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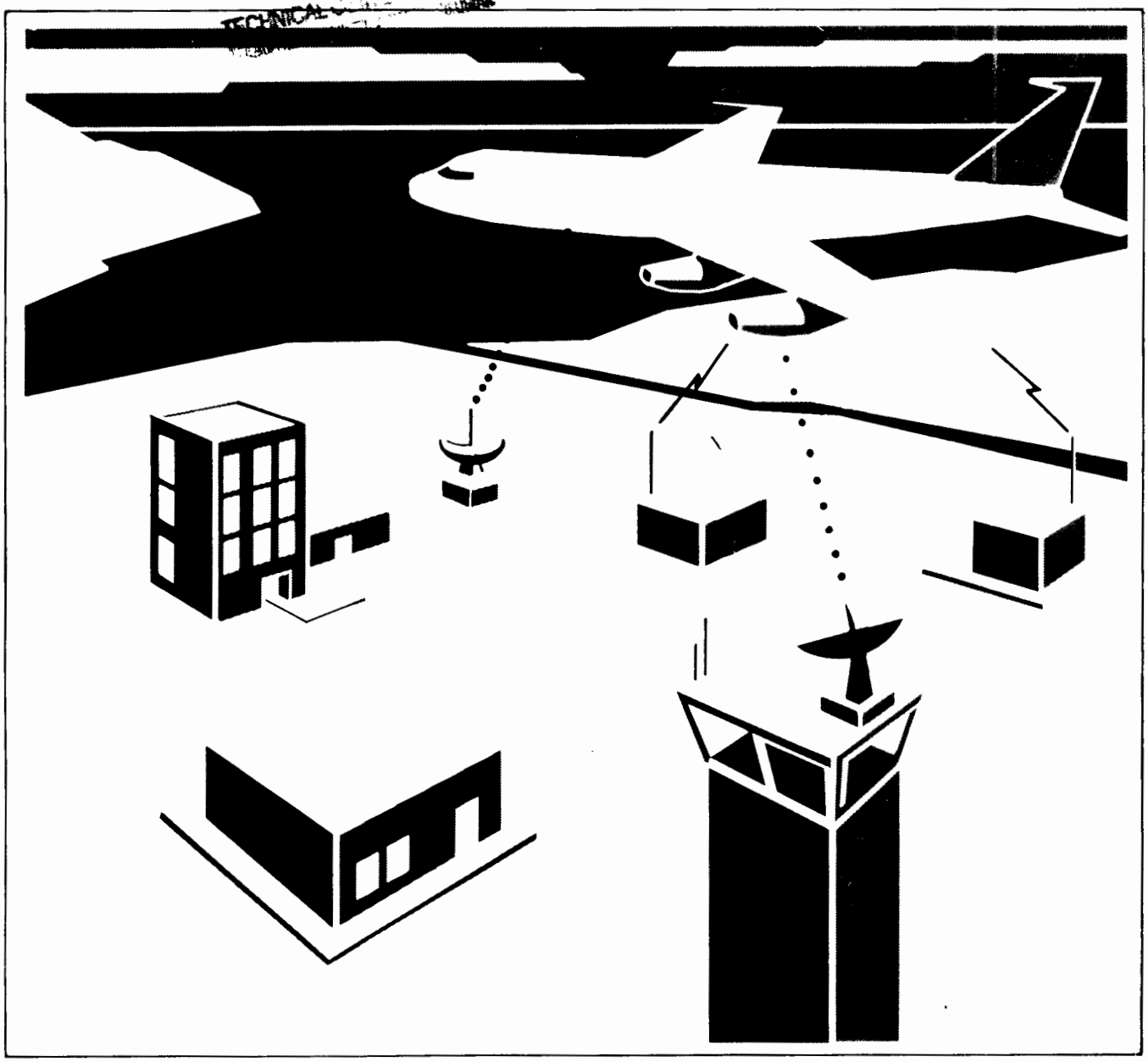
Flight Planning Operational Concept NAS—SR—131



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16. Abstract

This document is an operational concept of the flight planning processing system which will be in place upon implementation of the Federal Aviation Administration (FAA) National Airspace System (NAS) Plan. Flight planning encompasses all activities involved in the preparation of a flight, including the information retrieved by the pilot prior to the flight and used to make go/no go decisions; the information conveyed by the pilot to the NAS in the form of a flight plan; and all NAS-related services which support these activities. The objective of this document is to describe the relationship between subsystems, facilities, information, and operators/users involved in the flight planning process. In addition, the elements and operations of the NAS Plan are mapped into the flight planning requirements stated in the National Airspace System Requirement Specification (NASSRS, NAS-SR-1000). Several types of block diagrams are used to illustrate systems connectivity and operational flow. Scenarios are also derived to describe the flight planning process from a user's perspective.

This concept, along with seven other operational concepts, will complete the description of the system requirements as described in the NASSRS.

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).

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1.0 INTRODUCTION

Flight planning is an essential component of flight safety. It includes the major steps involved in the preparation of a flight and the NAS-related services which support flight planning. Preflight briefings and flight plans are the two major products associated with flight planning.

1.1 Background

The National Airspace System System Requirements Specification (NASSRS), NAS-SR-1000, is a compilation of requirements which specify the operational capabilities of the National Airspace System (NAS) in the 1995 and beyond time frame, and includes the requirement to provide assistance to users in every phase of flight planning. This NASSRS 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

This operational concept is intended to provide insight into the processes and interfaces directly involved in the flight planning process. More specifically, the objectives of this document are:

- To provide a common operational perspective across subsystems, operators and users.

- To show the interrelationship between subsystems, facilities, information, and operators/users.

The NASSRS is used as a reference throughout the document.

1.3 Scope

This document covers the flight planning requirements as delineated in Section 3.1 of the NASSRS. Requirements are categorized in the areas of Weather Information (3.1.1), Aeronautical Information (3.1.2), Flow Control and Delay Advisories (3.1.3), and Flight Plan Submission and Evaluation (3.1.4). This operational concept addresses all operations directly associated with flight planning.

The specific paragraphs in the NASSRS Section 3.1 are as follows:

3.1 FLIGHT PLANNING

3.1.1 Weather Information (Strategic)
- 3.1.1.A Acquiring and Maintaining Weather Information
- 3.1.1.B Priority to Hazardous Weather Information
- 3.1.1.C Pictorial Displays of Real-Time Weather Data
- 3.1.1.D Weather Presentation to Support Interpretation
- 3.1.1.E Flexible and Convenient Access to Weather Information
- 3.1.1.F Geographical Weather Retrieval for All Flight Phases
- 3.1.1.G Hazardous Weather Information Quality and Currency
- 3.1.1.H Weather Information Service in Peak Demand
- 3.1.1.I Weather Information Service Available Continuously

3.1.2 Aeronautical Information (Strategic)
- 3.1.2.A Aeronautical Information Currency
- 3.1.2.B Aeronautical Information Available Continuously to Specialists

3.1.2.C Aeronautical Information Available Continuously to Users
3.1.2.D Aeronautical Information Obtainable by Route or Specific Location
3.1.2.E Adequate Communications Access
3.1.2.F Adequate Peak Response Times

3.1.3 Flow Control and Delay Advisories
3.1.3.A Availability of Flight Information
3.1.3.B Weather Data Available for Flow Control
3.1.3.C Capabilities for Flow Control and Delay Advisories

3.1.4 Flight Plan Submission and Evaluation
3.1.4.A Receipt of Proposed Flight Plans and Amendments
3.1.4.B Direct User Input of Flight Plans
3.1.4.C Support for Multiple Flight Plans
3.1.4.D Interactive Flight Plan Validation and Acceptance
3.1.4.E Capability to Amend Active Flight Plans
3.1.4.F Dissemination of Flight Plan Information
3.1.4.G Automated Interfaces
3.1.4.H Communications Capacity under Peak Demand
3.1.4.I Processing Capacity under Peak Demand
3.1.4.J Capability to Cancel or Close Flight Plans

1.4 Methodology

The methodology used in this operational concept consists of presenting information in a number of different ways and from various perspectives. Four different kinds of diagrams are used to illustrate the flight planning process:

1. Operational Block Diagram. 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 is indicated by a number. This number remains the same in every operational concept.

   b. Dotted lines segregate facilities.

   c. Solid lines show digital data flow. Voice data flow is not shown.

   d. The blocks within each facility are the major processors.

2. Operational Flow Diagram. The operational flow diagram and associated description for each specialist/controller provides more detail about the inputs, processes, outputs and interfaces for each operator. Operational flow diagrams are used to functionally describe the products and services of individual specialists/controllers. The diagrams show major actions only. Ancillary actions such as requests for simulation and system conditions are not shown. Principal features of an operational flow diagram include the following:

a. Dotted lines segregate facilities.

b. Larger white boxes at the center of each diagram indicate specialist/controller/user functions. Shaded boxes indicate supporting systems.

c. The functions listed by lower case alphabetic characters in the white and shaded boxes are explained in the text.

3. Operational Sequence Diagram. The operational sequence diagram and associated description show a typical sequence of steps taken by operators/users in providing/receiving the service. Principal features of an operational sequence diagram include the following:

a. Users and specialists/controllers involved with providing/receiving the service are listed along the vertical axis. Other FAA facilities may also be listed on the vertical axis, when the systems involved provide a service to the user without human intervention.

b. The horizontal axis represents time. Sequential events or functions performed by an operator/user are indicated within separate boxes. Events which may occur simultaneously, or nearly so, are shown vertically. The numbers on the right side of the blocks, and on the top of the diamond-shaped boxes, refer to numbers in the text.

c. Decision point 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 an alphabetical character connect to another diagram on the following page.

e. Boxes bordered with a shaded pattern represent machines.

4. Operational Scenario Diagram. The operational scenario diagram and associated description depict a specific predefined situation and illustrate a particular subset of the generalized operational sequence or an unusual situation not covered by the operational sequence diagrams. Principal features of operational scenario diagrams include the following:

a. Users and specialists/controllers involved with providing the service are listed along the vertical axis.

b. The horizontal axis represents time. Sequential events or functions performed by an operator/user are indicated within separate boxes. The numbers on the right side of the blocks refer to numbers in the text.

1.5 Document Organization

The remainder of this document is organized as follows: Section 2 presents the main body of the document and is divided into six subsections.

Section 2.1 Support provides an overview description of the flight planning functions and introduces the personnel complement and facilities/systems which provide the required support. Services

provided by organizations outside of the NAS are also covered in this section.

Section 2.2 Information describes the information required or used in the flight planning process.

Section 2.3 Functions expand upon the functions performed at each position in appropriate flow diagrams and provides more detail about inputs, processes, outputs, and interfaces with the user. Related subsections of the NASSRS, Section 3.1, Flight Planning, are also referenced.

Presented in Section 2.4, Correlation of Operational Requirements, is a tabular summary correlating operational requirements, as stated in the NASSRS, with the description of functions provided in earlier sections.

Section 2.5 Operational Sequences presents typical operational sequences illustrating specific aspects of the flight planning process.

Section 2.6 Operational Scenarios illustrate special hypothetical events covering a variety of possible flight planning-related situations.

2.0 FLIGHT PLANNING OPERATIONS

2.1 Support

Safe and efficient use of the nation's airspace requires the provision of flight planning capabilities. Flight planning requires information such as expected route, altitude, and time of flight, as well as the anticipated flight conditions including weather, navigation systems, available routes, special use airspace, and flow control conditions.

Figure 2-1 graphically summarizes the NAS/user interfaces involved in the flight planning process. Figure 2-2 is a block diagram showing the interrelationship between equipment, facilities, operators/users, and the information used directly and indirectly to support flight planning. The specialist's functions associated with flight planning operations are briefly described in Section 2.1.1. Those same functions are presented in greater detail later in the document (Section 2.3).

2.1.1 NAS Facilities/Systems/Positions

A succinct description of the functions associated with each specialist position represented in the block diagram (Figure 2-2) is provided in the following paragraphs. Included with each description is a reference to the current procedures manual for the position and to those NAS Capital Investment Plan (CIP) projects that are most likely to affect how the specialist provides the described service.

Position 2: Automated Flight Service Station (AFSS) Preflight Briefing Specialist
Function: Provide preflight briefings to pilots, enter flight plans, assist with flight plan changes and cancel flight plans.
Description: The AFSS specialist delivers preflight briefings to pilots either over the phone or in person and enters flight plans and flight plan changes into the FSDPS data base.

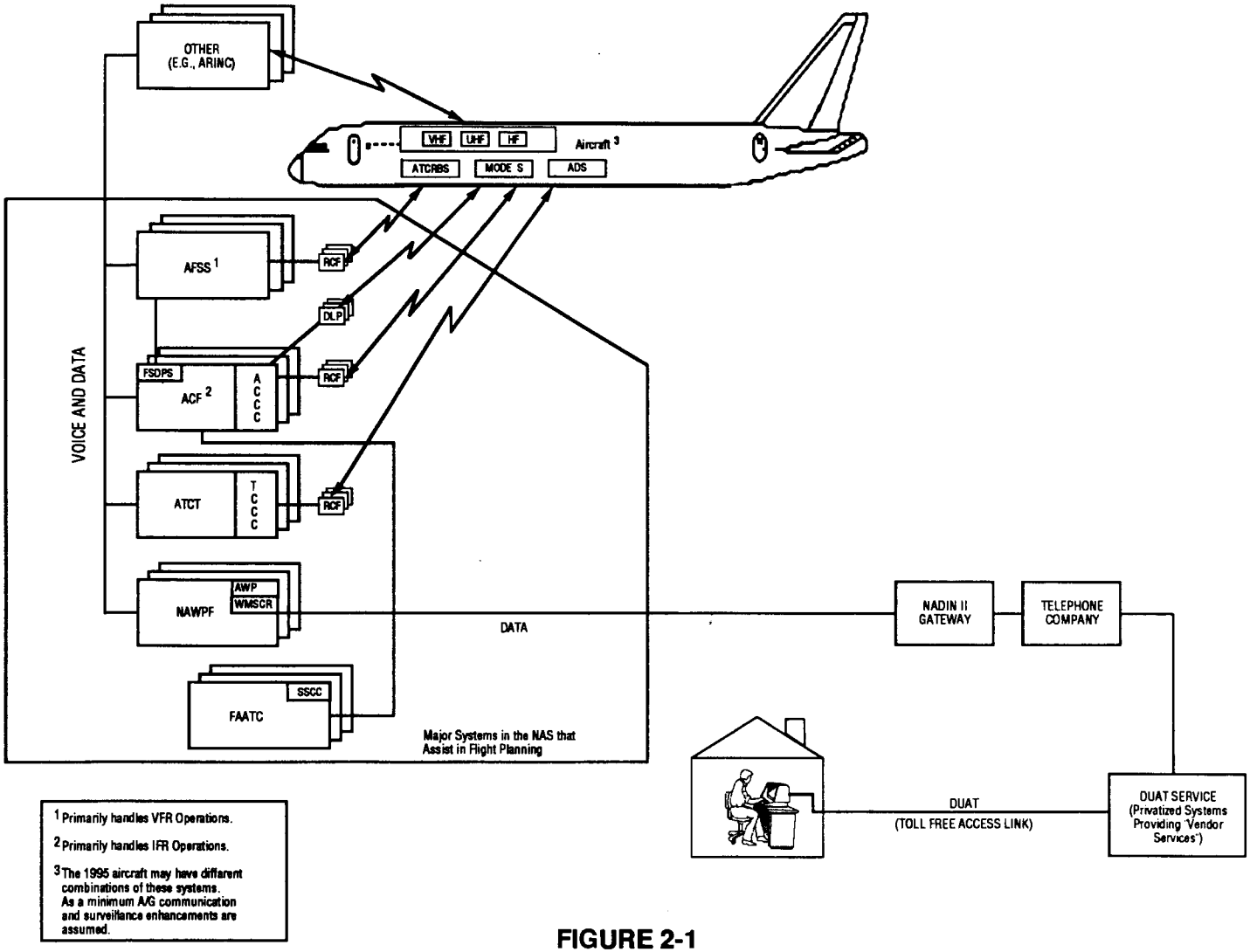
Procedures: FAA Handbook 7110.10J, Flight Services

Projects: Capital Investment Plan, Chapter 2, Section 3: Flight Service and Weather: Project 23-01, Flight Service Automation System (FSAS).

Position 3: AFSS In-Flight Briefing Specialist
Function: File, activate, and cancel and assist with flight plan changes. In-Flight Specialists also provide pilots with available meteorological and aeronautical information.
Description: The In-flight specialist provides in-flight assistance to the pilot by updating preflight briefings, accepting modifications to the flight plan, and closing flight plans.

Procedures: FAA Handbook 7110.10J, Flight Services

Projects: Capital Investment Plan, Chapter 2, Section 3: Flight Service and Weather: Project 23-01, Flight Service Automation System (FSAS).



