Access (FSAS)	30	0	0

(Continue)

Program	Subprogram	1987	1988	1989
Human Systems and Operations	Information Transfer and Management	2	2	1
	Flight Crew Certification Requirements	0	0	0
	Human Factors and Regulatory Support	0	0	1
	Intelligent Machine Interface	0	0	0
	Causal Factors in Accidents/ Incidents	1	2	1
	Controller Human Factors	0	1	1
	Automated Radar Training	0	1	4
	Control and Display Technology	0	0	0
	Human Performance Assessment and Improvement	0	0	0
Rotorcraft	RotorcrafT IFR Operations Evaluations	19	21	8
	Rotorcraft Obstruction Avoidance	0	0	2
	Heliport/Vertiport Design and Planning	0	0	0
	Rotorcraft Separation Standards	0	0	1
	Rotorcraft Communications	2	2	0
	Rotorcraft ATC Procedures	0	1	18
	Rotorcraft TERPS	1	5	0
	Rotorcraft Simulator Studies	0	1	0
	Rotorcraft Display and Control Studies	0	0	1
Support	FAA/NASA Cooperative Program	7	7	7
	Frequency Spectrum Management	0	0	0
	ASA Program Support	12	15	17
	Small Business Innovative Research	0	0	0
	Transportation Research Board	0	0	0

(Continue)

Program	Subprogram	1987	1988	1989
	ADL Management Initiatives	0	0	0
	Joint University Program	0	0	0
System	RE&D Plan	0	0	0
	System Requirements	33	19	22
	Management and Control Process	0	0	0
	Future System Definition	0	0	0
	Systems Engineering Management	1	3	2
	NAS Development Studies	0	20	8
	Systems Concept Definition	0	0	0
	National Airspace System Performance Analysis Capability	0	0	0
System Capacity and Airports	Separation Standards	30	33	39
	Airport Capacity Task Force Studies	11	13	7
	Implementation Planning For Task Force Studies	0	0	0
	Cockpit Display Evaluation	0	0	0
	Wake Vortex Avoidance/ Advisory System	0	5	2
	Precision Runway Monitor Back-to-Back Antenna	0	0	1
	Precision Runway Monitor-Hi Data Rate	0	0	0
	Simulation and Model Development	0	0	5
	Airport Safety Planning	0	1	6
	Terminal Airspace Application	0	0	0
	Terminal/Landside Traffic Modeling	0	0	0
	Airport Safety Support System	0	1	3

(Continue)

Program	Subprogram	1987	1988	1989
	Airport Surface Visual Control	10	7	7
	Capacity Enhancement Planning	0	0	2
	Handicapped Passenger Assistance	0	0	0
	Reduced Runway Occupancy Time	8	8	3
	All Weather Taxiway Guidance	0	1	0
	Airport Pavement	3	1	1
	Airport Design, Configuration and Capacity	0	0	0
	Capacity Development	7	15	13
	Terminal Airspace Assessment	0	0	0
Technology	Satellite Applications	4	1	1
	ATC Applications of ADS	1	1	14
	Advance Computer Science Applications	1	0	0
Terminal Tower Control	Terminal System (ARTS II/IIA)	0	3	0
	Sustain ARTS III/IIIA	0	3	0
	Mode S Terminal Interface	5	0	0
Tiltrotor	Tilt Certification Support	0	0	0
Total		262	282	293

Table 2.2: Staffing Levels for Advanced Computer Subprograms, Fiscal Years 1987-89

Subprogram	1987	1988	1989[a]
AERA 1	0	0	0
AERA 2	8	10	0
AAS	87	90	93
Advanced Traffic Management	1	2	1
AERA 3	11	1	1
Terminal ATC Automation	0	0	1
Airport Surface Traffic Automation	0	1	1
Dynamic Special Use Airspace	0	0	0
Total	107	104	97

[a]Estimate.

Table 2.3: Staffing Levels for Navigation Subprograms, Fiscal Years 1987-89

Subprogram	1987	1988	1989
GPS Utilization	0	0	9
Navigation Systems Development	1	1	1
Navigation Systems Engineering	20	25	9
MLS ATC Integration	0	0	1
MLS Step Program	0	0	0
MLS Displays	17	0	0
Instrument Approach Improvements	2	1	1
Flight Crew Performance	1	0	0
Total	41	27	21

Table 2.4: Staffing Levels for Aviation Weather Subprograms, Fiscal Years 1987-89

Subprogram	1987	1988	1989
CWP Future Interface Development	0	2	3
ACF Data Link Services	0	0	0
Central Weather Processing	20	32	25
Airborne Wind Shear Detection and Avoidance	1	1	1
Advance Windshear Sensor Development	0	0	1
Expanded LLWAS	0	3	4
ATC/Aircraft Wind Shear Information Transfer	0	0	0
LLWAS Voice Synthesis	0	0	6
Terminal Weather Radar	6	2	5
Weather Radar (NEXRAD)	13	9	4
Advanced WX Devices and Sensors	4	0	0
Weather Radar Processing and Display	2	0	0
Total	46	49	49

