

FAA  
SE  
9V  
3

COPY 1

# National Airspace System



U.S. Department of Transportation  
Federal Aviation Administration

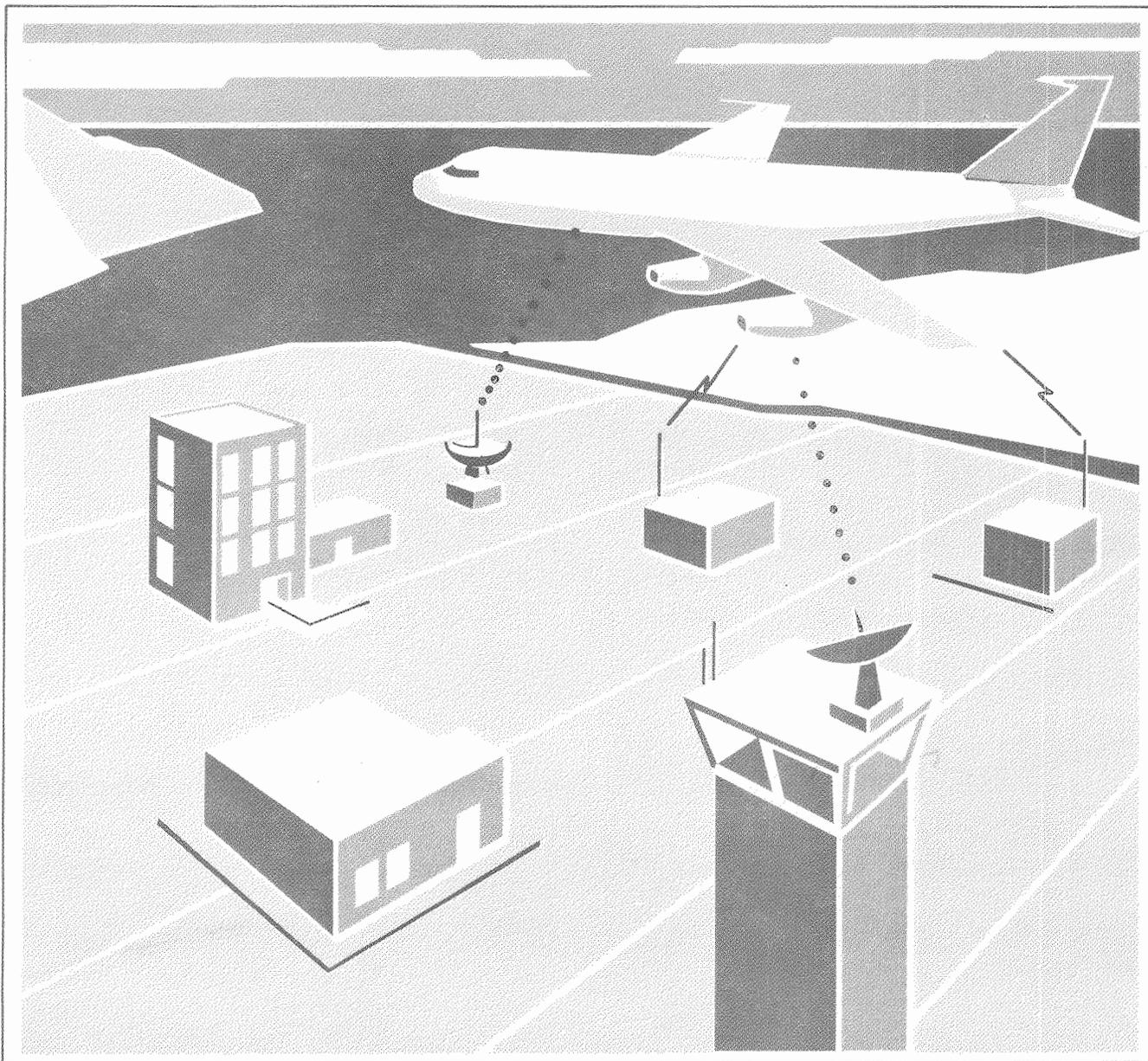
FEDERAL AVIATION ADMINISTRATION

DEC 26 1991

TECHNICAL CENTER LIBRARY  
ATLANTA, GEORGIA

Monitoring Operational Concept

NAS-SR-133



NOTICE

This document is disseminated under the sponsorship of the U.S. Department of Transportation in the interest of information exchange. The U.S. Government assumes no liability for its contents or use thereof.

1. Report No. <b>DOT/FAA/SE-91/3</b>		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle <b>Monitoring Operational Concept NAS-SR-133</b>				5. Report Date <b>October 1991</b>	
				6. Performing Organization Code	
				8. Performing Organization Report No.	
7. Author(s) <b>William Trent, Thomas Pickerell, Harold Nelson, Jr.</b>				10. Work Unit No. (TRAIS)	
9. Performing Organization Name and Address <b>Computer Resource Management, Inc. 950 Herndon Parkway, Suite 360 Herndon, VA 22070</b>				11. Contract or Grant No. <b>DTEA01-91-Y-01004</b>	
				13. Type of Report and Period Covered	
12. Sponsoring Agency Name and Address <b>U.S. Department of Transportation Federal Aviation Administration 800 Independence Ave., SW Washington, DC 20591</b>				14. Sponsoring Agency Code <b>ASE-300, Thomas Higgins</b>	
				15. Supplementary Notes	
16. Abstract  <p>A requirement for the National Airspace System (NAS) is to provide a variety of monitoring services to its users, as identified in the NAS System Requirement Specification, NAS-SR-1000. This document presents a concept of operations for monitoring. It describes monitoring capabilities and shows the relationships between subsystems, facilities, information, and operators/users. It is intended to provide a common perspective for personnel involved in monitoring services, assist in determining whether monitoring procedures meet formal requirements, and support coordination among the organizations involved.</p> <p>This concept, and the other seven operational concepts, will complete the description of the system requirements as described in the NASSRS.</p> <p>The eight operational concepts are: Communications (NAS-SR-136); Navigation (NAS-SR-134); Monitoring (NAS-SR-133); Maintenance and Support (NAS-SR-137); System Effectiveness (NAS-SR-138); Air Defense (NAS-SR-135); Flight Planning (NAS-SR-131); and Traffic Control and Airspace Management (NAS-SR-132).</p>					
17. Key Words <b>Monitoring National Airspace System Air Traffic Control</b>			18. Distribution Statement  <b>Document is available to the public through the National Technical Information Service Springfield, VA 22161</b>		
19. Security Classif. (of this report) <b>UNCLASSIFIED</b>		20. Security Classif. (of this page) <b>UNCLASSIFIED</b>		21. No. of Pages <b>46</b>	22. Price

Date	Description	Amount
1/1/2020	Opening Balance	1000.00
1/15/2020	Deposit	500.00
2/1/2020	Withdrawal	200.00
2/15/2020	Deposit	300.00
3/1/2020	Withdrawal	150.00
3/15/2020	Deposit	400.00
4/1/2020	Withdrawal	250.00
4/15/2020	Deposit	350.00
5/1/2020	Withdrawal	180.00
5/15/2020	Deposit	450.00
6/1/2020	Withdrawal	220.00
6/15/2020	Deposit	380.00
7/1/2020	Withdrawal	190.00
7/15/2020	Deposit	420.00
8/1/2020	Withdrawal	210.00
8/15/2020	Deposit	360.00
9/1/2020	Withdrawal	170.00

## TABLE OF CONTENTS

	<u>Page</u>
LIST OF FIGURES . . . . .	iii
LIST OF TABLES . . . . .	iii
1.0 INTRODUCTION . . . . .	1-1
1.1 Background . . . . .	1-1
1.2 Objective . . . . .	1-1
1.3 Scope . . . . .	1-1
1.4 Methodology . . . . .	1-2
1.5 Document Organization . . . . .	1-3
2.0 MONITORING OPERATIONS . . . . .	2-1
2.1 Support . . . . .	2-1
2.1.1 Positions/Systems/Functions . . . . .	2-1
2.1.2 Information . . . . .	2-4
2.1.2.1 Flight Plan Information . . . . .	2-5
2.1.2.2 Aircraft Position Information . . . . .	2-5
2.1.2.3 Information from Weather Sources . . . . .	2-6
2.2 Monitoring Services. . . . .	2-6
2.2.1 Flight Following . . . . .	2-6
2.2.1.1 Request & Acceptance of Flight Following Services . . . . .	2-7
2.2.1.2 Provision of Flight Following on Request . . . . .	2-7
2.2.1.3 Overdue Aircraft Flight Alerts . . . . .	2-7
2.2.1.4 Information on Overdue Aircraft . . . . .	2-7
2.2.2 Traffic Advisories . . . . .	2-7
2.2.2.1 Provision of Traffic Advisories . . . . .	2-8
2.2.2.2 Safety Advisories and Vectoring . . . . .	2-8
2.2.2.3 VFR Sequencing & Separation in Terminal Phases . . . . .	2-8
2.2.2.4 Advisories & Vectoring near Special Use Airspace . . . . .	2-8
2.2.2.5 Information on Aircraft under Traffic Advisory Service . . . . .	2-9
2.2.2.6 Determination of Potential Traffic Conflicts . . . . .	2-9
2.2.3 Weather Advisories . . . . .	2-9
2.2.3.1 Provision of Weather Advisories to Aircraft in Flight . . . . .	2-9
2.2.3.2 Weather Advisories Information Available Continuously . . . . .	2-9
2.2.3.3 User Access to Current Hazardous Weather Information . . . . .	2-10
2.2.3.4 Monitoring of Hazardous Weather to VFR Aircraft . . . . .	2-10
2.2.3.5 Assistance in Determining Avoidance Actions . . . . .	2-10
2.2.3.6 Weather Avoidance Communication Links . . . . .	2-10

TABLE OF CONTENTS (Cont.)

	<u>Page</u>
2.3 Functions . . . . .	2-10
2.3.1 AFSS Specialist (Positions 3 & 4) . . . . .	2-11
2.3.2 ACF Approach/Departure Controller (Position 6) and En route Controller (Position 7) . . . . .	2-13
2.3.3 ATCT Local Controller (Position 9) . . . . .	2-14
2.4 Correlation with Operational Requirements . . . . .	2-18
2.5 Operational Sequences . . . . .	2-18
2.5.1 Flight Following Operational Sequence . . . . .	2-18
2.5.2 Traffic Advisory Operational Sequence . . . . .	2-18
2.5.3 Weather Advisory Operational Sequence . . . . .	2-22
2.6 Operational Scenario . . . . .	2-25
2.6.1 Flight Following Operational Scenario . . . . .	2-25
2.6.2 Traffic Advisory Operational Scenario . . . . .	2-25
2.6.3 Weather Advisory Operational Scenario . . . . .	2-28
REFERENCES . . . . .	RE-1
GLOSSARY . . . . .	GL-1
ACRONYMS/ABBREVIATIONS . . . . .	AA-1

TABLE OF CONTENTS (Cont.)

LIST OF FIGURES

<u>Figure Number</u>		<u>Page</u>
2-1	OVERVIEW OF NAS/USER INTERFACES FOR MONITORING . . . . .	2-2
2-2	MONITORING OPERATIONAL BLOCK DIAGRAM . . . . .	2-3
2-3	AFSS SPECIALIST OPERATIONAL FLOW DIAGRAM . . . . .	2-12
2-4	ACF APPROACH/DEPARTURE AND EN ROUTE CONTROLLER OPERATIONAL FLOW DIAGRAM . . . . .	2-15
2-5	ATCT LOCAL CONTROLLER OPERATIONAL FLOW DIAGRAM . . . . .	2-17
2-6	FLIGHT FOLLOWING OPERATIONAL SEQUENCE DIAGRAM . . . . .	2-20
2-7	TRAFFIC ADVISORY OPERATIONAL SEQUENCE DIAGRAM (EN ROUTE) . . . . .	2-21
2-8	TRAFFIC ADVISORY OPERATIONAL SEQUENCE DIAGRAM (ATCT) . . . . .	2-23
2-9	WEATHER ADVISORY OPERATIONAL . . . . .	2-24
2-10	FLIGHT FOLLOWING SCENARIO . . . . .	2-26
2-11	TRAFFIC ADVISORY SCENARIO (EN ROUTE) . . . . .	2-27
2-12	TRAFFIC ADVISORY SCENARIO (ATCT) . . . . .	2-29
2-13	WEATHER ADVISORY SCENARIO . . . . .	2-30

LIST OF TABLES

<u>Table Number</u>		
2-1	MONITORING OPERATIONAL REQUIREMENTS CORRELATION . . . . .	2-19

1. Introduction

2. Methodology

3. Results

4. Discussion

5. Conclusion

6. References

7. Appendix

8. Bibliography

9. Index

10. Glossary

11. Acknowledgments

12. Author Biographies

13. Contact Information

14. Declaration of Interest

15. Funding Sources

16. Data Availability

17. Ethics Statement

18. Conflicts of Interest

19. Supplementary Materials

20. Correspondence

## 1.0 INTRODUCTION

### 1.1 Background

The National Airspace System (NAS) is required to provide a variety of monitoring services to its users. Among these services are flight following, traffic advisories, and weather advisories. The National Airspace System System Requirements Specification (NASSRS), NAS-SR-1000, describes the requirements for providing assistance to users during monitoring operations.

This operational concept document has been developed using an established standard format and is consistent in structure with a series of operational concepts written about various sections of the NASSRS.

### 1.2 Objective

The objective of this operational concept document is to describe how monitoring assistance will be provided in the future approved NAS. This operational concept describes NAS-provided monitoring services assist the user in emergency situations, in avoiding other aircraft, and in adverse weather. It is intended to be a descriptive document which provides FAA management and technical personnel and other user organizations with a clear understanding of how monitoring services are provided. More specifically, the purpose of this document is to:

- \* Provide a common operational perspective across subsystems, operators, and users.

- \* Show the interrelationship between subsystems, facilities, information, and operators/users.

### 1.3 Scope

This operational concept for monitoring describes the services provided as outlined in Section 3.3 of the NASSRS. The operations described are limited to those associated solely with monitoring. The concept describes the services provided by certain types of specialists/controllers. The names assigned to these specialist/controller positions are based on the primary functions performed; although the names of the positions may not agree with those commonly used today or may change at a later date as the NAS evolves, the functions performed will not change.

