

Limited Job Task Analysis (JTA) For Aviation Weather Products

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16. Abstract To assist in the understanding of weather product use by Air Traffic Control Specialists (ATCS) and Automated Flight Service Station (AFSS) Specialists, the Federal Aviation Administration (FAA) William J. Hughes Technical Center conducted a Limited Job Task Analysis (JTA) for select positions at an Automated Flight Service Station (AFSS) from January 10, 1994, to January 13, 1994, and an Air Route Traffic Control Center (ARTCC) from January 10, 1994, to January 18, 1994. Both facilities are located in Fort Worth, Texas. Among the positions evaluated were Preflight Specialists, Inflight Specialists, and Enroute Flight Advisory Service (EFAS) Specialists from the Ft. Worth AFSS and Traffic Management Coordinators (TMC) from the Ft. Worth ARTCC. The JTA was developed in two stages. The first stage of the JTA was a research effort in which several reference documents were used to develop task lists and flowcharts for Flight Service Specialists and TMCs. The second stage of the JTA involved confirming the flowcharts and weather tables developed during the first stage. This was accomplished by comparing the flowcharts and weather tables to observed job tasks and weather information requirements of specialists and controllers at the Ft. Worth AFSS and the Ft. Worth ARTCC. Although a few discrepancies were noted for the Inflight Specialists, the majority of the information in the flowcharts was confirmed during the observation session with Preflight and EFAS Specialists and TMCs. The discrepancies noted are discussed in detail along with issues relating to the user-system interface of weather systems and recommendations for new aviation weather products.			
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EXECUTIVE SUMMARY

To assist in the understanding of weather product use by Air Traffic Control Specialists (ATCS) and Automated Flight Service Station (AFSS) Specialists, the Federal Aviation Administration (FAA) William J. Hughes Technical Center conducted a Limited Job Task Analysis (JTA) for select positions at an Automated Flight Service Station (AFSS) from January 10, 1994, to January 13, 1994, and an Air Route Traffic Control Center (ARTCC) from January 10, 1994, to January 18, 1994. Both facilities are located in Fort Worth, Texas. Among the positions evaluated were Preflight Specialists, Inflight Specialists, and Enroute Flight Advisory Service (EFAS) Specialists from the Ft. Worth AFSS and Traffic Management Coordinators (TMC) from the Ft. Worth ARTCC. The intent of the JTA is to address how controllers and specialists access and use weather information and to identify issues regarding user interactions with current weather systems.

The JTA was developed in two stages. The first stage of the JTA was a research effort in which several reference documents (FAA 7210.3, FAA 7110.10, FAA 7110.65, Air Traffic Weather Needs and Requirements Report, and National Aviation Weather Program Plan) were used to develop task lists and flowcharts for Flight Service Specialists and TMCs. Tables were also developed listing required information for any task involving weather assessment or dissemination.

The second stage of the JTA involved confirming the flowcharts and weather tables developed during the first stage. This was accomplished by comparing the flowcharts and weather tables to observed job tasks and weather information requirements of specialists and controllers at the Ft. Worth AFSS and the Ft. Worth ARTCC.

Although a few discrepancies were noted for the Inflight Specialists, the majority of the information in the flowcharts was confirmed during the observation session with Preflight and EFAS Specialists and TMCs. The discrepancies noted are discussed in detail along with issues relating to the user-system interface of weather systems.

Based on the conclusions reached during this evaluation, several recommendations for new aviation weather products are suggested. Recommendations contained within this document should be utilized in the development of future systems and products.

1. INTRODUCTION.

The Federal Aviation Administration (FAA) William J. Hughes Technical Center is currently involved in several programs involving the creation, distribution and display of various aviation related weather products for use by Air Traffic (AT) personnel. Two recent reports, the AT Weather Needs and Requirements Report, October 1994, and the National Aviation Weather Program Plan, September 1992, address Air Traffic weather needs. Both reports provide information regarding current aviation weather information requirements. In addition, the National Aviation Weather Program Plan outlines general recommendations for future systems. While these reports address the specific needs of air traffic controllers, they do not outline the process by which controllers and specialists access and use weather information. It is necessary to understand this process so that designers can provide products that more accurately and efficiently meet the demands of controller job tasks.

To assist in the understanding of weather product use by Air Traffic Control Specialists (ATCS) and Automated Flight Service Station (AFSS) Specialists, the FAA Technical Center conducted a Job Task Analysis (JTA) for select positions at the AFSS and an Air Route Traffic Control Center (ARTCC) in Fort Worth, Texas (ZFW). The intent of the JTA is to address how controllers and specialists access and use weather information.

1.1 PURPOSE.

The purpose of this report is to describe the results of the JTA. The report supplements the Air Traffic Weather Needs and Requirements Report and the National Aviation Weather Program Plan by describing how controllers and specialists use aviation weather information. The report outlines how specific weather information is obtained, why it is obtained, and the format of the weather information. Information for this report was collected by FAA Technical Center personnel as part of the FAA Aviation Weather Development Program (AWDP).

1.2 SCOPE.

This report addresses objectives, participants, methodology, results, and conclusions. Recommendations regarding the development of new weather systems are also made. The report is written using FAA-STD-024B as a guideline. Titles and sections were changed where appropriate. The report provides the results of the JTA effort and outlines the observed process of obtaining

required weather information. Information format and usability problems are also discussed.

The JTA is limited in that it outlines only top level job tasks and addresses only weather related tasks and information. It does not address other aviation specific information. Job task and weather requirements information are discussed for the following positions:

- a. AFSS Preflight Specialists;
 - b. AFSS Inflight Specialists;
 - c. AFSS Enroute Flight Advisory Service (EFAS) Specialists;
- and
- d. ARTCC Traffic Management Unit (TMU) Traffic Management Coordinators (TMC).

While FAA standards and documents were used to compile the JTA information, data was only confirmed at the Fort Worth AFSS and Fort Worth ARTCC. It is likely that some minor variations in operational tasks may exist at other facilities.

2. REFERENCE DOCUMENTS.

FAA-STD-024B	Federal Aviation Administration Standard Content and Format Requirements for the Preparation of Test and Evaluation Documentation, August 22, 1994.
FAA 7210.3	Facility Operation and Administration, September 16, 1993.
FAA 7110.10	Flight Service, September 16, 1993.
FAA 7110.65	Air Traffic Control, September 16, 1993.
FAA ORDER 7032.15	Air Traffic Weather Needs and Requirements Report, October 5, 1994.
FCM-P27-1992	National Aviation Weather Program Plan, September, 1992.
ESD-TR-86-278	Guidelines for Designing User Interface Software, August, 1986.

3. SYSTEM DESCRIPTION.

3.1 MISSION REVIEW.

According to the National Aviation Weather Program Plan, current aviation weather products do not fully address the needs of airspace users. User needs continue to surpass the capability of current weather products. Both the Air Traffic Weather Needs and Requirements Report and the National Aviation Weather Program Plan partially identify user needs for the future. Therefore, the mission of the JTA was to further assess these user needs by outlining how weather information is used. Understanding how users utilize weather information will assist in the development of new FAA National Airspace System (NAS) weather products.

3.2 SYSTEM CONFIGURATION.

This section describes the position and general responsibilities of AT personnel utilized throughout the development of the JTA.

3.2.1 AFSS Preflight Specialists.

Preflight specialists provide all necessary meteorological and aeronautical information required by a pilot in making preflight decisions and calculations. Preflight specialist duties and information disseminated include:

- a. Obtain current and forecast weather information for departure, enroute, and terminal locations;
- b. Provide locations of hazardous and severe weather and alternate routes;
- c. Provide routes of flight, preferred routes, aids to navigation, notices to airmen (NOTAMS), restricted areas, military training routes, special military operations, terminal information, mileage, and flight computation;
- d. Provide any other information deemed necessary by the pilot or specialist; and
- e. Provide continued assessment and update of weather.

3.2.2 AFSS Inflight Specialists.

Inflight specialists' duties parallel preflight duties except that decisions and assistance given are more time critical

because the aircraft is airborne. Inflight specialist duties are:

- a. Provide emergency services to aircraft in distress;
- b. Obtain and disseminate pilot weather reports encountered during flight;
- c. Determine, during radio contact, pertinent information required by the pilot and furnish such information;
- d. Relay position reports, clearances, weather information, Air Traffic Control (ATC) messages, and flight plans between aircraft inflight and the appropriate control facility;
- e. Provide airport information service to landing and departing aircraft at non-towered airports;
- f. Maintain radio guard for enroute aircraft;
- g. Initiate contact with aircraft to obtain position reports; and
- h. Provide flight monitoring over hazardous areas.

3.2.3 AFSS Enroute Flight Advisory Service (EFAS) Specialists.

EFAS specialists provide enroute weather information to airborne aircraft in an assigned geographical area. Duties of EFAS specialists include:

- a. Provide in-depth knowledge of static (e.g., topography, frequencies) and dynamic information (e.g., airway structure, Navigational Aids [NAVAID], aeronautical information);
- b. Serve as focal point for consolidating reports of current enroute weather;
- c. Issue flight advisories interpolated to routes, altitudes, or alternates;
- d. Interpret and issue updates on trends in weather not specifically addressed in the forecast including thunderstorm and precipitation location;
- e. Interpret Geostationary Operational Environmental Satellite (GOES) data;

f. Provide departure, enroute, and arrival services as required; and

g. Provide emergency assistance as necessary.

