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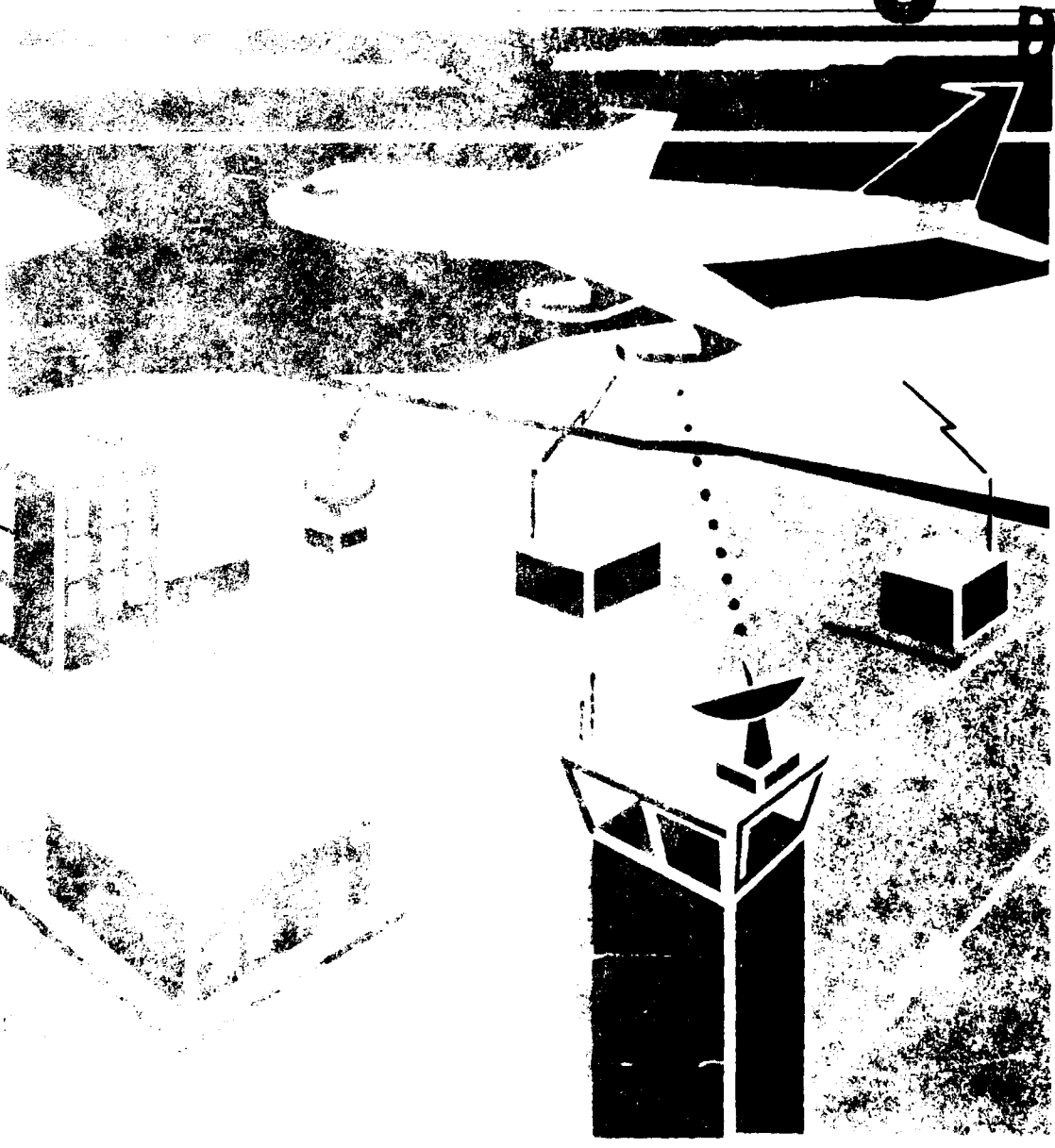
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16. Abstract A requirement for the National Airspace System (NAS) is to provide a variety of monitoring services to its users, as identified in the NAS System Requirement Specification, NAS-SR-1000. This document presents a concept of operations for 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.			
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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 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 NAS "end state" system. 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:

1. Provide a common operational perspective across subsystems, operators, and users.
2. 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 simplifying constraint of communications transparency has been implemented in the development of this operational concept; i.e., communications systems serve only as a "pass through" for information and are not included (Section 3.6 of the NASSRS describes communications requirements which are further described in another operational concept).

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

3.3 Monitoring

3.3.1 Flight Following

- A. Request and Acceptance of Flight Following Services
- B. Provision of Flight Following on Request
- C. Overdue Aircraft Flight Alerts
- D. Information on Overdue Aircraft

3.3.2 Traffic Advisories

- A. Provision of Traffic Advisories
- B. Safety Advisories and Vectoring
- C. VFR Sequencing and Separation in Terminal Phases
- D. Advisories and Vectoring near Special Use Airspace
- E. Information on Aircraft under Traffic Advisory Service
- F. Determination of Potential Traffic Conflicts

3.3.3 Weather Advisories

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

This particular operational concept presents an overview of Monitoring from a global perspective. Flight Following, Traffic Advisories, and Weather Advisories are presented from an overall point without addressing subparagraphs. The specific requirements for Flight Following (3.3.1.A-D), Traffic Advisories (3.3.2.A-F), and Weather Advisories (3.3.3.A-F) will be described in further detail in later operational concepts.

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 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 and associated description show a typical sequence of steps that are taken by operators/users to support monitoring operations. Principal features of an operation 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 of this document is divided into six subsections. Section 2.1 provides an overview description of the monitoring function and identifies the personnel compliment and physical entities (facilities and computer systems) which provide the required support. Section 2.2 describes the information used to provide monitoring services support. Section 2.3 provides descriptions of the functional decomposition of monitoring services. Sections 2.1, 2.2, and 2.3 reference related NASSRS 3.3 subsystems. Section 2.4 presents the correlation with operational requirements. Section 2.5 provides a sequence of interactions between system and personnel entities during the planning and the implementational phases of monitoring services. Section 2.6 describes monitoring operational scenarios.

2.0 MONITORING OPERATIONS

2.1 Support

The NAS is required to provide monitoring services to users, which is described in Section 3.3 of the NASSRS. Monitoring services consist of flight following, traffic advisories, and weather advisories to both IFR and VFR aircraft. These services may be provided by Automated Flight Service Station (AFSS) specialists, Approach/Departure and En Route Controllers at an Area Control Facility (ACF), or Local Controllers at an Airport Traffic Control Tower (ATCT).

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.

Position 3: In-Flight Specialist

Function: Provides flight following and weather advisories to aircraft in flight and provides traffic advisories to aircraft at airports with an AFSS and no control tower.

Description: A specialist in the AFSS who provides flight following services for aircraft flying over remote or hazardous areas. This specialist provides traffic advisories as part of Airport Advisory Service at selected airports and weather advisories on a continuous basis.