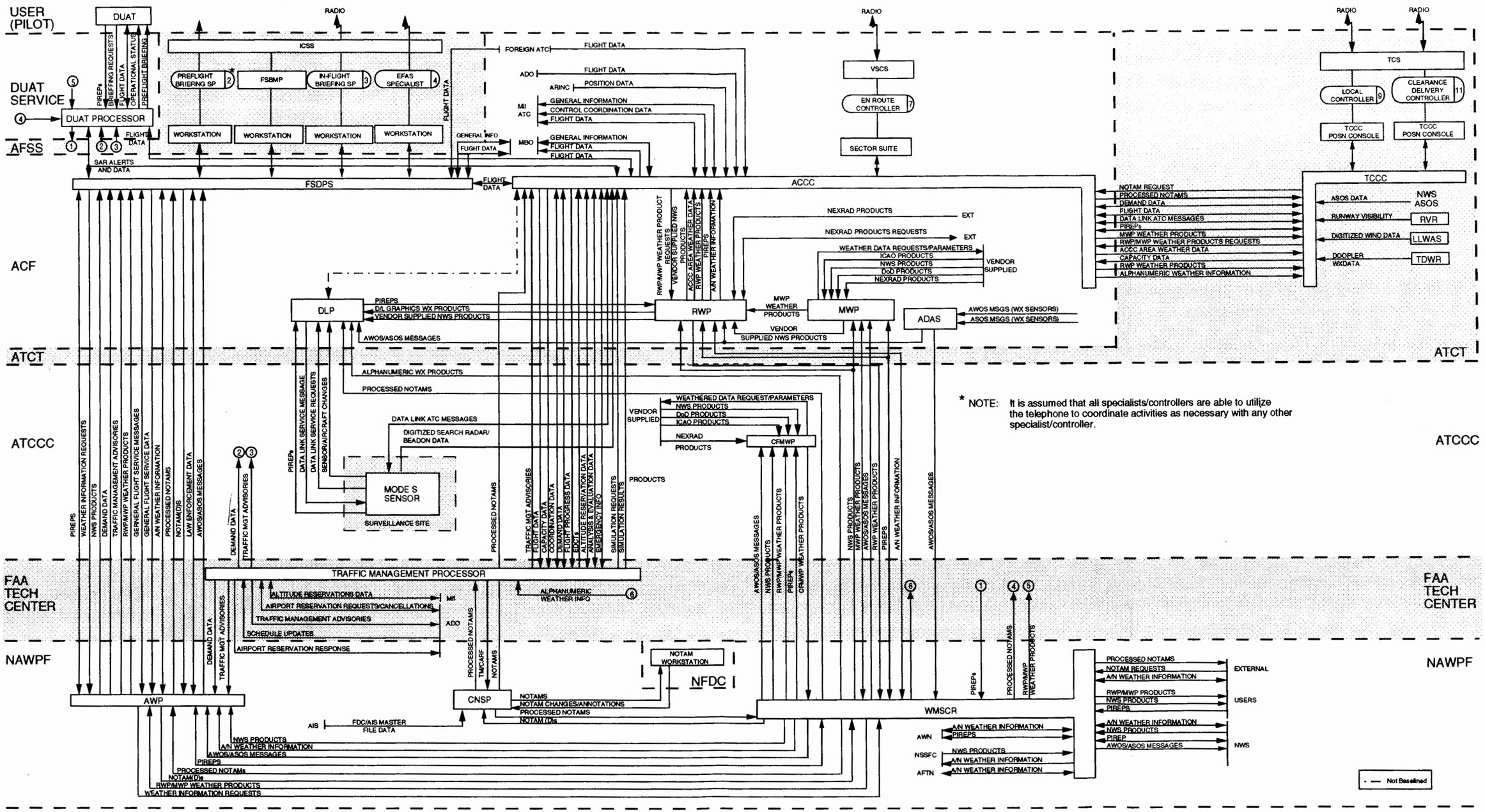
1 Primarily handles VFR Operations.

2 Primarily handles IFR Operations.

3 The 1995 aircraft may have different combinations of these systems. As a minimum A/G communication and surveillance enhancements are assumed.

FIGURE 2-1

OVERVIEW OF NAS/USER INTERFACES FOR FLIGHT PLANNING



* NOTE: It is assumed that all specialists/controllers are able to utilize the telephone to coordinate activities as necessary with any other specialist/controller.

FIGURE 2-2
FLIGHT PLANNING OPERATIONAL BLOCK DIAGRAM

Position 4: AFSS Specialist/En Route Flight Advisory Service (EFAS) Specialist
Function: Provide weather advisories to en route pilots upon request.
Description: The AFSS/EFAS specialist provides en route pilots with weather advisories, which focus primarily on real-time or near-time en route weather that could affect the aircraft's flight. The EFAS specialist also serves as the primary point of contact for the collection of Pilot Reports (PIREPs).

Procedures: FAA Handbook 7110.10J, Flight Services

Projects: Capital Investment Plan, Chapter 3, Section 3: Flight Service and Weather: Project 33-08, Hazardous In-Flight Weather Advisory Service (HIWAS) Expansion.

Position 7: Area Control Facility (ACF) En Route Controller
Function: Provide in-flight assistance mainly to pilots flying IFR to follow their flight plans.
Description: En route controllers provide pilots in-flight assistance in following (or changing) their flight plan. Controllers forward flight plan changes as required.

Procedures: FAA Handbook 7110.65G, Air Traffic Control
FAA Handbook 7110.83B, Oceanic Air Traffic Control

Projects: Capital Investment Plan, Chapter 2, Section 1: En Route Systems, Project 21-12, Advanced Automation System (AAS); Project 21-13, Automated En Route ATC (AERA); Project 21-15, Area Control Facilities (ACF).

Position 9: Air Traffic Control Tower (ATCT) Local Controller
Function: "Open" and "close" flight plans as well as relay activation and cancellation of VFR flight plans.
Description: Upon departure the controller activates the IFR flight plan. Upon determining that the aircraft has landed, the controller closes the flight plan (IFR).

Procedures: FAA Handbook 7110.65G, Air Traffic Control
FAA Handbook 7210.3J, Facility Operation and Administration.

Projects: Capital Investment Plan, Chapter 2, Section 2: Terminal Project 22-13: ATCT/Terminal Radar Approach Control Facility (TRACON) Establishment, Replacement and Modernization; Chapter 2, Section 1: En Route Systems, Project 21-12, Advanced Automation System (AAS); Project 21-15, Area Control Facilities (ACF).

Position 11: ATCT Clearance Delivery Controller
Function: Give pilot flight plan clearance prior to takeoff.
Description: Inform pilot of changes in intended route of flight by reading out the processed flight plan or indicating that the pilot is "cleared as filed" if the flight data is the same as the filed flight plan.

Procedures: FAA Handbook 7110.65G, Air Traffic Control
FAA Handbook 7210.3J, Facility Operation and Administration.

Projects: Capital Investment Plan, Chapter 2, Section 2: Terminal Project 22-13: ATCT/Terminal Radar Approach Control Facility (TRACON) Establishment, Replacement and

Modernization; Chapter 2, Section 1: En Route Systems, Project 21-12, Advanced Automation System (AAS); Project 21-15, Area Control Facilities (ACF).

2.2 Information

The information used or generated to support flight planning pertains to preflight briefings and the actual flight plan processing.

2.2.1 Preflight Briefings

Preflight briefings provided by the AFSS specialist or directly obtained by the pilot via Direct User Access Terminal (DUAT) are tailored to the pilot's needs. Pilots may also access the Telephone Information Briefing Service (TIBS) for prerecorded local or route briefings.

Information Requested from the User as an Input

The information required to provide the pilot with a preflight briefing pertains to the pilot's intended route of flight and the expected flight characteristics, as follows:

1. Type of flight planned
2. Aircraft number or pilot's name
3. Aircraft type
4. Departure airport
5. Route of flight
6. Destination
7. Flight altitude(s)
8. Estimated Departure Time (EDT) and Estimated Time En Route (ETE)

Once this information is received, the AFSS specialist is able to retrieve expected weather conditions along the route of flight as well as Notices to Airmen (NOTAMs) in effect in the area.

Information Generated

The information provided in a preflight briefing includes reports of adverse weather conditions (current and forecast) as well as weather and winds aloft. Other messages such as NOTAMs and flow control advisories are also provided. Depending upon the pilot's requirement, preflight briefings are presented in standard, outlook, or abbreviated formats.

Information Used in Support of Preflight Briefing Preparation

The NASSRS states multiple requirements for weather and aeronautical information as well as flow control and delay advisories in support of flight planning. The sources of information used to satisfy these requirements are also listed.

Weather

The Flight Service Data Processing System (FSDPS) provides a national-scale data base of weather products to support the AFSS specialist in performing his/her duties. This data base includes products generated by or received from the National Weather Service (NWS), introduced into the NAS via the Weather Message Switching Center Replacement (WMSCR) and transmitted to the FSDPS by the AWP. International weather products furnished by International Civil Aviation Organization (ICAO) are also available in the FSDPS data base.

Weather information can also be retrieved directly by the pilot via Mode S data link from the Data Link Processor (DLP), which maintains a data base of weather products received from the WMSCR.

Aeronautical Information (Strategic)

At the preflight briefing level, some aeronautical information is made available through NOTAMs. NOTAMs contain information concerning recent changes in facilities, equipment, services, and procedures used by pilots and FAA personnel. NOTAM (D) consists of information that requires wide distribution and pertains to en route navigational aids, civil public-use landing areas, and aeronautical data related to IFR operations. NOTAM (L) consists of local information including aircraft jettisoning fuel, bird activity, moored balloons, and military training activity. FDC NOTAMS are NOTAMS that contain regulatory flight information including, but not limited to, changes in charts, procedures, and airspace usage.

Flow Control And Delay Advisories

The Air Traffic Control Command Center (ATCCC) workstation provides direct access to appropriate data bases and programs resident in the processor at the Traffic Management Computer Complex (TMCC). The capability to utilize delay prediction programs, delay minimization programs, alternative flow simulation programs, and simulations of NAS operations is also provided.

Weather information which may affect flow management is transmitted to the pilot in-flight in the form of advisories. Upon departure and arrival, the pilot is able to receive the Automatic Terminal Information System (ATIS), a recording prepared by the tower controller and containing local weather and airport information. Before initiating a flight, the pilot is advised through the preflight briefing of conditions that may cause delays along the route or that may necessitate rerouting because advisories are in effect in some portions of the flight.

2.2.2 Flight Plan Submission and Evaluation

Section 3.1.4 of the NASSRS spells out the requirements associated with flight plan submission and evaluation. Unlike previous sections of the NASSRS (3.1.1, 3.1.2, and 3.1.3), which are dedicated to requirements for information, Section 3.1.4 emphasizes requirements for systems functions related to the handling of flight plans throughout the NAS. Consequently, references to those requirements will be made when specialists functions are discussed in Section 2.3 of this document. The information flow associated with flight plan filing can be categorized in terms of the information requested from the user as an input; the information generated; and the information used in support of flight plan evaluation as the output.

This information flow is discussed in the following subsections.

Information Requested from the User as an Input:

Whether the flight plan is filed or amended at the AFSS, the ACCC, via DUAT or data link, the following information is requested from the pilot:

1. Aircraft Identification
2. Type of Flight
3. Number and Type of Aircraft
4. True Airspeed or MACH Number
5. Departure Point
6. Departure Time

7. Requested Altitude
8. Route of Flight
9. Destination
10. Time En Route
11. Remarks
12. Fuel on board
13. Alternate Destination
14. Addresses/Closure Points
15. Number of Persons on Board
16. Color of Aircraft

Information Generated

The information obtained through IFR flight plan filing is either recorded by the FSDPS or the DUAT service (if the flight plan was filed through a DUAT), and then transmitted to the appropriate Area Control Computer Complex (ACCC) where the information is further processed to produce electronic "flight strips" at the ACF and the departure ATCT.

Information Used in Support of Flight Plan Evaluation

The information used in support of flight plan evaluation includes the computer-preferred routes, inputs from the Traffic Management Unit at the local level and Traffic Management Processor at the national level and any hazardous weather alert received directly from the sensors which mandate immediate rerouting of air traffic. Other data used in support of flight planning include "canned" flight plans stored at ACCCs and automatically activated prior to departure.

2.3 Functions

Presented in this section is a description of the specialist's functions directly related to flight planning. Those functions and associated specialist's positions were briefly introduced in Section 2.1.1. The operational flow diagrams included in each of the following subsections illustrate the information flow between the specialist and the user, between the specialist and other specialists, and between the specialist and data processing equipment.

Related functions are discussed in each subsection and are shown in the central block of each flow diagram. The same positions may be discussed in other operational concepts. The focus here is on functions specifically related to flight planning. Relevant NASSRS requirements are referenced. A table summarizing those requirements and their correlation with actual functions within the NAS is presented in Section 2.4.

2.3.1 AFSS Preflight Briefing Specialist (Position 2)

The preflight briefing specialist (Position 2 in the Block Diagram presented in Figure 2-2) provides information to the pilot and accepts flight plans or amendments to existing flight plans prior to departure. The functions outlined in Figure 2-3 are described in the following paragraphs.

a. FSDPS Processing. The FSDPS provides the processing capability and support to enable the Preflight Specialist to retrieve preflight weather briefings as well as file and amend flight plans (both Instrument Flight Rule (IFR) and Visual Flight Rule (VFR)).

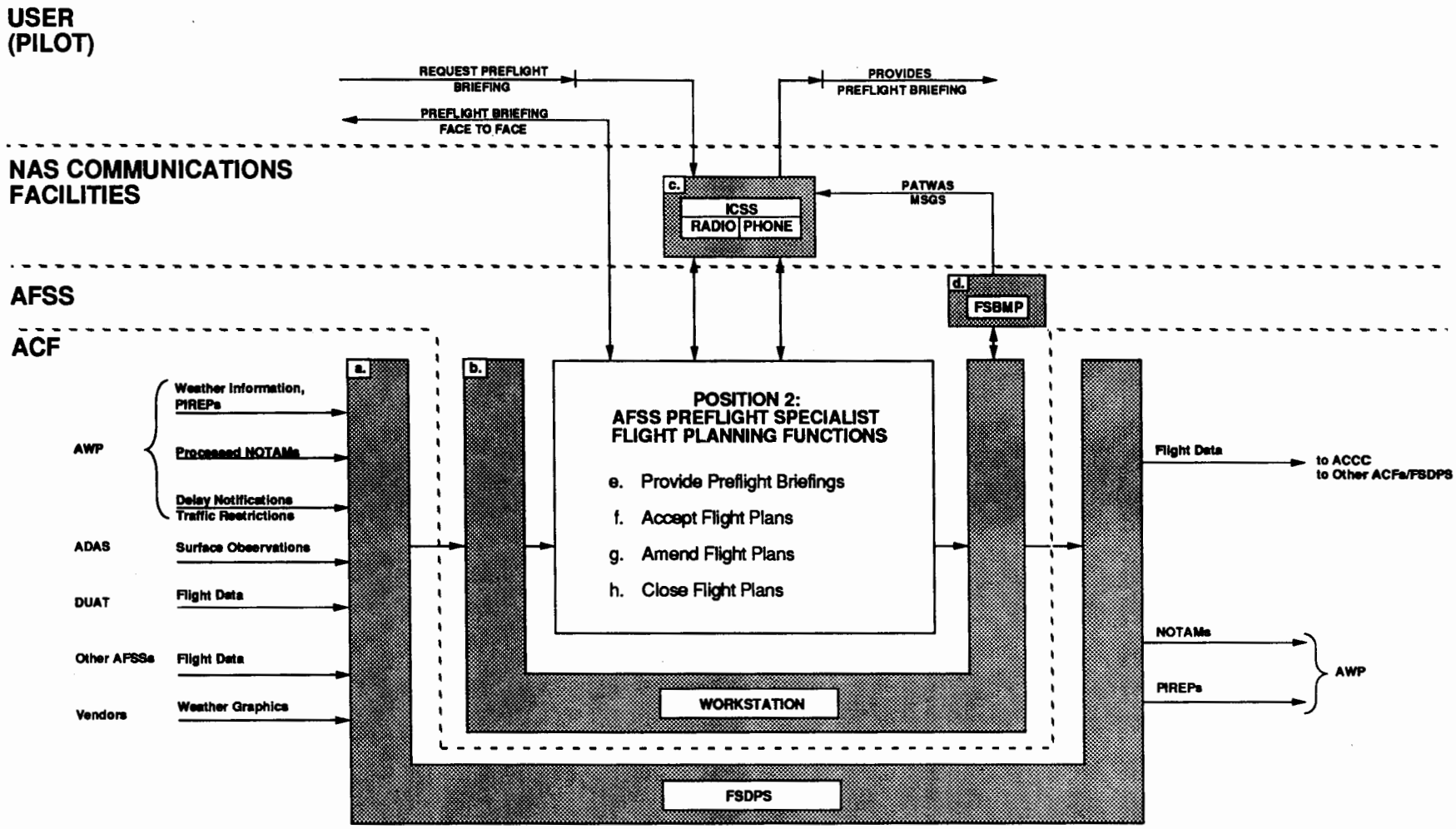


FIGURE 2-3
AFSS PREFLIGHT SPECIALIST (POSITION 2)
OPERATIONAL FLOW DIAGRAM

The FSDPS also provides the AFSS specialist access to the flight service weather and NOTAM data bases maintained by the AWP and stored locally at each FSDPS site.

NASSRS requirements: 3.1.1.A-G,I; 3.1.2.A-D; 3.1.4.A,B,D-G.

b. AFSS Work Station. The AFSS work station provides the computer-human interface between the AFSS specialist and the centralized flight service data base maintained in the FSDPS. The work station also supports the automated repetitive broadcast of weather information over VHF Omnidirectional Ranges (VORs) and the generation of Pilots Automatic Telephone Weather Answering Service (PATWAS) preflight briefing messages by the FSDPS.

NASSRS requirements: 3.1.1.A,C,D,F,G,I; 3.1.2.A,B,D; 3.1.4.A-G,I

c. Integrated Communications Switching System (ICSS). The ICSS provides AFSS specialists with voice communications within the AFSS and between the AFSS and other facilities. Telephone voice communications between AFSS specialists and pilots (preflight) or Fixed Base Operators (FBO) and military users is supported by the ICSS. The ICSS has the capability to record PATWAS preflight briefing messages received from specialists or from the Flight Service Broadcast Message Processor (FSBMP), and will play back the message upon request.

NASSRS requirements: 3.1.1.E; 3.1.2.E,F; 3.1.4.G,H

d. Flight Service Broadcast Message Processor (FSBMP). The FSBMP receives automatic alert messages from the FSDPS for specific weather message types. These message alerts are received via the AFSS work station. The FSBMP will also request regularly scheduled weather messages based on adaptation (e.g. surface weather observations). The FSBMP generates updated PATWAS preflight briefing messages and outputs these to the ICSS, where they will be stored for playback to pilots upon request.

NASSRS requirements: 3.1.1.A,B,E,G,H,I;

e. Provide Preflight Briefings. The AFSS preflight specialist, using his/her workstation and input from the pilot, retrieves a preflight briefing from the FSDPS data base tailored to the pilot's needs, i.e., the chosen route of flight, and provides it to the pilot either in person or over the phone. After the pilot has provided the requested input information, the specialist retrieves a preflight briefing in the desired format (abbreviated or standard).

NASSRS requirements: 3.1.1.A,B,G; 3.1.2.D; 3.1.4.F

In addition to the FSDPS data base, the specialist uses graphical weather products provided by private vendors to advise the pilot of any additional weather development that may affect the route of flight.

NASSRS requirements: 3.1.1.C,F,G,I

f. Accept Flight Plans. The specialist receives the necessary information from the pilot and inputs the data into the proper flight plan format (domestic or international), also specifying whether the flight plan is VFR, IFR or both.

NASSRS requirements: 3.1.4.A; 3.1.4.D.

g. Amend Flight Plans. If the pilot decides to amend the flight plan prior to departure, then the preflight briefing specialist handles the request. If the flight plan (IFR) is still in the FSDPS data base, the specialist retrieves it and amends it. However, if the flight plan has already been forwarded to the appropriate ACCCs and TCCC, then the specialist enters enough information to amend the previously processed flight plan and forwards the amendment to the appropriate facility.