3.2.4 ARTCC TMU Traffic Management Coordinator (TMC).

ARTCC TMU TMCs are responsible for analyzing traffic flow and metering aircraft in the ARTCC's area of responsibility and providing data to controllers and pilots to operate safely and economically. Duties include:

a. Develop and initiate flow control procedures as required between intracenter areas and between adjacent enroute facilities;

b. Issue flow control restrictions to adjacent center and/or towers as necessary;

c. Maintain a continuous awareness of the traffic flow, status of NAVAIDs, weather conditions, and traffic forecasts;

d. Act as liaison between major terminals and adjacent centers;

e. Operate the metering position in a timely manner to ensure maximum flow;

f. Develop and maintain schedules for releasing aircraft in adjacent areas during flow control procedures;

g. Ensure compliance with flow control requirements initiated by other facilities;

h. Notify users of possible delays and maintain statistical records of these delays;

i. Perform weather coordinator duties in a timely manner to ensure all users receive maximum benefit from weather information including Airmen Meteorological Information (AIRMET), Significant Meteorological Information (SIGMET), and Severe Weather Warnings;

j. Inform area manager of all flow control procedures in effect;

k. Interact and coordinate with the Air Traffic Control System Command Center (ATCSCC) as necessary

3.3 INTERFACES.

This section describes AT systems examined as part of the JTA.

3.3.1 AFSS Systems.

In the Ft. Worth AFSS, as at most AFSSs, each Preflight, Inflight, and EFAS specialist has a Model 1 Full Capacity (M1FC) system and a private vendor graphic weather system at their position. Specialists use these systems to access weather information for dissemination. These systems are described below.

3.3.1.1 Model 1 Full Capacity (M1FC).

M1FC provides specialists with route-specific weather data. The M1FC utilizes a command line interface, in which the user inputs requests by entering a route, location, or weather report via a keyboard. Once the request is entered, the M1FC outputs information in a textual format. Depending upon the request entered, the output can vary in length from one line of information to several pages of information. M1FC weather data is used by all AFSS Specialists to provide pilots with weather briefings and enroute weather updates. Weather information obtained from the M1FC includes:

- a. Weather synopsis,
- b. Severe weather warnings,
- c. Areas weather hazards,
- d. Convective outlooks,
- e. Surface aviation observations,
- f. Terminal forecasts,
- g. Area forecasts,
- h. Winds aloft, and
- i. PIREPs.

Figures A-1 through A-10 as shown in appendix A illustrate these components of the M1FC output. As shown in figures A-1 through A-10, M1FC text output is abbreviated. Figure A-10 demonstrates the conversion of a severe weather warning from abbreviated text to standard text.

3.3.1.2 Vendor Weather Systems.

Graphical representation allows users to obtain a spatial and temporal picture of current and forecasted weather. A number of private vendors provide weather products to AFSSs in the United States. These weather products are provided using different weather systems in a graphical format. The typical vendor system requires input via a keypad in order to access the weather

information. Ft. Worth AFSS utilizes a Weather Services International (WSI) weather system. WSI graphics require the user to input a number for the desired screen. Kavouras, Inc. also provides a graphic weather system. Kavouras, Inc. graphics require the user to move through a hierarchical menu structure in order to access weather information. Weather data obtained on the graphic weather systems include:

- a. Surface and upper air analysis,
- b. Freezing level analysis,
- c. Stability index analysis,
- d. Radar depiction,
- e. Current weather depiction,
- f. Surface and upper air prognosis,
- g. Satellite imagery (GOES), and
- h. Maximum wind and windshear analysis/prognosis.

3.3.2 TMC Systems.

TMCs receive most of their weather information from the collocated Center Weather Service Unit (CWSU). The CWSU meteorologist has limited duty, usually between 6 a.m. and 10 p.m. During these hours, the CWSU provides the TMC with weather briefings and updates on a regular basis. In order to provide these briefings and updates, the CWSU utilizes several systems. These systems include the Meteorologist Weather Processor (MWP), a desktop computer that collects information from the NWS, Next Generation Radar (NEXRAD), the National Airspace System (NAS) Host system, and Leased Service A System (LSAS).

In addition to communication with the CWSU, TMCs directly receive weather information via the MWP briefing terminal, the Aircraft Situation Display (ASD), the NAS Host computer, and the Keyboard Video Terminal (KBVT). When the CWSU is off-duty, the TMC utilizes the MWP briefing terminal, ASD, and KBVT to obtain the necessary weather information. If the TMC has questions or concerns about weather information displayed, he/she can call the ATCSCC or the Weather Service Forecast Office (WSFO) for further meteorological assistance.

The following systems are utilized by CWSUs and/or TMCs to provide weather for the TMU.

3.3.2.1 Meteorologist Weather Processor (MWP).

The MWP provides the CWSU with numerous weather products. These weather products are designed for the meteorologist to provide information to the TMC. MWP briefing terminals are located at

the TMU and at area supervisor stations throughout the ARTCC. These briefing terminals are linked to the MWP weather system at the CWSU. The MWP briefing terminal presents graphical weather products to TMCs. Using the briefing terminal, TMCs can select and display any of the MWP graphic weather products. TMCs select products by toggling through a list. Once a set of products is selected, the TMC initiates a looping sequence in which the products are sequentially presented for 10-15 seconds. A looping sequence must be initiated in order for the products to be automatically updated. Weather products most often displayed on the MWP briefing terminal include:

- a. Radar (both national and regional scales);
- b. Cloud coverage (GOES imagery for national and regional scales);
- c. Winds aloft; and
- d. Jet stream.

3.3.2.2 Aircraft Situation Display (ASD).

The primary role of the ASD is to provide aircraft information to TMCs. However, the ASD also provides TMCs with cloud coverage information and lightning data. TMCs interface with the ASD via a mouse and menu system with an alternate method of using function keys.

3.3.2.3 NAS Host Computer.

The hosts mission is to provide information for ATC. CWSUs utilize this text based system to disseminate Pilot Reports (PIREPs) to TMCs and controllers.

3.3.2.4 Keyboard Video Terminal (KBVT).

The KBVT is a text-based system that is used to obtain Surface Aviation Observation (SAO) weather reports and other weather observations required by the TMC.

3.3.2.5 Desktop Computer.

Most CWSUs have a desktop computer with a dedicated communication line that receives weather information from the National Weather Service (NWS). The desktop computer collects and displays information regarding AIRMETs, SIGMETs, Convective SIGMETs, and Severe Weather Warnings. Additionally, CWSUs receive scheduled and unscheduled aviation weather products from the NWS via the

computer. CWSUs consolidate this information and disseminate it to the TMCs via a printout.

3.3.2.6 NEXRAD.

NEXRAD is a doppler radar system that is used by CWSUs to provide reflectivity information to TMCs.

3.3.2.7 LSAS.

LSAS is a text-based system that is used by CWSUs as a backup system to disseminate PIREPs and retrieve weather.

4. JTA TASK ANALYSIS DESCRIPTION.

The JTA was developed in two stages. The first stage of the JTA was a research effort in which several reference documents (FAA 7210.3, FAA 7110.10, FAA 7110.65, Air Traffic Weather Needs and Requirements Report, and National Aviation Weather Program Plan) were used to develop task lists for Flight Service Specialists and Traffic Management Coordinators. A list of required information was developed for any task involving weather assessment or dissemination.

Following the compilation of job task lists and weather information requirements, job tasks were depicted using flowcharts. Corresponding weather information requirements were outlined in tables. Weather tables were then further expanded to include the process by which the required information was obtained. Information on the process included sources, interpretation, format, and utility of the weather data associated with the job tasks.

The second stage of the JTA involved confirming the flowcharts and weather tables developed during the first stage. This was accomplished by comparing the flowcharts and weather tables to observed job tasks and weather information requirements of specialists and controllers at an operational site.

4.1 OBSERVATION SCHEDULE AND LOCATIONS.

The observation locations for the JTA were the Ft. Worth AFSS and the Ft. Worth ARTCC TMU. Participants at the Ft. Worth AFSS were observed from January 10, 1994, to January 13, 1994. Participants at the Ft. Worth ARTCC were observed from January 10, 1994, to January 18, 1994. Observations took place between 8 a.m. and 5 p.m. CST.

4.2 PARTICIPANTS.

Participants were Preflight Specialists, Inflight Specialists, and EFAS Specialists from the Ft. Worth AFSS and TMCs from the Ft. Worth ARTCC. All participants were Full Performance Level (FPL) controllers/specialists.

4.3 OBSERVATION TOOLS.

Flowcharts and tables developed during the first stage of the JTA were used as check sheets and observation note forms. Appendix B contains sample forms.

4.4 JOB TASK ANALYSIS OBJECTIVES.

The principal objectives of the JTA were to:

- a. Determine high-level job tasks performed by AFSS Specialists and ARTCC TMCs in an operational setting;
- b. Determine the process by which the weather information required to perform those tasks is obtained and utilized; and
- c. Identify interpretation issues and usability requirements in order to improve future AFSS and ARTCC weather products and systems.

4.5 TESTING DESCRIPTIONS.

Not applicable.

4.6 DATA COLLECTION AND ANALYSIS METHOD.

4.6.1 Data Collection.

4.6.1.1 Ft. Worth AFSS Field Observations.

AFSS Specialists were briefed on the purpose of the JTA prior to the start of observations. Evaluators then observed specialists performing their normal job tasks. While observing the specialists, the evaluator utilized check sheets (see appendix B) to confirm information listed in the flowcharts and weather tables. In addition to visual observations, evaluators listened to specialist/pilot communications using an auxiliary headset. This allowed the evaluators to better understand the types of requests made by pilots and the processes that resulted. Approval was obtained from individual specialists prior to monitoring communications. Specialists were also asked questions regarding the use of systems or weather information.