Procedures: FAA, Flight Service Station Procedures
(7110.10I): Chapter 3, Section 2; Chapter 4, Section 1, 2, 7; Chapter 5, Section 2; Chapter 8, Section 1 - 5

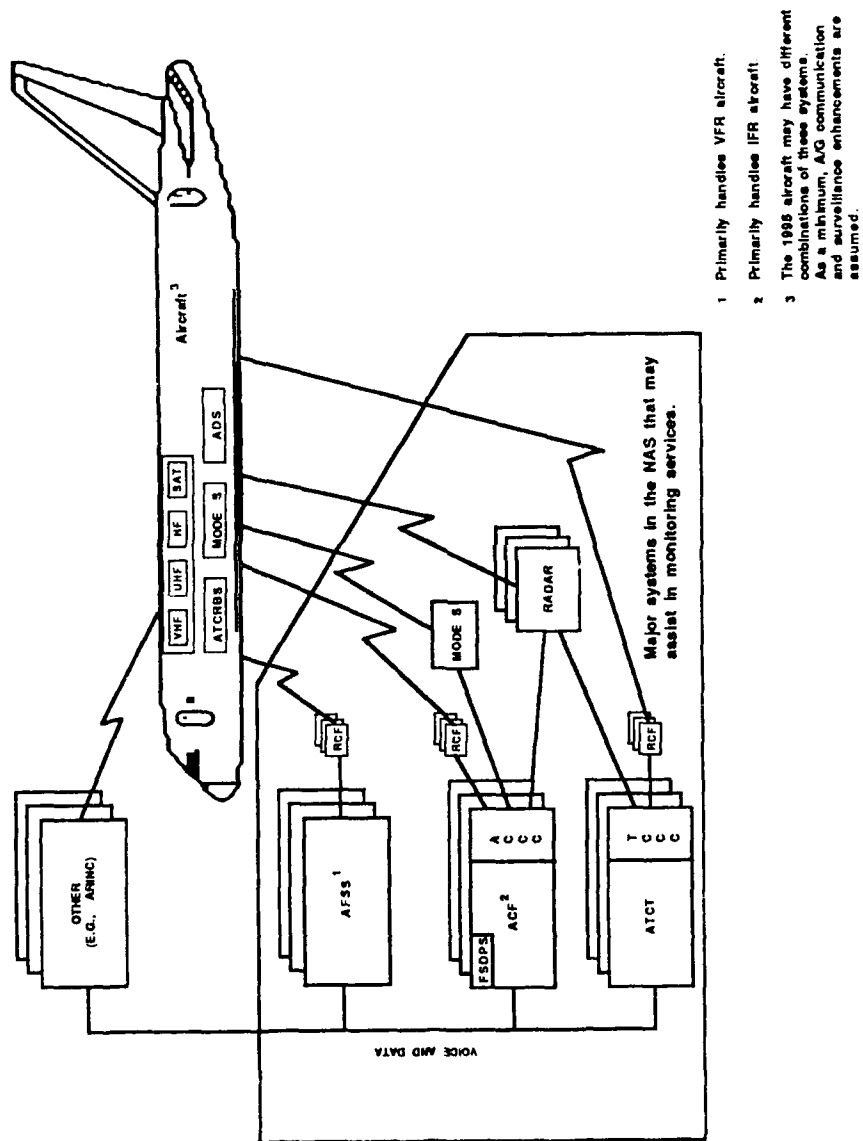
Projects: NAS Plan, Flight Service and Weather Systems: Project 1, Flight Service Automation System (FSAS)

Position 4: En Route Flight Advisory Specialist (EFAS)

Function: Provides en route aircraft with current weather advisories.

Description: The EFAS Specialist provides current information on weather as it exists along a route pertinent to a specific flight.

Procedures: FAA, Flight Service Station Procedures (7110.10I):
Chapter 4, Section 9; Chapter 5, Section 2; Chapter 8, Section 5



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

Projects: NAS Plan, Flight Service and Weather Systems: Project 1, Flight Service Automation System (FSAS)

Position 6 and 7: 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, provide traffic advisories to aircraft under their control based on other known traffic. Additionally, these controllers provide weather advisories to aircraft under their jurisdiction.

Procedures: FAA, "Air Traffic Control (7110.65F)";
Chapter 2, Section 1 and 6; Chapter 3, Section 9 and 10; Chapter 4, Section 3 and 7; Chapter 5, Section 1 and 6; Chapter 7, Section 6, 7, 8, 9; Chapter 8, Section 4; Chapter 9, Section 1 through 3

Projects: NAS Plan, En Route Systems: Project 15, Area Control Facilities (ACF); Terminal Systems: Project 13, ATCT/TRACON Establishment, Replacement, and Modernization

Position 9: Local Controller

Function: Provides traffic and weather advisories to pilots within the Airport Traffic Area (ATA).

Description: Local Controllers issue traffic advisories to pilots based on other known traffic within the ATA. Local controllers also issue weather advisories to pilots as it relates to their phase of flight.

Procedures: FAA, "Air Traffic Control (7110.65F)";
Chapter 2, Section 1 and 6; Chapter 3, Section 1, 10; Chapter 4, Section 3 and 7; Chapter 9, Section 1 through 3

Projects: NAS Plan, Terminal Systems: Project 13, ATCT/TRACON Establishment, Replacement, and Modernization

2.2 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.

2.2.1 Information from the Flight Plan

Since monitoring services (flight following, traffic advisories, and weather advisories) are provided to aircraft at a known position and traffic information is based on the location of other aircraft as depicted on the controller's presentation, the flight plan is the major source of information. The information provided therefore, is obtained from flight plans, which, in turn, are obtained from filed flight plans and amendments. Flight plan information 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. At the appropriate time, the flight plans are transferred to the TCCC so that tower controllers can use the information to provide monitoring services. Both Instrument Flight Rules (IFR) and Visual Flight Rules (VFR) aircraft flight plans are included.

2.2.2 Information about Aircraft Position

Information concerning the position of an aircraft requesting monitoring services is derived from the aircraft position and from the flight plan. The aircraft position is obtained from the individual pilot position report (if not being tracked) or by automated functions such as the ACCC at the ACF. This information is based on input from en route and terminal radars and 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.

2.2.3 Information about Traffic Advisories

Aircraft request traffic advisory services from controllers in ACFs and ATCTs. Once identified, traffic advisories are issued to all applicable aircraft (IFR and VFR). These advisories are based on both tracked and untracked aircraft in the vicinity of the requesting aircraft. Traffic advisories are based on known traffic or observed traffic. This information is obtained through voice, surveillance, and flight plan information.

2.2.4 Information about Weather Advisories

Weather condition information provided within the NAS includes data on precipitation, wind direction and velocity, icing conditions, and turbulence information. Airport weather information is gathered from a variety of sources including automatic surface observing systems (which monitor wind and runway visibility), radar detection, and the processing of weather phenomena. Additionally the detection and reporting of wind shear information is provided by other ground-based systems. Other weather information is obtained from satellite data.

This 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.

2.3 Functions

In order to clarify the flight following, traffic advisory, and weather advisory functions they are described with respect to the particular specialists who are most often involved with performing 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 In-Flight Specialist (Position 3)

The In-Flight Specialist provides flight monitoring services for all requesting aircraft flying regularly-traveled VFR routes across large bodies of water, swamps, or mountains. This service, which is called the Lake/Island, Mountain, and Swamp Reporting Service, is provided for the purpose of expeditiously alerting Search and Rescue (SAR) facilities when requested by flight service personnel.