The specific paragraphs appearing in NASSRS Section 3.3 are as follows:

#### 3.3 Monitoring

##### 3.3.1 Flight Following

- 3.3.1.A Request and Acceptance of Flight Following Services

- 3.3.1.B Provision of Flight Following on Request

- 3.3.1.C Overdue Aircraft Flight Alerts

- 3.3.1.D Information on Overdue Aircraft

##### 3.3.2 Traffic Advisories

- 3.3.2.A Provision of Traffic Advisories

- 3.3.2.B Safety Advisories and Vectoring

- 3.3.2.C VFR Sequencing and Separation in Terminal Phases

- 3.3.2.D Advisories and Vectoring near Special Use Airspace

- 3.3.2.E Information on Aircraft under Traffic Advisory Service
- 3.3.2.F Determination of Potential Traffic Conflicts

### 3.3.3 Weather Advisories

- 3.3.3.A Provisions of Weather Advisories to Aircraft in Flight
- 3.3.3.B Weather Advisory Information Available Continuously
- 3.3.3.C User Access of Current Hazardous Weather Information
- 3.3.3.D Monitoring of Hazardous Weather for VFR Aircraft
- 3.3.3.E Assistance in Determining Avoidance Actions
- 3.3.3.F Weather Avoidance Communications Links

## 1.4 Methodology

The methodology used to develop this operational concept is similar to the methods and tools utilized in system development in that successive levels of decomposition of the monitoring function are represented. This document begins with the overall concept and breaks it down to its most elemental levels of support, diagrammatic tools, and techniques that constitute monitoring support. These analytical tools are:

1. Operational Block Diagram/Description. The operational block diagram illustrates the connectivity between major elements of the NAS, i.e., processors, specialists/ controllers, and the user for those elements that support the service. The operational block diagram in this operational concept is extracted from the overall NAS Operational Block Diagram. Principal features of the operational block diagram/description include the following:
  - a. Each specialist/controller position category has been assigned a number that remains constant in every operational concept.
  - b. Dotted lines segregate facilities.
  - c. Solid lines show digital data flow. Voice data flow is not displayed.
  - d. The blocks within each facility are the major processors.
2. Operational Flow Diagrams/Descriptions. An operational flow diagram (for example, Figure 2-3 on page 2-12), and associated description for each specialist provides details about the inputs, processes, outputs, and interfaces for each operator; thus, the operational flow diagram provides an expansion of each element of the NAS shown in the monitoring master block diagram. Operational flow diagrams are used to functionally describe the products and services of individual specialists.
3. Operational Sequence Diagrams/Descriptions. The operational sequence diagram (for example, Figure 2-6 on page 2-20), and associated description show a typical sequence of steps taken by operators/users to support monitoring operations. Principal features of an operational sequence diagram include the following:

- a. The users, specialists, and computer systems involved with providing the monitoring functions are listed along the vertical axis. When required for further clarification other FAA facilities may also be listed on the vertical axis.
- b. The horizontal axis represents time. The sequential events or functions performed are indicated within separate boxes. Events which may occur simultaneously or near-simultaneously are shown vertically.
- c. Decision points or points where alternate paths may be followed are indicated by a diamond shape.
- d. Circles are connectors and indicate exit to, or entry from, another diagram. Circles with a lower case alphabetic character refer to an operator function described in the figure listed below the circle. Circles connect either to another sheet of the same diagram or to another diagram; the relevant figure number is listed below if a circle connects to a different diagram. Thus, the relationship between operator/user interactions and relevant NAS subsystems can be depicted.

## 1.5 Document Organization

The remainder of this document is organized in the following manner. Section 2 Monitoring Operations is divided into six subsections:

Section 2.1 Support provides an overview description of the monitoring function and identifies the personnel complement and physical entities (facilities and computer systems) which provide the required support.

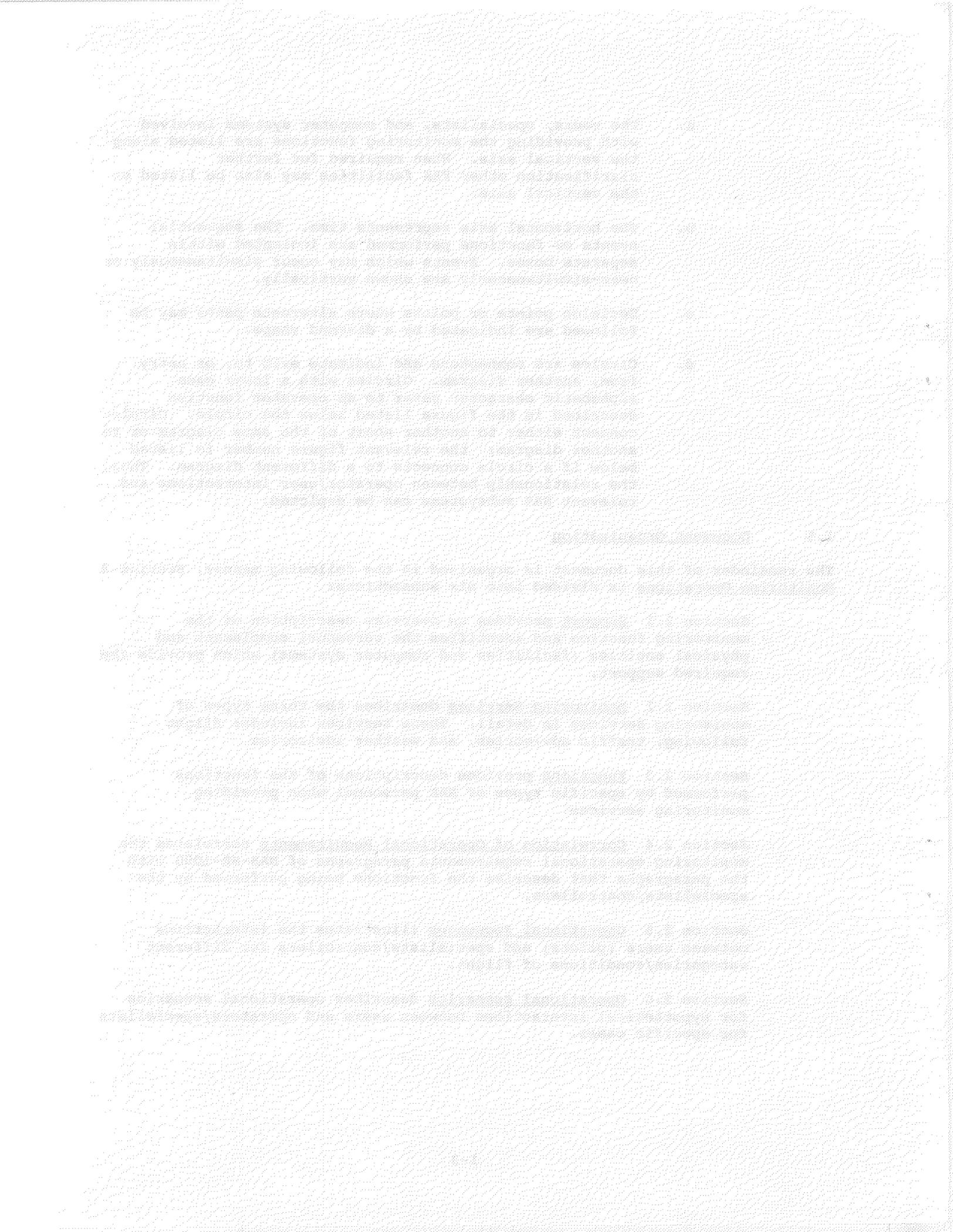
Section 2.2 Monitoring Services describes the three types of monitoring services in detail. These services include: flight following, traffic advisories, and weather advisories.

Section 2.3 Functions provides descriptions of the functions performed by specific types of NAS personnel when providing monitoring services.

Section 2.4 Correlation of Operational Requirements correlates the monitoring operational requirements paragraphs of NAS-SR-1000 with the paragraphs that describe the functions being performed by the specialists/controllers.

Section 2.5 Operational Sequences illustrates the interactions between users (pilots) and specialists/controllers for different categories/conditions of flight.

Section 2.6 Operational scenarios describes operational scenarios for hypothetical interactions between users and operators/specialists for specific cases.



## 2.0 MONITORING OPERATIONS

### 2.1 Support

The NAS is required to provide monitoring services to assist users in emergency situations, in avoiding other aircraft, and avoiding adverse weather. Monitoring services are described in Section 3.3 of the NASSRS. Monitoring services consist of flight following, traffic advisories, and weather advisories to aircraft on Instrument Flight Rules (IFR) and Visual Flight Rules (VFR) flight plans. These services may be provided by Automated Flight Service Stations (AFSS) specialists, Approach/Departure and En route Controllers at Area Control Facilities (ACF), or Local Controllers at Airport Traffic Control Towers (ATCT).

AFSSs are air traffic facilities which provide pilot briefings, en route communications and VFR search and rescue services, assist lost aircraft and aircraft in emergency situations, relay ATC clearances, originate Notices to Airmen (NOTAMS), broadcast aviation weather and NAS information, receive and process IFR flight plans, and monitor navigational aids (NAVAIDS). In addition, En route Flight Advisory Service (Flight Watch) is normally available throughout the conterminous U.S. and Puerto Rico. High altitude EFAS provides a discrete frequency within each ACF area for use by aircraft flying at altitudes of 18,000 feet MSL and above.

ACFs are established primarily to provide air traffic service to aircraft operating on IFR flight plans within controlled airspace, within both the terminal and en route phases of flight.

ATCTs have been established to provide for safe, orderly and expeditious flow of traffic on and in the vicinity of airports.

#### 2.1.1 Positions/Systems/Functions

Figure 2-1 presents an overview of NAS/user interfaces for monitoring services and displays the NAS facilities and systems involved.

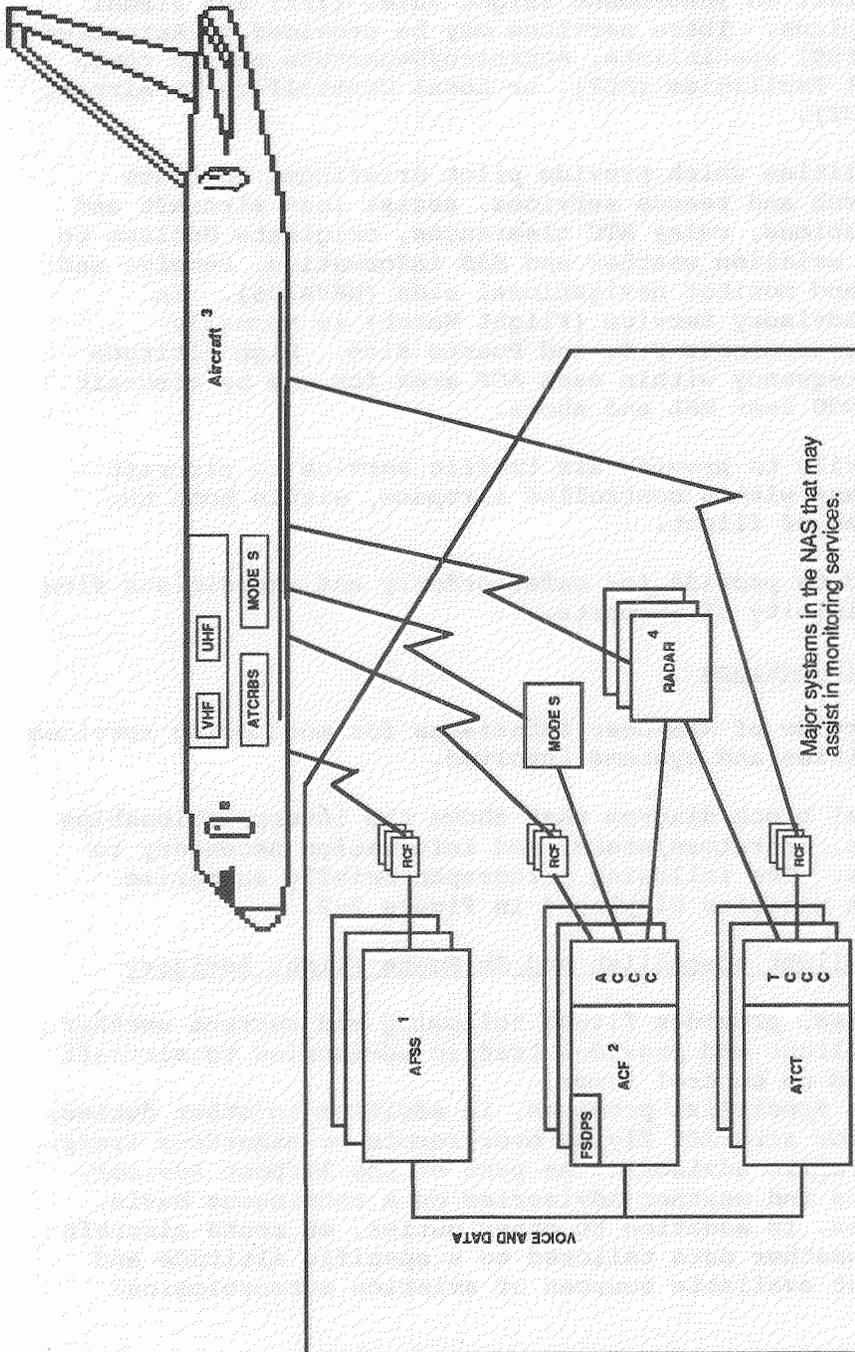
Figure 2-2 is an operational block diagram that shows the interrelationships among equipment, facilities, operators/users, and information necessary to support monitoring services. The following paragraphs briefly summarize monitoring services at each position displayed in Figure 2-2.

#### Positions 3 & 4: AFSS In-Flight Specialist and En Route Flight Advisory Specialist (EFAS)

Function: Among other duties, provides flight following and current weather advisories to aircraft in flight and provides traffic advisories to aircraft at airports with an AFSS and no control tower.

Description: The In-Flight Specialist provides, in addition to other duties, flight following services for aircraft flying over remote or hazardous areas. This specialist provides traffic advisories as part of the Airport Advisory Service at selected airports and weather advisories on a continuous basis. The EFAS Specialist provides, in addition to other duties, en route aircraft with timely and pertinent weather data tailored to a specific altitude and route using the most current available sources of aviation meteorological information.

Procedures: FAA Handbook 7110.10, Flight Services



- 1 Primarily handles VFR aircraft.
- 2 Primarily handles IFR aircraft.
- 3 Future aircraft may have different combinations of these systems.
- 4 Includes Terminal, En Route, and Weather radars.