At the end of the observations, users were debriefed. During the debriefing, users were asked to clarify any information not understood by the evaluator. The controllers were also free to ask any questions relating to the observation sessions and the check sheets.

4.6.1.2 Ft. Worth ARTCC Field Observations.

The observation procedure at the ARTCC was similar to that of the AFSS. TMCs were briefed on the purpose of the JTA prior to the start of observations. The TMU area is much smaller than the AFSS; therefore, it was difficult to actually sit with the TMCs. Instead, evaluators stood behind TMCs while they performed their job tasks.

While observing the TMCs, evaluators utilized check sheets (see appendix B) to confirm information listed in the flowcharts and weather tables. Because of the strong link between the CWSU and the TMC regarding weather, the evaluator also sat with the CWSU to better understand the type of information transferred from the CWSU to the TMC. When time permitted, TMCs were asked questions about their use of weather information.

At the end of the observation, users were debriefed. During the debriefing, controllers were asked to clarify any information not understood by the evaluator. Additionally, the TMCs were free to ask any questions relating to the observation sessions and the flow charts.

4.6.2 Analysis Methodology.

Information was gathered from the reference documents during the research stage of the JTA and was organized into flowcharts and weather information tables (see appendices C through G). Information in the flowcharts and weather tables was compared to the weather information in the Air Traffic Weather Needs and Requirements Report and the National Aviation Weather Program Plan to ensure a correlation between the information in the JTA data collection effort and these reports.

Following the field observations, information collected at the Ft. Worth AFSS and ARTCC was summarized. This information was compared to the original flowcharts and weather tables. Discrepancies were verified and necessary modifications were made to the flowcharts and tables.

The modified flowcharts and weather tables are located in appendices D through G. Instructions regarding the use of the flowcharts and weather tables are outlined in appendix C.

5. RESULTS AND DISCUSSION.

This section presents the findings of the JTA. Results discussed include comparisons of researched and observed job tasks and user-system interface issues.

5.1 JOB TASK COMPARISONS.

5.1.1 Preflight Specialists.

The majority of the information represented in the flowcharts was confirmed during the observation session. All of the specialists performed a self-brief when coming onto the position in lieu of making contact with the NWS or an EFAS Specialist for briefing information as indicated in figure 1 (see Preflight JTA, appendix D for all charts and tables). Making contact with the NWS or an EFAS Specialist was a task outlined in FAA 7110.10. It should be noted, sample size was small (n=9); therefore, it should not be assumed that contacting the NWS or an EFAS Specialist for briefing information does not occur in a larger population.

5.1.2 Inflight Specialists.

The following discrepancies were noted between the information gathered during the first stage of the JTA and the information obtained while observing specialists at the Ft. Worth AFSS:

a. Contrary to the flowchart depicted in figure 2, Ft. Worth AFSS does not monitor any of the NAVAIDs, Very High Frequency (VHF) Omnidirectional Range (VOR), etc. The FAA is currently moving this task out of the AFSSs (see Inflight JTA, appendix E for all charts and tables).

b. Ft. Worth AFSS monitors Meacham Field which is a controlled airport; therefore, local airport advisories are not provided to pilots by Inflight Specialists. Figure 3 depicts how local airport advisories are performed by specialists for uncontrolled airports.

c. The Transcribed Weather Broadcast (TWEB) is not broadcast at Ft. Worth AFSS; however, the facility does broadcast the Hazardous Inflight Weather Advisory Service (HIWAS) and record the Telephone Information Briefing Service (TIBS). Information normally disseminated during the TWEB is outlined in table 1. Similar information is broadcast during the HIWAS and recorded for the TIBS.

NOTE: Discrepancies mentioned are not considered critical and do not affect the core job tasks performed at the AFSS. All other inflight flowcharts and weather tables were confirmed.