The In-Flight Specialist also provides airport advisory services at airports served by an AFSS and no control tower. The Airport Advisory Service includes advisories on weather, airport information, and traffic. The traffic advisories provided are based on factual information about observed or reported aircraft in the air or on the ground at the airport. Additionally, In-Flight specialists advise pilots of that status of Special Use Airspace (SUA) with reference to the pilots reported position.

As part of the in-flight services In-Flight Specialists provide pilots with weather information including advisories for the pilot's route of flight.

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

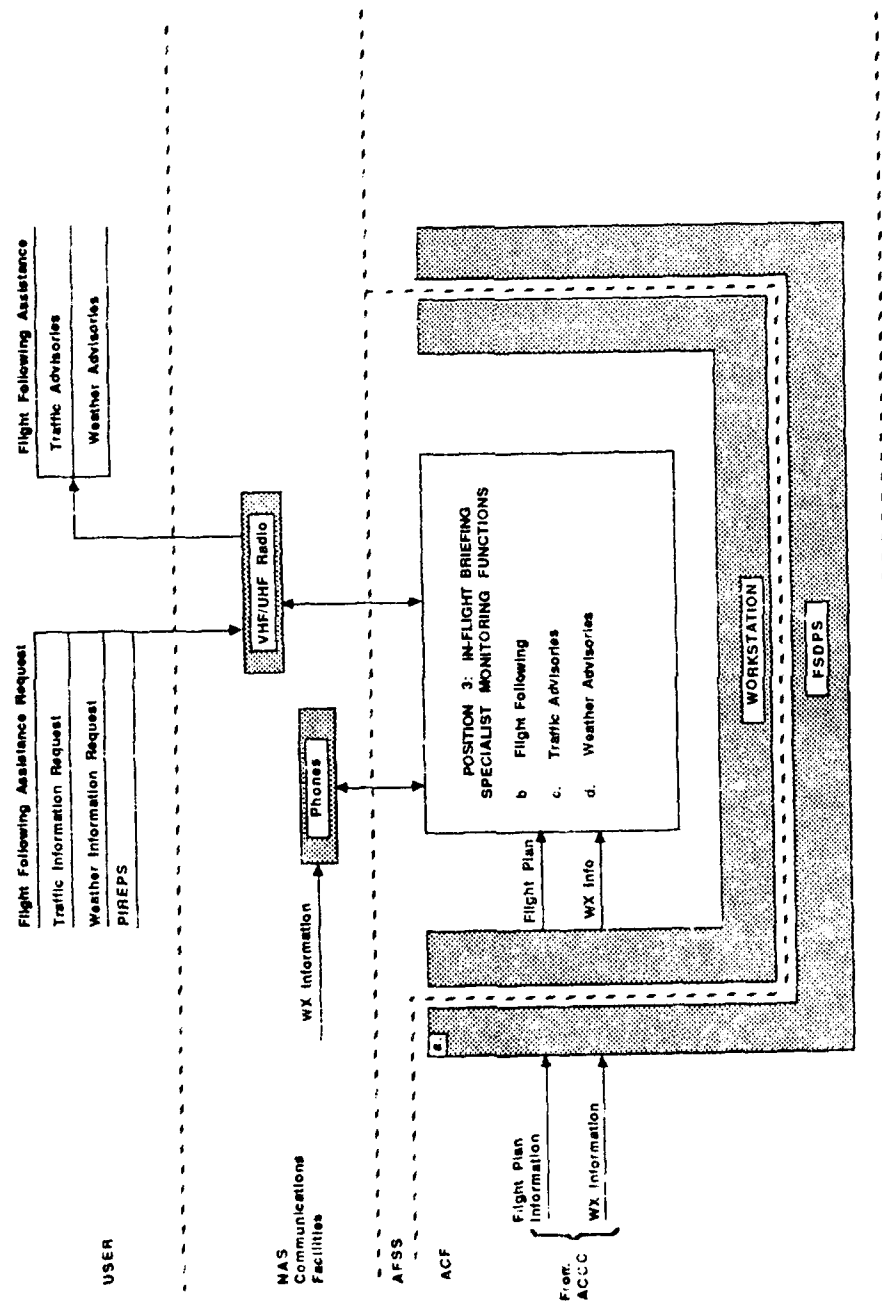


FIGURE 2-3
POSITION 3: IN-FLIGHT BRIEFING SPECIALIST
MONITORING OPERATIONAL FLOW DIAGRAM

- a. FSDPS processing. The FSDPS provides processing capability and related support by accepting, processing, tracking, and updating the flight plans of aircraft requesting monitoring services. The FSDPS provides the In-Flight Specialist with weather products for briefing pilots along their route of flight.

NASSRS Requirement 3.3.1, 3.3.2, 3.3.3

- b. Flight Following. The In-Flight Specialist monitors flights, as requested to ensure timely emergency assistance if the need develops. The NAS alerts the specialist when an aircraft being provided with flight following services is overdue. When this occurs, the NAS provides the aircraft's identification, its type, as well as the time and location of its last reported position.

NASSRS Requirement 3.3.1

- c. Traffic Advisories. The in-Flight Specialist provides traffic advisory services at designated airports. The information provided is based on pilot reports from aircraft in the airport traffic pattern as well as observed traffic on the airfield.

NASSRS Requirement 3.3.2

- d. Weather Advisories. 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 3.3.3

2.3.2 En Route Flight Advisory Service (EFAS) Specialist (Position 4)

The En Route Flight Advisory Service (EFAS) Specialist provides en route aircraft with accurate weather information along with specific routes of flight, in sufficient time to prevent unnecessary changes to flight plans, but, when necessary, to allow pilots to terminate the flights or alter courses before adverse conditions are encountered.

The EFAS Specialist obtains 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 EFAS specialists are surface analysis, weather depiction analysis, upper air analysis, winds aloft prognosis, and wind shear prognosis reports. Additionally, EFAS specialists obtain pilot reports (PIREPS) on current weather conditions along their routes of

flight. 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.

Figure 2-4 is an operational flow diagram which displays the functions and services provided by the EFAS Specialist at the AFSS. Functions performed by the equipment and the EFAS Specialist are lettered within each block and are described in the corresponding paragraphs below.

- a. FSDPS Processing. The FSDPS houses the processing and storage capability for weather data. Weather information is provided to the specialists in a variety of formats for issuance to users.

NASSRS Requirement 3.3.3

- b. Weather Advisories. The EFAS Specialist informs users of hazardous weather conditions and allows users to request and accept in-flight weather advisories. The NAS provides assistance upon request to users who want to avoid hazardous weather conditions along their route of flight.

NASSRS Requirement 3.3.3

2.3.3 Approach/Departure and En Route Controller (Position 6/7)

Approach/Departure and En Route Controllers provide essentially the same services and, for this reason, the two positions have been combined. These controllers provide pilots, under their control traffic, information about other known traffic in the vicinity. Included in this service is safety alerts issued to aircraft approaching terrain, obstructions and Special Use Airspace (SUA) areas. Additionally, weather advisories are relayed to pilots on a workload permitting basis.