**FIGURE 2-1  
OVERVIEW OF NAS/USER INTERFACES  
FOR MONITORING**

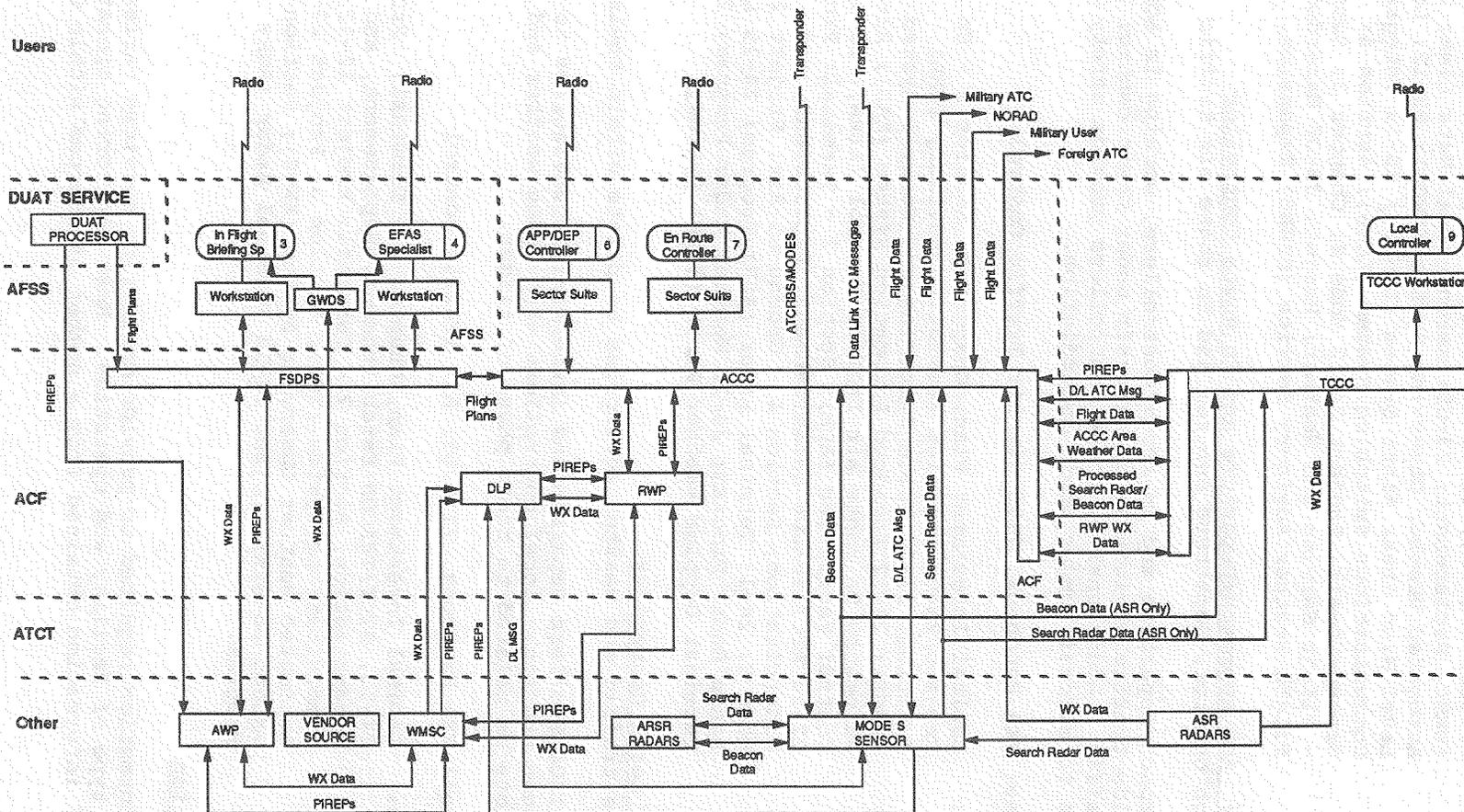


FIGURE 2-2  
MONITORING CONNECTIVITY BLOCK DIAGRAM

**Projects:** Capital Investment Plan, Chapter 2; Section 3 - Flight Service and Weather; Project 23-01: Flight Service Automation System (FSAS); 23-02: Central Weather Processor (CWP); 23-04: Weather Message Switching Center (WMSC) Replacement; 23-05: Aeronautical Data Link; 23-09: Automated Weather Observing System (AWOS); 23-12: Low-Level Wind Shear Alert System (LLWAS); 23-13 Integrated Communications Switching System (ICSS); Section 4: Ground-to-Air; Project 24-12 Mode S; Chapter 3; Section 3 - Flight Service and Weather; Project 33-08 Hazardous In-Flight Weather Advisory Service (HIWAS) Expansion.

**Positions 6 and 7: ACF Approach/Departure and En Route Controller**

**Function:** Approach control, Departure control and En route air traffic control.

**Description:** Approach/Departure and En route Controllers, working in ACFs, separate and provide traffic advisories to aircraft under their control based on other known traffic. Additionally, these controllers provide safety and weather advisories to aircraft under their jurisdiction.

**Procedures:** FAA Handbook, 7110.65, Air Traffic Control

**Projects:** Capital Investment Plan, Chapter 2: Section 1 - En route; Project 21-09 Conflict Resolution Advisory (CRA) Function; 21-11 Voice Switching and Control System (VSCS); 21-12 Advanced Automation System (AAS); 21-13 Automated En route Air Traffic Control (AERA); 21-15 Area Control Facilities (ACF); Section 2 - Terminal: Project 22-13 ATCT/TRACON Establishment, Replacement, and Modernization; Section 4 - Ground-to-Air: Project 24-12 Mode S; 24-13 Terminal Radar (ASR) Program; 24-15 Long Range Radar Program; 24-16 Weather Radar Program; 24-18 Terminal Doppler Weather Radar (TDWR) System.

**Position 9: ATCT Local Controller**

**Function:** Provides traffic and weather advisories to pilots within their area of jurisdiction.

**Description:** Local Controllers separate and issue traffic advisories to pilots based on other known traffic. Local controllers also issue weather and safety advisories to pilots as related to their phase of flight.

**Procedures:** FAA Handbook, 7110.65, Air Traffic Control

**Projects:** Capital Investment Plan, Chapter 2 - Terminal; Project 21-13, ATCT/TRACON Establishment, Replacement, and Modernization; Section 2 - Terminal: Project 22-12 Tower Communications System (TCS); Section 3; Project 23-09 Automated Weather Observing System (AWOS); Section 4 Ground-to-Air; Project 24-13 Terminal Radar (ASR) Program.

**2.1.2 Information**

The amount of information required to provide monitoring services varies according to the type of facility and operation. Most monitoring operations require a core of information obtained from a number of sources within the NAS.

### 2.1.2.1 Flight Plan Information

Monitoring services are provided to aircraft based on a known position. Traffic information is based on the location of other aircraft as depicted on the controller's presentation. Flight plans are the major source of information that assist controllers in locating these aircraft. This information is obtained from flight plans and amendments.

Flight plans may be stored in one of several processors, depending on where the initial flight plan was filed. The processors include the Flight Service Data Processing Service (FSDPS), the Direct User Access Terminal (DUAT) service, or the Area Control Computer Complex (ACCC). Within the FSDPS, the ACCC, or the Tower Control Computer Complex (TCCC), flight plans are accepted, stored, and processed. Flight plans are transferred at the appropriate time to the ACCC or TCCC so that controllers and specialists can use the information to provide monitoring services. Both Instrument Flight Rules (IFR) and Visual Flight Rules (VFR) aircraft flight plans are included.

#### VFR Flight Plan

VFR flight plans are normally filed with the AFSS. These flight plans contain such information as aircraft identification, type of aircraft, airspeed, departure point, departure time, destination, estimated time of arrival (ETA), altitude and route of flight, fuel, and the number of people on-board.

#### IFR Flight Plan

Pilots must file a complete flight plan in order to receive an air traffic clearance. IFR flight plans contain such information as aircraft identification, type of aircraft, airspeed, coordination fix and crossing time, altitude, departure airport, proposed departure time, requested altitude, route of flight, destination, and transponder code. IFR flight plans are normally filed with ACFs and ATCTs.

### 2.1.2.2 Aircraft Position Information

Information concerning the position of an aircraft requesting monitoring services is derived from the individual pilot position report (if not being tracked), by automated functions such as the ACCC at the ACF, or from the flight plan. Based on input from en route and terminal radars, radar-tracked aircraft position information is displayed to En route and Approach/Departure Controllers respectively. In the ATCT, the TCCC accepts and maintains target and track data received from the ACCC. Additionally the TCCC receives surveillance data from local airport surveillance equipment.

#### Primary Surveillance Radar

Surveillance radars (primary radars) are divided into two general categories: Airport Surveillance Radar (ASR) and Air Route Surveillance Radar (ARSR). ASR is designed to provide relatively short range coverage in the general vicinity of an airport and provide surveillance data to control towers. ARSR is a long range radar system designed to provide a display of aircraft locations over large areas. ARSRs provide surveillance data to controllers located in ACFs

#### Secondary Surveillance Radar

In addition to primary surveillance radar the FAA operates two types of secondary surveillance radar systems: the Air Traffic Control Radar Beacon System (ATCRBS) and the Mode S sensor system. ATCRBS is a ground based radar

beacon transmitter-receiver which scans in synchrony with the primary radar and transmits discrete radio signals that repetitively request all transponders to reply on the mode being used. The replies received are then mixed with the primary radar returns and both are displayed on the same controller display. A transponder is the airborne beacon transmitter-receiver which automatically receives the signals from the interrogator. The transponder selectively replies with a specific pulse group (code) only to those interrogations being received on the mode to which it is set. These replies are independent of, and much stronger than the primary radar return.

The Mode S sensor provides beacon surveillance coverage in conjunction with search radar coverage as part of a nationwide surveillance network. Mode S sensors detect and report the presence and location of a transponder-equipped aircraft. The Mode S sensor interrogates ATCRBS-equipped aircraft and selectively interrogates only Mode S transponder-equipped aircraft.

In addition to surveillance processing, Mode S performs the necessary functions to facilitate the use of data link. This includes decoding, storing, prioritizing, routing, checking, scheduling, and formatting the data link messages which are a part of either a Mode S interrogation or reply. The Mode S sensor sends PIREPs and data link service requests to the Data Link Processor (DLP) and receives data link service messages from the DLP. Through this data link arrangement, the pilot has access to specific weather and aeronautical information stored at the DLP.

#### 2.1.2.3 Information from Weather Sources

Weather information is forwarded to the ACCC, the TCCC, and the FSDPS, and is forwarded in turn to controllers/specialists in the ACFs, the ATCTs and the AFSSs for issuance to pilots.

AFSS specialists obtain weather briefing information from the FSDPS. Weather inputs to the FSDPS are obtained from automated weather processors, which derive this information from surveillance, satellite, automated and nonautomated weather observation systems. Among the many reports available to En route Flight Advisory Service (EFAS) specialists at the AFSS are surface analysis, weather depiction analysis, upper air analysis, winds aloft prognosis, and wind shear prognosis reports. The EFAS specialist tailors the information received to the phase of flight that begins after climb out and ends with descent to land. Immediate destination weather and terminal forecasts are also provided upon request.

AFSS specialists also obtain graphic weather information from the Flight Service Graphic Weather Display System (GWDS). The GWDS is an independent, vendor supplied graphics system which provides all graphic weather products required to perform the pre-flight, in-flight, or en route flight advisory service (EFAS) weather briefing functions.

## 2.2 Monitoring Services

Monitoring services are divided into three areas: flight following, traffic advisories, and weather advisories. The following paragraphs further describe these functions.

### 2.2.1 Flight Following

The NAS is capable of monitoring flights to ensure timely emergency assistance whenever necessary. The following paragraphs further describe flight following services.

#### 2.2.1.1 Request and Acceptance of Flight Following Services

The NAS provides flight following to any user with an active flight plan. NAS specialists can accept requests from airborne aircraft for flight following services. In order to provide these services such information as aircraft identification, position, speed, altitude, future routing is required from the pilot.

#### 2.2.1.2 Provision of Flight Following on Request

The NAS provides various degrees of flight following services, depending on the type of flight plan filed, aircraft avionics, communications and surveillance coverage of the route and altitude flown, and degree of pilot participation (e.g., communications contact, position, and ETA updates). These services are available regardless of weather conditions and surveillance coverage of the route being flown.

The NAS ensures that hazardous area reporting service is available for users operating in NAS designated lake, island, mountain, and swamp areas. Selected AFSSs provide flight monitoring where regularly traveled VFR routes cross large bodies of water, swamps, and mountains (referred to as Lake, Island, Mountain and Swamp Reporting Service). This service is provided for the purpose of expeditiously alerting Search and Rescue (SAR) facilities when required. The NAS also provides flight following service on selected low-altitude and remote area environments such as off-shore oil platforms.

#### 2.2.1.3 Overdue Aircraft Flight Alerts

The NAS alerts the specialist, through the workstation, when a flight being provided with flight following service is overdue. The alarm, either visual or aural, repeats itself regularly until manually deactivated by the specialist.

Pilots are requested to make position reports at least every 10 minutes, via radio. A flight providing airborne position reports is considered overdue if it is out of surveillance coverage and contact has not been re-established within 15 minutes of the expected report time, or as determined by the specialist.

The NAS initiates the search and rescue process at a preset time (normally 30 minutes) after the estimated time of arrival of an aircraft whose active flight plan has not been closed. The FSDPS accomplishes this by providing an alert message at the designated AFSS workstation display(s) concerning an active flight for which 30 minutes have passed since the given ETA and no closure message has been received.

#### 2.2.1.4 Information on Overdue Aircraft

The NAS provides the specialist with information on the overdue aircraft, such as aircraft identification, type, time, location of last position and last assigned frequency. Additionally, the NAS provides the specialist with time and location of last reported or known position, future routing, a prioritized list of the facilities to be notified to begin a communications search for the overdue aircraft, and any historical information known on the aircraft and pilot that may aid in the communications search.

#### 2.2.2 Traffic Advisories

Radar traffic information service is provided by radar ATC facilities. Pilots receiving this service are advised by controllers of any radar target observed

on the radar display which may be in proximity to their aircraft or its intended route of flight. Traffic information is based upon the aircraft's position as presented on the controller's presentation (for radar).