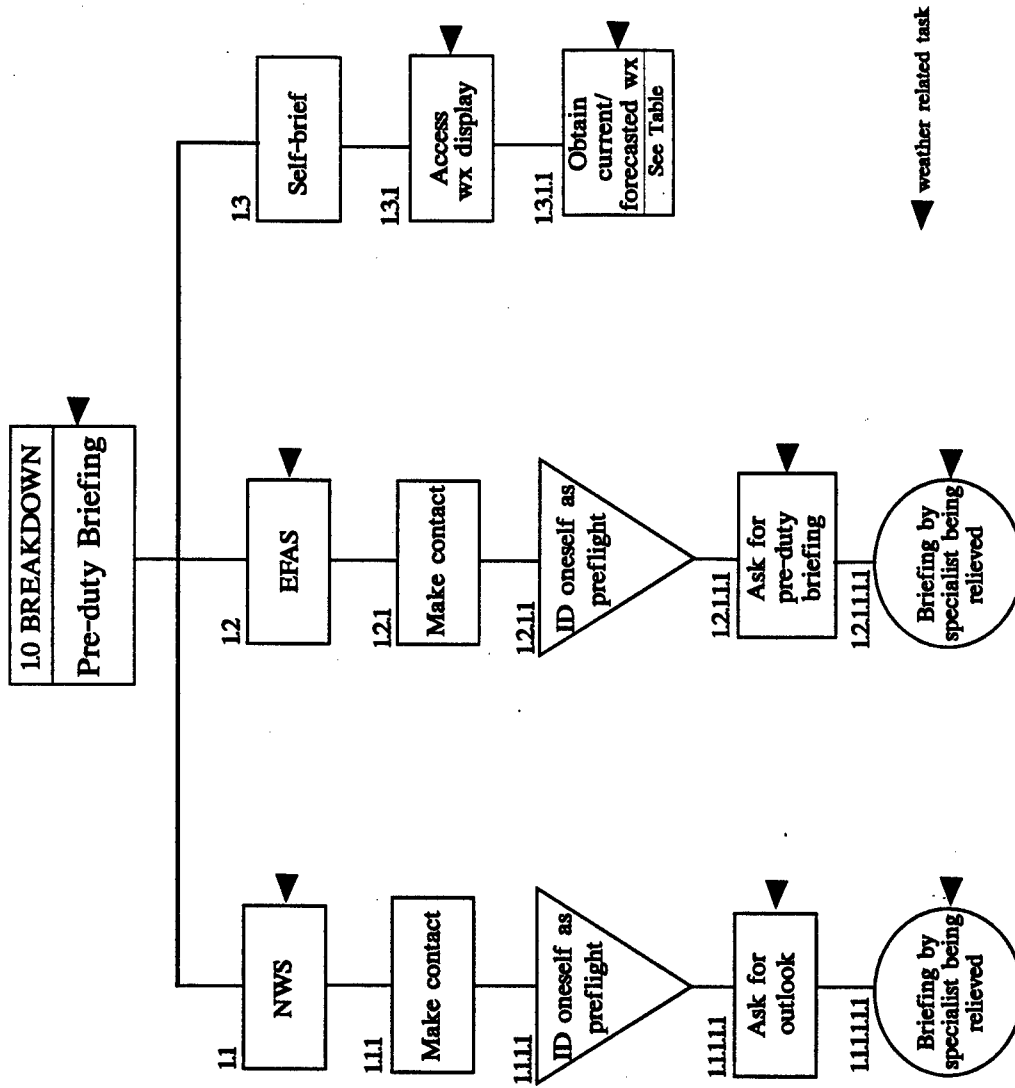


FIGURE 1. PREFLIGHT SPECIALIST SELF-BRIEFING FLOWCHART

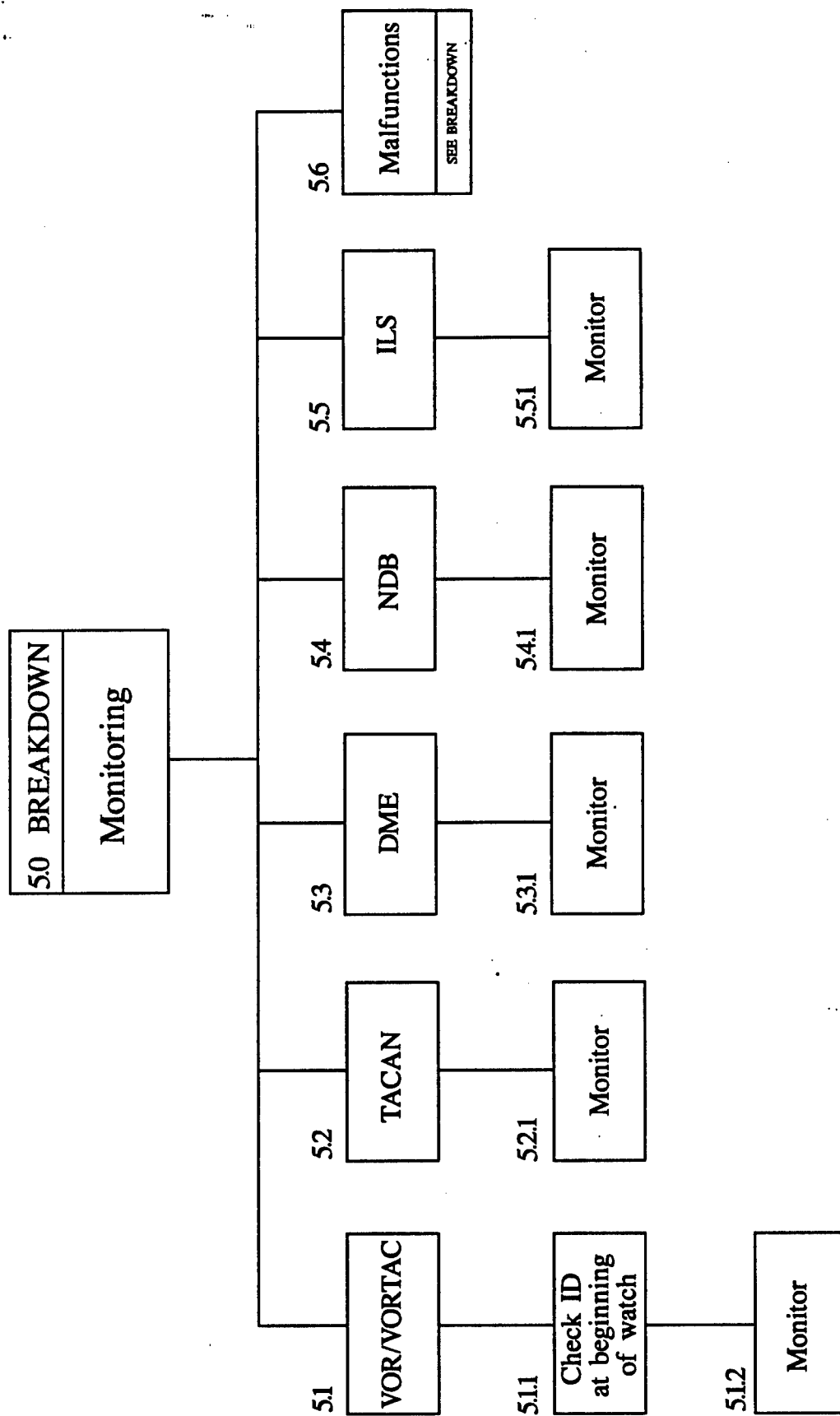


FIGURE 2. INFILIGHT SPECIALIST MONITORING FLOWCHART

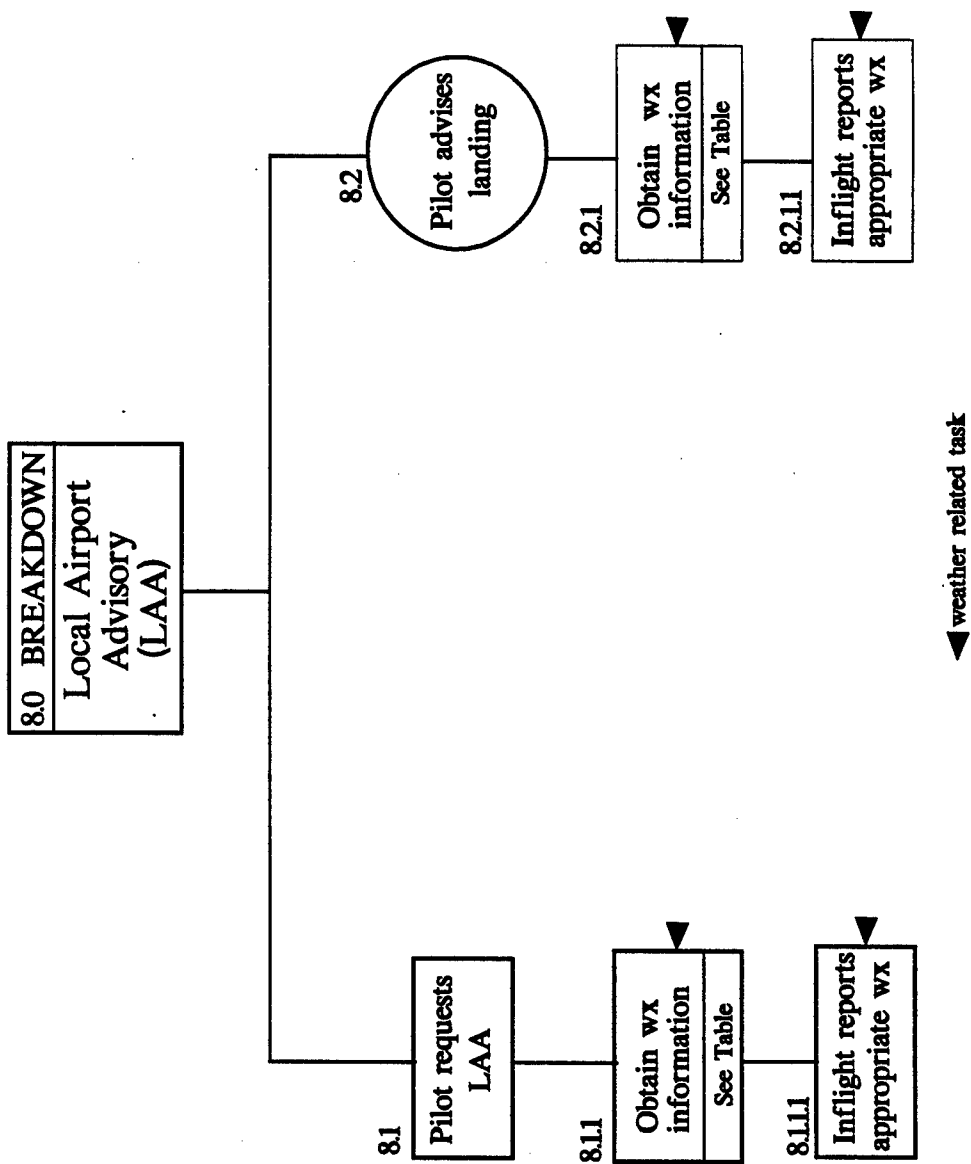


FIGURE 3. INFLIGHT SPECIALIST LOCAL AIRPORT ADVISORY FLOWCHART

TABLE 1. TRANSCRIBED WEATHER BROADCAST

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Obtain convective SIGMET	Issue hazardous wx	M1FC and facility made graphic wx		Text and graphics	Data is disseminated in broadcast
Obtain SIGMET	Issue hazardous wx	M1FC and facility made graphic wx		Text and graphics	Data is disseminated in broadcast
Obtain AIRMET	Issue hazardous wx	M1FC and facility made graphic wx		Text and graphics	Data is disseminated in broadcast
Obtain Center Wx Advisory	Issue hazardous wx	M1FC and facility made graphic wx		Text and graphics	Data is disseminated in broadcast
Obtain Severe Wx Watch	Issue hazardous wx	M1FC and facility made graphic wx		Text and graphics	Data is disseminated in broadcast

5.1.3 EFAS Specialists.

The information in the flow charts was confirmed during the observation sessions. (See EFAS JTA, appendix F for all charts and tables.)

5.1.4 Traffic Management Coordinators.

Information contained in the flowcharts regarding the job tasks performed by TMCs was confirmed during the observation sessions. (See TMC JTA, appendix G for all charts and tables.) TMU supervisors are briefed at the beginning of each shift by the CWSU meteorologists. Supervisors then brief the TMCs. This briefing was not originally listed in the flowcharts. The briefings given to both TMU supervisors and TMCs are updated as needed by the CWSUs.

5.2 USER-SYSTEM INTERFACE ISSUES.

This section discusses issues related to the user-system interface of weather systems currently in use at AT facilities (see paragraph 3.3). According to the report, Guidelines for Designing User Interface Software, there are six functional areas regarding user-system interfaces. These areas are:

- a. Data Entry - User input for data and computer responses to such input;
- b. Data Display - Output of data from a computer to the user including visual and auditory output;
- c. Sequence Control - Logical means by which user actions and computer responses are linked;
- d. User Guidance - Computer prompts and feedback that aid users in performing their tasks;
- e. Data Transmission - Computer mediated transmission of data; and
- f. Data Protection - Functional capabilities that guard against unauthorized data access or data loss.

During the JTA, issues directly related to the data entry, data display and sequence control functional areas were identified. Therefore, user interface issues will be discussed according to these functional areas.

5.2.1 Data Entry.

Results of the JTA regarding user-system interface data entry issues are discussed in this section.

5.2.1.1 AFSS.

The following AFSS issues were identified:

a. Most AFSS Specialists utilize locally produced graphics. These graphics are created by specialists using the text information from AIRMETS, SIGMETs, and Convective SIGMETs. Specialists utilize a drawing function on the vendor system to draw colored lines around the area affected by the meteorological warning (see figure 4). The process of manually drawing these graphics is time-consuming and tedious. If there are several AIRMETS or SIGMETs, creating the graphics can take up to 30 minutes. At Ft. Worth AFSS, the graphics are updated approximately every 2 to 3 hours.

b. Flight plans can be recorded using paper and pencil or using the M1FC. Flight plan filing on the M1FC is accomplished via a form-fill type screen. The specialist tabs to the appropriate field and types in the necessary information. During the observation sessions, it was noted by the evaluator that the form is not organized according to the way most flight plan information is disseminated. Several specialists had to continuously tab from the beginning of the form to the end of the form to enter data. There are slight format differences between paper and electronic flight plans.

5.2.1.2 TMC.

No data entry issues were identified for TMC systems.

5.2.2 Data Display.

Results of the JTA regarding user-system interface data display issues are discussed in this section.