NASSRS requirements: 3.1.4.A,E

h. Close Flight Plans. Upon arrival, the pilot informs the preflight specialist that the flight has been completed. This is done by either visiting the AFSS or by calling the facility by telephone. It should be noted that AFSS specialists other than the preflight briefing specialist may receive notification that a flight has been completed. If the AFSS receiving the information is not the destination AFSS, then the flight plan closure notification is forwarded to the proper destination AFSS. The flight closing notification is entered into the computer to inhibit the search and rescue flag which would automatically be issued on the screen, had an aircraft become overdue.

NASSRS requirements: 3.1.4.J.

2.3.2 AFSS In-flight Briefing Specialist (Position 3)

The In-flight Briefing Specialist provides weather briefings to pilots and amends active flight plans and accepts new flight plans from aircraft in-flight, as represented in Figure 2-4. The In-flight Specialist may also be called upon to close a VFR flight plan.

a. FSDPS Processing. The FSDPS provides the processing capability to enable the In-flight Specialist to file and amend flight plans (both IFR and VFR). The FSDPS forwards flight plans to the affected ACCC (IFR) and other FSDPSs (VFR) as required. The FSDPS also provides the AFSS specialist access to weather and NOTAM data bases maintained by the AWP and stored locally at each FSDPS site.

NASSRS requirements: 3.1.1.A-G,I; 3.1.2.A-D,E; 3.1.4.A,B,D-G.

b. AFSS Work Station. The AFSS work station provides the computer-human interface between the AFSS specialist and the centralized flight service data base maintained in the FSDPS. The work station also supports the automated repetitive broadcast of weather information over VORs and the generation of PATWAS preflight briefing messages by the FSDPS.

NASSRS requirements: 3.1.1.A,C-G,I; 3.1.2.B; 3.1.4.A-G,I

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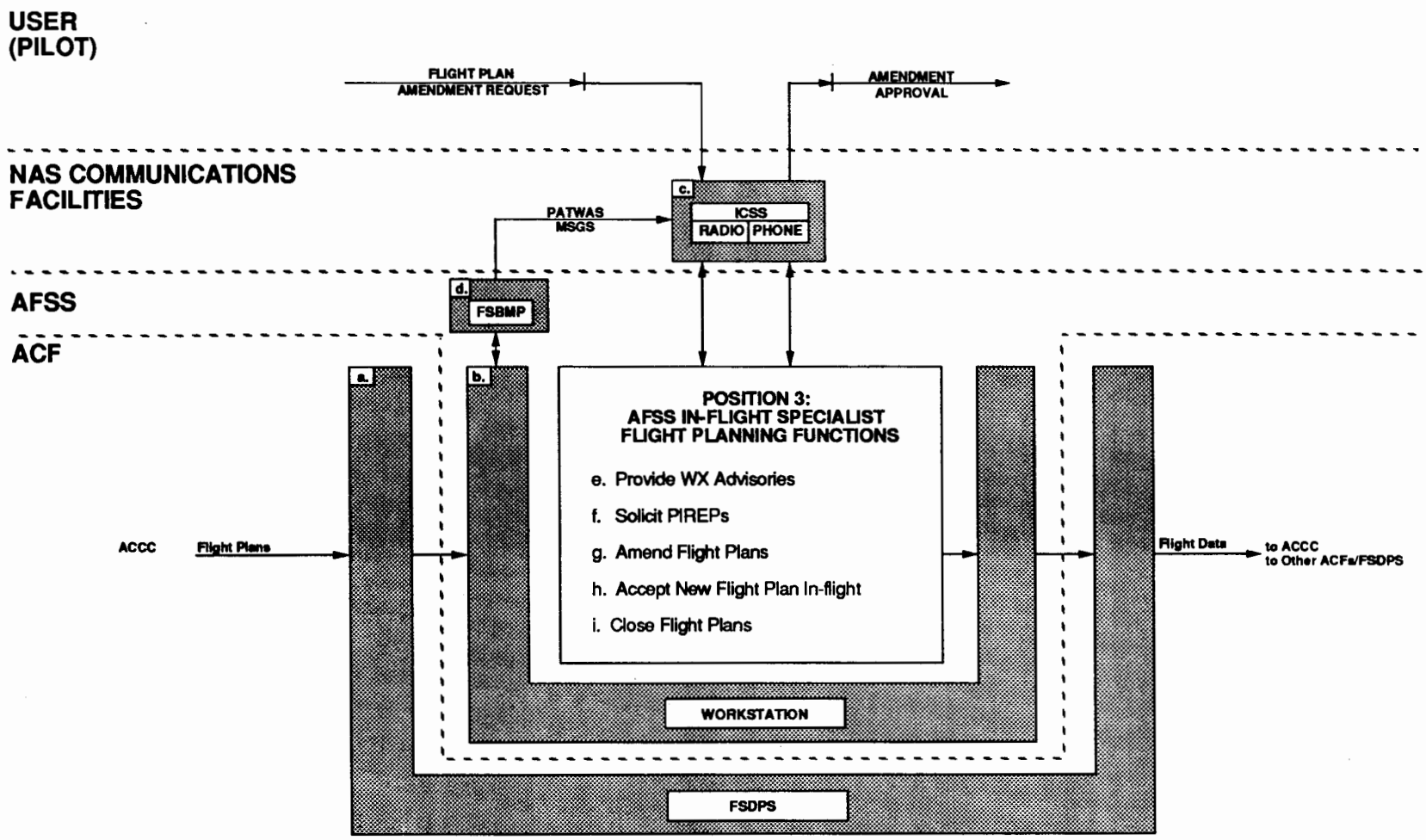

FIGURE 2-4
AFSS IN-FLIGHT SPECIALIST (POSITION 3)
OPERATIONAL FLOW DIAGRAM

c. Integrated Communications Switching System. The ICSS provides AFSS specialists with voice communications within the AFSS and between the AFSS and other facilities. Telephone voice communications between AFSS specialists and pilots (preflight) or Fixed Base Operator (FBO) and military users is supported by the ICSS. The ICSS has the capability to record PATWAS preflight briefing messages received from specialists or from the FSBMP, and will play back the message upon request.

NASSRS requirements: 3.1.1.A,H; 3.1.2.E,F; 3.1.4.G,H

d. Flight Service Broadcast Message Processor. The FSBMP receives automatic alert messages from the FSDPS for specific weather message types. These message alerts are received via the AFSS work station. The FSBMP will also request regularly scheduled weather messages based on adaptation (e.g. surface weather observations). The FSBMP generates updated PATWAS preflight briefing messages and outputs these to the ICSS, where they will be stored for playback to pilots upon request.

NASSRS requirements: 3.1.1.B,E,G,I;

e. Provides Weather Advisories. The In-flight Specialist also provides weather advisories including pertinent information contained in PIREPs to pilots that request this information.

NASSRS requirements: 3.1.1.A,B,G

f. Solicit PIREPs. In-flight Specialists collect PIREP information from pilots concerning atmospheric conditions.

NASSRS requirements: 3.1.1.A

g. Amend Flight Plans. The In-flight Specialist handles requests for flight plan amendments received by radio from the pilot in flight. The specialist enters these requests at the workstation for inclusion in the FSDPS.

NASSRS requirements: 3.1.4.E

h. Accept New Flight Plan In-flight. The In-flight Specialist takes the flight plan information from the pilot and directs the pilot to request a clearance from the appropriate en route ACF. The In-Flight Specialist may also obtain an IFR clearance from the ACF controller and deliver it to the requesting pilot

NASSRS requirements: 3.1.4.A

i. Close Flight Plans. The In-flight Briefing Specialist may close a flight plan, workload permitting.

NASSRS requirements: 3.1.4.J.

2.3.3 AFSS EFAS Specialist (Position 4)

The AFSS EFAS specialist supports flight planning by providing timely and pertinent weather advisories for the VFR pilot's route of flight. Figure 2-5 is an operational flow diagram describing the functions and services provided by the EFAS specialist at the AFSS.

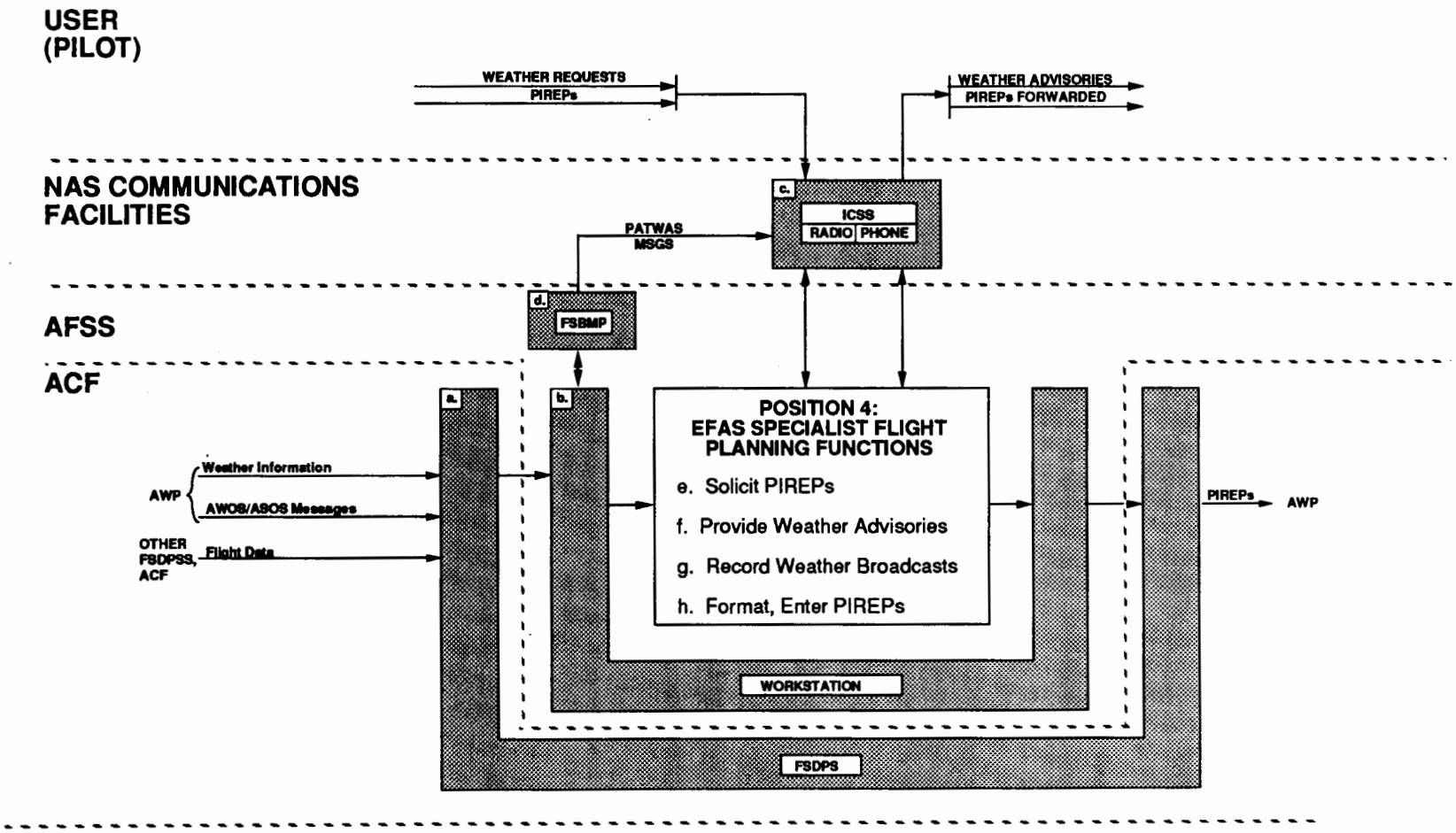

FIGURE 2-5
AFSS/EFAS SPECIALIST FUNCTIONS (POSITION 4)
OPERATIONAL FLOW DIAGRAM

a. FSDPS Processing. The FSDPS provides the processing capability and support to enable the AFSS specialist to retrieve preflight weather briefings. It supports automatic notification of critical weather events to specialists.

NASSRS requirements: 3.1.1.A-G,I; 3.1.2.A-D

b. AFSS Work Station. The AFSS work station provides the computer-human interface between the EFAS specialist and the centralized flight service data base maintained in the FSDPS.

NASSRS requirements: 3.1.1.A,C; 3.1.2.B

c. Integrated Communications Switching System. The ICSS provides EFAS specialists with radio communications between the AFSS and pilots. The ICSS has the capability to record PATWAS preflight briefing messages received from specialists or from the FSBMP, and will play back the message upon request.

NASSRS requirements: 3.1.1.H; 3.1.2.E

d. Flight Service Broadcast Message Processor. The FSBMP receives automatic alert messages from the FSDPS for specific weather message types. These message alerts are received via the AFSS work station. The FSBMP will also request regularly scheduled weather messages based on adaptation (e.g. surface weather observations). The FSBMP generates updated PATWAS preflight briefing messages and outputs these to the ICSS, where they will be stored for playback to pilots upon request.

NASSRS requirements: 3.1.1.A,B,E,G,H,I;

e. Solicits PIREPs. EFAS specialists collect PIREPs. Pilots are solicited for weather reports concerning upper winds, temperatures, wind shear, turbulence, precipitation, icing, and other weather phenomena encountered. The EFAS specialist notifies the participating aircraft that may be affected, other AFSS specialists, the ACF meteorologist, and the National weather Service (NWS).

NASSRS requirements: 3.1.1.A.

f. Provides Weather Advisories. Upon request, the EFAS specialist provides weather advisories including pertinent information contained in PIREPs and recommends appropriate actions to assist the pilot in avoiding hazardous weather. If the pilot has already encountered hazardous weather, the EFAS specialist provides assistance in getting out of the hazardous weather area.

NASSRS requirements: 3.1.1.A,B,G

g. Records Weather Broadcasts. In some AFSSs, in addition to his/her basic responsibilities, the EFAS specialist may also prepare telephone and VOR broadcasts to advise pilots of weather conditions likely to be encountered.

NASSRS requirements: 3.1.1.E.

h. Formats, Enters PIREPs. The EFAS specialist receiving a PIREP ensures its completeness, ascertains that it is not a duplicate of information already received and forwarded, and formats and enters the PIREP into the FSDPS for transfer to the AWP.

NASSRS requirements: 3.1.1.A.

2.3.4 ACF En Route Controller (Position 7)

The en route controller, working in the ACF, assists pilots in following their flight plans. Figure 2-6 is an operational flow diagram describing the flight planning functions performed by the En Route Controller. Functions performed by the equipment and specialist are lettered within each block and are described in the corresponding paragraphs below.

a. ACCC Processing. The ACCC receives flight plans from the following sources:

- The FSDPS
- Airline Dispatch Offices
- Military Sources
- TCCC (Updates/Requests)

The ACCC supports the flight planning functions of the en route controller by accepting, storing, and processing VFR and IFR flight plans and provides the capability to transfer flight plan data, including VFR data from the system data base to any facility. VFR and IFR flight plans are automatically removed from the data base when completed or obsolete. Recurring flight plans are stored in the ACCC data base and automatically activated about half an hour before departure. Airline dispatch offices enter data directly into the ACCC data base. Military flight plans can also be logged directly into the ACCC data base.

NASSRS requirements: 3.1.1.A; 3.1.2.A,B,C; 3.1.3.A,B;

The ACCC has processing capabilities to evaluate proposed IFR flight plans, match them with preferred routes, and produce flight data entries indicating the flight plan as filed (in black print) and the computer proposed flight plan (in red). These flight strips are no longer output on a printer; instead, they appear on the en route controller screen for evaluation.

NASSRS requirements: 3.1.4.A-F,G

b. Voice Switching and Control System. The Voice Switching and Control System (VSCS) allows ACF specialists to coordinate flight plan, weather and aeronautical information with pilots and other specialists using both radios and phones.

NASSRS requirements: 3.1.2.E,F; 3.1.4.H

c. Validate/Modify Flight Plans. Flight data appears on the en route controller's console as current flight strips. Those flight strips may be of variable length to furnish sufficient completeness of message content. The controller evaluates the proposed versus computer-preferred route and decides whether to use that route as default or coordinate a different route.

NASSRS requirements: 3.1.4.A,C,D

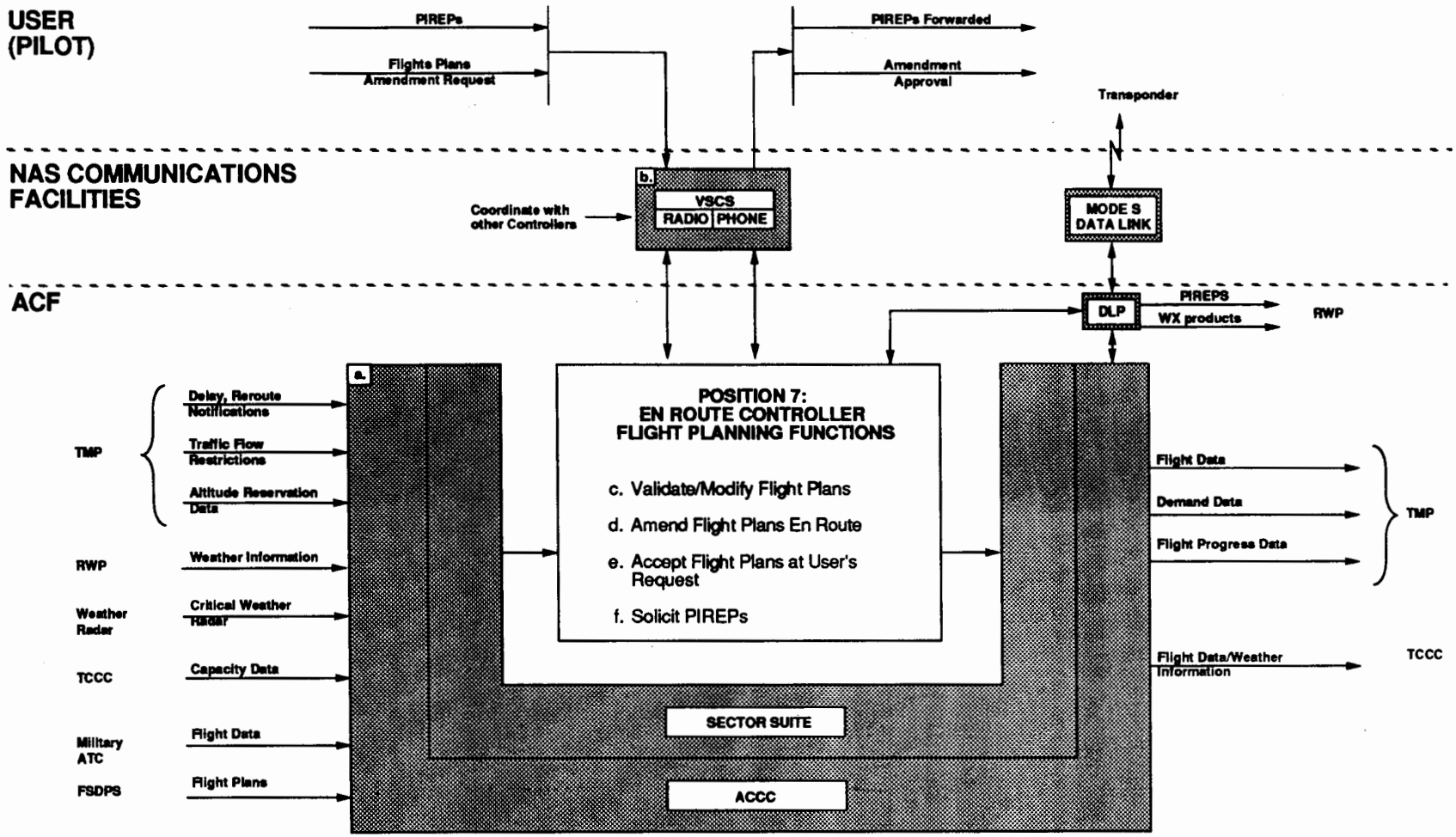

FIGURE 2-6
EN ROUTE CONTROLLER FUNCTIONS (POSITION 7)
OPERATIONAL FLOW DIAGRAM

d. Amend Flight Plans En Route. If the pilot decides to modify a flight plan while en route, a request is first made to the en route controller. On a workload permiting basis, the En route Controller will record the amendments at the en route workstation. Otherwise, the controller may suggest that the pilot change frequency and contact the AFSS in-flight specialist.