#### 2.2.2.1 Provision of Traffic Advisories

Traffic advisory information is obtained through voice, surveillance, and flight plan information. Traffic information is routinely provided to all aircraft operating on IFR flight plans except when the pilot advises he does not desire the service.

The degree of traffic advisory service provided by the NAS is dependent upon the type of flight plan filed, the aircraft avionics, the NAS communication and surveillance coverage of the route and altitude flown, and the degree of participation by pilots of other aircraft in the vicinity. The NAS is capable of determining when a potential traffic conflict exists between a requesting VFR aircraft and other aircraft of which the NAS is aware.

AFSS specialists at designated airports without control towers provide Airport Advisory Service to arriving and departing aircraft. This information includes known factual information about observed or reported traffic which may constitute a collision hazard. This may include positions of aircraft in flight or aircraft and vehicles operating on the airport.

#### 2.2.2.2 Safety Advisories and Vectoring

Safety advisories and vectoring services are given to participating aircraft when situations occur involving proximity to the terrain, obstructions, special use airspace, or other aircraft.

Radar controllers in the ACF use current data on the elevation of terrain and obstructions within their areas of responsibility to provide safety advisories. The specialists are alerted via their displays to a predicted aircraft impact with terrain or obstructions in sufficient time to permit communication with the flight crew, crew reaction, and aircrew maneuvering prior to the predicted collision. Specialists alert appropriately equipped and participating aircraft to a NAS-predicted conflict with the terrain, obstructions, aircraft or special use airspace within 10 seconds of the NAS prediction. Additionally, the NAS selects and displays a recommended avoidance vector to the controller for issuance to aircraft affected by NAS-predicted conflicts.

#### 2.2.2.3 VFR Sequencing and Separation in Terminal Areas

The NAS displays the positions of VFR aircraft in the terminal arrival and departure phases of flight and is capable of applying both IFR and VFR separation services when both types of traffic are operating within terminal areas. Additionally, the NAS points out other traffic to controllers for issuance to pilots receiving VFR separation services.

#### 2.2.2.4 Advisories and Vectoring near Special Use Airspace (SUA)

Part of the monitoring services to pilots is to provide advisory and vectoring services to participating aircraft approaching special use airspace. NAS systems monitor the airspace around special use airspace and notify specialists when known traffic approaches it. The NAS selects and displays recommended avoidance vectors to the controller for issuance to pilots of an aircraft predicted to penetrate special use airspace. The NAS also maintains current data on the status and boundaries of special use airspace.

Special use airspace (SUA) is restricted because of special activities or characteristics within that airspace. SUA can be hazardous to nonparticipating aircraft and limitations are imposed upon such aircraft to restrict their entry into these restricted areas.

#### 2.2.2.5 Information on Aircraft Under Traffic Advisory Service

The NAS obtains identification, position, speed, altitude, and heading information on aircraft being provided traffic advisory service from flight plans (both VFR and IFR).

#### 2.2.2.6 Determination of Potential Traffic Conflicts

The NAS determines when a potential traffic conflict exists between a requesting VFR aircraft and other aircraft of which the NAS is aware. This capability is based on flight plan information and the position of each aircraft.

### 2.2.3 Weather Advisories

The NAS provides the capability to inform users of hazardous weather conditions and allows users to request and accept in-flight weather advisories. The degree of hazard posed by the weather depends upon its intensity, the characteristics of the aircraft, and the phase of flight (take-off, en route, landing). The NAS is required to provide assistance in avoiding hazardous weather upon request by a user.

#### 2.2.3.1 Provision of Weather Advisories to Aircraft in Flight

The NAS provides weather advisories to aircraft in flight including continuous broadcasts of hazardous weather. The continuous Hazardous In-flight Weather Advisory Service (HIWAS) message contains information concerning weather phenomena in the vicinity of the broadcast that may be hazardous to aviation.

The NAS provides for direct specialist-to-pilot communications for exchange of weather information. Pilots are encouraged to make reports of en route weather conditions (called PIREPs) to specialists. One of the primary duties of the EFAS specialist at the AFSS is to serve as a collection point for the exchange of PIREPs, and to provide pilots with other useful information concerning weather along the route of flight.

The NAS also provides direct user access to weather advisories on a request/reply basis. Pilots can access this information from home or office locations by using the Direct User Access Terminal Service (DUATS), which is accessible by logging in from modem-equipped computer terminals or personal computers. After becoming airborne, pilots can directly access weather via data link service.

The NAS provides hazardous weather information to users while airborne, for the volume of airspace extending from the surface to an altitude of 60,000 feet MSL and within 100 NM horizontal distance from the aircraft's current position.

#### 2.2.3.2 Weather Advisories Information Available Continuously

Weather advisory information is continuously available at selected general aviation airports with instrument approach procedures and terminal areas. The NAS continuously broadcasts the latest approved aerodrome and terminal area conditions on communications media which can be accessed by aircraft in flight and on the ground. The NAS responds to user and specialist requests for

weather information from other NAS facilities, such as AFSSs, ACFs, or ATCTs, and from user owned and operated input/output devices, through common carrier communication networks.

#### 2.2.3.3 User Access to Current Hazardous Weather Information

Using automated equipment the NAS broadcasts current information on hazardous weather conditions on communications media that can be selectively accessed by appropriately equipped aircraft. This information is broadcast over selected VOR voice channels or via data link service. Users have direct access at all times to current information on hazardous weather conditions along their route of flight. Hazardous weather broadcasts are updated at least every 30 minutes and not more than 5 minutes after a significant change of weather.

Dissemination of hazardous weather information is given priority over the dissemination of routine weather information. This information includes location and extent of weather phenomena, intensity, wind velocity, and direction of movement.

#### 2.2.3.4 Monitoring of Hazardous Weather for VFR Aircraft

Weather phenomena which pose a hazard to VFR aircraft are detected, located, and monitored. Weather phenomena that may affect VFR flight operations are tracked and reported with the same resolution, accuracy, and dissemination as any other weather conditions.

#### 2.2.3.5 Assistance in Determining Weather Avoidance Actions

AFSS specialists assist users in determining an appropriate course of action in avoiding weather or transitioning to instrument flight. These alternative courses of action include suggestions for new routes, new altitudes, course deviations, or alternate aerodromes. ATC specialists provide for rapid transition to IFR operation upon request by an appropriately rated and equipped user.

#### 2.2.3.6 Weather Avoidance Communications Links

The NAS is also capable of providing reliable communications links between users and specialists for the exchange of information relating to weather avoidance. This capability includes accepting and responding to requests for weather information from airborne aircraft via voice or data link communications.

### 2.3 Functions

Flight following, traffic advisory, and weather advisory functions are described with respect to the particular specialists who perform them. Some of the functions may be performed, at one time or another, by any of the specialists identified.

The following paragraphs describe in more detail the functions performed by the specialists/controllers introduced in Section 2.1. The operational flow diagrams associated with each paragraph display the information flows between the specialist and the users, the specialist and other specialists, and the specialist and data processing equipment.

The functions performed by the NAS are explicitly covered by requirements specified in the NASSRS. The pertinent NASSRS paragraphs that specify functions performed by the NAS are referenced in the paragraphs that follow

the functional description. As used in this paragraph, the term "specialist" also includes controllers.

### 2.3.1 AFSS Specialists (Positions 3 & 4)

In addition to their other duties, In-Flight Specialists provide flight following services for all requesting aircraft flying regularly-traveled VFR routes across large bodies of water, swamps, or mountains. Airport advisory services at airports served by an AFSS and no control tower are also provided. In-Flight specialists advise pilots of the status of SUA with reference to the pilot's reported position.

The En route Flight Advisory Service (EFAS) Specialist provides en route aircraft with current weather information along with specific routes of flight. This allows pilots to terminate the flights or alter courses before adverse conditions are encountered. Additionally, EFAS specialists obtain pilot reports (PIREPs) on current weather conditions along their routes of flight.

Figure 2-3 is an operational flow diagram that displays the functions and services provided by the specialists at the AFSS. Functions performed by equipment and specialists are lettered within each block and are described in the corresponding paragraphs below.

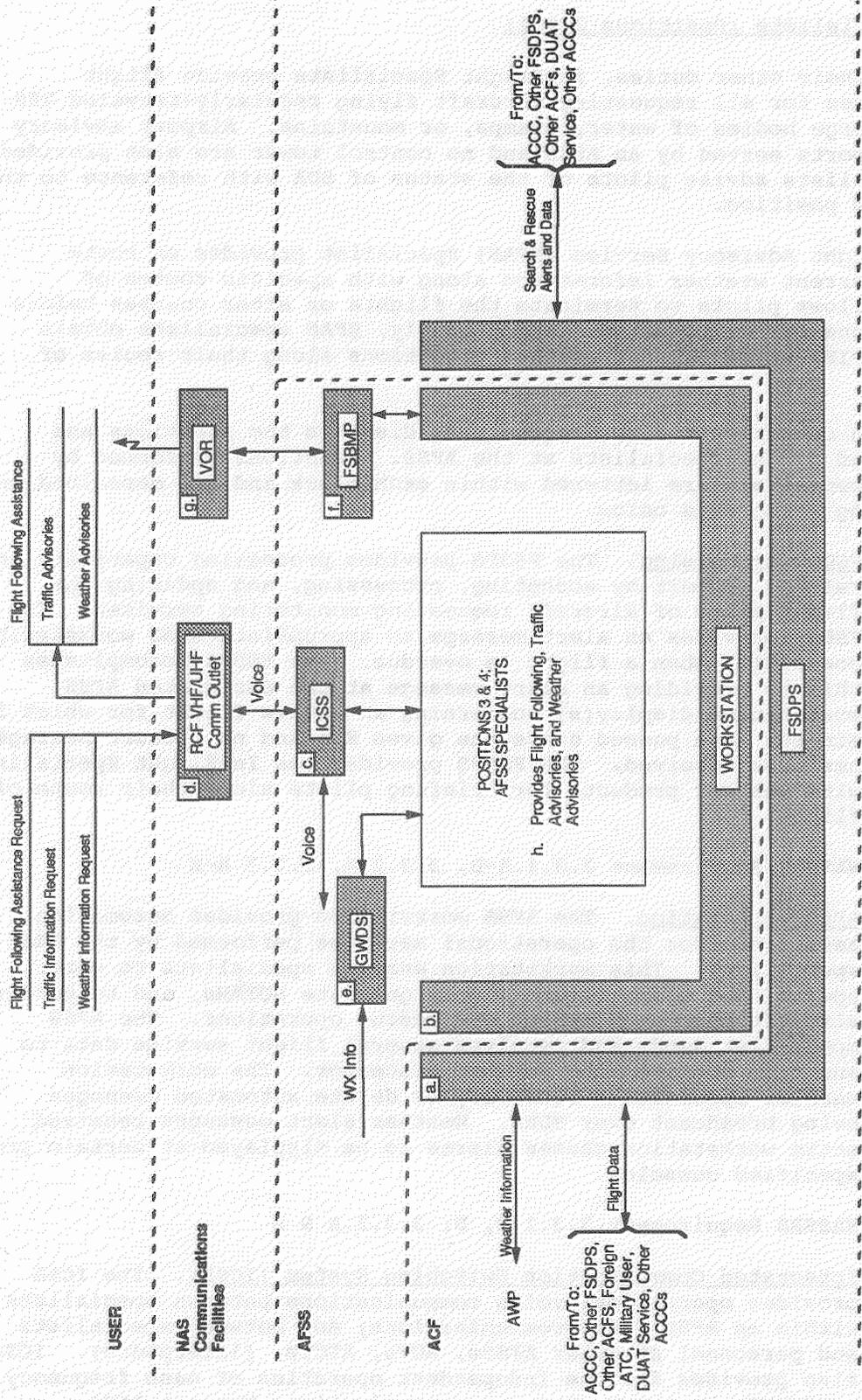
- a. FSDPS processing. The FSDPS provides processing capability and related support by accepting, processing, and updating the flight plans of aircraft requesting monitoring services. The FSDPS provides an alert message to appropriate AFSS workstation console(s) when a flight is overdue. The FSDPS accomplishes this by providing an alert message at the designated AFSS workstation display(s) concerning an active flight for which 30 minutes have passed since the given ETA and no closure message has been received. The FSDPS provides the In-Flight Specialist with weather products for briefing pilots along their route of flight.

NASSRS Requirement 3.3.1.A-D, 3.3.2.A, 3.3.3.A-E

- b. AFSS Workstation. The AFSS workstation provides automation assistance for the operational services performed by the AFSS specialists. This workstation enables specialists to enter, update, and close flight plans, generate NOTAMs, and to perform aircraft emergency search and rescue operations. The AFSS specialist sends and receives general flight service data to and from the Aviation Weather Processor. The workstation enables specialists to modify or delete automated messages being broadcast over VORs. Weather alert messages received at the workstation causes alerts to be displayed at certain pre-specified consoles.

NASSRS Requirement 3.3.1.C, D; 3.3.3.A & B

- c. Integrated Communication Switching System (ICSS). The ICSS provides operational voice communications between specialists within an AFSS (intercommunications) and between specialists and personnel at other AFSSs, ACFs, ATCTs, (interphone). ICSS also provides for the independent operation of each frequency (VHF/UHF) on the ground-air communications between AFSS specialists and pilots. The ICSS provides the means for specialists to obtain PIREPs, weather reports and requests, SAR



**FIGURE 2-3**  
**POSITION 3 AND 4: IN-FLIGHT BRIEFING & EFAS SPECIALISTS**  
**MONITORING OPERATIONAL FLOW DIAGRAM**

messages, SUA information, and to provide preflight/in-flight weather briefings and hazardous weather conditions to pilots.

NASSRS Requirement 3.3.1.B, 3.3.2.D, 3.3.3.A-E

- d. Remote Communications Facility (RCF). The RCF provides two way voice communications links between specialists in an AFSS and pilots in the air or on the ground. This is accomplished using ground based VHF and UHF transmitters and receivers. One-way communications links are provided by RCFs for transmitting weather and Automatic Terminal Information Service (ATIS) messages to pilots.

NASSRS Requirement 3.3.1.A

- e. Flight Service Graphic Weather Display System (GWDS) The GWDS displays a large selection of National Weather Service (NWS) charts and graphs, weather satellite images, NEXRAD-derived products, and hazardous weather area outline products to the specialists.