5.2.2.1 AFSS.

The following AFSS issues were identified:

a. The area forecast and the enroute weather forecast are included in a standard weather briefing which is outlined in table 2. These forecasts are obtained from the M1FC in a text format. The forecasts are then confirmed using vendor graphic weather products, SAOs, locally produced graphics, and satellite

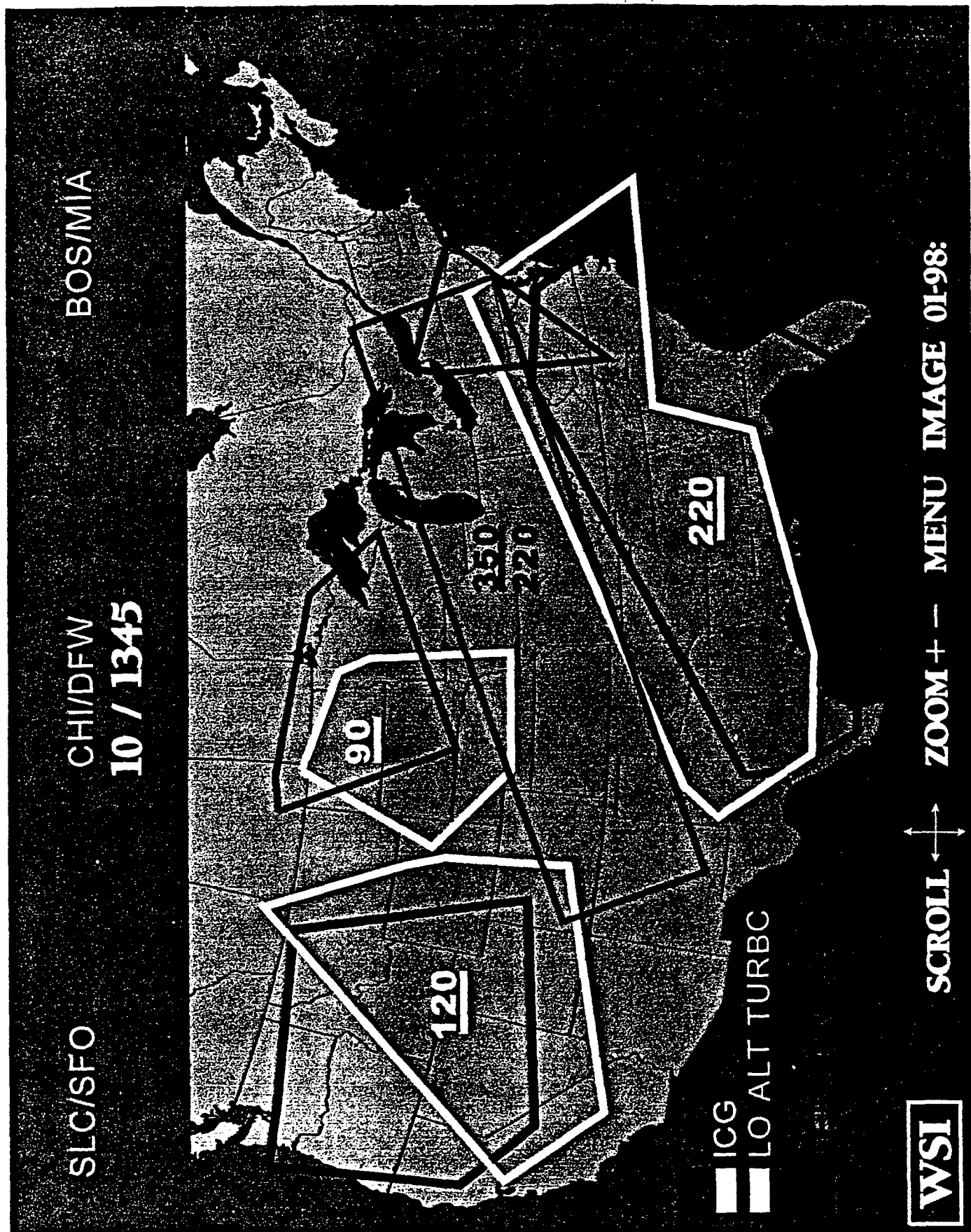


FIGURE 4. LOCALLY PRODUCED GRAPHICS

TABLE 2. STANDARD WEATHER BRIEFING M1FC OUTPUT

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Obtain adverse wx conditions	Check adverse wx that would affect flight	M1FC		Text	Adverse wx may alter flight plan
Obtain LLWAS	Check for Approach and Departure	M1FC	Confirm with PIREPs	Text	Light aircraft may be unable to navigate
Obtain thunder-storms	Check for Hazardous wx	M1FC, radars, and vendor graphic wx		Text and graphics	May cause delay or alter flight plan
Obtain icing	Check for Hazardous wx	M1FC and facility graphic wx	Confirm with PIREPs and verify info	Text and graphics	May make change in alt. Necessary
Obtain weather advisories	Check for hazardous wx	M1FC and vendor graphic wx	Confirm with radar and PIREPs	Text and graphics	May cause delay or alter flight plan
Obtain weather depiction	Look for areas of VFR/IFR	Vendor graphic wx	Confirm using GOES and SA	Graphics	Look for IFR cond./alternate airport
Obtain satellite imagery	Used to verify wx information	Vendor graphic wx	Compare to surface chart, SA, prog chart	Graphics	Monitoring of cloud coverage/ frontal zones
Obtain terminal forecast	Provides terminal area forecast	M1FC	Compare to SA conditions, and radar	Text	Provides wx in terminal area and airports

TABLE 2. STANDARD WEATHER BRIEFING (CONTINUED)

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Obtain synopsis	Provide locn and mvmt of wx systems	M1FC and vendor graphic wx	Compare to satellite imagery	Text and graphics	Used for short and long range briefing
Obtain current Conditions	Summarize SA's, PIREPs, RAREPs	M1FC	Confirm using M1FC and PIREPs	Text	Used to create a summary of current wx
Obtain en-route wx forecast	Provide forecast along route	M1FC and vendor graphic wx	Comparing text and graphic information	Text and graphics	Provide wx for climb, en route, descent
Obtain area forecast	Provide forecast along route	M1FC	Compare wx from M1FC to radar	Text	Summarizes hazardous wx over area
Look at prognosis Charts	Provide forecast along route	Vendor graphic wx		Graphics	Note deviations from FA and FT
Check destination forecast	Provide forecast wx for dstn.	M1FC		Text	Provides expected wx at destination
Obtain winds aloft	Provide wind speed and direction	M1FC and vendor graphic wx	Interpolate winds from M1FC btwn alt.	Text and graphics	Provide best altitude for flight
Obtain PIREPs	Request for pilot reports	Radio and M1FC	Used to confirm M1FC and vendor wx	Verbal info and text	Used to compare actual vs. forecast

imagery. Based on specialist comments, it appears these comparisons may increase task difficulty since the specialists are comparing textual weather information to graphical weather information. This difference in format is likely to increase interpretation time which, in turn, decreases task efficiency. The impact of this inefficiency would be greatest during time critical high traffic periods. Specialists reported the forecasts would be easier to use if they were in a graphical format.

b. The M1FC displays winds aloft at 3000, 6000, 9000, 12,000, 15,000, 18,000, 21,000, 24,000, 27,000, 30,000, 33,000, 36,000, and 39,000 feet above Mean Sea Level (MSL) (see appendix A). Most specialists directly read the winds at those flight levels; however, specialists may be asked to interpolate the winds aloft information between flight levels for the pilot. Given that specialists mentally interpolate winds aloft between flight levels, this process is likely to increase the amount of time spent analyzing and interpreting selected weather.

c. PIREPs are presented in a text format on the M1FC (see appendix A). PIREPs are used often to confirm information obtained from M1FC and the vendor weather systems. In addition, PIREPs are given to pilots as additional weather information when applicable. When PIREPs are received over the radio, the specialist must type the information into the M1FC. In order to use PIREPs effectively, specialists reported that they have to interpret the PIREPs and mentally place them along the route of flight.

d. M1FC provides large amounts of text information. Most of this information is considered to be quite valuable to the specialist; however, the users reported it was difficult to visualize and interpret. Additionally, specialists reported they must constantly filter considerable amounts of information at the time of a request. This filtering process is performed in order to better organize the information and make it more usable. For example, a standard weather briefing on the M1FC (see figure 5) presents information in the order of dissemination. However, if a specialist needs to obtain any other weather information (e.g., outlook briefing, abbreviated briefing), they must filter through the M1FC output and mentally organize it. The filtering process appears to impact EFAS Specialists more because they are responsible for a larger geographical area. The inflight specialist may be able to maintain a clearer picture of enroute weather since their area of responsibility is significantly smaller than the EFAS Specialist.

e. Both the M1FC and vendor weather systems display weather products that lack high-resolution data and that are not real-time. Specialists reported this was very frustrating as it

-40NW AND-ORF-180ESE SBY

REF WW 732:

TS BERYL IS MOVG NNEWD 5-10 KTS INTO SWRN GA. A LARGE AREA OF
CNVTN CONTS OVER NERN GLFMEX. STGST ACTVY WILL BE MOVG ONSHR
DURG NEXT SVRL HRS. GSTNRY FNT STRETCHES FM NERN NC TO SWRN NC
AND NRN AL TO CNTRL LA. TSTMS CONT BUT HAVE BEEN WKNG ALG NC CST.

HUDSON

WA REPORTS

BOSS WA 160955 AMD
AIRMET SIERRA UPDT 2 FOR IFR VALID UNTIL 161400

AIRMET IFR...NY OH PA WV VA...UPDT
FROM BGM TO AVP TO LYH TO ORF TO GSO TO 40SW BKW TO HNN TO ERI TO

16:12:40

PD
BGM

OCNL CIG BLO 10 VSBY BLO 3F. CONDS CONTG BYD 14Z ENDO 16Z.

....
BOST WA 160745
AIRMET TANGO UPDT 1 FOR TURBC VALID UNTIL 161400

NO SCFNT TURBC XPCD.