Figure 2-5 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 provides the processing capability to accept, store, and manipulate flight plan information which is then used in tracking aircraft automatically or manually. This tracking of aircraft, and also displaying of aircraft not under the control of these controllers, is used when providing traffic advisories. The ACCC also stores and displays weather information for relaying to pilots.

NASSRS Requirement 3.3.2, 3.3.3

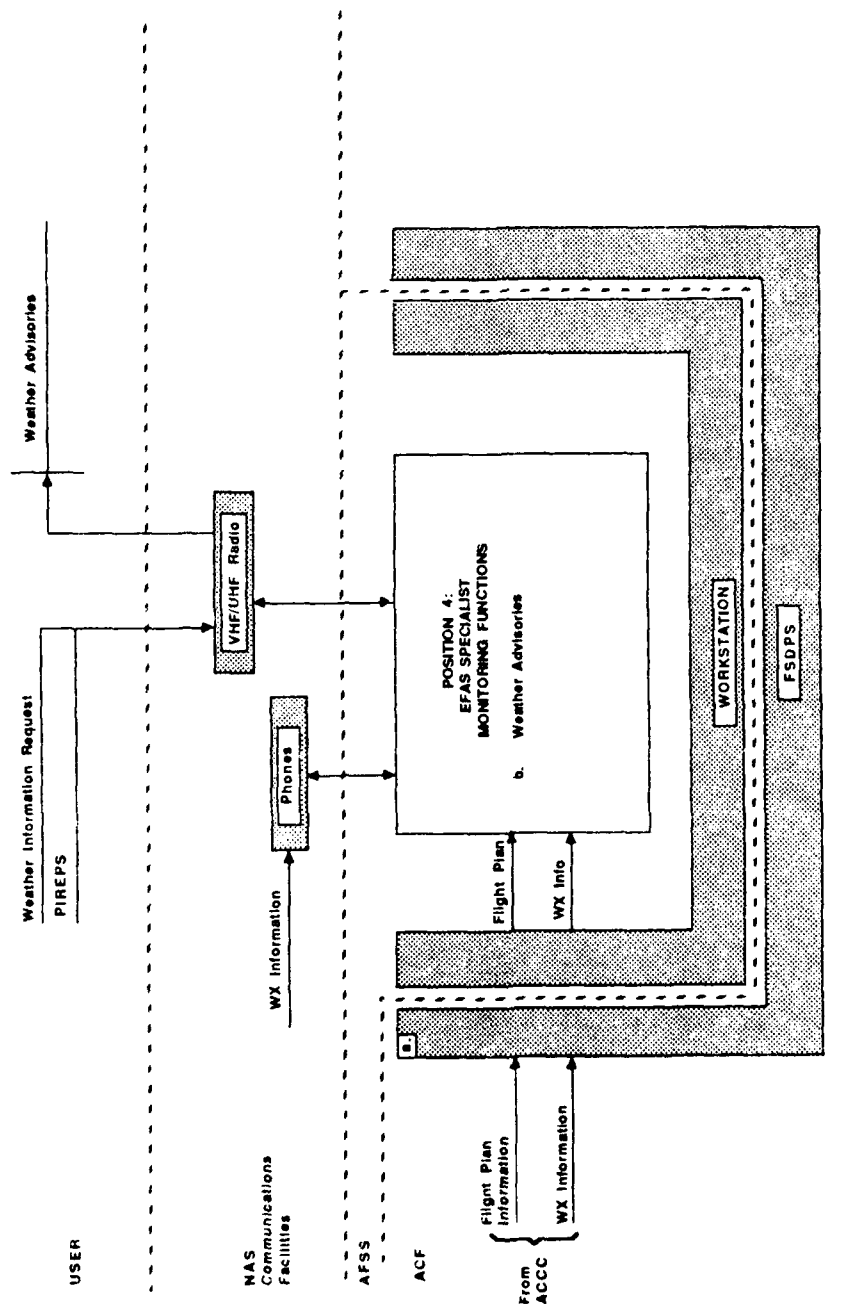


FIGURE 2-4
POSITION 4: EFAS SPECIALIST
MONITORING OPERATIONAL FLOW DIAGRAM

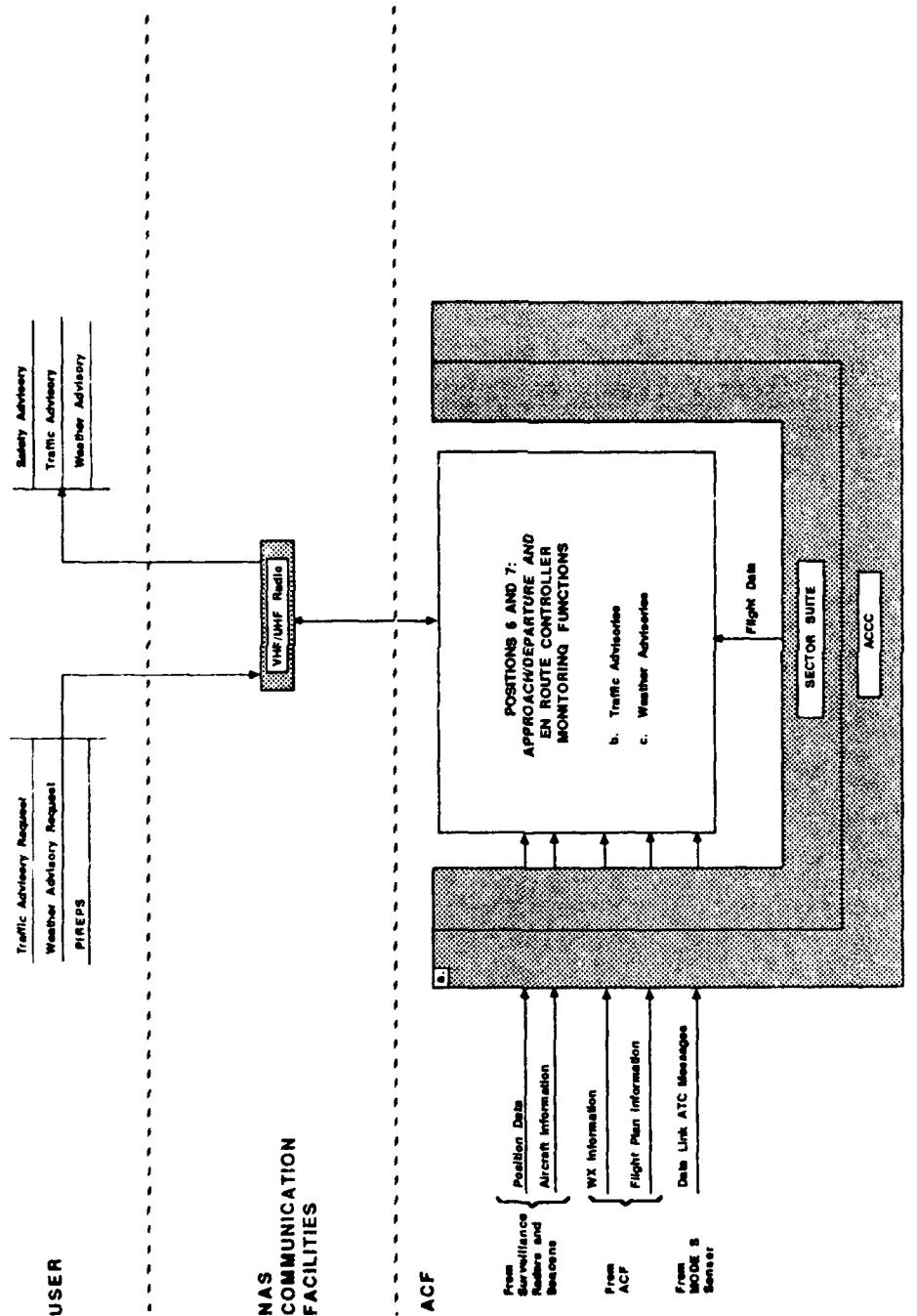


FIGURE 2-5
POSITIONS 6 AND 7: APPROACH/DEPARTURE
AND EN ROUTE CONTROLLER
MONITORING OPERATIONAL FLOW DIAGRAM

- b. Traffic Advisories. Controllers working in the ACF provide traffic advisories and safety advisories concerning proximity to terrain and obstructions, Special Use Airspace (SUA) or other aircraft. The provision of this service is dependent on the type of flight plan filed, aircraft avionics, NAS communications, as well as the surveillance coverage for the route and altitude flown.

NASSRS Requirement 3.3.2

- c. Weather Advisories. The NAS provides weather information products to controllers working at the ACF. The weather products are used to plan for a more efficient flow of air traffic within the ACF area. Weather information is available to controllers for issuance to pilots, but on a workload permitting basis only.

NASSRS Requirement 3.3.3

2.3.4 Local Controller (Position 9)