NASSRS Requirement 3.3.3.A-E

- f. Flight Service Broadcast Message Processor (FSBMP) The FSBMP receives automatic alert messages and weather messages from the FSDPS including: Significant Meteorological Information (SIGMETS), Airman's Meteorological Information (AIRMETS), Center Weather Advisories, Urgent PIREPs, and Severe Weather Watches. The FSBMP automatically generates weather messages that are continuously broadcast over certain VORs, and generate pilot's automatic telephone weather answering service preflight briefing messages.

NASSRS Requirement 3.3.3.A-E

- g. VHF Omni-range (VOR) The VOR provides a voice communications radio outlet for transmitting meteorological messages, including hazardous weather advisories. These messages include automated broadcast messages generated at the AFSS.

NASSRS Requirement 3.3.3.A-E

- h. Monitoring Advisories. AFSS specialists provide monitoring services to requesting pilots to ensure timely emergency assistance if the need develops. The NAS alerts the specialist when an aircraft that has previously filed a flight plan is overdue. Traffic advisory services are provided at designated airports with Airport Advisory Services. The NAS maintains a current status on weather conditions and informs users of hazardous weather conditions along their route of flight. The NAS allows users to request and accept in-flight weather advisories as well as advisories on the weather conditions at destination airports.

NASSRS Requirement 3.3.1.A-D, 3.3.2.A, 3.3.3.A-E

### 2.3.2 ACF Approach/Departure and En Route Controller (Position 6 & 7)

Approach/Departure and En route Controllers provide pilots, who are under their control, information concerning other known traffic in their vicinity.

Included in this service are safety alerts issued to aircraft approaching terrain, obstructions and SUA areas. Additionally, weather advisories are relayed to pilots on a workload permitting basis.

Figure 2-4 is an operational flow diagram that displays the functions and services provided by the Approach/Departure Controller in the ACF. Functions performed by the equipment and the Approach/Departure Controller are lettered within each block and are described in the corresponding paragraphs below.

- a. ACCC Processing. The ACCC accepts, stores, and manipulates flight plan information which is then used in tracking aircraft automatically or manually. The ACCC provides surveillance data processing and automatic tracking of aircraft which allows controllers to display aircraft when providing traffic advisories. The ACCC also stores and displays weather information for relaying to pilots.

NASSRS Requirement 3.3.2.A-F, 3.3.3.A & E.

- b. Voice Switching and Control System (VSCS). The VSCS provides a local voice switching node to connect ACF operational positions to VHF/UHF transmitters and receivers. The VSCS operates in conjunction with these RCFs which provide two-way radio communications with pilots for provision of traffic and safety advisories. VSCS provides the primary ground-ground interphone function as a voice switch which provides voice connectivity between air traffic operational positions within the ACF and other specialists within the NAS to coordinate air traffic.

NASSRS Requirement 3.3.2.A-F

- c. Remote Communications Facility (RCF). The RCF provides two-way voice communications links between specialists in an ACF and pilots in the air. This is accomplished using ground based VHF and UHF transmitters and receivers.

NASSRS Requirement 3.3.2.A-F

- d. Mode S Sensor. The primary functions of the Mode S sensor are to detect and report the presence and location of transponder-equipped aircraft in a specific volume of airspace and to provide a direct data communications link between ground-based processors and data link equipped aircraft for relaying of weather products.

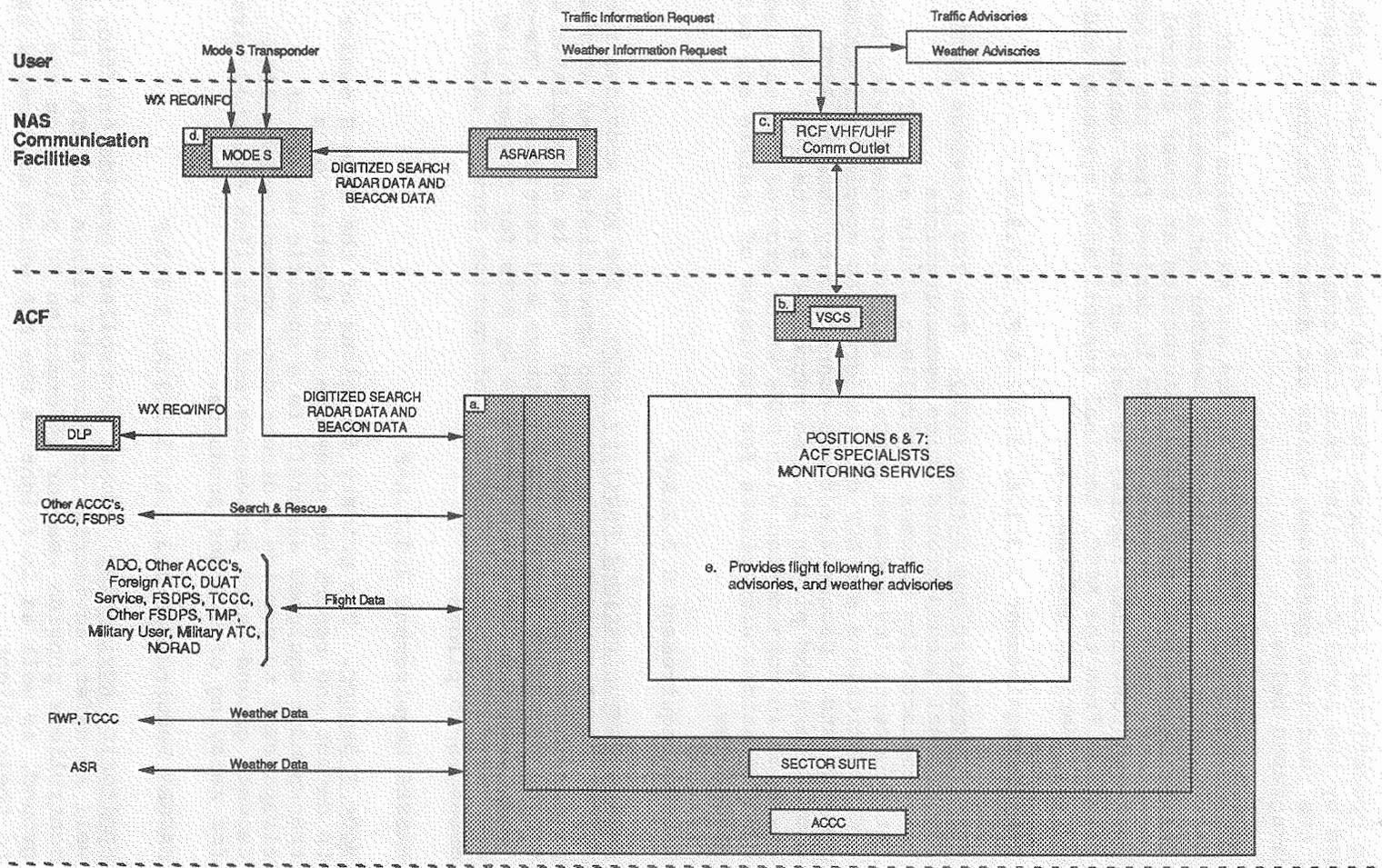
NASSRS Requirement 3.3.1.A, 3.3.2.A, 3.3.3.F

- e. Monitoring Services. Controllers working in the ACF provide traffic advisories and safety advisories concerning proximity to terrain and obstructions, SUA or other aircraft. Weather information is available to controllers for issuance to pilots.

NASSRS Requirement 3.3.1.A, 3.3.2.A-F, 3.3.3.A

### 2.3.3 ATCT Local Controller (Position 9)

Local Controllers, working in Air Traffic Control Towers (ATCT), provide traffic advisory services within the Airport Traffic Area (ATA) based on surveillance presentation of aircraft position and visual observations. Local controllers provide safety advisory information about special use airspace



**FIGURE 2-4**  
**POSITION 6,7, & 22: APP/DEP & ENROUTE CONTROLLERS**  
**MONITORING OPERATIONAL FLOW DIAGRAM**

within their jurisdiction to pilots based on their position. In addition to traffic and safety advisories, Local Controllers provide arriving and departing aircraft with information on changing weather conditions in the terminal area as it relates to their phase of flight.

Figure 2-5 is an operational flow diagram that displays the functions and services provided by the Local Controller from the control tower. Lettered blocks identify the functions performed, which are described in the corresponding paragraphs below.

- a. TCCC processing. The TCCC accepts and maintains aircraft target, track, flight plan, and weather data received from the parent ACCC and displays this information at tower control positions. The information used is derived from the flight plan and controller inputs, as well as automated weather products from the ACCC, terminal surveillance systems, and locally derived information.  
  
NASSRS Requirement 3.3.1.A, 3.3.2.A-F, 3.3.3.A
- b. Tower Communications System (TCS). The TCS provides ATCT operational ground-ground voice communications interconnectivity between controllers within an ATCT, interconnectivity between ATCTs, and interconnectivity between ATCT controllers and ACF controllers/AFSS specialists/ATCCC specialists. Ground-air radio connectivity between ATCT controllers and pilots is also supported by the TCS. The TCS operates in conjunction with RCFs which provide two-way radio communications with pilots for provision of traffic and safety advisories.  
  
NASSRS Requirement 3.3.2.A-F
- c. Remote Communications Facility (RCF). The RCF provides two-way voice communications links between specialists in an ATCT and pilots in the air or on the ground. This is accomplished using ground based VHF and UHF transmitters and receivers. One-way communications links are provided by RCFs for transmitting weather and Automatic Terminal Information Service (ATIS) messages to pilots.  
  
NASSRS Requirement 3.3.2.A-F
- d. Mode S Sensor. The primary functions of the Mode S sensor are to detect and report the presence and location of a transponder-equipped aircraft in a specific volume of airspace and to provide a direct data communications link between ground-based processors and data link equipped aircraft for relaying of weather products.  
  
NASSRS Requirement 3.3.1.A, 3.3.2.A, 3.3.3.F
- e. Monitoring Advisories. Local Controllers provide traffic, as well as safety advisories to aircraft within the ATA. Local controllers provide weather information to pilots on the ground, as well as in-flight in the ATA which may pose a hazard to their flight.  
  
NASSRS Requirements 3.3.2.A-F, 3.3.3.A

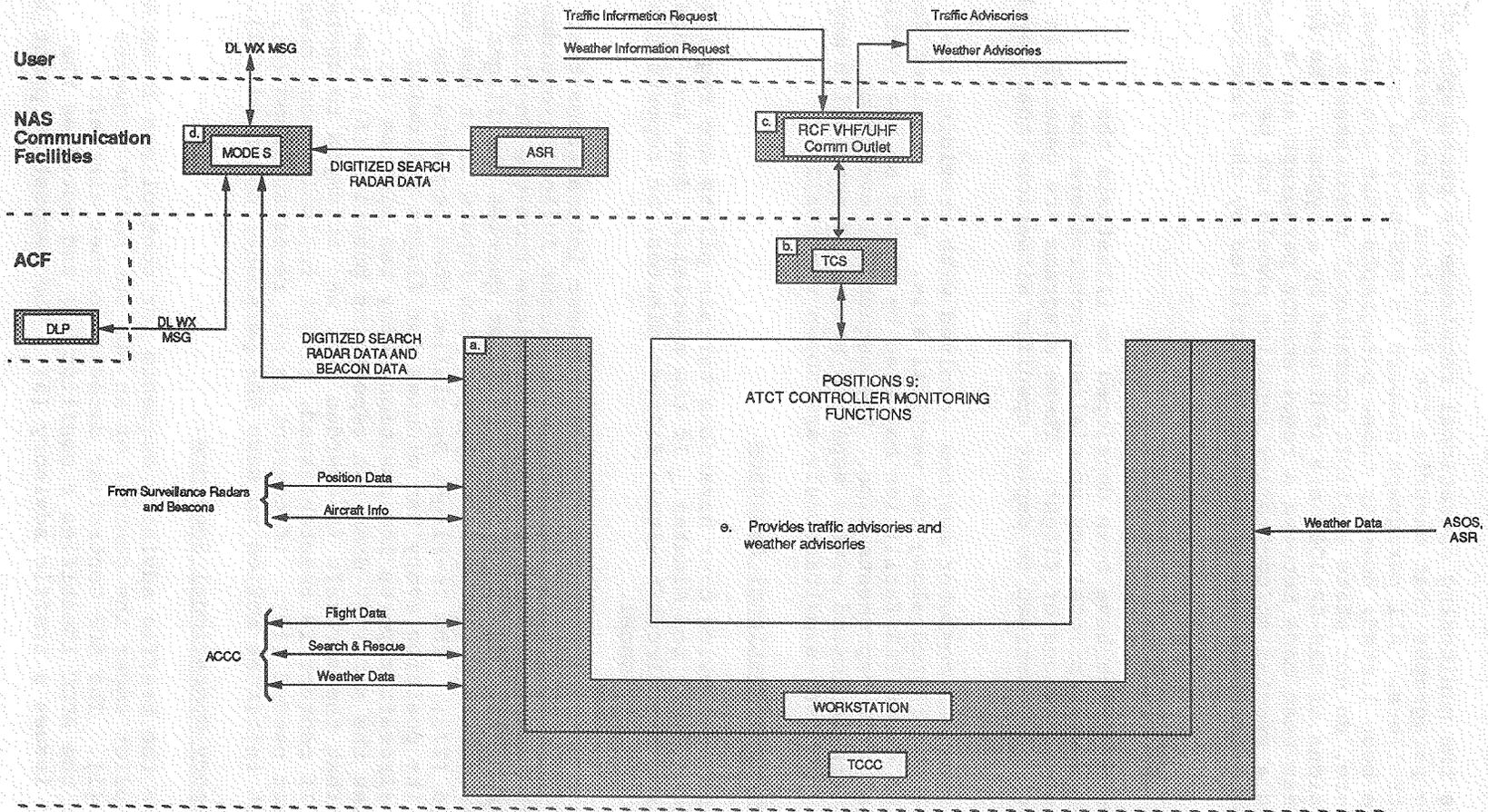


FIGURE 2-5  
POSITION 9: LOCAL CONTROLLER  
MONITORING OPERATIONAL FLOW DIAGRAM

## 2.4 Correlation with Operational Requirements

Table 2-1 correlates the monitoring operational requirements paragraphs of NAS-SR-1000 with the paragraphs that describe the functions being performed by the specialists/controllers. All paragraph numbers in NAS-SR-1000 associated with monitoring have been listed; however those paragraphs that are either introductory in nature, do not state explicit operational requirements, or reference other portions of NAS-SR-1000 are indicated by a hyphen. The fact that a correlation has been made between a requirements paragraph and a paragraph describing a specialist/controller function should not be construed to mean that the requirement is being completely fulfilled by the function described.