NASSRS requirements: 3.1.4.E,J

e. Accept Flight Plans at User's Request. On rare occasions, the controller will accept a flight plan from an aircraft in-flight. This is done only if time allows and the flight plan is relatively simple. In order not to "block" the frequency for too long, the controller takes the minimum amount of information from the pilot and enters it into the computer. Other data used for search and rescue purposes is verbalized by the pilot and recorded but not written down by the controller.

NASSRS requirements: 3.1.4.A,C

f. Solicit PIREPs. When unusual weather conditions exist and real time data in a particular area is desired, the controller solicits PIREPs from pilots. These PIREPs are then entered into the system for further distribution to other users.

NASSRS requirements: 3.1.1.A

2.3.5 ATCT Local Controller (Position 9)

The local controller's functions related to flight planning are represented graphically on Figure 2-7.

a. TCCC Processing. In a stand-alone processing mode (when communications with the parent ACCC become unavailable), the TCCC accepts manually entered flight plans. Otherwise, the TCCC receives IFR/VFR flight plan data from the ACCC, plus the results of the data processing performed by the ACCC.

NASSRS requirements: 3.1.1.G; 3.1.4.A,D,F

b. Tower Communication System (TCS). The TCS provides tower controllers with air-ground communications capability to request PIREPS from pilots and to relay flight plan modifications.

NASSRS requirements: 3.1.1.A; 3.1.2.E,F; 3.1.4.G,H

c. Activate Flight Plan. The controller activates the IFR flight plan after the pilot has received the takeoff clearance and departs.

NASSRS requirements: 3.1.4.D

d. Close Flight Plan. The controller closes the IFR flight plan when the pilot lands and terminates the flight.

NASSRS requirements: 3.1.4.J.

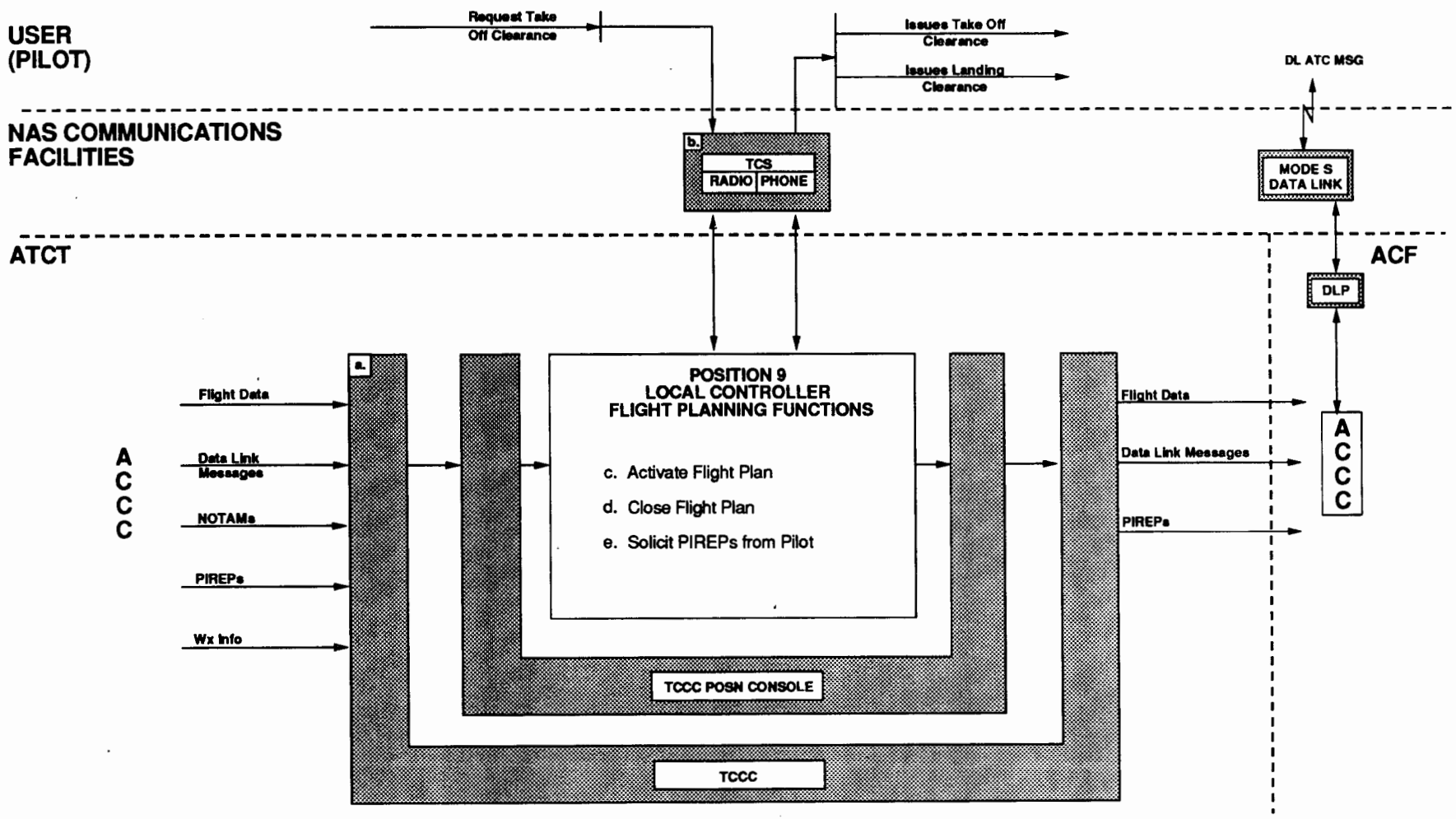

FIGURE 2-7
LOCAL CONTROLLER FUNCTIONS (POSTITION 9)
OPERATIONAL FLOW DIAGRAM

e. Solicit PIREPs From Pilot. The controller may solicit information from the pilot regarding braking condition on the runway or any unusual condition experienced on arrival which could assist other pilots in planning their own flights.

NASSRS requirements: 3.1.1.A

2.3.6 ATCT Clearance Delivery Controller (Position 11)

A graphical summary of the clearance delivery controller's functions related to flight planning is provided in Figure 2-8.

a. TCCC Processing. In a stand-alone processing mode (when communications with the parent ACCC become unavailable), the TCCC accepts manually entered flight plans. Otherwise, the TCCC receives IFR/VFR flight plan data from the ACCC, plus the results of the data processing performed by the ACCC.

NASSRS requirements: 3.1.4.A,D

b. Tower Communication System (TCS). The TCS provides ground-ground voice communications interconnectivity between controllers within an ATCT and between ATCT controllers and other facilities to coordinate aeronautical and flight plan information. The TCS also allows Traffic Management Specialists to coordinate flow control restrictions with specific ATCTs.

NASSRS requirements: 3.1.2.E; 3.1.3.C; 3.1.4.F,H

c. Give Clearance to Pilot. The function of the clearance delivery controller is to inform the pilot of the actual flight plan. If it is exactly matching the flight plan initially filed, the controller may limit the message to "cleared as filed". If the computer-preferred route differs from the originally filed flight plan, the controller reads the corrected flight plan to the pilot.

NASSRS requirements: 3.1.4.D,G

d. Enter or Amend Flight Plans. On occasion, the clearance delivery controller will enter a flight plan at the tower.

NASSRS requirements: 3.1.4.E,G

2.4 Correlation With Operational Requirements

Table 2-1 summarizes the correlation of the flight planning operational requirements paragraphs of NAS-SR-1000 with the paragraphs describing the functions being performed by specialists/controllers. All flight planning paragraph numbers of NAS-SR-1000 are listed; paragraphs which are introductory in nature, do not state an explicit operational requirement, or which reference other portions of NAS-SR-1000 are indicated with a dash. The fact that a correlation is shown between a requirements paragraph and a paragraph describing the specialist/controller functions performed should not be construed as indicating that the requirement is completely fulfilled.

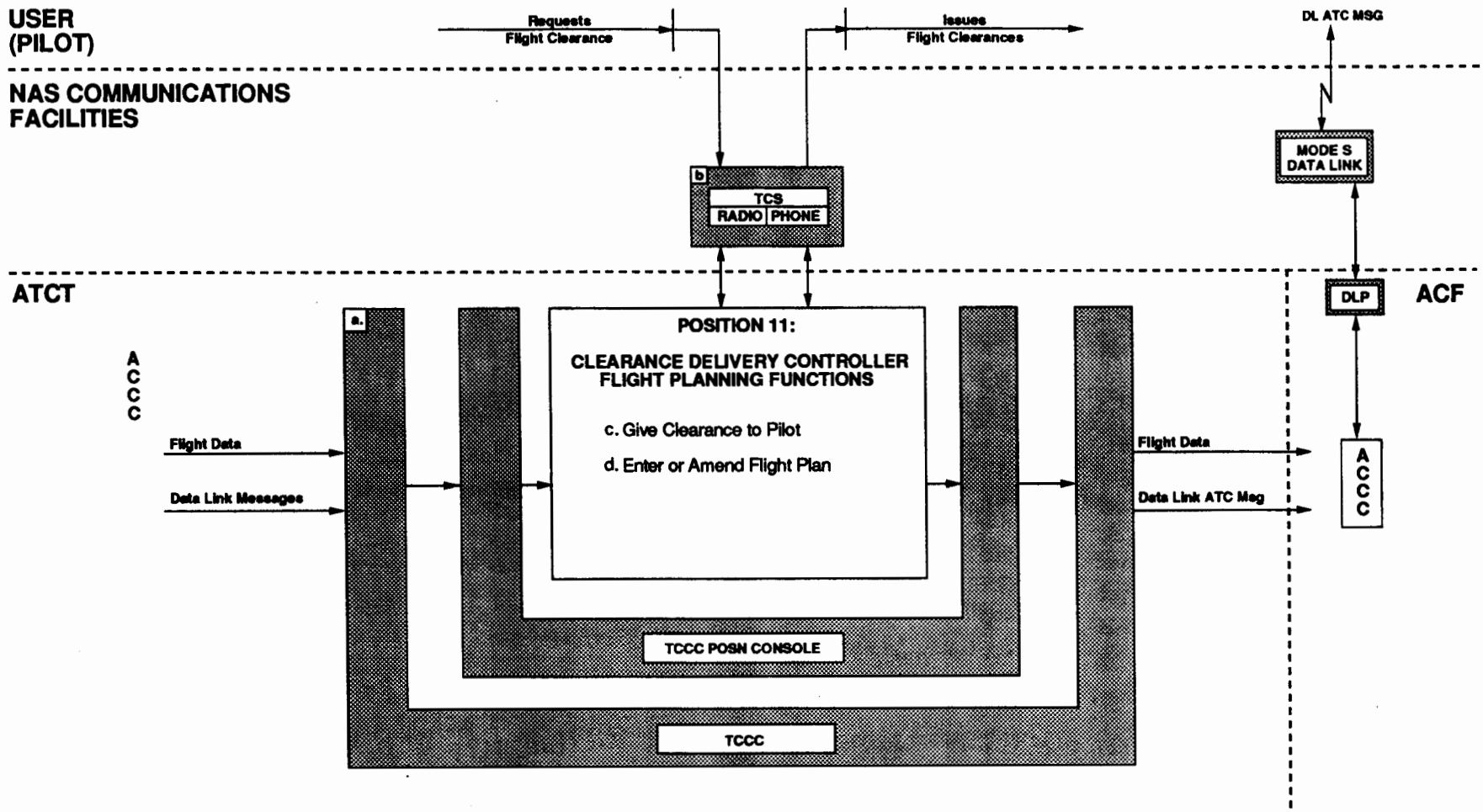

FIGURE 2-8
CLEARANCE DELIVERY CONTROLLER (POSITION 11)
OPERATIONAL FLOW DIAGRAM

TABLE 2-1
FLIGHT PLANNING OPERATIONAL REQUIREMENTS CORRELATION

Position / NAS-SR-1000 Paragraph	AFSS Preflight Specialist								AFSS Inflight Specialist								AFSS EFAS Specialist								En Route Controller								Local Controller						Clearance Delivery Controller			
Paragraph	2.3.1.a	2.3.1.b	2.3.1.c	2.3.1.d	2.3.1.e	2.3.1.f	2.3.1.g	2.3.1.h	2.3.2.a	2.3.2.b	2.3.2.c	2.3.2.d	2.3.2.e	2.3.2.f	2.3.2.g	2.3.2.h	2.3.3.a	2.3.3.b	2.3.3.c	2.3.3.d	2.3.3.e	2.3.3.f	2.3.3.g	2.3.3.h	2.3.4.a	2.3.4.b	2.3.4.c	2.3.4.d	2.3.4.e	2.3.4.f	2.3.4.g	2.3.5.a	2.3.5.b	2.3.5.c	2.3.5.d	2.3.5.e	2.3.6.a	2.3.6.b	2.3.6.c	2.3.6.d
3.1.1 Weather Information																																										
.A.1 Acquisition	X	X		X	X				X	X		X					X	X		X		X																			
.A.2 Surface Observations	X	X		X	X				X	X		X					X	X		X		X																			
.A.3 Weather Aloft	X	X		X	X				X	X		X					X	X		X		X																			
.A.4 PIREPs	X	X		X	X				X	X		X	X				X	X		X	X	X		X	X					X			X			X					
.A.5 Trend	X	X		X	X				X	X		X					X	X		X		X	X																		
.A.6 Forecast	X	X		X	X				X	X		X					X	X		X		X																			
.B Hazardous Weather	X			X	X				X	X	X	X					X	X		X		X																			
.C.1 Graphic Information (Specialist)	X	X			X				X	X							X	X																							
.C.2 Real Time Pictorial (Specialist)	X	X			X				X	X							X	X																							
.C.3 Real Time Pictorial (Users)	X																																								
.D.1 Readability of Display	X	X							X	X							X	X																							
.D.2 Consistent Format	X	X							X	X							X	X																							
.D.3 Horizontal/Vertical Depiction	X	X							X	X							X	X																							
.E.1 User Access																																									
.E.2 Commercial Interfaces for User Access to Weather Information			X						X	X							X																								
.E.3 Interactive Weather Retrieval Capability	X			X					X	X		X								X																					
.F.1 Route Oriented Retrievals	X	X															X																								
.F.2 Area Related Weather Information	X	X							X	X							X																								
.F.3 Specific Weather Information	X	X							X	X							X																								
.F.4 Tailored Information	X	X			X				X	X							X																								
.G.1 Alert User of Hazardous Information	X	X			X				X	X		X	X				X	X		X		X																			
.G.2 Mean Response Time to Specialist		X							X	X							X	X		X		X																			
.G.3 Real Time/Update Rate		X		X					X	X							X	X		X		X																			
.G.4 Terminal Area Hazardous Weather Detection		X							X			X						X																							
.G.5 Audible Alarm		X							X			X																				X									
.H Communications Requirements*	-	-	X	X	-	-	-	-	-	-	X	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
.I Availability of Weather Information (round the clock)	X	X		X	X				X	X		X					X			X																					
3.1.2 Aeronautical Information																																									
.A.1 Aeronautical Information Acquisition	X	X							X	X							X	X							X																
.A.2 Accept and Verify	X	X															X								X																
.A.3 Preferred Route, Special Route Airspace	X	X																																							
.B.1 Aeronautical Information Continuously Available to Specialist	X	X							X	X							X								X																
.C.1 Aeronautical Information Continuously Available to Users	X																X								X																
.D.1 Aeronautical Information Available Along Specific Route, or by Locations	X	X			X				X	X							X																								
.E Communications	-	-	X	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	X	-	-	-	-	-	-	X	-	-	-	-	-	-	X	-	-	-	-	X	-	-	-
.F Response Time	-	-	X	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-

TABLE 2-1
FLIGHT PLANNING OPERATIONAL REQUIREMENTS CORRELATION
(CONCLUDED)