Table 2.5: Staffing Levels for Aircraft Safety Subprograms, Fiscal Years 1987-89

Subprogram	1987	1988	1989
Safety Fuel Evaluation	2	2	0
Aircraft Systems Fire Safety	39	42	52
Regulatory Development Support Activities	0	0	1
Propulsion/Fuel Systems	33	22	18
Crashworthiness/Airworthiness	16	14	12
Aging Aircraft NDI	0	0	0
Flight Safety/Atmospheric Hazards	15	13	13
Explosive Sabotage Detection	10	16	15
Total	115	109	111

SECTION 3

SCHEDULING INFORMATION ON FAA'S RE&D SUBPROGRAMS

Table 3.1: Scheduling Information on Air Traffic Control Subprograms, Fiscal Years 1987-89

Program	Subprogram	Start Date	End Date
Aircraft Separation Assurance	TCAS III Implementation	10/01/86	04/01/94
	TCAS II Development	10/01/83	09/01/89
	TCAS II Implementation	10/01/83	02/01/92
	TCAS III Development	10/01/81	03/01/92
	Rotorcraft TCAS	10/01/83	09/01/87
	Passive TCAS I	10/01/87	09/01/88
ATC Requirement Studies	ADM Support	10/01/79	03/01/92
Beacon	Low-Altitude Surveillance	10/01/84	09/01/94
	Special Surveillance System	10/01/87	09/01/89
	Surface Traffic Surveillance	Not Funded	
	Mode S Integrated Tracker	10/01/88	09/01/95
Communications	Future System Requirements	Not Funded	
	Aeronautical Data Link	10/01/78	09/01/95
	Data Link Technical Development	10/01/87	09/01/89
	NADIN/NADIN II	10/01/77	09/01/94
	Network Management Control	10/01/87	09/01/94
	Communication Planning and Design	10/01/77	09/01/94
	VSCS	10/01/78	09/01/94
Enroute Control	Conflict Alert Resolution	10/01/77	09/01/87
	Enroute Metering	10/01/77	09/01/84
Flight Service Stations	Direct User Access	10/01/77	09/01/86
Human Systems and Operations	Information Transfer and Management	10/01/85	09/01/95

(Continue)

Program	Subprogram	Start Date	End Date
	Flight Crew Certification Requirements	10/01/88	09/01/94
	Human Factors and Regulatory Support	10/01/88	09/01/93
	Intelligent Machine Interface	10/01/87	09/01/88
	Causal Factors in Accidents/ Incidents	10/01/87	Continuing
	Controller Human Factors	10/01/87	09/01/94
	Automated Radar Training	10/01/87	09/01/91
	Control and Display Technology	10/01/88	09/01/94
	Human Performance Assessment and Improvement	10/01/88	Continuing
Rotorcraft	Rotorcraft IFR Operations Evaluation	10/01/77	09/01/94
	Rotorcraft Obstruction Avoidance	10/01/87	09/01/94
	Heliport/Vertiport Design and Planning	10/01/88	09/01/94
	Rotorcraft Separation Standards	10/01/87	09/01/94
	Rotorcraft Communications	10/01/86	09/01/88
	Rotorcraft ATC Procedures	10/01/87	09/01/94
	Rotorcraft TERPS	10/01/79	09/01/88
	Rotorcraft Simulator Studies	10/01/87	09/01/94
	Rotorcraft	10/01/87	09/01/94
Support	FAA/NASA Cooperative Program	10/01/77	Continuing
	Frequency Spectrum Management	Not Funded	
	ASA Program Support	10/01/79	09/01/94

(Continue)

Program	Subprogram	Start Date	End Date
	Small Business Innovative Research	10/01/83	Continuing
	Transportation Research Board	10/01/88	Continuing
	ADL Management Initiatives	10/01/87	09/01/94
	Joint University Program	10/01/88	Continuing
System	RE&D Plan	10/01/87	Continuing
	System Requirements	10/01/85	Continuing
	Management and Control Process	10/01/88	Continuing
	Future System Definition	10/01/87	Continuing
	Systems Engineering Management	10/01/77	Continuing
	NAS Development Studies	10/01/87	Continuing
	Systems Concept Definition	10/01/88	Continuing
	National Airspace System Performance Analysis Capability	10/01/88	09/01/96
System Capacity and Airports	Separation Standards	10/01/77	09/01/94
	Airport Capacity Task Force Studies	10/01/81	Continuing
	Implementation Planning for Task Force Studies	10/01/88	09/01/89
	Cockpit Display Evaluation	10/01/88	09/01/89
	Wake Vortex Avoidance/ Advisory System	10/01/77	01/01/05
	Precision Runway Monitor Back-to-Back Antenna	10/01/87	09/01/89
	Precision Runway Monitor-High Data Rate	10/01/87	09/01/90
	Simulation and Model Development	10/01/86	09/01/97
	Airport Safety Planning	06/01/84	06/01/95