Local Controllers, working in Air Traffic Control Towers (ATCT), provide traffic advisory services within the terminal Airport Traffic Area (ATA). Local controllers provide safety advisory information about special use airspace 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 current weather in the terminal area as it relates to their phase of flight.

Figure 2-6 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 houses the flight data and aircraft position, and weather information that is used by the Local Controller to provide traffic and weather advisories. 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 3.3.2, 3.3.3

- b. Traffic Advisories. Local Controllers provide traffic, as well as safety advisories to aircraft within the ATA.

NASSRS Requirement 3.3.2

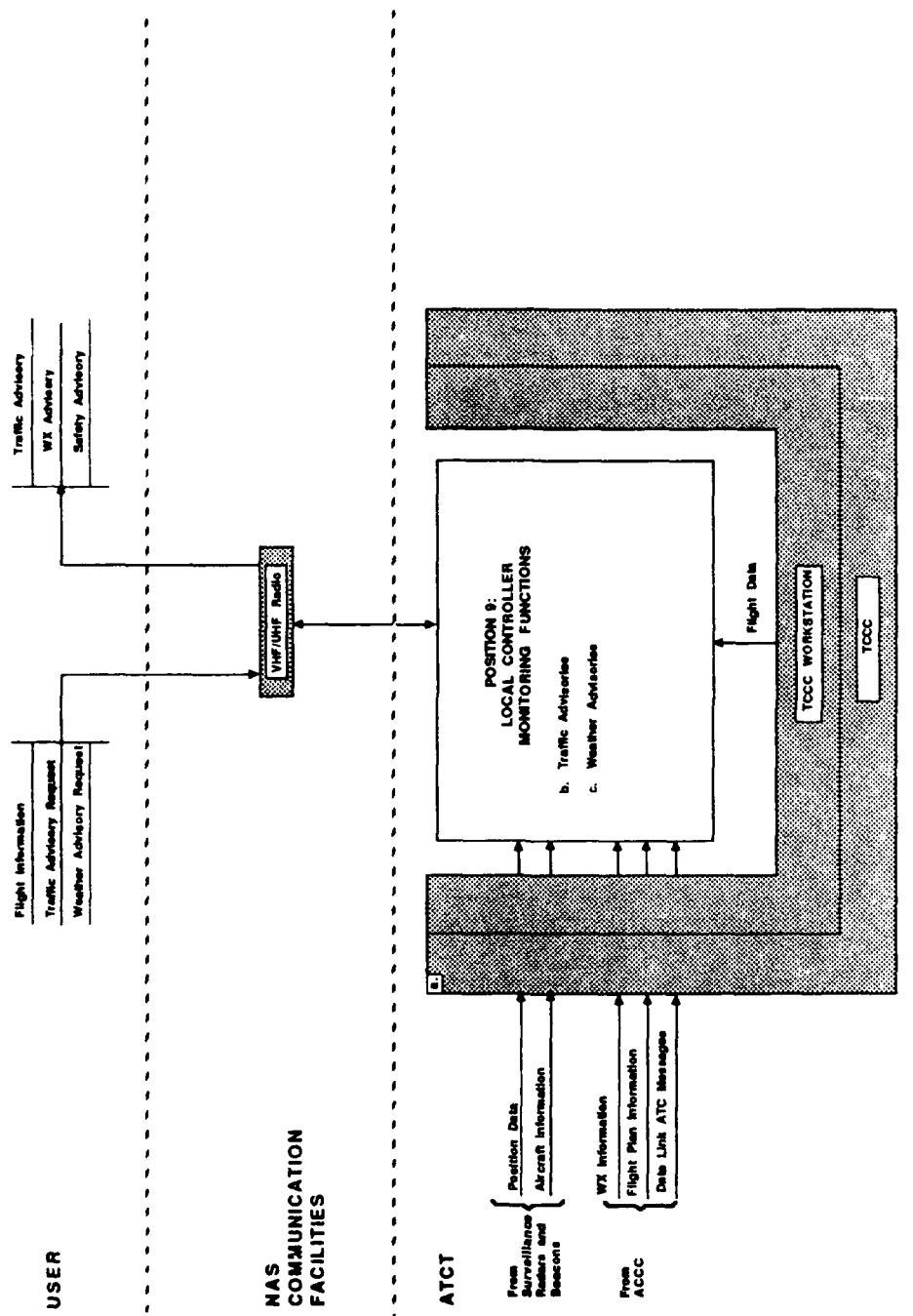


FIGURE 2-6
POSITION 9: LOCAL CONTROLLER
MONITORING OPERATIONAL FLOW DIAGRAM

- c. Weather Advisories. 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 3.3.3

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 double-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.

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 2-7 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 his/her 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 FSDPS detects that the aircraft is overdue (7) and alerts the specialist (8), who attempts to contact the aircraft (9). If contact is reestablished, flight following continues (10) until it is no longer needed (11). If contact is not re-established, the In-Flight Specialist initiates action to have SAR personnel notified (12).