## 2.5 Operational Sequence

Operational sequence diagrams have been developed to illustrate the interactions between users (pilots) and specialists/controllers for different categories/conditions of flight. These diagrams are general in nature and should not be construed to depict specific situations that may be encountered.

The users, specialists, and computer systems involved with providing the monitoring functions are listed along the vertical axis. When required for further clarification other FAA facilities may also be listed on the vertical axis. The horizontal axis represents time. The sequential events or functions performed are indicated within separate boxes. Events which may occur simultaneously or near-simultaneously are shown vertically.

### 2.5.1 Flight Following Operational Sequence

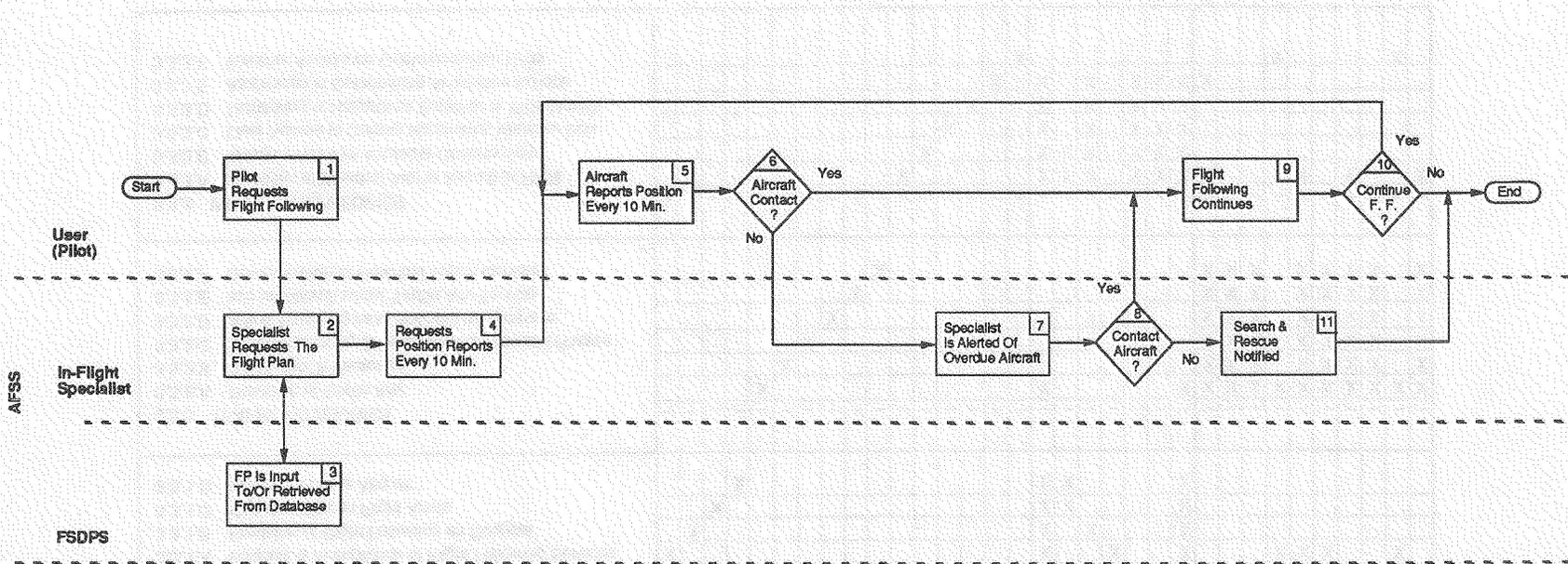
When requesting flight following over hazardous terrain pilots are required to report their positions every ten minutes. If the specialist does not receive a position report from the aircraft within fifteen minutes, he reports the overdue aircraft to SAR personnel.

Figure 2-6 displays a general sequence of operator/user interactions that occur when the In-Flight specialist is performing flight following/overdue alerts. An aircraft requests flight following services from the In-Flight Specialist at the AFSS (1). The In-Flight Specialist queries the flight database for the aircraft's flight plan or flight plan inputs if it has not already been entered (2/3). The In-Flight Specialist then requests the aircraft to report its position every ten minutes for flight following purposes (4). The aircraft reports its position every ten minutes (5). If after fifteen minutes the aircraft does not report its position (6), the specialist detects that the aircraft is overdue (7), who attempts to contact the aircraft (8). If contact is reestablished, flight following continues (9) until it is no longer needed (10). If contact is not re-established (8), the In-Flight Specialist initiates action to have SAR personnel notified (11).

### 2.5.2 Traffic Advisory Operational Sequence

Figure 2-7 describes the traffic advisory sequence for controllers in an ACF. In this sequence a pilot under the control of an ACF controller requests traffic advisories (1). The ACF Controller detects another aircraft approaching (2), or the ACCC identifies a conflict (3) and notifies the controller (4), who issues a traffic advisory (5). The requesting pilot looks





**FIGURE 2-6  
FLIGHT FOLLOWING  
OPERATIONAL SEQUENCE DIAGRAM**

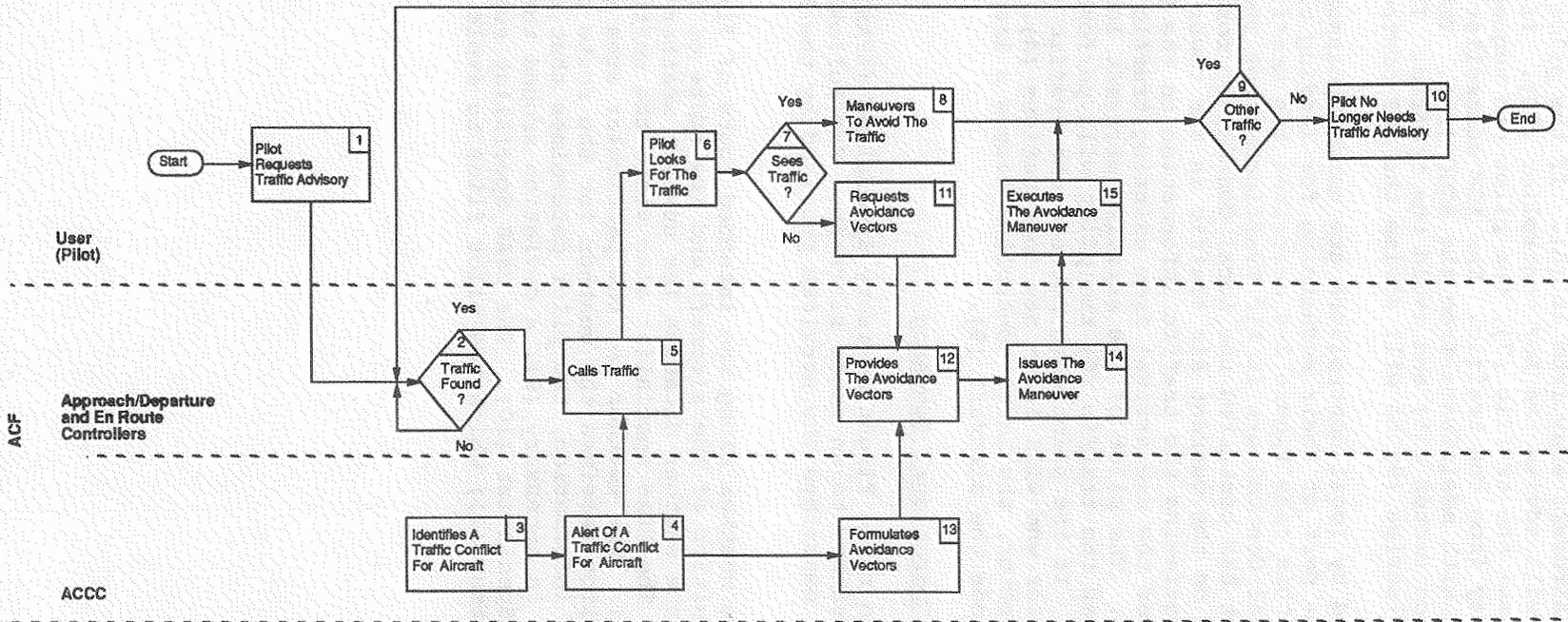


FIGURE 2-7  
TRAFFIC ADVISORY  
OPERATIONAL SEQUENCE DIAGRAM

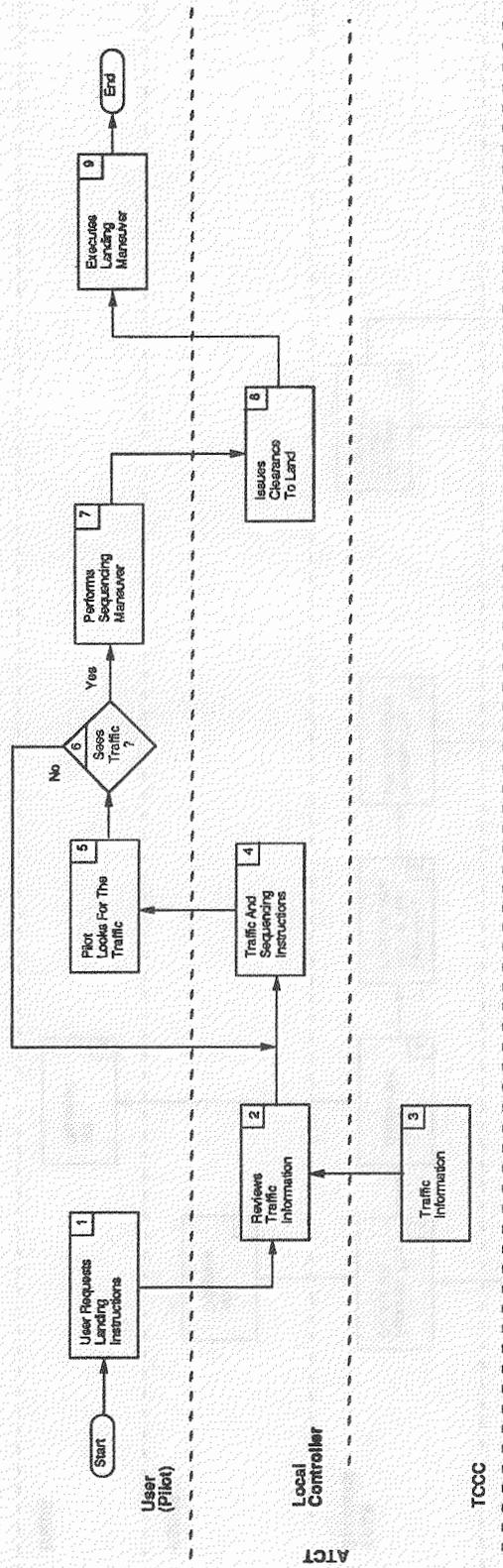
for the traffic (6/7). If he observes that the traffic's proximity is too close, he maneuvers his aircraft away from it (8). If the pilot no longer needs advisories (9) he will advise the ACF controller (10). If the requesting pilot cannot see the traffic (7), the pilot can request an avoidance vector (11) away from the traffic. The ACF controller recommends an avoidance vector (12/14) with assistance from the ACCC (13). The pilot can then execute the avoidance vector (15) and avoid the traffic. If the pilot no longer needs traffic advisories (9) he will advise the ACF controller (10).

Traffic advisories issued by local controllers are normally issued to arriving and departing aircraft as part of their sequencing for landing clearance or departure clearance. In this case Figure 2-8 describes the traffic advisory function provided by Local Controllers in Air Traffic Control Towers (ATCT). In this sequence, a pilot has contacted the Local Controller for landing instructions (1). Based on the current air traffic in the tower traffic pattern (2), and after reviewing the traffic information on the TCCC (3), the Local Controller separates the new arrival from existing traffic by sequencing it behind the others (4). The pilot of the arriving aircraft looks for traffic (5) and if he sees the traffic (6) the pilot will perform the sequencing maneuver (7). If the pilot does not see the traffic (6) he will advise the Local Controller who will issue new instructions (4). Once other traffic is no longer a factor, the Local Controller issues a landing clearance to the pilot (8), who lands the aircraft (9).

### 2.5.3 Weather Advisory Operational Sequence

As stated earlier, the En route Flight Advisory Specialist (EFAS) provides information on current weather to en route aircraft. The following sequence, displayed in Figure 2-9, describes the services provided by the EFAS Specialist.

A pilot requests en route weather along the intended route of flight (1). Based on the reported position of the aircraft and its route of flight, the EFAS Specialist queries the weather database for current weather (2) which is stored in the FSDPS (3). The EFAS specialist also views the weather (4) displayed on the GWDS (5). The weather for the particular area (6) is relayed to the pilot (7). The pilot receives the weather for the route of flight (8). If, based on the weather information, the pilot determines that a deviation from the route of flight is necessary (9), a deviation around the weather is requested from the EFAS Specialist (10). The EFAS Specialist suggests a deviation around the weather (11) which the pilot flies to avoid the weather (12).