....
BOSZ WA 160745
AIRMET ZULU UPDT 1 FOR ICG AND FRZLVL VALID UNTIL 161400

FRZLVL...90-110 N OF YOW-PWM LN SLPG TO 140-160 S OF SBN-SLT-BDR
LN.

FAH REPORTS

NJ FAH--DATA MISSING
PA FAH--DATA MISSING
DE FAH--DATA MISSING
MD FAH--DATA MISSING

SD REPORTS

ACY 1130 PPIOM 161500=

16:12:40

PD

SA REPORTS

MIV SA 1150 E250 BKN 4F 233/62/58/2204/022/324 57
MDT SA 1150 M70 BKN 10 222/61/57/0000/019/ 212 55
CXY SA 1150 E60 BKN 12 60/54/2504/021
ACY SA 1151 240 -BKN 9 224/62/60/0000/019/ 322 1004 47453 TIDE MINUS
003 CITY 74 63
GWT SA--DATA MISSING
GWR SA--DATA MISSING
WWD SA 1155 AWOS CLR BLO 120 10 66/58/0000/021
WWD SA 1215 AWOS CLR BLO 120 10 67/58/0000/021
WWD SA 1235 AWOS CLR BLO 120 10 69/59/0000/021
PHL SA 1152 250 -BKN 7 220/64/55/0404/018/ 115 1001 61
DDV SA 1155 40 SCT E200 BKN 4F 227/65/62/0201/020/ 220 1501=
ILG SA 1150 70 SCT 250 -BKN 15 224/64/57/0206/019/ 220 1071 57
APG SA 1153 70 SCT 250 -BKN 7 227/64/59/0000/020=

FIGURE 5. STANDARD WEATHER BRIEFING M1FC OUTPUT

LNS SA 1145 -X 65 SCT 200 -BKN 5H 58/55/0000/019/H2
 UA REPORTS
 DDV UA /OV END/TM 1229/FL060/TP PA31/WX FV 4F/TB SMTH/RM S'BD ALG V16
 FT REPORTS
 MIV FT 160808 CLR 5F DCNL C50 BKN 3F.
 12Z C50 BKN 250 BKN 1706.
 22Z C30 BKN 80 OVC 1408.

16:12:41
 PD
 05Z C12 BKN 50 OVC 1307 CHC 4R-..
 MDT FT CDR 161108 1125Z CLR DCNL C50 BKN.
 13Z C50 BKN 250 BKN.
 19Z C25 BKN 50 OVC 1408.
 03Z C20 BKN 40 OVC 1506 CHC 4R-..
 07Z C12 BKN 30 OVC 1406 CHC CB OVC 3R-..
 CXY FT--DATA NOT DISTRIBUTED
 ACY FT 160808 250 SCT DCNL C50 BKN.
 12Z C50 BKN 250 BKN 1207.
 22Z C30 BKN 80 OVC 1407.
 06Z C12 BKN 50 OVC 1307 CHC 4R-..
 PHL FT 160808 250 -SCT DCNL C50 BKN.
 13Z C50 BKN 250 BKN 1706.
 23Z C50 BKN 80 OVC 1607.
 04Z C25 BKN 50 OVC 1207 CHC C12 BKN 30 OVC 4R-..
 DDV 1212 VRB03KT 6000 BR BKN200 QNH3005INS CIGND
 BECMG 1314 13007KT 8000 HZ SCT050 SCT120 BKN200 QNH3007INS CIG200
 BECMG 1920 17010KT 9000 HZ SCT035 BKN090 OVC200 QNH3005INS CIG090
 BECMG 0102 17005KT 6000 BR BKN035 OVC090 QNH3003INS CIG035
 VC-SHRA
 BECMG 0607 18009KT 4800 -RA BR SCT010 BKN020 OVC035 QNH3000INS
 CIG020 SKY -X=

16:12:41
 PD
 ILG FT 160808 CLR DCNL 50 SCT.
 09Z 50 SCT 250 -BKN DCNL 5F.
 13Z 50 SCT C100 BKN DCNL C50 BKN.
 21Z 30 SCT C50 BKN 1006 DCNL 15 SCT C30 BKN.
 04Z 25 SCT C40 OVC 1008 DCNL 15 SCT C25 BKN 4F CHC R=

FAC REPORTS
 BOSC FA 160845
 SYNOPSIS AND VFR CLDS/WX
 SYNOPSIS VALID UNTIL 170300Z
 CLDS/WX VALID UNTIL 162100... OTLK VALID 162100-170300Z
 ME NH VT MA RI CT NY LO NJ PA OH LE WV MD DC DE VA AND CSTL WTRS
 SEE AIRMET SIERRA FOR IFR CONDS AND MTN OBSCN.
 TSTMS IMPLY SVR OR QTR TURBC SVR ICG LLWS AND IFR CONDS
 NON MSL HGTS DENOTED BY AGL OR CIG.
 SYNOPSIS... SFC HI CNTRD OVR PA AT 09Z WL MOV EWD OVR NJ CSTL WTRS
 BY 03Z. QSTNRY FNT FM ATLC WWD THRU NC WL CHG LTL THRU 03Z.
 ...KERR..

FIGURE 5. STANDARD WEATHER BRIEFING M1FC OUTPUT (Continued)

16:12:41

PD

NJ ERN PA... SCT CI WITH QCNL 30 SCT-BKN 80 137 50 BKN 80

OTLK... VFR.

WRN AND CNTRL PA... CLR. VSBYS SWRN PA 3-5F 147 50 SCT

OTLK... VFR.

MD DC DE VA

MD DC DE AND NRN VA... 50 BKN-SCT 100 BKN 150 187 30 SCT-BKN 50

OVC 150. OTLK... VFR.

SRN VA... 15-25 SCT-BKN 30-50 OVC 150 WITH QCNL VSBYS 3-5R-F.

OTLK... MVFR CIG R F.

CSTL WTRS

N OF SBY... SCT-BKN CI. OTLK... VFR.

S OF SBY... 30-50 SCT-BKN 80 BKN-OVC 150 WITH WDLY SCT RW-/TRW-.

CB TOPS TO 400. OTLK... MVFR CIG R F.

....

FD REPORTS

	FOR USE	3000	6000	9000	12000	18000	24000	30000	34000	39000
ACY 1609-18 F2	9900	2810+10	2818+08	2820+05	2624-09	2628-21	274936	266646	267255	
EMI 1609-18 F2	9900	2509+09	2716+08	2716+05	2624-09	2528-21	264836	256446	257155	
	FOR USE	45000	53000							
ACY	FD--DATA MISSING									

16:12:41

PD

FOR USE 45000 53000

EMI 1609-18 F9 264560 273461

NO REPORTS

!MIV 08/037 MIV 14-32 CLSD

!MDT 08/001 MDT 13-31 CLSD 0415-0900 DLY EFF 170415-180900

!MDT 08/002 MDT 13-31 NW 1000 CLSD EFF 161300-1930

!CXY 04/003 CXY 8 SFL OTS 0200-0959 DLY

!ACY 08/026 ACY 13-31 CLSD EFF 160930-161330

!ACY 08/027 ACY ILS GS OTS EFF 161300-162100

!MIV 08/065 VCN PAJA 3NMR VCN355010 10500/BLO EFF 161700-2355

!PHL 07/049 PHL 9L-27R RCLS OTS

!DOV 08/001 DOV 19 SFL OTS

!ILG 08/008 ILG 9-27 CLSD

!DCA 06/085 PPM VOR OTS

!LNS 08/007 LNS ILS GS OTS

!IPT 08/042 RAV R5B02A/B ACTV EFF 172030-180200

!FDC 4/3454 FDC FI/P U.S. GOVERNMENT FLIGHT INFORMATION -

AIRPORT/FACILITY DIRECTORY EFFECTIVE 23 JUN

TO 18 AUG 1994: VOLUMES OF NORTHEAST AND EAST

CENTRAL HAVE BEEN REPORTED TO HAVE DUPLICATE

AND MISSING PAGES. OTHER VOLUMES COULD BE

INVOLVED. THIS IS A RANDOM PROBLEM CAUSED BY

16:12:41

PD

A GOVERNMENT PRINTING CONTRACTOR. CHECK ALL

BOOKS AND CONTACT NOAA DISTRIBUTION, RIVERDALE,

MD, TELEPHONE 800-638-8972 FOR A FREE RFPI ACFMNT

!FDC 4/3786 FDC FI/T U.S. GOVERNMENT FLIGHT INFORMATION PUBLICATION:
PACIFIC CHART SUPPLEMENT (PCS) AMENDMENTS NOTICE EFFECTIVE

FIGURE 5. STANDARD WEATHER BRIEFING M1FC OUTPUT (Continued)

21 JULY 1994 TO 18 AUGUST 1994: (TERMINAL PROCEDURE FOR
BEDFORD, INDIANA VS PCS AMEND NOTICE). ALL CORRECTED CIVILIAN
SHIPMENTS OF THE PCS AMEND NOTICE WERE REDISTRIBUTED ON
FRIDAY 15 JULY 1994. CONTACT NOAA DISTRIBUTION, RIVERDALE, MD.
TELEPHONE 800-638-8972 IF ORDER NOT RECEIVED.

AC REPORTS

MKC AC 160700

CONVECTIVE OUTLOOK...REF AFDS NMCOPH940

VALID 161200 - 171200Z

REF WW 731...VALID UNTIL 0900Z.

THERE IS A SLGT RISK OF SVR TSTMS TO THE RGT OF A LN FM 30 WSW AGG
MAI ATL 45 SSE TYS TRI PSK DAN RWI 30 S EWN CONT 35 SE JAX
25 NNW PIE.