TABLE 2-1
MONITORING OPERATIONAL REQUIREMENTS
CORRELATION

	IN-FLIGHT SPECIALIST	EFAS SPECIALIST	APPROACH/ DEPARTURE AND EN ROUTE CONTROLLER	LOCAL CONTROLLER
NAS-SR-1000 PARAGRAPH	2.3.1a 2.3.1b 2.3.1c 2.3.1d	2.3.2a 2.3.2b	2.3.3a 2.3.3b 2.3.3c	2.3.4a 2.3.4b 2.3.4c
3.3 General	—	—	—	—
3.3.1 Flight Following	X		X	X
3.3.2 Traffic Advisories	X		X	X
3.3.3 Weather Advisories	X	X	X	X

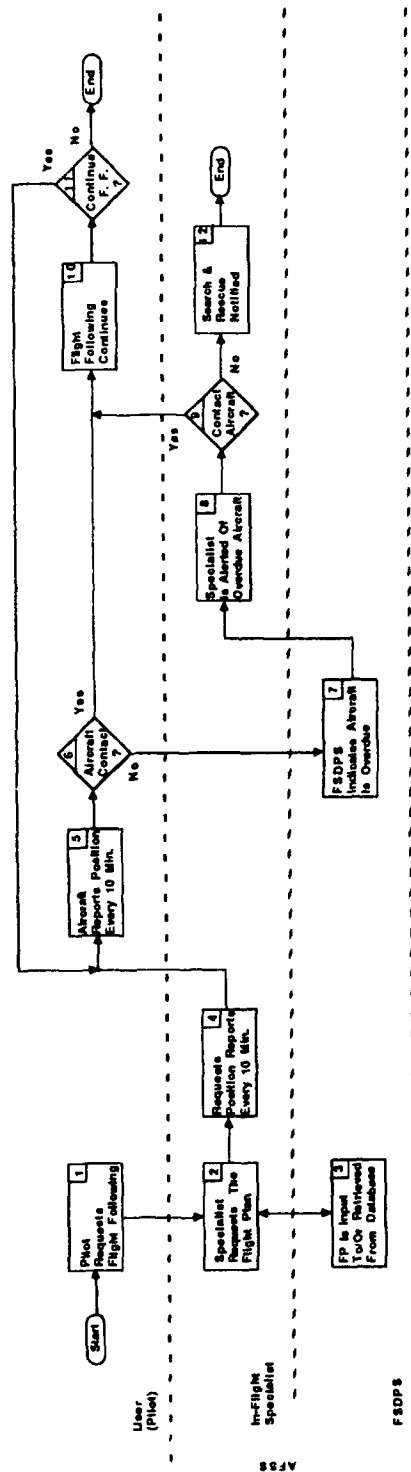


FIGURE 2-7
FLIGHT FOLLOWING
OPERATIONAL SEQUENCE DIAGRAM

2.5.2 Traffic Advisory Operational Sequence

Figure 2-8 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 for the traffic (6/7). If he observes that the traffic's proximity is too close, he maneuvers his aircraft away from it (8) and no longer needs advisories (9/10). 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.

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 2-9 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), the Local Controller separates the new arrival from existing traffic by sequencing it behind the others (4). The arriving aircraft is lined up in the traffic pattern based on the Local Controller's instructions (5/6/7). Once other traffic has cleared the area, 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 2-10, describes the services provided by the EFAS Specialist.

An aircraft requests en route weather along his/her 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 (2/3). The weather for the particular area (4) is relayed to the pilot (5). The en route pilot obtains the weather for his/her route of flight (6). If, based on the weather information, the pilot determines that he/she needs to deviate from this route of flight to avoid bad weather (7), he/she requests alternate routing from the EFAS Specialist (8). The EFAS Specialist suggests an alternate route around the weather (9) which the pilot flies to avoid the weather (10).