**FIGURE 2-8  
TRAFFIC ADVISORY (ATCT)  
OPERATIONAL SEQUENCE DIAGRAM**

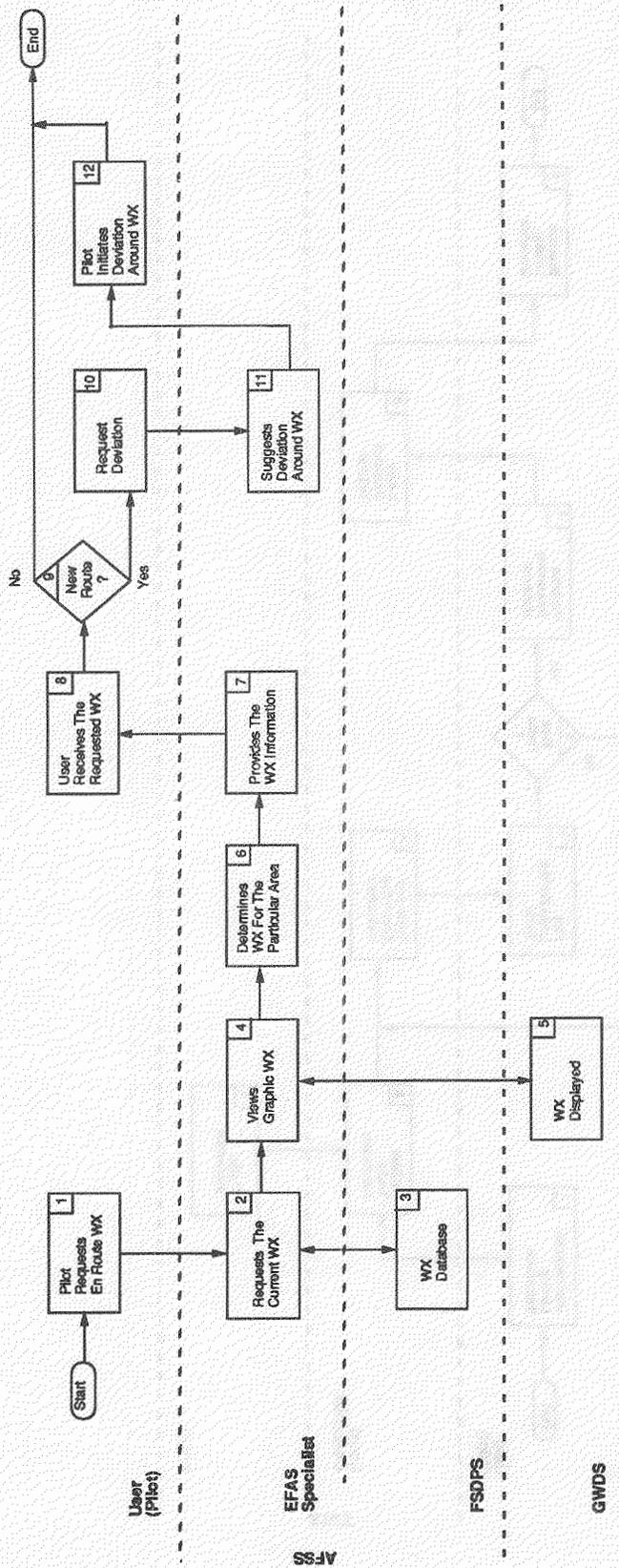


FIGURE 2-9  
WEATHER ADVISORY  
OPERATIONAL SEQUENCE DIAGRAM

## 2.6 Operational Scenario

Figures 2-10 through 2-13 present operational scenarios for specific hypothetical situations. They are similar to the sequence diagrams in Figures 2-6 through 2-9 in that they show functional sequences and interactions between specialists and users and among specialists, but differ in that they show more detail and provide only one branch where a decision is made.

The users, specialists, and computer systems involved with providing the monitoring functions are listed along the vertical axis. When required for further clarification other FAA facilities may also be listed on the vertical axis. The horizontal axis represents time. The sequential events or functions performed are indicated within separate boxes. Events which may occur simultaneously or near-simultaneously are shown vertically.

Again, each row illustrates the action of one of the participants and the numbers in the upper right hand corners of the action rectangles generally represents the sequence of their occurrence.

### 2.6.1 Flight Following Operational Scenario

Figure 2-10 presents an operational scenario for flight following. It is similar to the operational sequence diagrams displayed in Figure 2-6; however, this scenario presents the interactions that would take place between operators/users in a specific case.

This scenario assumes that N27865, a Piper Cherokee, is about to fly over a designated mountainous area. The pilot contacts the AFSS and requests flight following while flying over this area (1). The In-Flight Specialist queues up the flight plan (2) from the database (3) and starts flight following services by requesting N27865 to report its position every ten minutes (4). The pilot of N27865 makes the position reports each 10 minutes (5) and the specialist receives them (6). However, the pilot fails to report his position fifteen minutes after making his second position report (7). The In-Flight Specialist after attempting to re-establish contact the pilot, initiates SAR notification (8).

### 2.6.2 Traffic Advisory Operational Scenario

In the second scenario, Figures 2-11, and 2-12 present an operational scenario for an aircraft requesting traffic advisories. It is similar to the operational sequence diagrams displayed in Figures 2-7 and 2-8; however, this scenario provides more detail and represents the interactions that would take place between operators/users in a specific case.

In Figure 2-11, N24222, a Cessna-172 on a VFR flight plan, contacts the Washington ACF and requests traffic advisories (1). Once the aircraft is identified and correlated with a track (2/3), the ACF Controller provides traffic advisories (4). An untracked target approaches Cessna 222 and the ACF Controller reports the traffic (5). At first, the Cessna 222 does not see the traffic. The ACF Controller issues another traffic advisory (6) on the unidentified aircraft (7) and, this time, the Cessna 222 sees the traffic and turns to avoid it (8). Once clear of the traffic and no longer needing traffic advisory services, N24222 requests a frequency change (9) which is approved by the ACF controller (10).

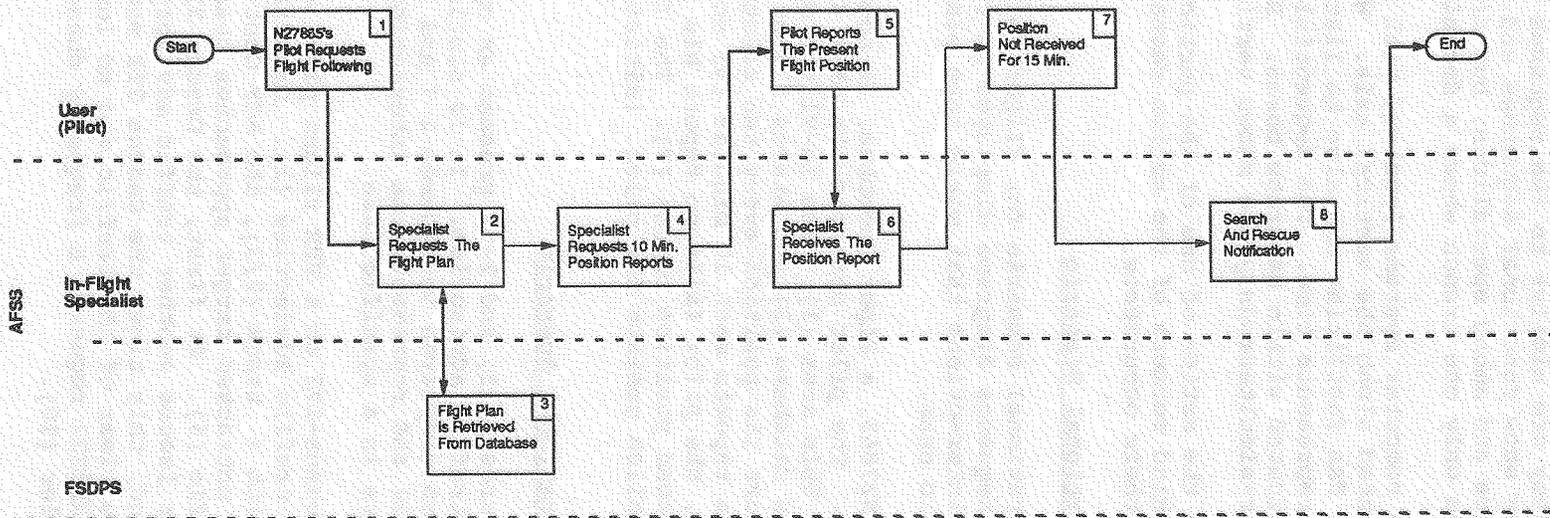


FIGURE 2-10  
 FLIGHT FOLLOWING DIAGRAM  
 OPERATIONAL SCENARIO

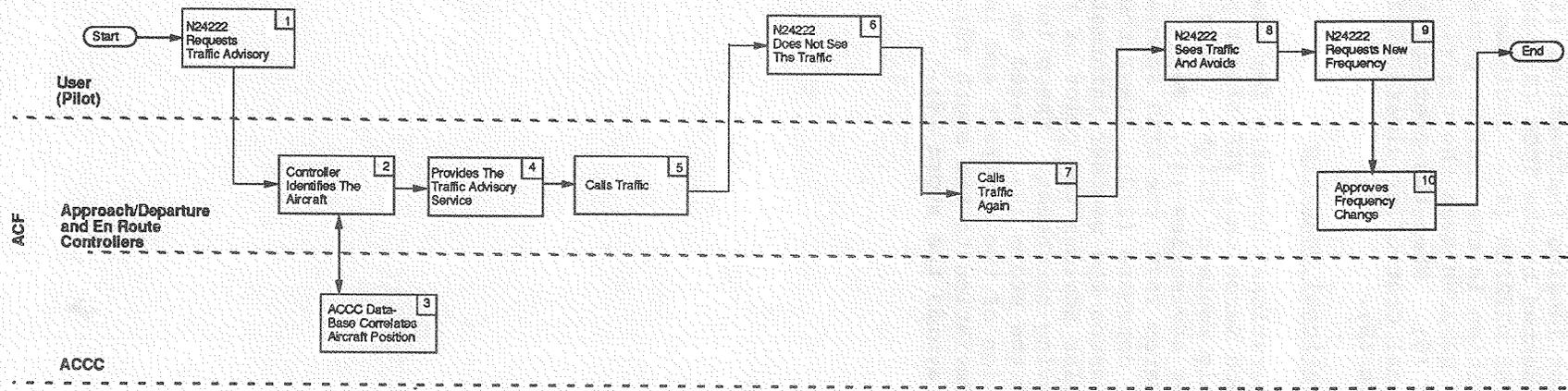
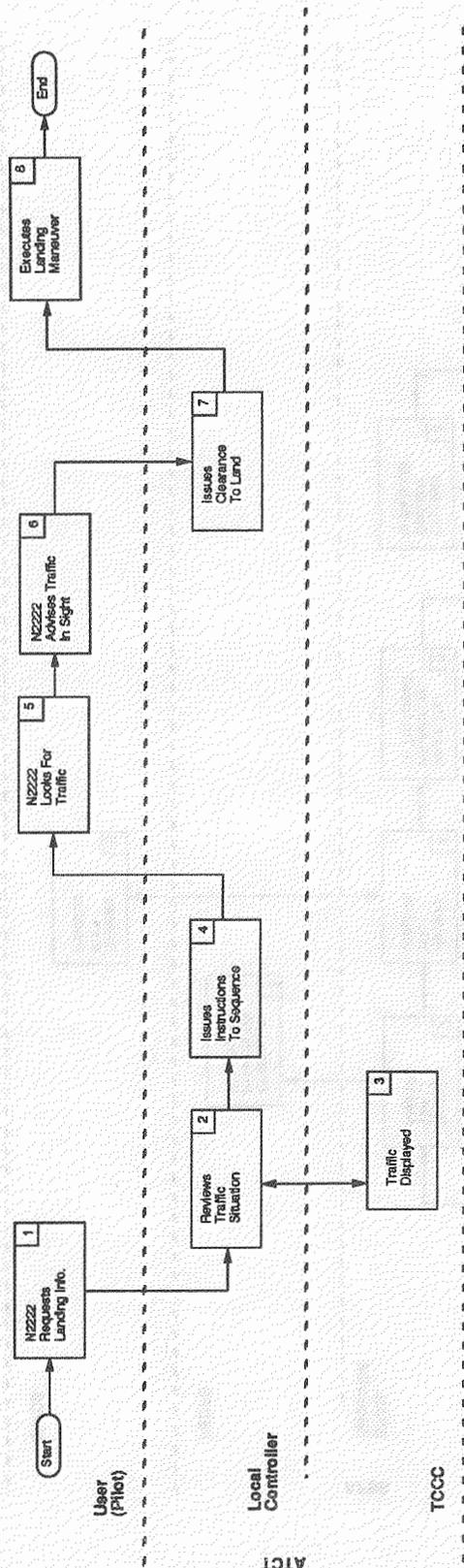


FIGURE 2-11  
TRAFFIC ADVISORY (EN ROUTE)  
OPERATIONAL SCENARIO

In Figure 2-12, N2222MM, a Mitsubishi MU-2, contacts Martinsburg Tower five miles south of the airport for landing instructions (1). After reviewing the traffic situation (2) as presented by the TCCC (3), the Local Controller issues landing instruction for N2222MM (4). Included in the landing sequence is the type aircraft and position in the traffic pattern that N2222MM was told to follow (5). The pilot of N2222MM sees the traffic and positions the aircraft behind that traffic (6). When the previous traffic ahead of N2222MM is no longer a factor the Local Controller clears N2222MM to land (7). The pilot then lands the aircraft (8).

### 2.6.3 Weather Advisory Operational Scenario

Figure 2-13 describes the operational scenario for weather advisories. In this scenario, N9267R, a Beech Baron on a VFR flight plan, observes a storm developing ahead of him on his route of flight. He contacts the Washington AFSS Flight Watch for weather advisories (1). Based on the reported position and route of flight of the Baron 267R, the EFAS Specialist calls up weather information from the weather database (2/3), views the weather presentation (4) from the GWDS (5), and issues the weather information on the storm to the pilot (6). The EFAS Specialist advises the pilot of the position of the storm and that it appears to be moving northeast. The pilot of Baron 267R requests a suggested deviation around the storm (7). Based on the location of the storm and the reported position of the aircraft and intended destination, the EFAS Specialist suggests a deviation to the south (8). The pilot of Baron 267R flies to the south and avoids the storm (8).