16:12:41

PD

THERE IS A SLGT RISK OF SVR TSTMS TO THE RGT OF A LN FM 25 NE ELO
DLH STC MHE ANW LBF SNY 30 SW BFF 45 SW REJ 35 N DIK 45 N MOT

GEN TSTMS ARE FCST TO THE RGT OF A LN FM 20 W YUM TRM NID
40 S TVL TVL RND LOL 25 N ELY DPO OOD PIH 45 ENE 63S ...CONT...IWD
EAU RST HLC GCK LBL 30 ESE AMA 45 ESE LBB MWL DAL 20 NNE SHV MIU
MCB MOB 25 NNW CEW TOI CHA LOZ JKL CRW EKN DCA 20 E WAL.

T.S. BERYL CONTS TO DRIFT ERRATICALLY INVOF PAM...AND WAS POORLY
INITIALIZED BY 16/00Z ETA/NGM/AVN MDLS. COORD WITH NHC
FASTER/FARTHER W FCSTS OF NGM/ETA SEEM UNRSNBL GIVEN CURRENT TRENDS
OF LTL OR NO TRANSLATION. MDL FCST OF STQ HB-H7 JETS ARND ERN SIDE
OF THIS SYS ARE RSNBL GIVEN XPCD TIGHT GRADS BTWN BERYL REMNANTS
AND BERMUDA HIGH. FCST RAOBS AND GRIDDED PROGS...ADJUSTED FOR XPCD
SLOWER TRANSLATION OF SYS...INDC STG LOW LVL SPD/DIR SHEAR ACRS
MUCH OF SERN U.S. OTLK AREA. HELICITIES TO NR 200 J/KG IN PROCD
SNDGS INDC POT FOR MESOCYCLOES...BUT CRTST CAVEAT WL BE MINIMAL
INSTBY AS IMPLIED BY NEARLY SATURATED FCST SNDGS AND HIGH NGM MEAN
RH FIELDS. MID LVL DRY AIR ENTRAINMENT INTO CRCLN WL AID POT
INSTBY. STG/SVR TSTMS ARE MOST FAVORED WHERE INSOLATION IS
SUSTAINED AND CONTRIBUTES SOFTLY TO LOW LVL INSTBY. ISOLD

16:12:41

PD

TORNADOES ARE PSBL...MAINLY E OF THE CENTER TRACK

AMS ACRS PTNS NRN AND N CNTRL PLAINS IS FCST TO DSTBLZ SOFTLY THIS
AFTN...WITH -8 LI'S AND CAPES >3000 J/KG FROM NWRN NEB TO SRN/SERN
ND. ALTHOUGH MID/UPR LVL SUPPORT IS PROCD TO BE RATHER WK SEC
CDFNT WL MOV SEWD INTO NRN PTNS OF THIS RGN AND PROVIDE SOME LIFT.
FCST RAOBS AND GRIDDED PROGS INDC LACK OF LOW LVL MSTR BUT SEC
ANALYSES SHOW LOW/MID 60S DEWPTS OVR PTNS OF THIS RGN. BLV GRIDDED
ETA BNDRY LYR DEWPT PROGS ACRS NRN PLAINS MAY BE SMWHT LOW BASED ON
CRNT ANALYSES AND EVAPOTRANSPIRATIVE EFFECTS. WITH STG
INSOLATION...PSEUDOADIABATIC LAPSE RATES OCCUR IN MODIFIED FCST
SNDGS...RESULTING IN HIGH-BASED CNVTN AND RISK OF DRY MICROBURSTS.
LRG HAIL IS ALSO PSBL.

FIGURE 5. STANDARD WEATHER BRIEFING M1FC OUTPUT (Continued)

increased the specialist's lack of confidence in their weather information. This lack of confidence increases the likelihood of making more comparisons across systems and products to ensure accuracy. This leads to increased interpretation time.

5.2.2.2 TMC.

As mentioned earlier, TMCs receive most of their pre-duty weather and weather updates from the CWSU meteorologist (see paragraph 3.3.2). However, since CWSU meteorologists operate during limited hours usually between 6 a.m. and 10 p.m.; therefore, TMCs are required to interpret radar and other products presented on the MWP briefing terminals. Most of the weather information on the MWP is in a graphic format; however, some products such as AIRMETS, SIGMETs and Convective SIGMETs, are presented in a text format. TMCs indicated these products might be more efficiently represented in a graphical format.

5.2.3 Sequence Control.

Results from the JTA involving issues related to user-system interface sequence control issues are discussed in this section.

5.2.3.1 AFSS.

The following user-system interface sequence control issues were identified:

a. The WSI graphical weather displays at the Ft. Worth AFSS are accessed via a keypad on which the specialist types the number of the display needed. Most specialists have the numbers for the more commonly used displays memorized; however, when the specialist cannot remember a display number, they must look through a list of 98 display titles to find the appropriate display number. This appears to be both time-consuming and frustrating. The Kavouras, Inc. graphical weather displays are also accessed via a keypad. However, Kavouras menus have a more semantic representation where specialists have titles associated with the top-level menus and use numerics to access submenus. This representation has a possible drawback of having a user becoming "lost" in the layering of the submenus.

b. Commands for the MIFC must be typed in. This is not a problem for a single item request; however, when a pilot requests several pieces of information, or when the specialist has to obtain weather information from another area of the country, these commands become tedious. In addition, it was noted during the observation sessions that typing errors increased frustration levels and response time. Typing errors also resulted in the retrieval of incorrect information.

5.2.3.2 TMC.

During the evaluation, it was noted that the TMCs had to access several weather systems to retrieve all of the necessary weather (ASD, MWP, KBVT). This normally occurred when the CWSU meteorologist was off duty. Each of these systems has a different user-system interface. Therefore, TMCs are using several different systems each with unique interfaces to access necessary weather. This was reported by the TMCs to be time-consuming.

6. CONCLUSIONS.

In general, the information gathered during the observations verified the Job Task Analysis (JTA) flowcharts and weather tables. In addition to the flowchart verifications, issues involving the handling, availability, and interpretation of weather information were noted.

The following conclusions were reached:

a. Accessing and comparing weather information from several systems to ensure weather accuracy (see paragraph 5.2.2.1, 5.2.3.2) is time-consuming and may lead to increased task difficulty as well as increased levels of workload.

b. Attempting to relate graphical and textual weather information (see paragraph 5.2.2.1) may increase the amount of mental interpretation required to properly utilize products. Increased interpretation may lead to increased levels of task difficulty and workload.

c. The need to read, interpret and mentally filter several pages of Model 1 Full Capacity (M1FC) text (see paragraph 5.2.2.1) is time-consuming and inefficient.

d. Locally produced graphics are an attempt at reducing the amount of textual information (see paragraph 5.2.1.1); however, the process of creating these graphics is time-consuming and needs to be improved.

e. Command line interfaces (typing in requests) on some of the current weather systems are tedious and time-consuming (see paragraph 5.2.3.1). Additionally, this interaction becomes time consuming and frustrating when typographical errors are made.

f. Current vendor graphic weather systems are based on a user interface that is not efficient and requires too many user inputs for each request and/or action (see paragraph 5.2.3.1).

7. RECOMMENDATIONS.

Based on the above mentioned conclusions, several recommendations for new aviation weather products are suggested. The following recommendations should be utilized in the development of future systems and products:

a. Integrate weather products onto one existing platform or create a single weather platform that allows Air Traffic (AT) personnel to access all necessary weather information. This will eliminate time spent comparing weather information from one system to that obtained from another system.

b. Spatial and temporal products (e.g., icing, turbulence, precipitation, winds aloft) should be represented graphically. In contrast, highly detailed, site-specific weather information (e.g., Surface Aviation Observations (SAOs), Terminal Forecasts) should be presented to the user in a textual format. Regardless of format, all information should be presented using one system. This report's findings correlate with the findings from the Guidelines for Designing User Interface Software report in that both reports suggest graphical representation be used to display data showing relations in space and time.

c. Organize large outputs of weather information in a meaningful manner so as to not overload the controller or specialist. This may be best accomplished by organizing weather information in smaller and more applicable formats. The output should be tailored to individual tasks. For example, a product-by-product output resembling the sequence of a standard weather briefing would provide smaller, more meaningful pieces of information for specialists.

d. The creation of locally produced graphics should be automated.

e. Design user interfaces so that controllers and specialists can accomplish a task using as few steps as possible. The menuing system should be organized so that it represents the nature of the tasks to be completed. It should be noted that an intuitive and efficient interface may require both trackball type, command line, and function key input.

f. Pilot Reports (PIREPs) may be represented more efficiently in a graphical presentation. Some specialists reported that they mentally place PIREPs along the route of flight. Graphical depiction of PIREPs along the route of flight could relieve controllers from this mental tracking task.