NAS-SR-1000 Paragraph \ Position	AFSS Preflight Specialist								AFSS Inflight Specialist								AFSS EFAS Specialist								En Route Controller								Local Controller				Clearance Delivery Controller			
	2311a	2311b	2311c	2311d	2311e	2311f	2311g	2311h	2322a	2322b	2322c	2322d	2322e	2322f	2322g	2322h	2323a	2323b	2323c	2323d	2323e	2323f	2323g	2323h	2344a	2344b	2344c	2344d	2344e	2344f	2344g	2344h	2354a	2354b	2354c	2354d	2364a	2364b	2364c	2364d
3.1.3 Flow Control and Delay Advisories																																								
.A.1 Flight Information to ATCCC Specialist																									X															
.A.2 Flight Information to Local Traffic Management Coordinators																									X															
.A.3 Flight Information, Current and Forecast to Users																									X															
.B.1 Current and Forecast Weather (for flow control)																									X															
.B.2 Weather Forecast up to 24 hours in Advance																									X															
.B.3 National Scale Weather Information and International FTs																									X															
.B.4 Traffic Management Coordinators to Receive Unscheduled Forecasts																									X															
.C Processing and Communication Capacity																																						X		
3.1.4 Flight Plan Submission and Evaluation																																								
.A Flight Plan and Amendments Processing	X	X							X	X					X																		X				X			
.A.1 User Direct Entry/Specialist Entry	X	X			X	X			X	X					X										X		X		X				X				X			
.A.2 Domestic/International	X	X			X	X			X	X					X										X		X						X				X			
.A.3 IFR/VFR Flight Plans	X	X			X	X			X	X					X										X		X		X				X				X			
.A.4 Multiple Flight Plans and Stopovers	X	X			X	X			X	X					X										X		X						X				X			
.A.5 Accept Flight Plans 24 hours in Advance	X	X			X	X			X	X					X										X		X						X				X			
.A.6 Accept and Sotre Recurring Flight Plans	X	X			X	X			X	X					X										X		X						X				X			
.B Direct User Access to Flight Plan Information																																								
.B.1 Direct User Input	X																								X															
.B.2 Direct/Easy Filing	X										X																													
.C Preferred Routes		X							X	X																X														
.C.1 Computer/User Preferred Routes		X																							X	X			X											
.C.2 User Preferred Routes																										X														
.C.3 Ability to Duplicate Repetitive Information																									X	X														
.D Interactive Validation of Flight Plans	X	X			X				X	X																X						X		X			X			
.D.1 Format and Logic Check	X	X			X				X	X																X						X		X			X			
.D.2 Error Notification	X	X			X				X	X																X						X		X			X			
.D.3 Accept/Rejection Notification	X	X			X				X	X																X						X		X			X			
.E Capability to Amend Active Flight Plan	X	X				X			X	X					X																									X
.E.1 Amended by Authorized Specialist only	X	X				X			X	X					X												X													X
.E.2 Accessed and Activated by Authorized Specialist only	X	X				X			X	X					X												X													X
.E.3 Amendments to Active Flight Plans	X	X				X			X	X					X												X													X
.E.4 Highlight Amendments	X	X				X			X	X					X												X													X
.E.5 Retain Original Flight Plan	X	X				X			X	X					X										X		X													X
.F Flight Plan Dissemination																																	X							
.F.1 Automatic Addressing	X	X							X	X															X								X							
.F.2 Automated Exchange with Adjacent Foreign Facilities	X	X							X	X															X								X							
.F.3 Processing in Correct Time Sequence	X	X							X	X															X								X							
.F.4 Coordination with Foreign Facilities	X	X							X	X															X								X							
.F.5 Reformatting Capability to International Standard	X	X		X					X	X															X								X							
.G Interfaces	X	X																																						
.G.1 With Direct Access User Systems	X		X																						X															
.G.2 Access to NAS	X	X	X						X	X															X															
.G.3 Interface with Airlines and Military	X	X							X	X															X															
.G.4 Computer Security	X	X																							X															
.G.5 Air-Ground/Air Data Communications	X		X						X	X	X														X									X				X		X
.H Response Time	-	-	X	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	X	-	-	-	X	-	-
.I Response Time during Peak Demand	X	X																																						
.J Cancel or Close Flight Plans which have been entered into the System								X	X	X						X										X	X									X				

2.5 Operational Sequences

Operational sequence diagrams have been developed to illustrate the interaction between users (pilots) and specialists/controllers for different phases of flight planning. Support systems are mentioned but their roles are not described in detail. The diagrams are general in nature as they are intended to provide an overall depiction of the flight planning process.

Operational sequences are based on the end-state NAS as described in baselined documents (e.g., Level 1 Design). However, services currently under investigation are mentioned in the process description. Numbers associated with each "box" on the operational sequence figures are quoted in the following sections to help the reader trace the flight planning process from the preparation of a flight to the completion of the flight, in VFR as well as IFR conditions. Specific situations are developed as scenarios in Section 2.6.

2.5.1 Flight Planning for a VFR Flight: Operational Sequence

An operational sequence diagram illustrating the flight planning process involved in a VFR flight is presented in Figure 2-9. The sequence numbers on the figure are used as references in this section.

Before initiating a VFR flight, the pilot must acquire enough knowledge of the intended route of flight to determine whether the trip can be safely undertaken. The information sought prior to departure includes weather information, flight advisories and NOTAMs affecting the portion of airspace and airports covered in the intended flight (1). This information is available in preflight briefings prepared at the AFSS by preflight specialists or through the DUAT Service. A limited amount of weather information is also available through the Pilot's Automatic Telephone Weather Answering Service (PATWAS).

The pilot at this point has several options available for retrieving the required information, including: using a DUAT to automatically obtain a preflight briefing by logging onto a personal computer at home (2); using PATWAS to obtain a general indication of weather conditions in the area of interest (3); or contacting the AFSS prior to departure, either by phone or by a personal visit to the station (4). In the latter case, a preflight briefing is obtained from the AFSS in the format requested (abbreviated or complete) and tailored to the intended route of flight.

At this point, the pilot has been briefed on relevant weather conditions and has been advised whether flying VFR is recommended, and can make a go/no go decision (5). If weather conditions do not allow flying VFR, then the pilot may decide to either postpone the flight or go IFR (see Section 2.5.2). However, if the weather is forecast to be VFR and the pilot decides to go, he/she can either fly without filing a flight plan (6) or file a flight plan before leaving (7).

The information contained in the flight plan facilitates locating the aircraft if it does not reach its destination at the expected time of arrival. The pilot has the choice of either filing a flight plan via DUAT (8), or by contacting the AFSS preflight specialist (9). Via DUAT, the pilot selects the flight

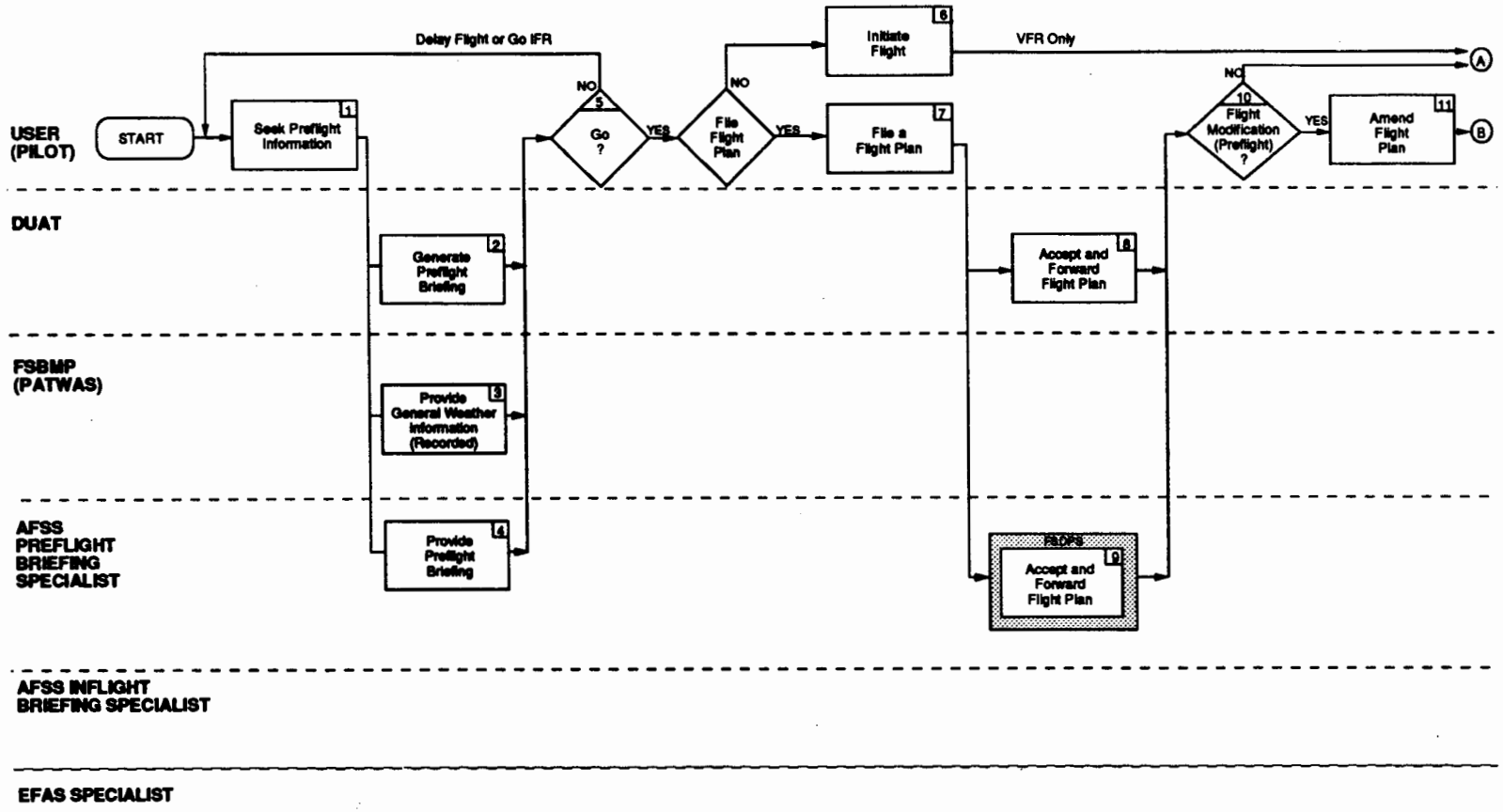

FIGURE 2-9
VFR FLIGHT PLANNING
OPERATIONAL SEQUENCE

plan filing option and fills in the fields as required, being guided through the process by the user friendly, menu driven system which also points out any detected errors in format or logic (8). If the pilot has chosen to obtain the preflight briefing from the AFSS, the flight plan may be filed there also. The AFSS specialist enters the flight plan as filed at the AFSS work station. The FSDPS forwards a copy of the flight plan to the affected AFSS (9) and/or ACCC.

The pilot may have to modify the flight plan prior to departure (10). For example, the time of departure may change or the previously chosen route may have to be altered. In this case, the pilot must amend the flight plan filed earlier (11). This can be done via DUAT (prior to the flight plan being forwarded) by retrieving the flight plan and amending it, or by canceling the previous flight plan and entering a new one (12), or by contacting the AFSS and advising the preflight specialist of the changes (13). Again the FSDPS forwards copies of the amended flight plan as needed. The pilot at this point is ready for departure.

As soon as the flight is initiated, the pilot contacts the In-Flight Specialist at the local AFSS via radio to activate the flight plan (14). The specialist acknowledges receipt of the message and forwards the flight plan to the destination AFSS (15). En route, the pilot may at any time contact the In-flight AFSS Specialist, to obtain or convey information (16) or the EFAS Specialist, to request specific weather information (17). If the pilot decides to alter the initially preferred route (18) (for example as a result of receiving an in-flight advisory from the AFSS) and a flight plan has been filed, the pilot advises the In-Flight Specialist of the changes by amending the previous flight plan (19).

The pilot is notified verbally by the AFSS In-Flight Specialist that the changes have been effected. If the pilot contacts the AFSS specialist in order to amend a flight plan, the specialist enters the changes at their workstation and the changes are forwarded as appropriate to other AFSSs by the FSDPS (20). The pilot then proceeds with the flight as filed (21). If no flight plan has been filed and the pilot decides to modify the original route, the pilot does not have to notify the AFSS of the change. However, contact may be kept with the In-Flight Specialist to obtain information pertinent to the new route.

Upon arrival (22), the pilot closes the flight plan if a flight plan was filed. This can be done on approach just before landing by radio contact with the AFSS and advising the In-Flight Specialist that the flight plan can be closed. If the AFSS specialist cannot be reached by radio, after landing the pilot calls the AFSS by telephone and talks to the Preflight Specialist (23). The pilot is also able to contact the tower if the destination airport has one. However, this is not usually done as tower controllers are frequently busy guiding IFR flights into the airport and usually do not have the time to provide additional services.

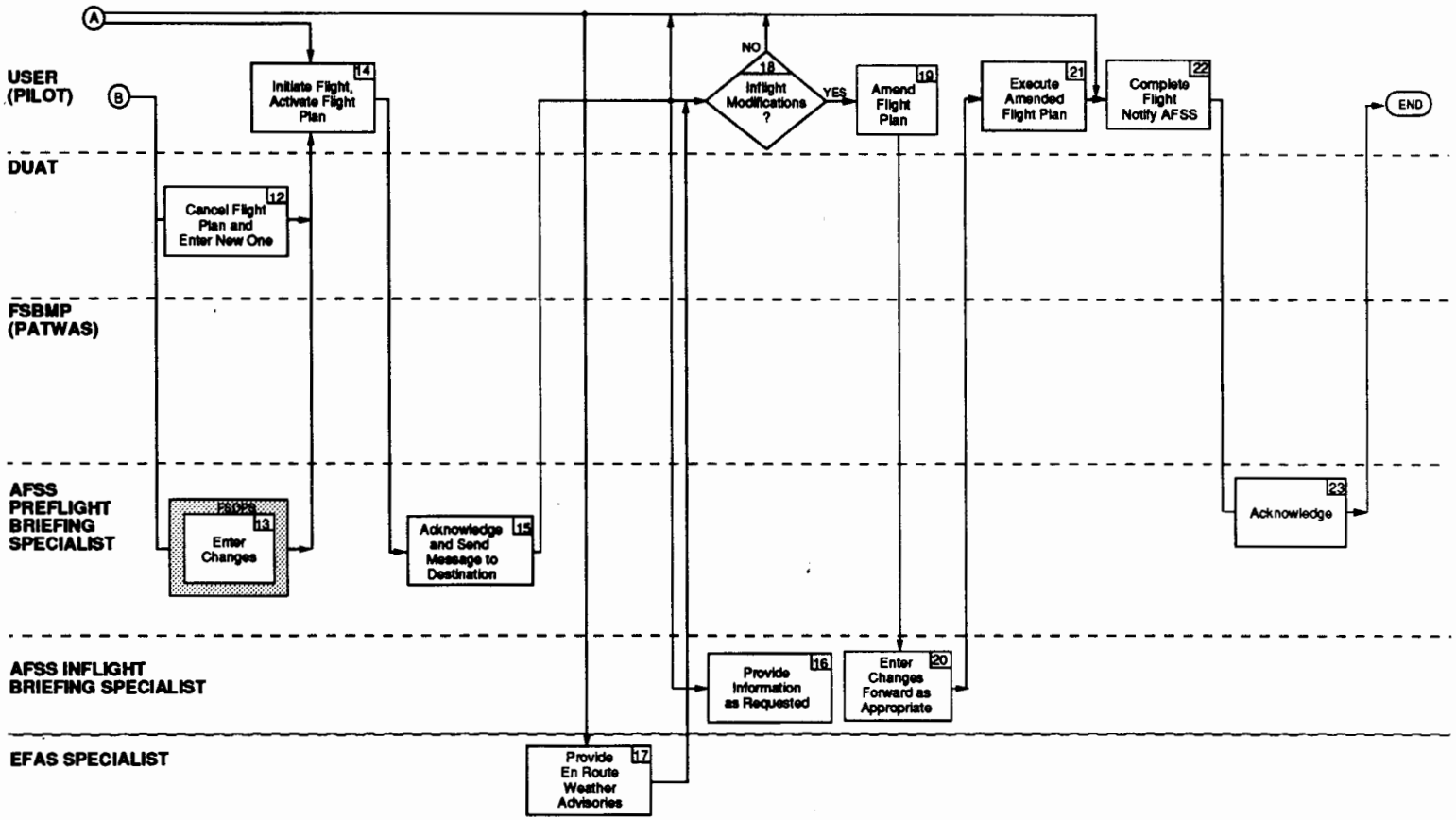

FIGURE 2-9
VFR FLIGHT PLANNING
OPERATIONAL SEQUENCE
(CONCLUDED)

2.5.2 General Aviation Flight Planning Operational Sequence

An operational sequence diagram illustrating the flight planning process involved in a general aviation (GA) IFR flight is presented in Figure 2-10. The sequence numbers on the figure are referenced throughout this section.

The initial steps required for the preparation of an IFR flight are similar to the ones described in the previous section (VFR flights). First, the pilot needs preflight information (1). Pilots associated with a dispatch office, may receive preflight briefings from such offices, located at the airport (2). These briefings are generally composed from commercially available systems and may contain much of the information available at the AFSS, possibly in different formats. GA pilots and others not associated with a dispatch office must obtain preflight briefings via DUAT (3), or from PATWAS at the FSBMP (4) (for general weather information), or from the AFSS (5). The procedures employed in obtaining the briefings are the same as those described in Section 2.5.1. After obtaining a preflight briefing, the pilot is able to make a go/no go decision (6).

If the flight is scheduled, then the flight plan is already in the ACCC data base and flight data for that flight appears at the en route controller console about half an hour before departure (7). The same flight data is also available in the tower from the Clearance Delivery Controller (8). If the flight is not scheduled but an airline is operating it, the dispatch office files the flight plan directly with the affected ACCC through National Airspace Data Interchange Network (NADIN) (9).

A pilot flying IFR is not necessarily affiliated with an airline. A given pilot may be a GA pilot who decided to fly IFR because VFR flight was not recommended, or out of personal preference. In this case, the pilot proceeds to file a flight plan (10), either via DUAT (11) or by contacting the AFSS preflight specialist (12). Once entered, the DUAT filed flight plan is analyzed for consistency, using a data base containing all national fixes and routes. If the flight plan is technically correct, then it is automatically forwarded within a specified time ahead of departure to the appropriate ACCC.

If the flight plan is filed at the AFSS, the Preflight Briefing Specialist requests the necessary information from the pilot and enters it in the proper format on the workstation (12). If any error is detected by the specialist/computer upon entry, the pilot is advised of the error and has the opportunity to correct it "on the spot".

If the DUAT filed flight plan does not match the information contained in the data base, then the flight plan is rejected and the pilot has to either reenter the corrected flight plan data again or contact the AFSS. In this example, the pilot is informed that the submitted flight plan was rejected (13), a corrected flight plan must be refiled using DUAT (14) which is then forwarded to the ACCC (15). The pilot is now able to wait for departure time to receive clearance and initiate the flight.

Prior to departure however, the pilot may have to amend the flight plan (16). The flight plan is amended (17) either via DUAT or by contacting the AFSS preflight specialist. If the DUAT filed flight plan has not yet been forwarded to ACCC, the pilot is able to retrieve the flight plan and modify it (18).