**FIGURE 2-12  
TRAFFIC ADVISORY (ATCT)  
OPERATIONAL SCENARIO**

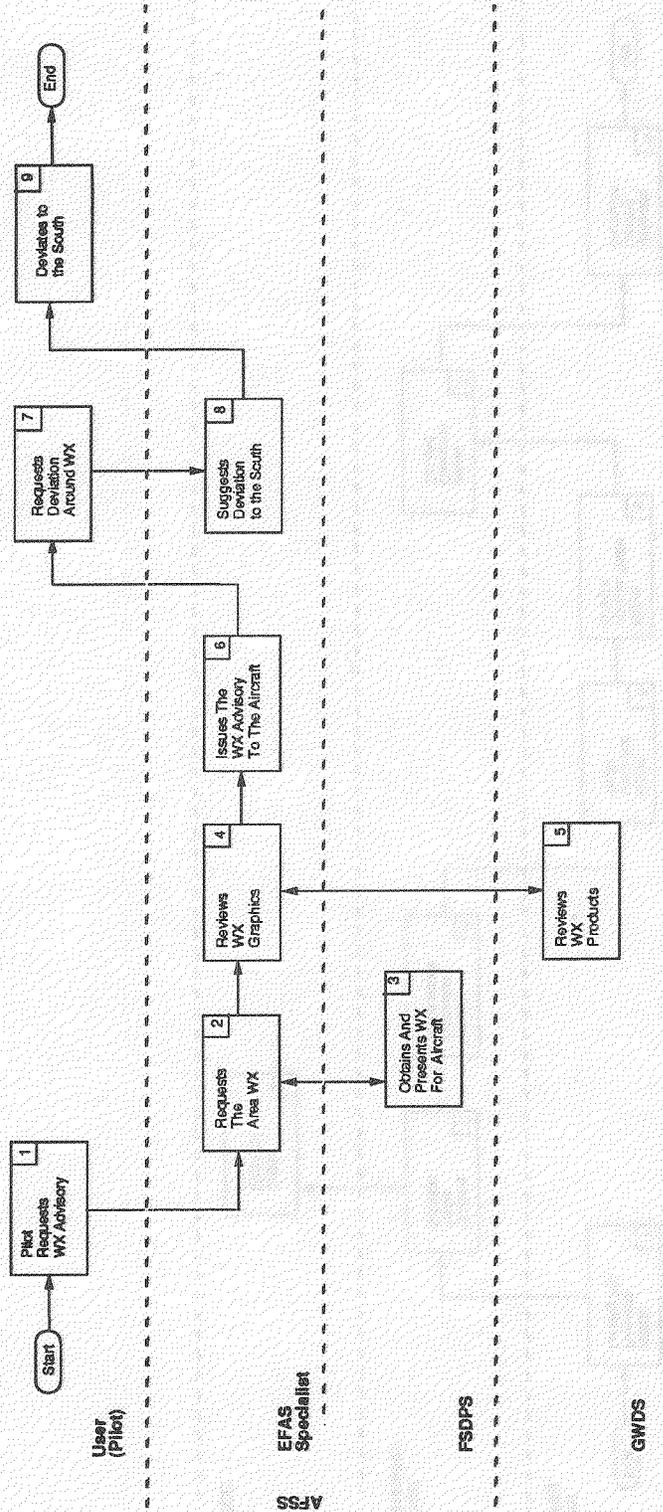


FIGURE 2-13  
WEATHER ADVISORY  
OPERATIONAL SCENARIO

## REFERENCES

Federal Aviation Administration, Air Traffic Control, 7110.65, Current edition, Washington, D.C.

Federal Aviation Administration, Airman's Information Manual, Current edition, Washington, D.C.

Federal Aviation Administration, Flight Service Station Procedures, 7110.10, Current edition, Washington, D.C.

Federal Aviation Administration (December 1986), National Airspace System Level I Design Document, NAS-DD-1000B, Washington, D.C.

Federal Aviation Administration (June 1988), National Airspace System Plan, Facilities, Equipment and Associated Development, Washington, D.C.

Federal Aviation Administration (October 1986), National Airspace System Requirements Specification, NAS-SR-1000, Washington, D.C.

Federal Aviation Administration (December 1986), National Airspace System Specification, NAS-SS-1000, Washington, D.C.



## GLOSSARY

ACCC - The Primary function of the Area Control Computer Complex (ACCC) is the support of air traffic control services at the area level. ACCC's will provide automated assistance for communication and coordination of operational data to support primary processing, data entry and display, monitoring of control consoles, emergency processing, support and training, and diagnostics and repair.

These services enable controllers to: maintain safe separation between aircraft and between aircraft and obstructions or special use airspace; maintain an orderly and efficient flow of air traffic with minimum interference with pilot intent; collect flight information and disseminate it to controllers and pilots; improve the efficiency with which the air traffic control function is achieved; and support oceanic control, area control, and approach control in all airspace except that delegated to airport traffic control towers (ATCT).

ADVISORY - Advice and information provided to assist pilots in the safe conduct of flight and aircraft movement.

AERODROME - A defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure, and movement of aircraft.

AIRCRAFT - Devices that are used or intended to be used for flight in the air; when used in air traffic control terminology may include the flight crew.

AIRCRAFT CONFLICT ADVISORY - A safety advisory issued by ATC to aircraft under their control if ATC is aware of an aircraft that is not under their control at an altitude which, in the controller's judgement, places both aircraft in unsafe proximity to each other. The issuance of a safety advisory is contingent upon the capability of the controller to have an awareness of an unsafe condition.

AIRCRAFT IDENTIFICATION - The words, letter(s), and numerals (or combination thereof) which uniquely identify an aircraft, e.g., Air Force 1, N1234Y, United 341, T5678.

AIRPORT - An area on land or water that is used or intended to be used for the landing and takeoff of aircraft, including its buildings and facilities, if any.

AIRPORT TRAFFIC AREA (ATA) - That airspace within a five statute mile radius from the geographical center of the airport at which a control tower is operating, extending from the surface up to, but not including, an altitude of 3,000 feet above the elevation of the airport.

AUTOMATED FLIGHT SERVICE STATION (AFSS) - A station that provides interactive alphanumeric and graphic workstations for the flight service specialists to provide the following services: pilot briefings, en route communications, and VFR search and rescue services; assist lost aircraft and aircraft in emergency situations; relay ATC clearances; originate Notices to Airmen (NOTAM); broadcast aviation weather and NAS information; receive and process IFR flight plans; and monitor NAVAIDS. In addition, at selected locations, AFSSs provide En route Flight Advisory Services (Flight Watch), take weather observations, issue airport advisories, and advise Customs and Immigration of transborder flights.

**CONFLICT ALERT** - A function of certain air traffic control automated systems designated to alert specialists to existing or pending situations that are determined by program parameters to require their immediate attention/action.

**EN ROUTE** - One of three phases of flight services (terminal, en route, oceanic). En route service is provided outside of terminal airspace and is exclusive of oceanic control.

**EN ROUTE AIR TRAFFIC CONTROL SERVICES** - Air traffic control services provided to aircraft on IFR flight plans, generally by ARTCCs (ACF), when these aircraft are operating between departure and destination terminal areas. When equipment capabilities and controller workloads permit, certain advisory/assistance services may be provided to VFR aircraft.

**EN ROUTE ADVISORY SERVICE (EFAS) FLIGHT WATCH** - A service specifically designed to provide, upon request, timely weather information pertinent to the type of flight, intended route of flight, and altitude.

**FLIGHT FOLLOWING** - The monitoring of the progress of a flight whose navigation is being provided by the pilot. The system will correlate the aircraft position with the proposed flight plan. Flight following may be accomplished either through procedural methods or surveillance assistance.

**FLIGHT PLAN** - Specified information relating to the intended flight of an aircraft that is filed orally or in writing with an ATC facility.

**HAZARDOUS WEATHER** - Weather conditions which have the potential to significantly increase the likelihood of aviation accidents. Hazardous weather conditions include moderate to severe icing, moderate to severe turbulence, moderate to severe precipitation, wind shear, thunderstorms, hail, sustained high winds near the surface, or widespread areas of low visibility.

**IFR AIRCRAFT/IFR FLIGHT** - An aircraft conducting flight in accordance with instrument flight rules.

**INSTRUMENT FLIGHT RULES (IFR)** - Rules governing the procedures for conducting instrument flight. Also a term used by pilots and controllers to indicate type of flight plan.

**KNOWN TRAFFIC** - With respect to ATC clearances, aircraft whose altitude, position, and intentions are known to ATC. With respect to collision avoidance, aircraft whose altitude and position are known to ATC.

**MONITORING SERVICES** - Certain aeronautical advisory services made available by the NAS to airborne aircraft. Services consist of VFR flight following and the providing of various degrees of traffic and weather information to requesting pilots.

**NATIONAL AIRSPACE SYSTEM (NAS)** - The NAS as used herein describes the FAA facilities, hardware, and software that are a predominant part of the NAS infrastructure and the personnel who operate and maintain that equipment to provide services to the user.

**REMOTE AREAS** - Sparsely populated areas such as mountains, swamps, and large bodies of water.

**PARTICIPATING AIRCRAFT** - Aircraft in any of the following categories:

1. Aircraft conducting flight in accordance with instrument flight rules (IFR aircraft)

2. Aircraft conducting flight in accordance with visual flight rules (VFR aircraft) in a Terminal Control Area
3. VFR aircraft operating on a special VFR clearance
4. VFR aircraft with an operating Mode C transponder
5. VFR aircraft communicating with ATC

**ROUTE** - A defined path, consisting of one or more courses in a horizontal plane, which aircraft traverse over the surface of the earth.

**SAFETY ADVISORY** - A safety advisory issued by ATC to aircraft under their control if ATC is aware that the aircraft is at an altitude which, in the controller's judgement, places the aircraft in unsafe proximity to terrain, obstructions, or other aircraft.

**SEARCH AND RESCUE (SAR)** - A service which seeks missing aircraft and assists those found to be in need of assistance. It is a cooperative effort using the facilities and services of available Federal, state, and local agencies.

**SPECIALIST** - The internal individual or group who provides service through the NAS (e.g., controllers, engineers, maintenance and management personnel).

**SPECIAL USE AIRSPACE (SUA)** - Airspace of defined dimensions identified by an area on the surface of the earth wherein activities must be confined because of their nature and/or wherein limitations may be imposed upon aircraft operations that are not a part of those activities. These areas include Alert Area, Controlled Firing Area, Military Operations Area, Prohibited Area, Restricted Area, and Warning Area.

**SURVEILLANCE** - The detection, location, and tracking of aircraft within NAS airspace for the purposes of control, separation, and identification. Surveillance systems are electronic in nature; visual methods are purposely excluded. In the case of dependent surveillance, the aircraft provides all flight information. Surveillance systems are differentiated as independent, independent cooperative, and dependent.

**TCCC** - The tower control computer complex (TCCC) will provide the primary work station (data entry and display capabilities and processing) required for the conduct of the operational services by ATCT controllers. The TCCC will provide an automated tower cab information system and the primary operational position equipment for ATCT controllers. The TCCC will generally: present local environment and airport system flight status, and surveillance data to the controllers; provide control over the local airport systems; and provide an interface with a parent ACF.

**TERMINAL AREA** - A general term used to describe airspace in which approach control service or airport traffic control service is provided.

**TERMINAL AREA FACILITY** - A facility providing air traffic control service for arriving and departing IFR, VFR, Special VFR, Special IFR aircraft and, on occasion, en route aircraft.

**TOWER/AIRPORT TRAFFIC CONTROL TOWER (ATCT)** - A terminal facility that uses air-ground radio communications, visual signaling, and other devices to provide ATC services to aircraft operating in the vicinity of an airport or on the movement area. ATCTs authorize aircraft to land or takeoff at the airport controlled by the tower or to transit the airport traffic area regardless of

flight plan or weather conditions (IFR or VFR). A tower may also provide approach control services.

**TRAFFIC-**

1. A term used by a specialist to transfer radar identification of an aircraft to another specialist for the purpose of coordinating separation action. Traffic is normally issued (a) in response to a handoff or point out, (b) in anticipation of a handoff or point out, or (c) in conjunction with a request for control of an aircraft.

2. A term used by ATC to refer to one or more aircraft.

**TRAFFIC ADVISORIES** - Advisories issued to alert pilots to other known or observed air traffic which may be in such proximity to the position or intended route of flight of their aircraft to warrant attention. Such advisories may be based on:

1. Visual observation
2. Observation of radar identified and non-identified aircraft targets on an ATC radar display
3. Verbal reports from pilots or other facilities

The word "traffic" followed by additional information, if known, is used to provide such advisories; e.g., "Traffic, 2 o'clock, one zero miles, southbound, eight thousand."

**USER** - The external individual or group that receive services from the NAS (e.g., Pilot, Air Carrier, General Aviation, Military, Law Enforcement Agencies).

**VECTOR** - A heading issued to an aircraft to provide navigational guidance.

**VFR AIRCRAFT/VFR FLIGHT** - An aircraft conducting flight in accordance with visual flight rules or operating on a special VFR clearance.

**VISUAL FLIGHT RULES (VFR)** - Rules that govern the procedures for conducting flight under visual conditions. The term "VFR" is also used in the United States to indicate weather conditions that are equal to or greater than minimum VFR requirements. In addition, it is used by pilots and controllers to indicate type of flight plan.

ACRONYMS/ABBREVIATIONS

<u>ACRONYM</u>	<u>MEANING</u>
AAS	Advanced Automation System
AERA	Automated En route Air Traffic Control
ACCC	Area Control Computer Complex
ACF	Area Control Facility
ADO	Airline Dispatch Office
AFSS	Automated Flight Service Station
AIRMET	Airmen's Meteorological Information
ARSR	Air Route Surveillance Radar
ASOS	Automatic Weather Surface Observing System
ASR	Airport Surveillance Radar
ATA	Airport Traffic Area
ATC	Air Traffic Control
ATCRBS	Air Traffic Control Radio Beacon System
ATCT	Air Traffic Control Tower
ATIS	Automatic Terminal Information Service
AWOS	Automated Weather Observing System
AWP	Aviation Weather Processor
CRA	Conflict Resolution Advisory
CWP	Central Weather Processor
DL	Data Link
DLP	Data Link Processor
DUAT	Direct User Access Terminal
ETA	Estimated Time of Arrival
EFAS	En route Flight Advisory Service
FAA	Federal Aviation Administration
FSAS	Flight Service Automation System
FSEMP	Flight Service Broadcast Message Processor
FSDPS	Flight Service Data Processing System
GWDS	Graphic Weather Display System
HIWAS	Hazardous In-Flight Weather Advisory Service
ICSS	Integrated Communications Switching System
IFR	Instrument Flight Rules
LLWAS	Low-Level Wind Shear Alert System
MODE S	Discrete Addressable Secondary Radar System with Data Link
MSL	Mean Sea Level
NAS	National Airspace System
NASSRS	National Airspace System System Requirements Specification
NAVAID	Navigational Aid
NEXRAD	Next Generation Weather Radar
NM	Nautical Mile
NORAD	North American Defense Command
NOTAM	Notice to Airmen
NWS	National Weather Service

PIREP	Pilot Report
RCF	Remote Communication Facility
RWP	Real Time Weather Processor
SAR	Search and Rescue
SIGMET	Significant Meteorological Information
SUA	Special Use Airspace
TCCC	Tower Control Computer Complex
TCS	Tower Communications System
TDWR	Terminal Doppler Weather Radar
TMP	Traffic Management Processor
TRACON	Terminal Radar Approach Control Facility
UHF	Ultra High Frequency
VFR	Visual Flight Rules
VHF	Very High Frequency
VOR	VHF Omnidirectional Range
VSCS	Voice Switching and Control System
WMSC	Weather Message Switching Center
WMSCR	Weather Message Switching Center Replacement
WX	Weather