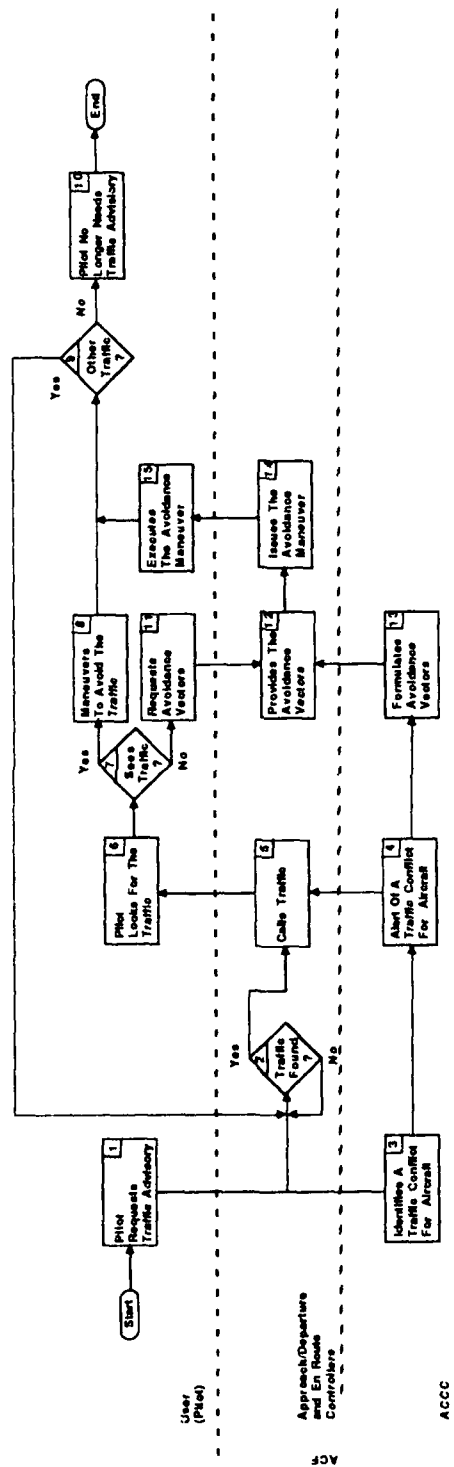


FIGURE 2-8
TRAFFIC ADVISORY
OPERATIONAL SEQUENCE DIAGRAM

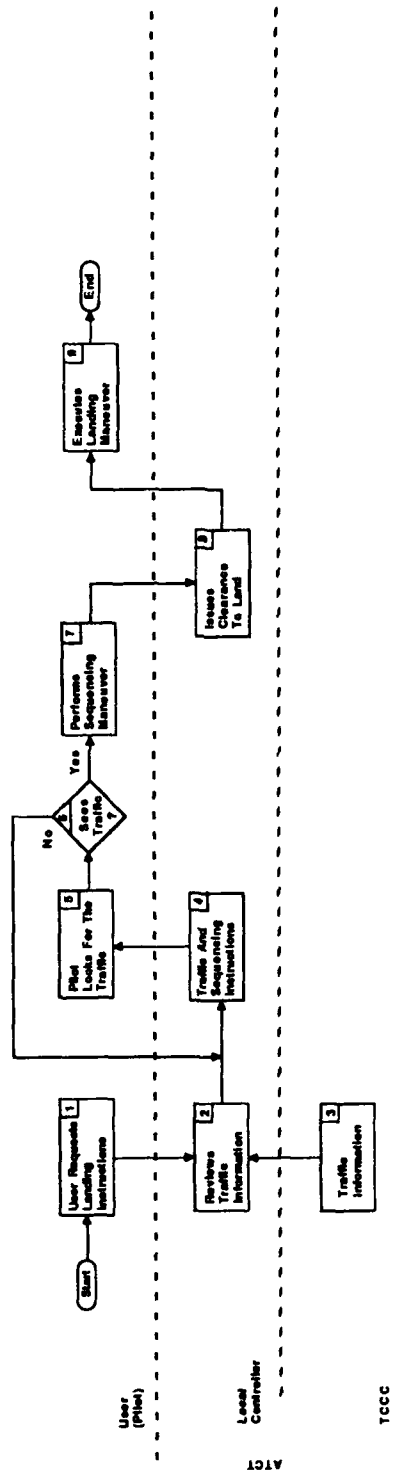


FIGURE 2-9
TRAFFIC ADVISORY (ATCT)
OPERATIONAL SEQUENCE DIAGRAM

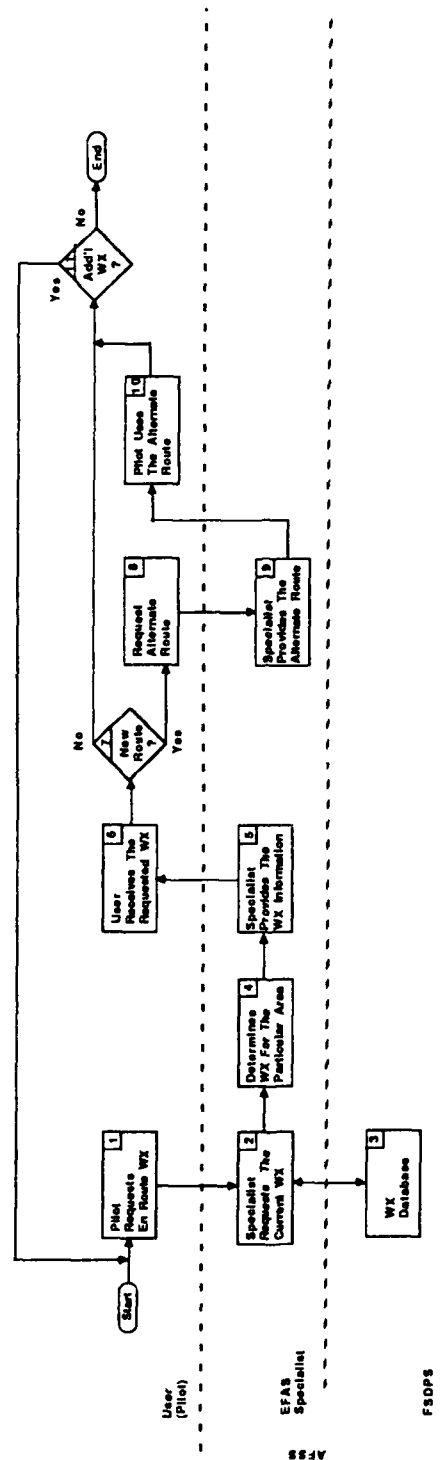


FIGURE 2-10
WEATHER ADVISORY OPERATIONAL
SEQUENCE DIAGRAM

2.6 Operational Scenario

2.6.1 Flight Following Operational Scenario

Figure 2-11 presents an operational sequence for flight following. It is similar to the operational sequence diagrams displayed in Figure 2-7; 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). Cherokee 865 fails to report his position fifteen minutes after making his second position report (5/6), the specialist determines that Cherokee 865 is overdue (7/8). The In-Flight Specialist is alerted (9) of the overdue status of N27865 and initiates SAR notification (10).

2.6.2 Traffic Advisory Operational Scenario

In the second scenario, Figures 2-12, and 2-13 present an operational scenario for an aircraft requesting traffic advisories. It is similar to the operational sequence diagrams displayed in Figures 2-8 and 2-9; however, this scenario provides more detail and represents the interactions that would take place between operators/users in a specific case.

In Figure 2-12, 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 frequency change (9) which is approved by the ACF controller (10).

In Figure 2-13, 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 was 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 the traffic (6). When the previous traffic ahead of N2222MM is clear the Local Controller clears N2222MM to land (7).

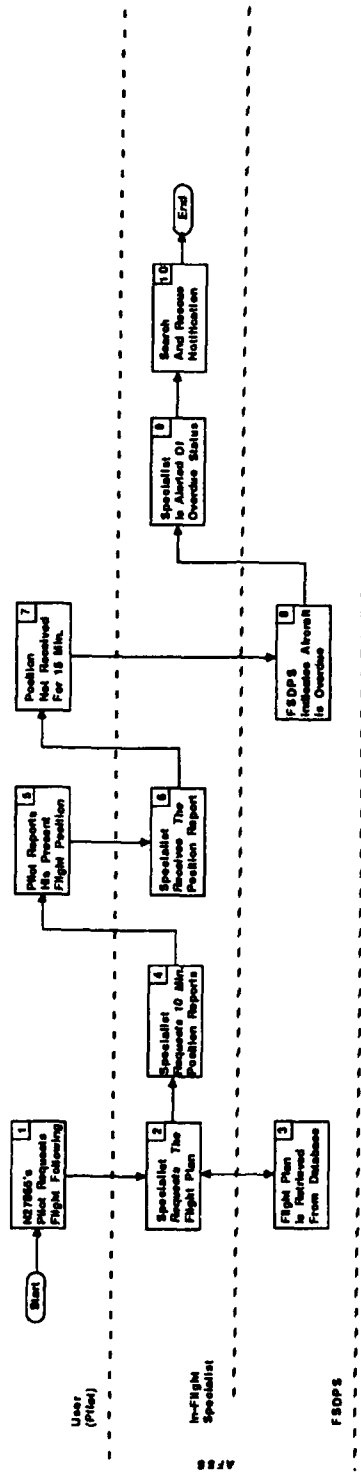


FIGURE 2-11
FLIGHT FOLLOWING SCENARIO

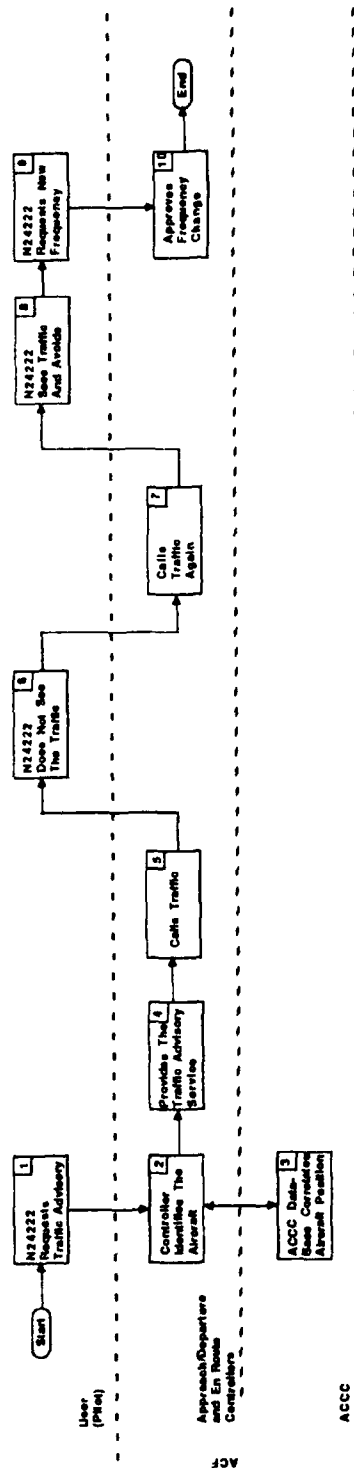


FIGURE 2-12
TRAFFIC ADVISORY SCENARIO
(EN ROUTE)