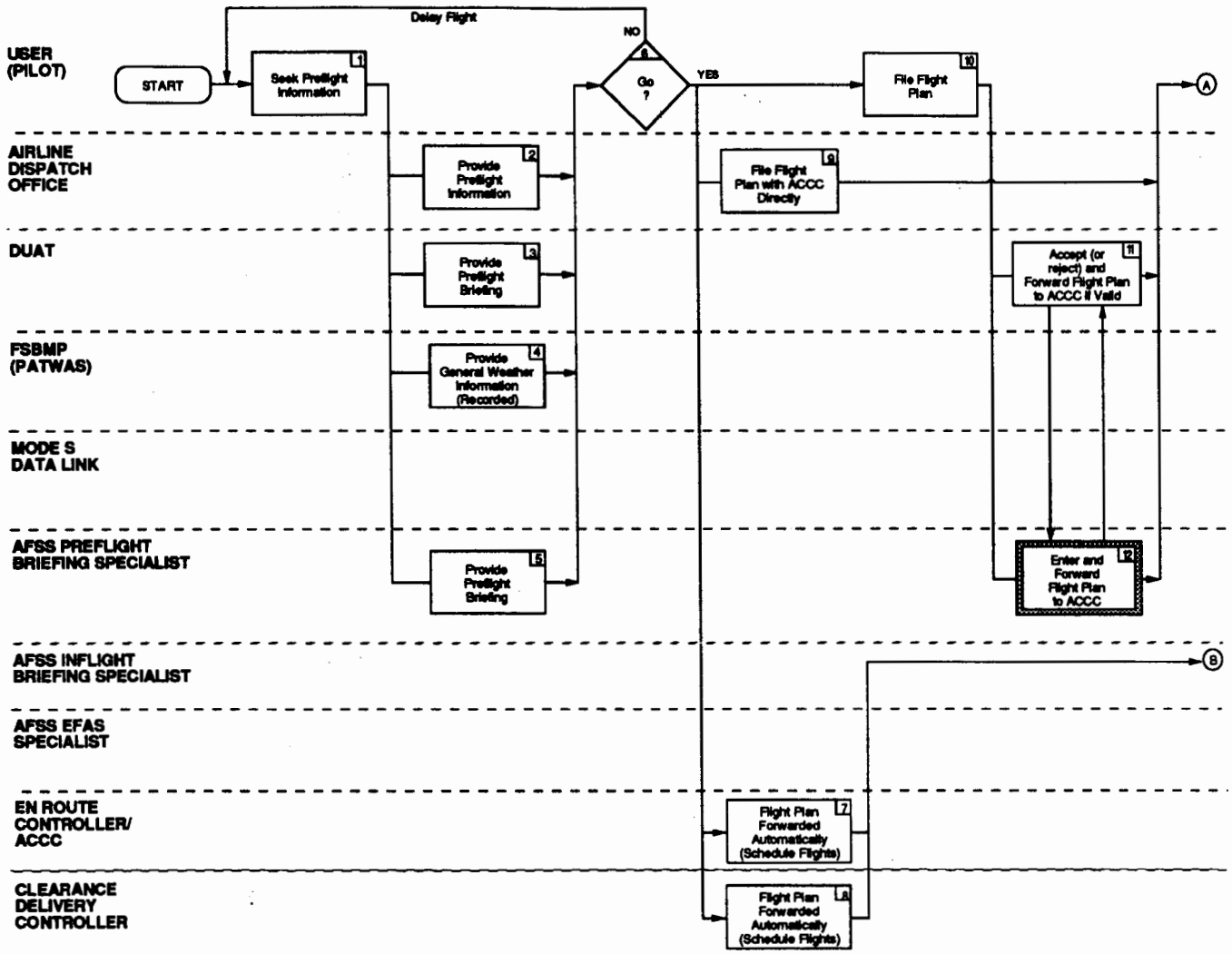

FIGURE 2-10
IFR FLIGHT PLANNING
OPERATIONAL SEQUENCE

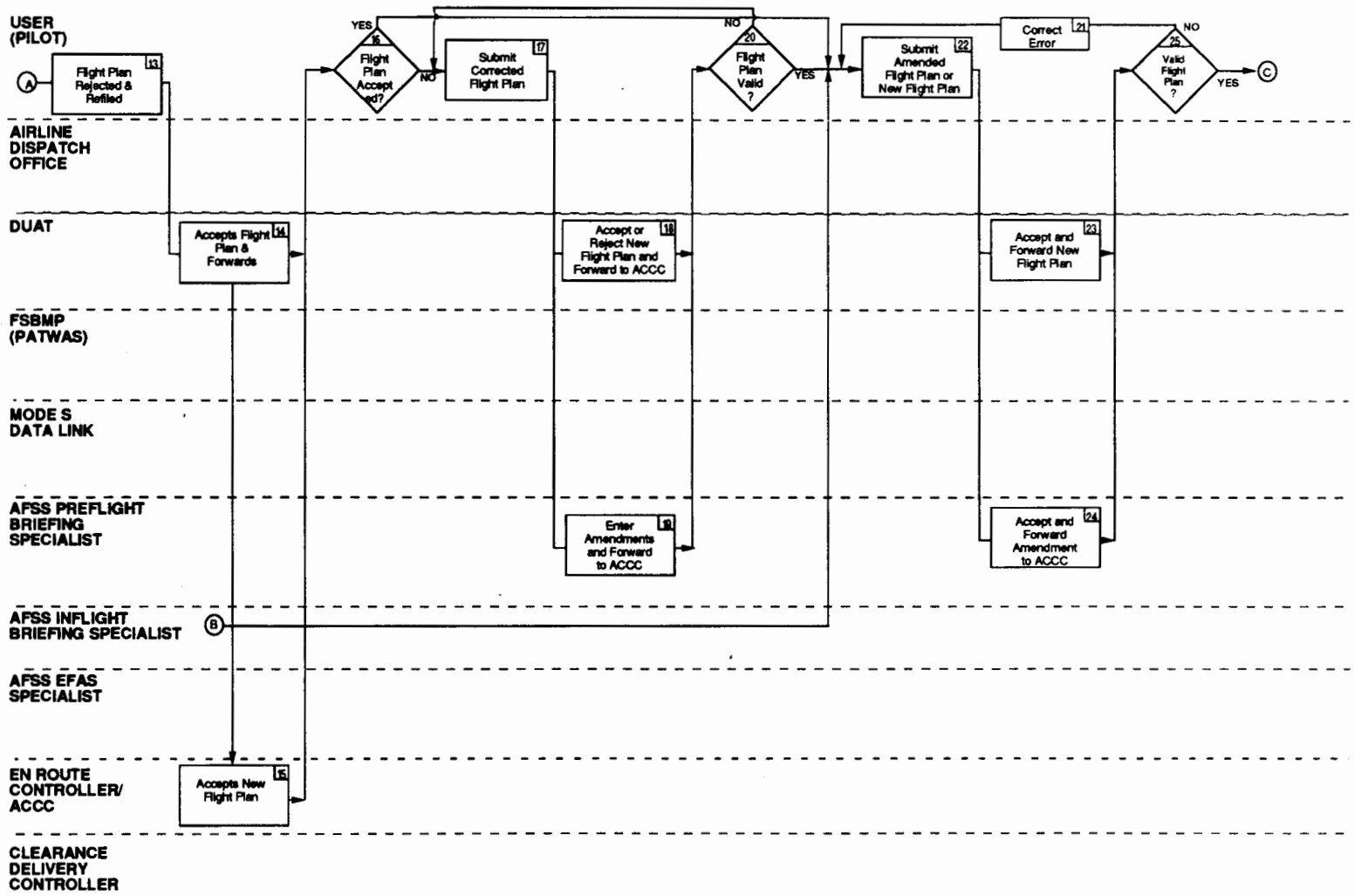

FIGURE 2-10
IFR FLIGHT PLANNING
OPERATIONAL SEQUENCE
(CONTINUED)

The AFSS Preflight Specialist, when contacted for amending a flight plan, retrieves it from the FSDPS data base, if it has not yet been forwarded, and amends it (19). Again, the pilot checks whether the flight plan was accepted by the system as filed (20). If it is not, the error is corrected (21) and the flight plan resubmitted (22, 23, 24 and 25), otherwise, the pilot is ready to receive the clearance which will allow flight initiation.

The pilot requests clearance from the Clearance Delivery controller (26) and recieves the clearance. If the clearance is the same as the filed flight plan (27) the Clearance Delivery controller may simply indicate that the flight is "cleared as filed" (28). Otherwise, the new route is read to the pilot (29). "New routes" are determined as follows: When the proposed flight strip is issued by the ACCC to the controller workstation, it is examined by the controller. If the controller believes it is necessary, a new route, different from the filed flight plan and different from the computer-preferred route, is entered at the controller workstation to override previous flight plans. Otherwise, the computer-preferred route, which may or may not match the submitted flight plan, becomes the valid flight plan.

The controller's decision is influenced by the traffic management coordinator who determines at the local level if rerouting is necessary, due to weather conditions for example. In turn, the traffic management coordinator is in contact with the traffic management specialist who monitors traffic flow at the national level.

After receiving a clearance, the pilot contacts the ground controller for taxi instructions and then the local controller for takeoff clearance. After initializing the flight (30), the pilot may contact the EFAS specialist at the AFSS to obtain specific weather information or advisories or listen to recorded advisories broadcast by the AFSS (31). Once in-flight, contact is maintained with ACF, either verbally (32), or via data link (33). The en route controller is also in contact with the traffic management coordinator who may suggest the rerouting of some aircraft under certain conditions, such as hazardous weather. The traffic management coordinator receives traffic flow information at a national scale from the traffic management specialist.

Flight modifications en route (34) may occur as follows: Either the controller is contacted directly by the traffic coordinator or indirectly by the traffic management specialist to advise pilots in a certain area of a rerouting, or the pilot requests to amend the flight plan in-flight (35). Changes are in that case transmitted over the radio to the en route controller who, if the changes are feasible, enters them on a workstation (36). The pilot whose aircraft is equipped with data link capabilities may be able to downlink a request (37). Acknowledgement of the revised flight plan would in this case be uplinked to the aircraft (38).

Finally, the pilot obtains the clearance to land from the local controller and lands the aircraft (39). This is equivalent to "closing" the flight plan since completion of the flight is acknowledged. If the aircraft is equipped with data link capabilities, clearance may also be requested and granted via data link (40).

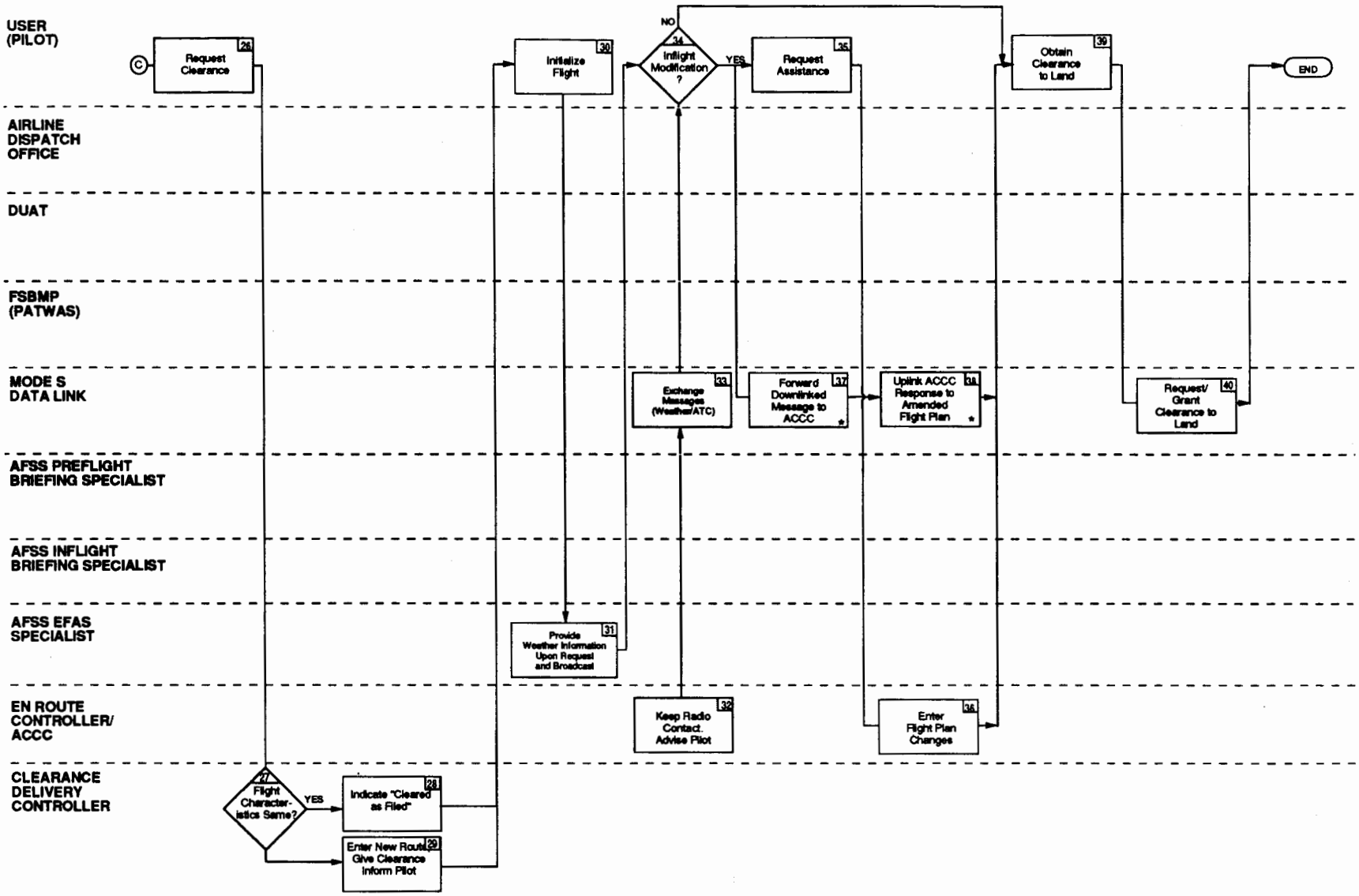

FIGURE 2-10
IFR FLIGHT PLANNING
OPERATIONAL SEQUENCE
(CONCLUDED)

2.5.3 Flight Planning For an IFR, Classified Flight: Operational Sequence

An operational sequence diagram illustrating the flight planning process involved in an IFR, classified military flight is presented in Figure 2-11. The sequence numbers on the figure are used as references in this section.

Flight planning in the military environment is comparable to the operational sequences presented earlier. Consequently, the operational sequence described in this section is simplified to emphasize procedures that are significantly different from civilian operations. Preflight and in-flight amendments of flight plans, for example, have not been included here, as the procedures involved are similar to those described earlier. Also, the discussion is limited to IFR flight planning. The handling of classified flight plans, however, is emphasized.

The military pilot getting ready to initiate a VFR, IFR, classified, or non classified flight plan must, just like the civilian pilot, obtain preflight information (1). This is accomplished by dialing the PATWAS for general weather information (2), contacting the AFSS in person or over the phone (3) or contacting the military base operator (4). The Military Base Operators (MBOs) provide services to the military that are similar to those that AFSSs provide to civilian pilots, specifically weather briefings, NOTAMs, and the capability to file flight plans.

After obtaining a preflight briefing, the pilot is able to make a go/no go decision (5). Filing the classified flight plan is the next step (6). It is accomplished through the intermediary of the MBO specialist, who sends the flight plan to the ACF in an encrypted format either via NADIN or by courier (7).

At the ACF, a special printer with decrypting capabilities prints out a proposed flight strip which either the military operations specialist or the area supervisor has access to (8). If the flight strip does not require immediate attention (9), it is deposited into a safe (10). When the flight plan should be activated, it is retrieved from the safe (11) and the military specialist or area supervisor writes down the flight progress strip and distributes it to controllers (12). The pilot obtains a clearance to takeoff from the military tower controller if departing from a military facility or from a tower controller at a civilian airport (13). The en route controller from then on provides separation from other aircraft and assists the pilot as required (14).

Once the aircraft has passed through the ACF airspace, the classified flight strip is collected by the military operations specialist or the area supervisor (15) and returned to the safe to be destroyed later as specified in security regulations (16). The pilot ends the flight by requesting clearance to land either at a civilian or at a military airport (17). Flight strips are handled the same way at the departure/arrival tower as was described for the en route environment.