(Continue)

Program	Subprogram	Start Date	End Date
	Terminal Airspace Application	10/01/88	09/01/89
	Terminal/Landside Traffic Modeling	10/01/86	09/01/93
	Airport Safety Support System	10/01/77	06/01/95
	Airport Surface Visual Control	10/01/80	01/01/06
	Capacity Enhancement Planning	10/01/86	Continuing
	Handicapped Passenger Assistance	10/01/87	09/01/88
	Reduced Runway Occupancy Time	10/01/87	01/01/14
	All Weather Taxiway Guidance	Not Funded	
	Airport Pavement	10/01/77	01/01/15
	Airport Design, Configuration, and Capacity	10/01/87	01/01/05
	Capacity Development	10/01/77	Continuing
	Terminal Airspace Assessment	10/01/88	09/01/89
Technology	Satellite Applications	10/01/77	Continuing
	ATC Applications of ADS	10/01/84	04/01/93
	Advance Computer Science Applications	10/01/83	09/01/87
Terminal Tower Control	Terminal System (ARTS II/IIA)	10/01/86	09/01/89
	Sustain ARTS III/IIIA	10/01/86	09/01/89
	Mode S Terminal Interface	10/01/77	09/01/87
Tiltrotor	Tilt Certification Support	10/01/87	09/01/94

Table 3.2: Scheduling Information on Advanced Computer Subprograms, Fiscal Years 1987-89

Subprogram	Start Date	End Date
AERA 1	10/01/78	09/01/87
AERA 2	10/01/78	09/01/87
AAS	10/01/81	04/01/01
Advanced Traffic Management	10/01/80	04/01/95
AERA 3	10/01/86	02/01/99
Terminal ATC Automation	10/01/87	09/01/94
Airport Surface Traffic Automation	10/01/87	09/01/05
Dynamic Special Use Airspace	10/01/87	04/01/97

Table 3.3: Scheduling Information on Navigation Subprograms, Fiscal Years 1987-89

Subprogram	Start Date	End Date
GPS Utilization	10/01/87	10/01/93
Navigation Systems Development	10/01/77	Continuing
Navigation Systems Engineering	10/01/81	09/01/94
MLS ATC Integration	10/01/88	09/01/89
MLS Step Program	10/01/79	09/01/86
MLS Displays	10/01/83	09/01/87
Instrument Approach Improvements	10/01/86	09/01/89
Flight Crew Performance	10/01/82	09/01/87

Table 3.4: Scheduling Information on Aviation Weather Subprograms, Fiscal Years 1987-89

Subprogram	Start Date	End Date
CWP Future Interface Development	10/01/87	09/01/92
ACF Data Link Services	Not Initiated	
Central Weather Processing	10/01/80	09/01/90
Airborne Wind Shear Detection and Avoidance	10/01/86	09/01/91
Advance Windshear Sensor Development	Not Initiated	
Expanded LLWAS	10/01/87	09/01/93
ATC/Aircraft Wind Shear Information Transfer	10/01/88	09/01/89
LLWAS Voice Synthesis	10/01/88	09/01/93
Terminal Weather Radar	10/01/83	04/01/93
Weather Radar (NEXRAD)	10/01/80	09/01/94
Advanced WX Devices and Sensors	10/01/86	09/01/87
Weather Radar Processing and Display	10/01/80	09/01/87

Table 3.5: Scheduling Information on Aviation Medicine Subprograms, Fiscal Years 1987-89

Subprogram	Start Date	End Date
Aeromedical Program Support	10/01/77	Continuing
Protection and Survival	10/01/77	Continuing
Workforce Optimization Research	10/01/87	Continuing
Human Performance Research	10/01/87	Continuing

Table 3.6: Scheduling Information on Aircraft Safety Subprograms, Fiscal Years 1987-89

Subprogram	Start Date	End Date
Safety Fuel Evaluation	10/01/77	09/01/88
Aircraft Systems Fire Safety	10/01/77	Continuing
Regulatory Development Support Activities	10/01/86	09/01/90
Propulsion/Fuel Systems	10/01/77	01/01/02
Crashworthiness/ Airworthiness	10/01/77	Continuing
Aging Aircraft NDI	10/01/88	09/01/98
Flight Safety/ Atmospheric Hazards	10/01/77	Continuing
Explosive Sabotage Detection	10/01/77	09/01/93

Table 3.7: Scheduling Information on Environment Subprograms, Fiscal Years 1987-89

Subprogram	Start Date	End Date
Aircraft Engine Emissions Reduction Control	10/01/77	Continuing
Fuel Shortage Continuation Plan	10/01/87	09/01/89
Fuel Conservation	10/01/87	09/01/94
Aircraft Noise Reduction	10/01/77	Continuing

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