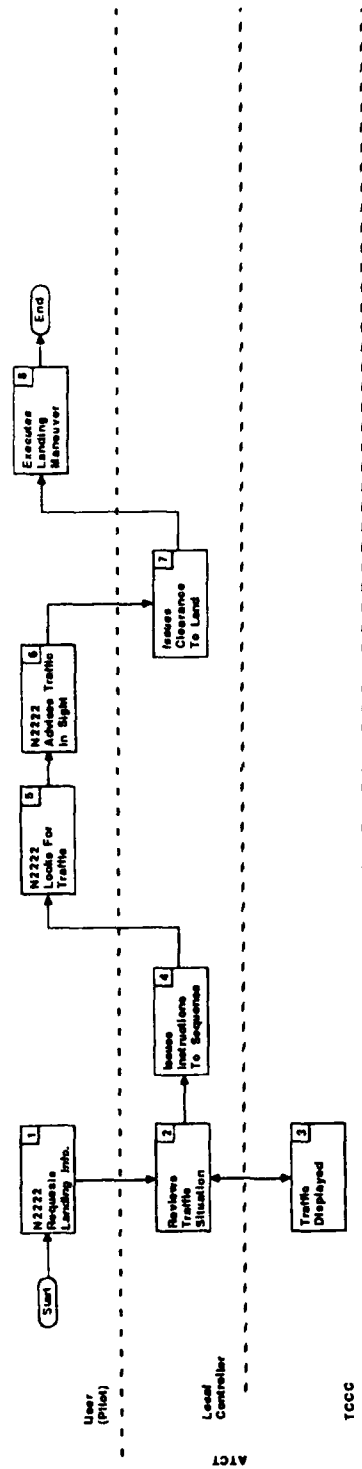


FIGURE 2-13
TRAFFIC ADVISORY SCENARIO
(ATCT)

2.6.3 Weather Advisory Operational Scenario

Figure 2-14 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), and issues the weather information on the storm to the pilot (4). 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 alternate routing around the storm (5). Based on the location of the storm and the reported position of the aircraft and intended destination, the EFAS Specialist issues an alternate routing (6). The pilot of Baron 267R flies the alternate routing and avoids the storm (7). Once around the storm and in the clear, the pilot of Baron 267R initiates a frequency change from the Flight Watch Specialist (8/9).

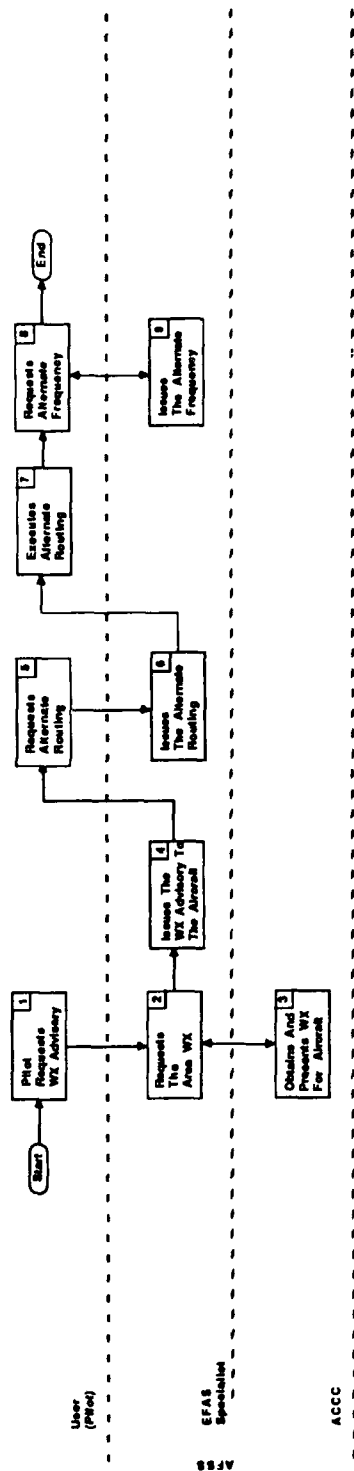


FIGURE 2-14
WEATHER ADVISORY SCENARIO

REFERENCES

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

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

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

Federal Aviation Administration (December 1986), National Airspace System Level I Design Document, NAS-DD-1000B, (Includes SCN-1 through SCN-11), 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, (Includes SCN-1 through SCN-5), 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 to communicate and coordinate operational data to support primary processing, data entry and display, monitor control console, emergency processing, support and training, and diagnostic 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; support oceanic control, area control, and approach control in all airspace except that delegated to airport traffic control towers (ATCT).

ADDITIONAL SERVICES - Advisory information provided by ATC which includes but is not limited to the following:

1. Traffic advisories
2. Vectors
3. Altitude deviation information of 300 feet or more from an assigned altitude
4. Advisories that traffic is no longer a factor
5. Weather and chaff information
6. Weather assistance
7. Bird activity information
8. Holding pattern surveillance

Additional services are provided to the extent possible only upon the controller's capability to fit them into his performance of higher priority duties. Their provision is also contingent upon the limitations of equipment, volume of traffic, frequency congestion, and controller workload. The controller has complete discretion for determining if he is able to provide or continue to provide an additional service in a particular case.

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

AIRCRAFT - Device/s 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 will provide interactive alphanumeric and graphic workstations for the flight service specialists.

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 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 workload 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.

FLIGHT SERVICE STATION (FSS) - 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 (NOTAM); broadcast aviation weather and NAS information; receive and process IFR flight plans; and monitor NAVAIDS. In addition, at selected locations, FSSs provide En Route Flight Advisors Services (Flight Watch), take weather

observations, issue airport advisories, and advise Customs and Immigration of transborder flights.

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.

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 status flight, and surveillance data to the controllers and 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. Authorizes 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>
ACCC	Area Control Computer Complex
ACF	Area Control Facility
AFSS	Automated Flight Service Station
ALNOT	Alert Notice
ARINC	Aeronautical Radio Incorporated
ATA	Airport Traffic Area
ATC	Air Traffic Control
ATCRBS	Air Traffic Control Radio Beacon System
ATCT	Air Traffic Control Tower
DF	Direction Finder
DUAT	Direct User Access Terminal
EFAS	En Route Flight Advisory Service
FSAS	Flight Service Automation System
FSDPS	Flight Service Data Processing System
FSS	Flight Service Station
IFR	Instrument Flight Rules
MODE S	Discrete Addressable Secondary Radar System with Data Link
NAS	National Airspace System
PIREP	Pilot Report
RCF	Remote Communication Facility
SAR	Search and Rescue
SAT	Satellite
SUA	Special Use Airspace
TCCC	Tower Control Computer Complex
UHF	Ultra High Frequency
VFR	Visual Flight Rules
VHF	Very High Frequency
WX	Weather