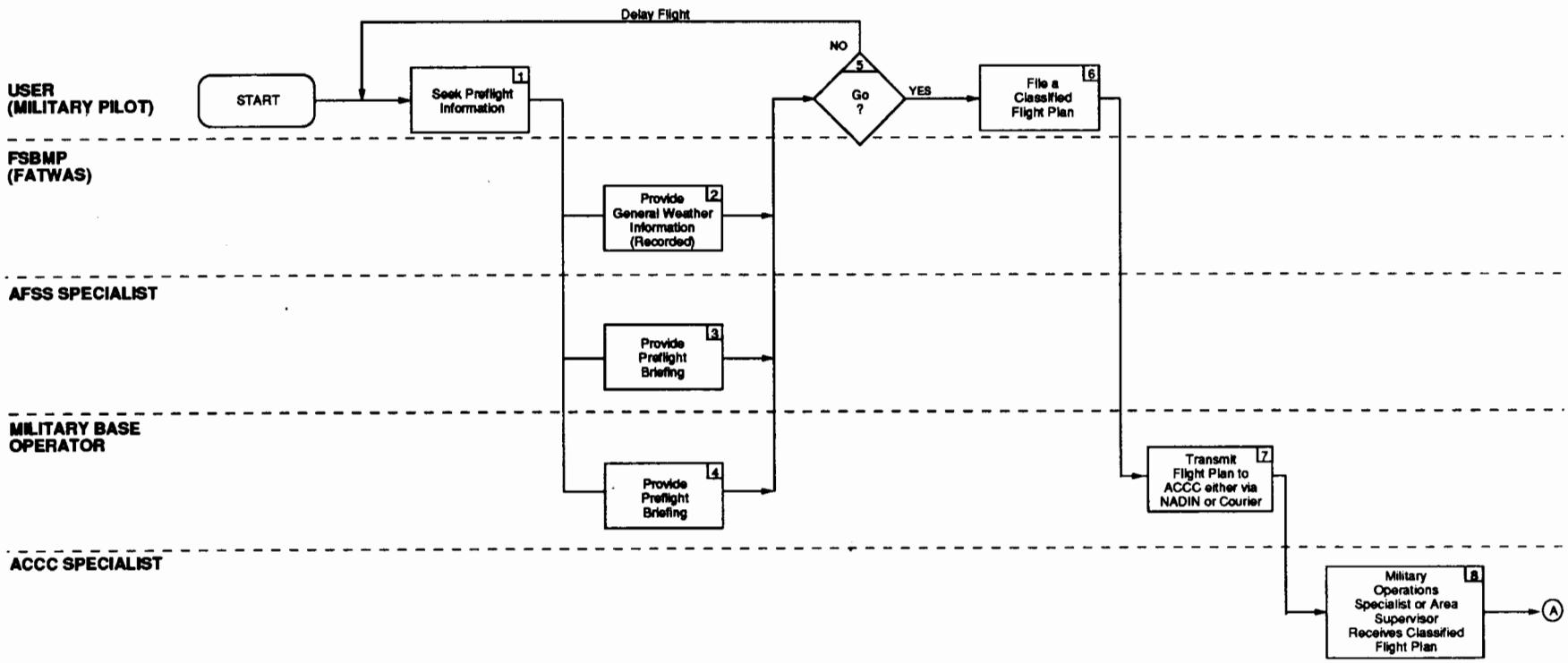

FIGURE 2-11
CLASSIFIED FLIGHT PLANNING
OPERATIONAL SEQUENCE

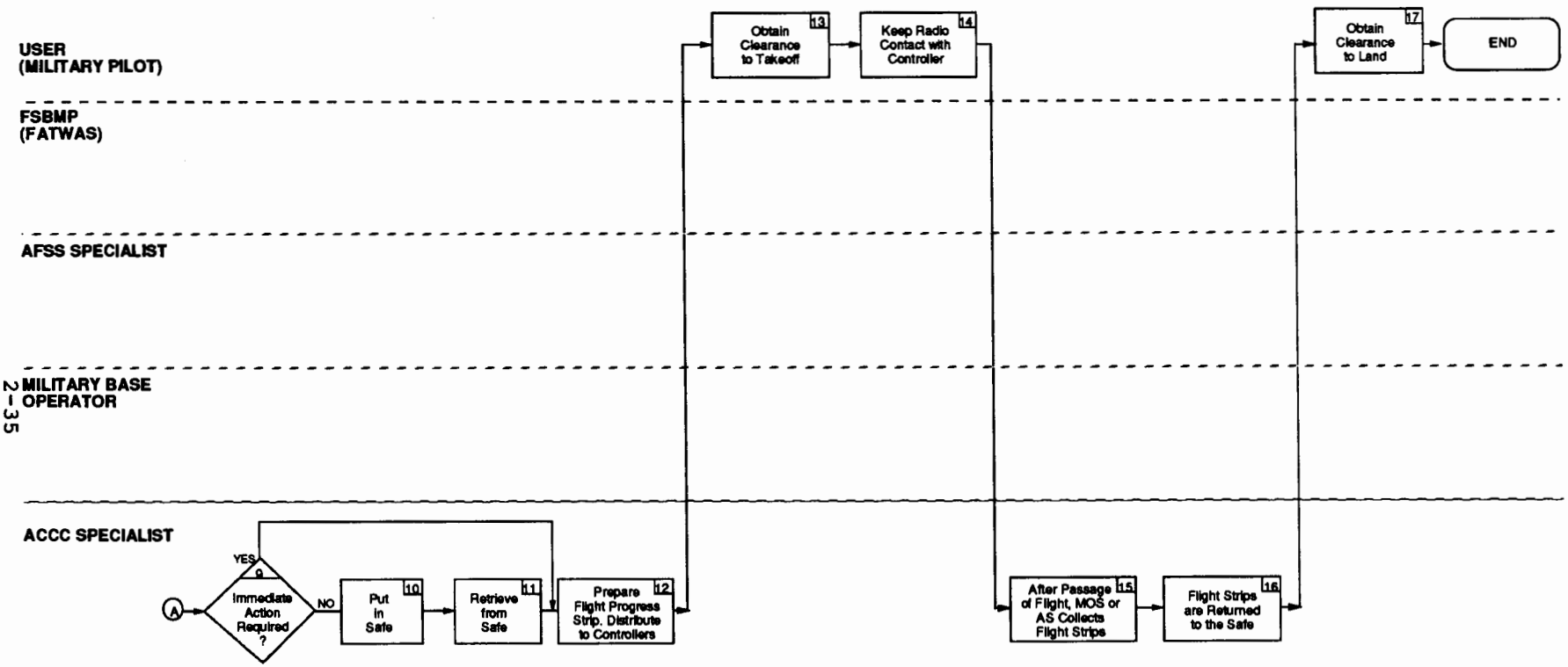

FIGURE 2-11
CLASSIFIED FLIGHT PLANNING
OPERATIONAL SEQUENCE
(CONCLUDED)

2.6 Operational Scenarios

Specific hypothetical situations illustrating the flight planning process for GA as well as scheduled airline pilots are presented in this section.

2.6.1 Planning a Flight With a General Aviation Pilot

A flow chart sequence illustrating this scenario is provided in Figure 2-12. Numbers on Figure 2-12 are referenced throughout this section.

A GA pilot, owner of a Mooney Executive, a single engine aircraft, occasionally flies from Dulles Airport, Virginia, to Raleigh-Durham, North Carolina. On this bright Sunday morning, he would rather fly VFR. He needs to obtain a preflight briefing to check on weather conditions along his route of flight (1). This is readily done from his home computer, which he uses to access DUAT services (2).

Through a menu-driven program, the pilot requests a briefing tailored to his route of flight, that is from Dulles to Raleigh-Durham, along the specific route he is proposing to take. He gets a printed copy of the briefing to read and take along with him. The briefing indicates VFR conditions all the way to Raleigh Durham, but the forecast portion of the briefing indicates a possibility of a thunderstorm developing later on that day. The pilot thinks he should reach his destination before these conditions develop.

The next thing he wants to do is file a flight plan using the DUAT (3). The DUAT Service sends an acceptance message to the pilot's computer that the filed flight plan was accepted. This message means that the flight plan has been error and format-checked by the DUAT Service. The flight plan is then forwarded to the appropriate facility by the DUAT Service contractor (4). The pilot can now go to the airport (5).

While awaiting clearance, the pilot listens to the recorded ATIS message (6). Prior to take off, the pilot must comply with the procedural rules in effect at Dulles Airport. Even though the pilot is flying VFR, must contact the Clearance Delivery controller, to obtain a flight clearance (7) out of the Dulles terminal area. The controller verbally issues a clearance for the flight (8), which the pilot acknowledges (9). The Ground Controller provides the pilot assistance in reaching the runway he is to take off from. The pilot indicates he is ready for take off (10). Finally the Local Controller gives him clearance to take off (11).

Once airborne, the pilot requests permission from the Departure Controller to switch frequency to the AFSS in order to open his VFR flight plan (12). The controller acknowledges the request (13). The pilot tunes in to the local AFSS and opens his flight plan (14). An In-Flight AFSS specialist approves the departure time communicated to him by the pilot (15). Approximatly 70 miles north of Raleigh-Durham, the sky is clear but it is getting progressively overcast and the pilot wonders if the forecast thunderstorm announced in his preflight briefing is not developing sooner than he expected. He contacts the EFAS specialist at the Leesburg AFSS (16). The specialist confirms that weather conditions are deteriorating rapidly in the area. The pilot decides at this point that it may be prudent to switch from a VFR to an IFR flight plan.

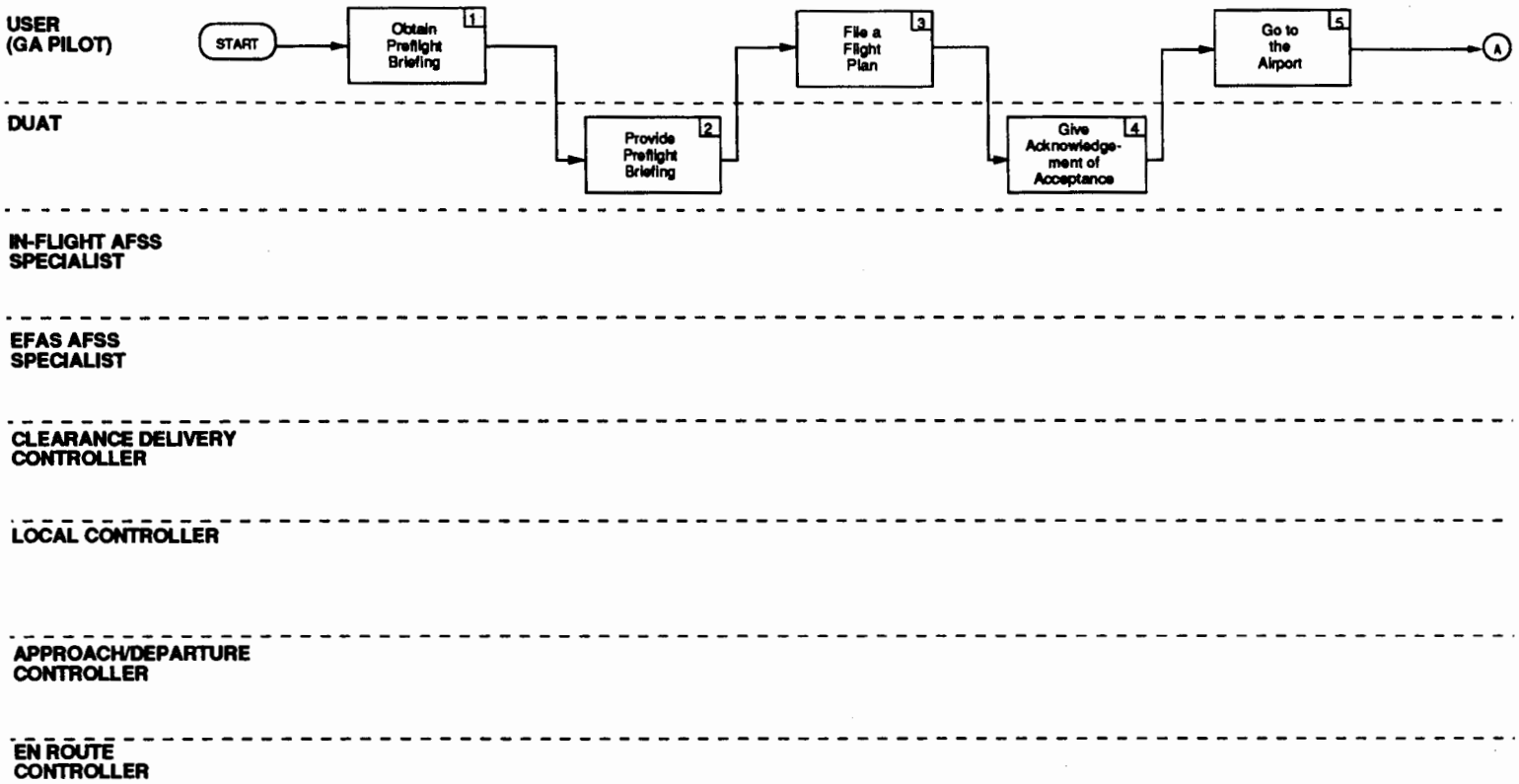

FIGURE 2-12
GA PILOT
OPERATIONAL SCENARIO

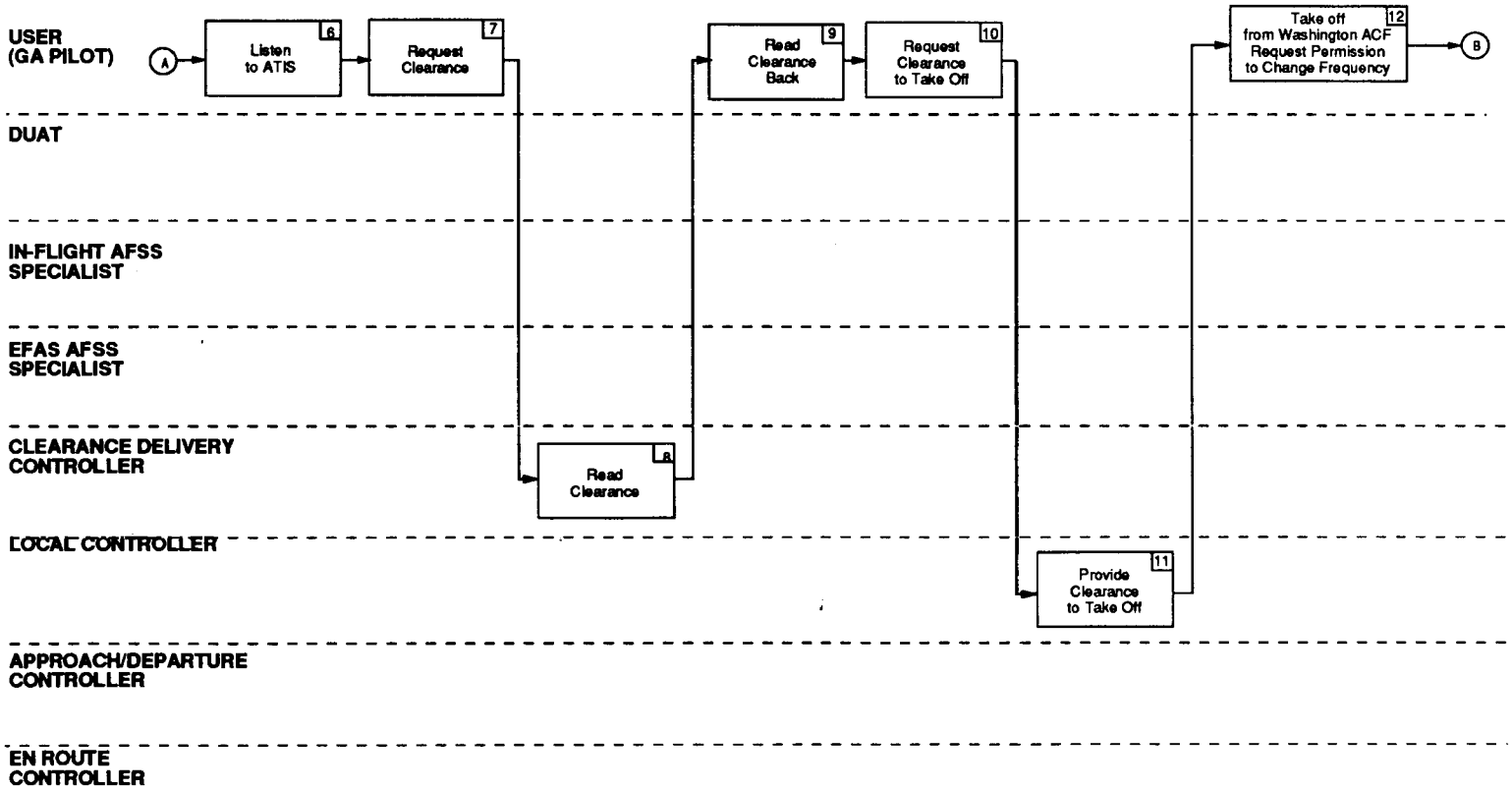

FIGURE 2-12
GA PILOT
OPERATIONAL SCENARIO
(CONTINUED)

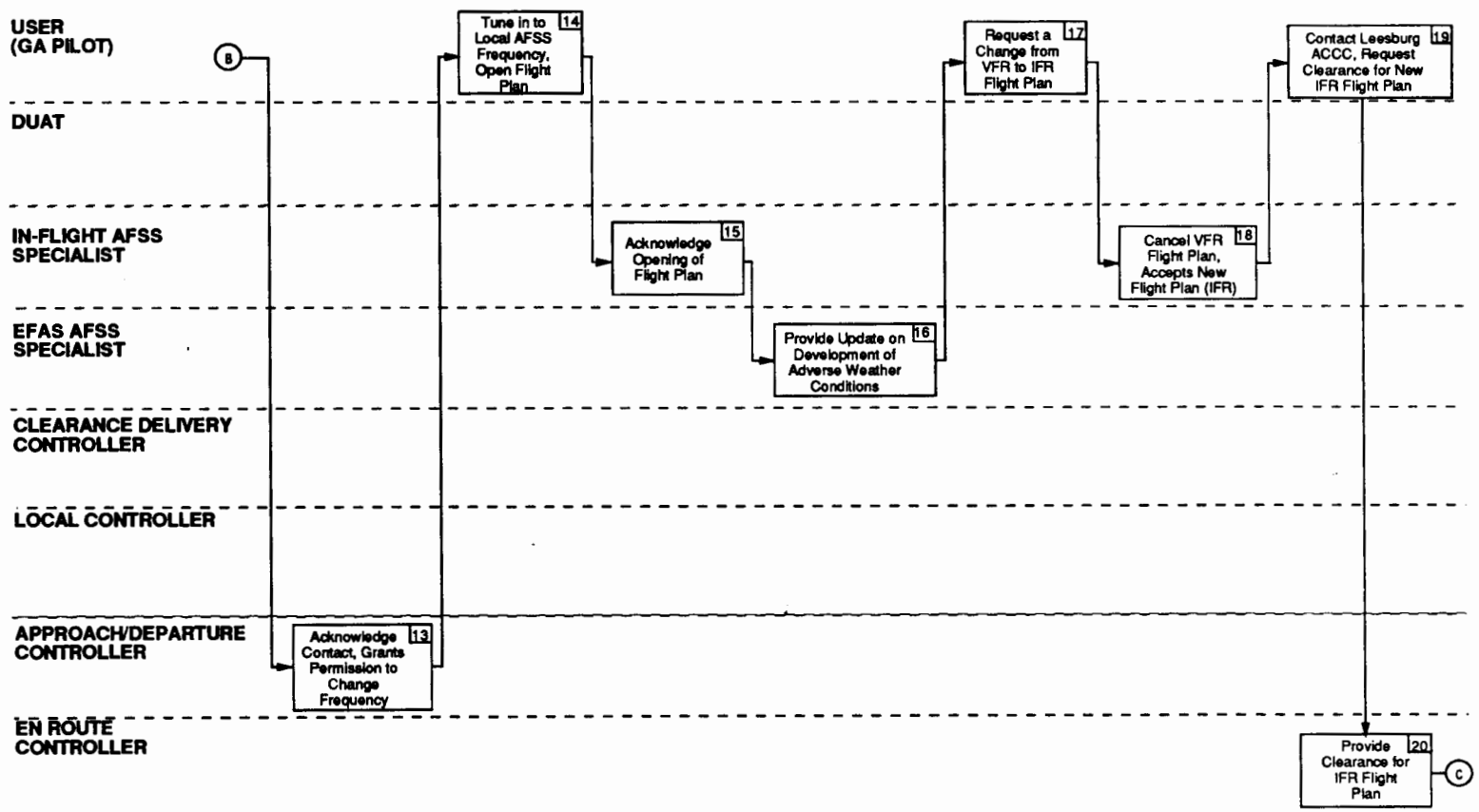

FIGURE 2-12
GA PILOT
OPERATIONAL SCENARIO
(CONTINUED)

He contacts Leesburg AFSS and requests to change the status of his flight plan, talking to the In-Flight specialist (17). The specialist suggests he cancel his previously filed flight plan and file a new one, starting from the next fix he is to fly over, which is the South Boston VOR, 50 miles north of Raleigh, to his final destination. (18) (Prior to reaching this point, he is still flying VFR.)

By the time he reaches that fix, he calls the Washington ACF, the en route control facility in charge of this area, and requests a clearance for his new IFR flight plan (19). By the time the pilot contacts the en route facility, the controller has received notification of his proposed flight plan. Since it is in agreement with the computer preferred route, the controller gives the pilot clearance for an IFR flight plan to his final destination (20).

The pilot acknowledges the clearance (21), then tunes in to listen to the Raleigh-Durham Airport ATIS message (22). The recorded message indicates a thunderstorm approaching the area, but the pilot is now nearing his destination so he should not have any problem. About 20 miles north of Raleigh-Durham, the controller advises the pilot to contact Raleigh Approach on the approach control frequency (23). The Approach Controller advises the pilot of the runway in use, and stays in radio contact with the pilot until he is about 5 miles away from Raleigh-Durham (24). At that point the pilot is advised to contact the tower (25). The Local Controller issues him a clearance to land (26) and the pilot lands the aircraft (27).

2.6.2 Planning A Flight With An Airline Pilot

A flow chart sequence illustrating this scenario is provided in Figure 2-13. Numbers used in Figure 2-13 are referenced throughout this section.

At 8:00 AM, a USAir pilot arrives at the airport. Flight 265 is scheduled to leave Baltimore/Washington International at 9:00 AM and arrive at Boston at 10:20 AM. At 8:15 AM, the pilot stops by the USAir dispatch office which is located at the airport. He obtains his preflight briefing at a walk up counter (1,2). The flight number is printed on it to identify it from other scheduled flights. The briefing provides information on the route of flight from Baltimore to Boston, that is the usual listing of fixes and altitudes prescribed for that particular flight, and the weather conditions to be expected on the trip. Weather maps are also posted on the wall for the pilot's use. The pilot has already familiarized himself with weather conditions by watching the cable weather channel at home before leaving, so he picks up the printout and gets ready to board the aircraft.

The airline flight crew boards the aircraft at 8:30 AM (3). The pilot reads the briefing and enters the flight plan into the aircraft computer, the Flight Management System (FMS), which is used when the flight is conducted on the "autopilot" mode. The aircraft is equipped with data link, and the flight plan is automatically loaded into the FMS. The forecast over Long Island indicates deteriorating weather conditions due to an approaching line of thunderstorms.

At 8:30 AM, the traffic management coordinator at the New York ACF is evaluating traffic projections over Long Island in the next few hours. Considering the line of thunderstorms approaching the area, the coordinator feels that aircraft, scheduled to fly over Robbinsville fix, located about 30 miles south of New York John F. Kennedy Airport (JFK) should be re-routed from that fix towards the west to avoid the hazardous weather conditions currently developing until the storm has completely cleared (4). The coordinator retrieves from his computer a listing of all affected flight plans, prints

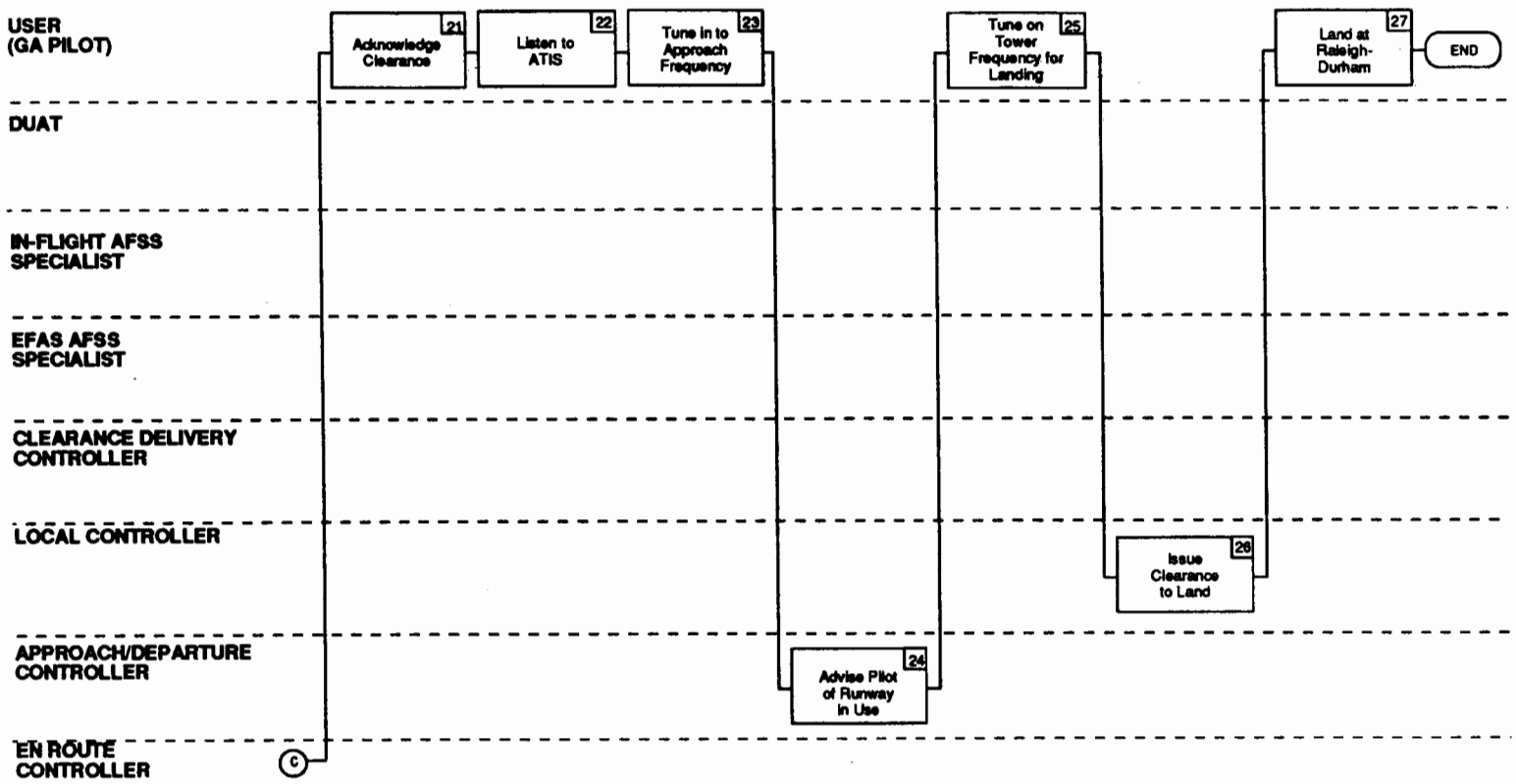

FIGURE 2-12
GA PILOT
OPERATIONAL SCENARIO
(CONCLUDED)

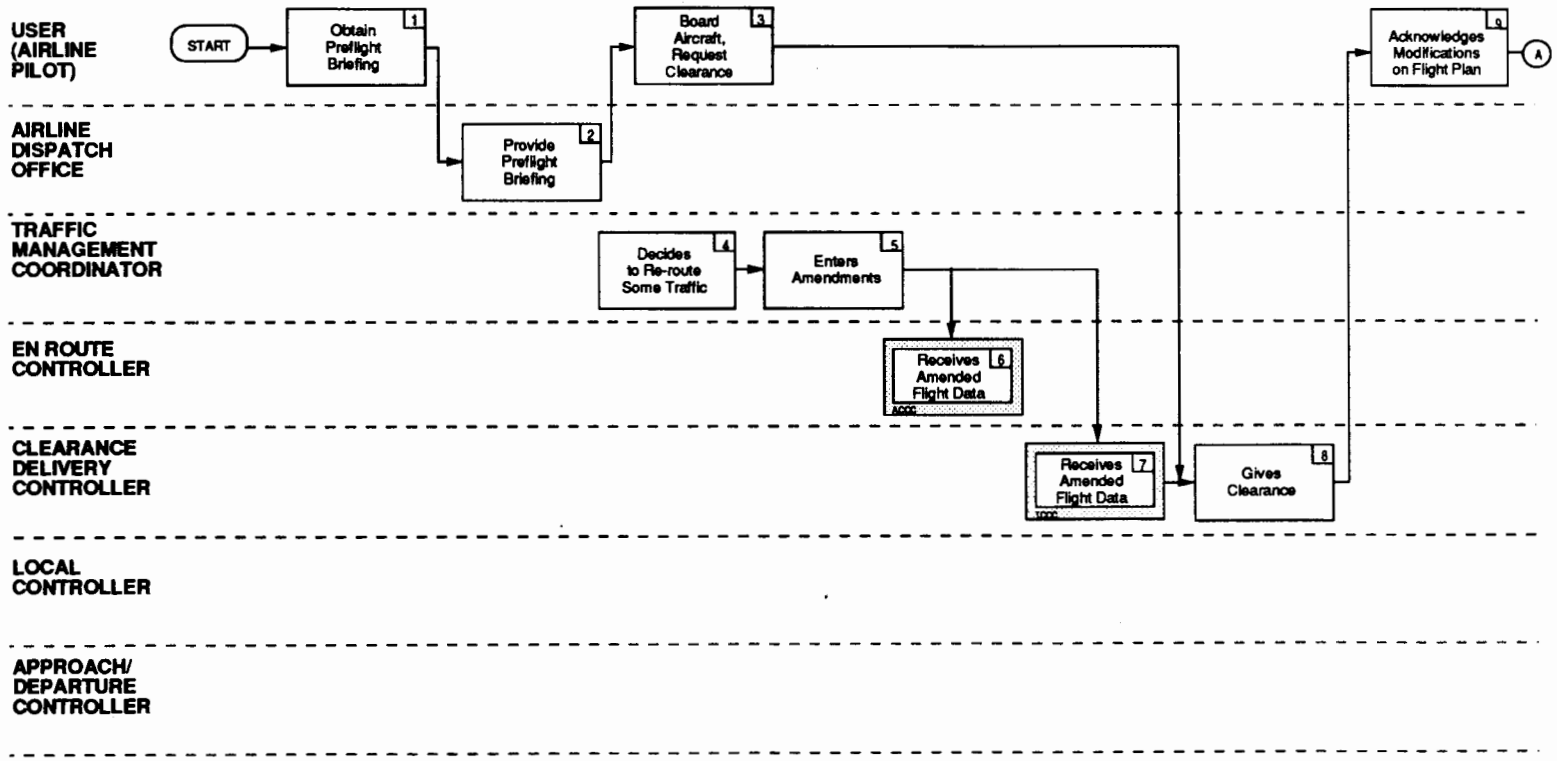

FIGURE 2-13
AIRLINE PILOT
OPERATIONAL SCENARIO

them out, and moves to a controller's position to enter the amendment to each selected flight plan (5). The amendment for Flight 265 consists of a rerouting overriding the preferred route from Robbinsville to Boston. The aircraft, maintaining an altitude of 23,000 feet, is to take V123 to Carmel Fix, and then J75 to Logan Airport. This route will take the aircraft west of Long Island.

By 8:45 AM, the amendment is processed and the preferred route portion of the flight plan is modified (6). By the time the pilot contacts the Clearance Delivery controller, the rerouting has been integrated in the flight plan and the pilot is informed that he is expected to fly a different route from the usual one, that is from Robbinsville to Boston Logan (7,8). The pilot acknowledges by reading back the amended clearance (9) and waits for the Ground Controller to provide him with taxiing instructions to the active runway. His copilot enters the modifications in the aircraft computer. Once this is done, the pilot waits behind other aircraft ready to depart, until the Local Controller issues a clearance for take off (10). At 9:05 AM, USAir Flight 265 takes off, and shortly thereafter, the pilot establishes contact with the Departure Controller (11,12). The rest of the flight is conducted exactly as specified in the amended flight plan (13,14).

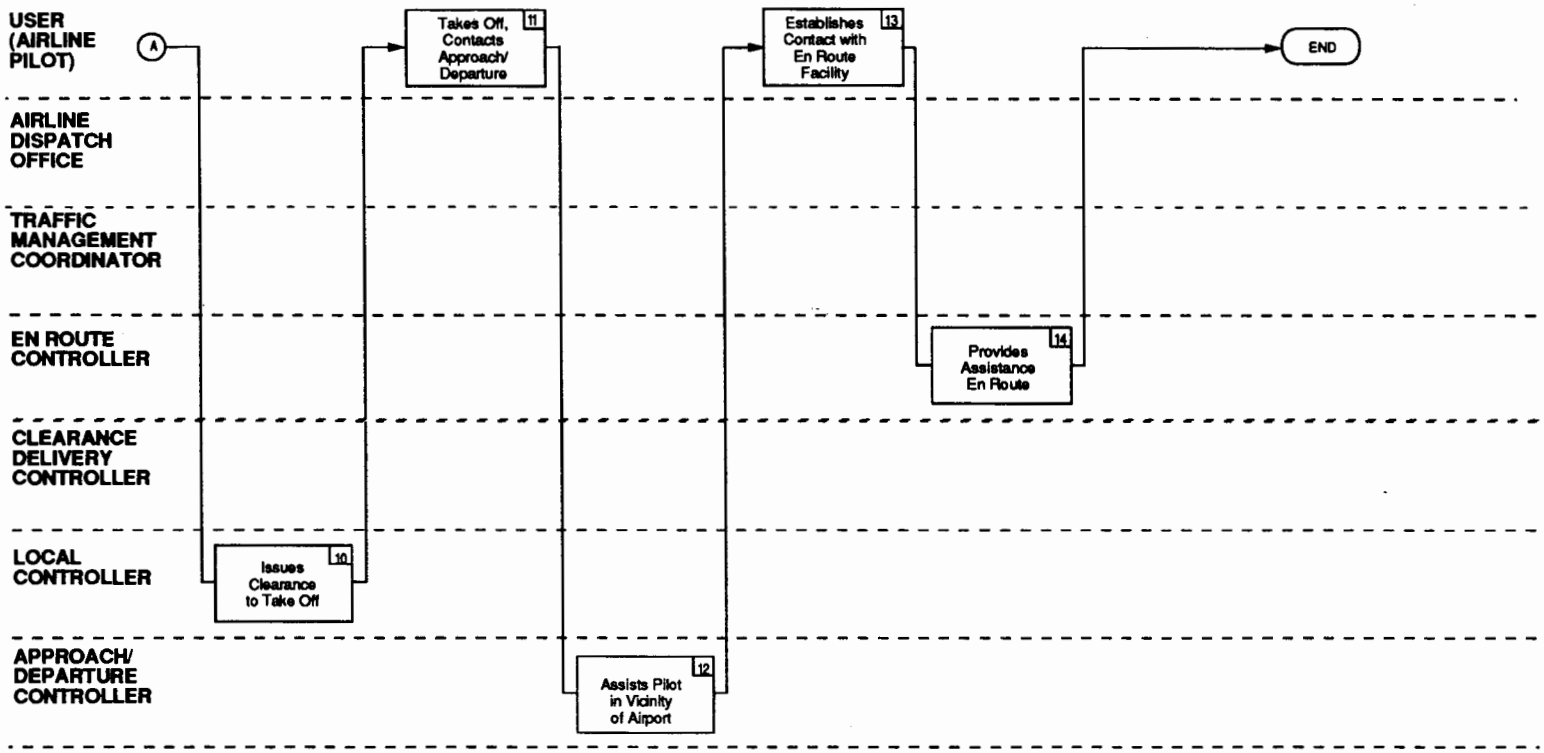

FIGURE 2-13
AIRLINE PILOT
OPERATIONAL SCENARIO
(CONCLUDED)

GLOSSARY OF ACRONYMS

ACRONYM	MEANING
AAS	Advanced Automation System
ACCC	Area Control Computer Complex
ACF	Area Control Facility
ADAS	Automated Weather Observing System Data Acquisition System
ADO	Airline Dispatch Office
ADS	Automatic Dependent Surveillance
AERA	Automated En Route Air Traffic Control
AFSS	Automated Flight Service Station
ATC	Air Traffic Control
ATCCC	Air Traffic Control Command Center
ATCRBS	Air Traffic Control Radar Beacon System
ATCT	Air Traffic Control Tower
ATIS	Automatic Terminal Information System
AWOS	Automated Weather Observing System
AWP	Aviation Weather Processor
CFMWP	Central Flow Meteorologist Weather Processor
DLP	Data Link Processor
DUAT	Direct User Access Terminal
EDT	Estimated Departure Time
EFAS	En Route Flight Advisory Service
ETE	Estimated Time En Route
FAA	Federal Aviation Administration
FBO	Fixed Base Operator
FMS	Flight Management System
FP	Flight Plan
FSAS	Flight Service Automation System
FSBMP	Flight Service Broadcast Message Processor
FSDPS	Flight Service Data Processing System
GA	General Aviation
HIWAS	Hazardous Inflight Weather Advisory Service
ICAO	International Civil Aviation Organization
ICSS	Integrated Communication Switching System
IFR	Instrument Flight Rule
JFK	John F. Kennedy Airport
LLWAS	Low Level Wind Shear Alert System
MBO	Military Base Operator
Mode S	Mode Select
MWP	Meteorologist Weather Processor
NADIN	National Airspace Data Interchange Network
NAS	National Airspace System
NASSRS	National Airspace System Requirements Specification
NAWPF	National Aviation Weather Processing Facility
NFDC	National Flight Data Center
NOTAM	Notice to Airman

NWS	National Weather Service
PATWAS	Pilot Automatic Telephone Answering Service
PIREP	Pilot Report
RCF	Remote Communications Facility
RWP	Real Time Weather Processor
RVR	Runway Visual Range
SAR	Search and Rescue
SSCC	Sector (System) Support Computer Complex (at FAATC)
TCCC	Tower Control Computer Complex
TCS	Tower Communications System
TDWR	Terminal Doppler Weather Radar
TMCC	Traffic Management Computer Complex
TMP	Traffic Management Processor
TRACON	Terminal Radar Approach Control Facility
UHF	Ultra High Frequency
VFR	Visual Flight Rules
VHF	Very High Frequency
VOR	Very High Frequency Omnidirectional Range
WMSCR	Weather Message Switching Center Replacement

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