8. ACRONYMS.

AAR	-	Airport Acceptance Rate
AFOS	-	Automated Family Of Services
AFSS	-	Automated Flight Service Station
AIRMET	-	Airmen Meteorological Information
ARTCC	-	Air Route Traffic Control Center
ASD	-	Aircraft Situation Display
ASP	-	Airport Sequencing Program
AT	-	Air Traffic
ATC	-	Air Traffic Control
ATCF	-	Air Traffic Control Facility
ATCSCC	-	Air Traffic Control System Command Center
AWC	-	Aviation Weather Center
AWR	-	Aviation Weather Research
CWA	-	Center Weather Advisory
CWSU	-	Center Weather Service Unit
DF	-	Direction Finder
DME	-	Distance Measuring Equipment
DSTN	-	Destination
EFAS	-	Enroute Flight Advisory Service
ETA	-	Estimated Time of Arrival
ETD	-	Estimated Time of Departure
FA	-	Area Forecast
FAA	-	Federal Aviation Administration
FD	-	Winds Aloft
FPL	-	Full Performance Level
FRZGLVL	-	Freezing Level
FT	-	Terminal Forecast
GOES	-	Geostationary Operational Environmental Satellite
HIWAS	-	High Altitude Weather Alert Service
ID	-	Identification
IFR	-	Instrument Flight Rules
ILS	-	Instrument Landing System
JTA	-	Job Task Analysis
K Index	-	Lifted Index
KBVT	-	Keyboard Video Terminal
LAA	-	Local Airport Advisory
LABS	-	Leased Service AB
LLWAS	-	Low Level Windshear Alert System
LOCN	-	Location
LSAS	-	Leased Service A System
M1FC	-	Model 1 Full Capacity
MOA	-	Military Operation Area
MSL	-	Mean Sea Level
MVMT	-	Movement
MWP	-	Meteorologist Weather Processor
NAS	-	National Airspace System
NAVAID	-	Navigational Aid

NDB	-	Non-directional Beacon
NEXRAD	-	Next Generation Radar
NOTAM	-	Notice to Airmen
NMC	-	National Meteorological Center
NWS	-	National Weather Service
PIREP	-	Pilot Report
RADAT	-	Radio Sound Observation Data
RAREP	-	Radar Report
RH	-	Relative Humidity
RT	-	Real Time
RVR	-	Runway Visual Range
RVV	-	Runway Visibility Value
SAO	-	Surface Aviation Observation
SD	-	Radar Report
SIGMET	-	Significant Meteorological Information
TACAN	-	Tactical Air Navigation Station
TIBS	-	Telephone Information Broadcast Service
TRACON	-	Terminal Radar Approach Control
TMC	-	Traffic Management Coordinator
TMC-T	-	Traffic Management Coordinator - Terminal
TMS	-	Traffic Management System
TMU	-	Traffic Management Unit
TWEB	-	Transcribed Weather Broadcast
VFR	-	Visual Flight Rules
VHF	-	Very High Frequency
VIP	-	Video Integrator Processor
VOR	-	VHF Omnidirectional Range
VORTAC	-	VHF Omnidirectional Range TACAN
WA	-	Airmet
WS	-	Sigmet
WSI	-	Weather Services International
WST	-	Convective Sigmet
WW	-	Severe Weather Watch
WX	-	Weather

Appendix A
Model 1 Full Capacity Output

HUDSON

WA REPORTS

BOSS WA 160955 AMD
AIRMET SIERRA UPDT 2 FOR IFR VALID UNTIL 161400

AIRMET IFR...NY OH PA WV VA...UPDT
FROM BGM TO AVP TO LYH TO ORF TO QSO TO 40SW BKW TO HNN TO ERI TO

16:12:40

PD

BGM

OCNL CIG BLO 10 VSBY BLO 3F. CONDS CONTG BYD 14Z ENDS 16Z.

....
BOST WA 160745
AIRMET TANGO UPDT 1 FOR TURBC VALID UNTIL 161400

NO SGFNT TURBC XPCD.

....
BOSZ WA 160745
AIRMET ZULU UPDT 1 FOR ICG AND FRZLVL VALID UNTIL 161400

FRZLVL...90-110 N OF YOW-PWM LN SLPG TO 140-160 S OF SBN-SLT-BDR
LN.

FIGURE A-1. M1FC OUTPUT OF WEATHER SYNOPSIS

-40NW AND-DRF-180ESE SBY

REF WW 732.

TS BERYL IS MOVG NNEWD 5-10 KTS INTO SWRN GA. A LARGE AREA OF
CNVTN CONTS OVER NERN GLFMEX. STGST ACTVTY WILL BE MOVG ONSHR
DURG NEXT SVRL HRS. GSTNRY FNT STRETCHES FM NERN NC TO SWRN NC
AND NRN AL TO CNTRL LA. TSTMS CONT BUT HAVE BEEN WKNG ALQ NC CST.

FIGURE A-2. M1FC OUTPUT OF SEVERE WEATHER WARNINGS

FAH REPORTS	
NJ	FAH--DATA MISSING
PA	FAH--DATA MISSING
DE	FAH--DATA MISSING
MD	FAH--DATA MISSING

FIGURE A-3. M1FC OUTPUT OF AREA WEATHER HAZARDS

MKC AC 160700

CONVECTIVE OUTLOOK...REF AFOS NMC6PH940

VALID 161200 - 171200Z

REF WW 731...VALID UNTIL 0900Z.

THERE IS A SLGT RISK OF SVR TSTMS TO THE RGT OF A LN FM 30 WSW AGG
 MAI ATL 45 SSE TYS TRI PSK DAN RWI 30 S EWN ...CONT 35 SE JAX
 25 NNW PIE.

16:12:41

PD

THERE IS A SLGT RISK OF SVR TSTMS TO THE RGT OF A LN FM 25 NE ELO
 DLH STC MHE ANW LBF SNY 30 SW BFF 45 SW REJ 35 N DIK 45 N MOT.

GEN TSTMS ARE FCST TO THE RGT OF A LN FM 20 W YUM TRM NID
 40 S TVL TVL RNO LDL 25 N ELY DPG OGD PIH 45 ENE 63S ...CONT...IWD
 EAU RST HLC QCK LBL 30 ESE AMA 45 ESE LBB MWL DAL 20 NNE SHV MLU
 MCB MOB 25 NNW CEW TOI CHA LOZ JKL CRW EKN DCA 20 E WAL.

T. S. BERYL CONTS TO DRIFT ERRATICALLY INVOF PAM...AND WAS POORLY
 INITIALIZED BY 16/00Z ETA/NGM/AVN MDLS. COORD WITH NHC.
 FASTER/FARTHER W FCSTS OF NGM/ETA SEEM UNRSNBL GIVEN CURRENT TRENDS
 OF LTL OR NO TRANSLATION. MDL FCST OF STG HB-H7 JETS ARND ERN SIDE
 OF THIS SYS ARE RSNBL GIVEN XPCD TIGHT GRADS BTWN BERYL REMNANTS
 AND BERMUDA HIGH. FCST RAOBS AND GRIDDED PROGS...ADJUSTED FOR XPCD
 SLOWER TRANSLATION OF SYS...INDC STG LOW LVL SPD/DIR SHEAR ACRS
 MUCH OF SERN U. S. OTLK AREA. HELICITIES TO NR 200 J/KG IN PROGD
 SNDGS INDC POT FOR MESOCYCLONES...BUT CRTST CAVEAT WL BE MINIMAL
 INSTBY AS IMPLIED BY NEARLY SATURATED FCST SNDGS AND HIGH NGM MEAN
 RH FIELDS. MID LVL DRY AIR ENTRAINMENT INTO CRCLN WL AID POT
 INSTBY. STG/SVR TSTMS ARE MOST FAVORED WHERE INSOLATION IS
 SUSTAINED AND CONTRIBUTES SCFNTLY TO LOW LVL INSTBY. ISOLD

16:12:41

PD

TORNADOES ARE PSBL...MAINLY E OF THE CENTER TRACK.

AMS ACRS PTNS NRN AND N CNTRL PLAINS IS FCST TO DSTBLZ SCFNTLY THIS
 AFTN...WITH -B LI'S AND CAPES >3000 J/KG FROM NWRN NEB TO SRN/SERN
 ND. ALTHOUGH MID/UPR LVL SUPPORT IS PROGD TO BE RATHER WK SEC
 CDFNT WL MOV SEWD INTO NRN PTNS OF THIS RGN AND PROVIDE SOME LIFT.
 FCST RAOBS AND GRIDDED PROGS INDC LACK OF LOW LVL MSTR. BUT SEC
 ANALYSES SHOW LOW/MID 60S DEWPTS OVR PTNS OF THIS RGN. BLV GRIDDED
 ETA BNDRY LYR DEWPT PROGS ACRS NRN PLAINS MAY BE SMWHT LOW BASED ON
 CRNT ANALYSES AND EVAPOTRANSPIRATIVE EFFECTS. WITH STG
 INSOLATION...PSEUDOADIABATIC LAPSE RATES OCCUR IN MODIFIED FCST
 SNDGS...RESULTING IN HIGH-BASED CNVTN AND RISK OF DRY MICROBURSTS.
 LRG HAIL IS ALSO PSBL.

FIGURE A-4. M1FC OUTPUT OF CONVECTIVE OUTLOOKS

PD

SA REPORTS

MIV SA 1150 E250 BKN 4F 233/62/58/2204/022/324 57
MDT SA 1150 M70 BKN 10 222/61/57/0000/019/ 212 55
CXY SA 1150 E60 BKN 12 60/54/2504/021
ACY SA 1151 240 -BKN 9 224/62/60/0000/019/ 322 1006 47653 TIDE MINUS
003 CITY 74 63
GWT SA--DATA MISSING
GWR SA--DATA MISSING
WWD SA 1155 AWOS CLR BLD 120 10 66/58/0000/021
WWD SA 1215 AWOS CLR BLD 120 10 67/58/0000/021
WWD SA 1235 AWOS CLR BLD 120 10 69/59/0000/021
PHL SA 1152 250 -BKN 7 220/64/55/0404/018/ 115 1001 61
DOV SA 1155 40 SCT E200 BKN 4F 227/65/62/0201/020/ 220 1501=
ILG SA 1150 70 SCT 250 -BKN 15 224/64/57/0206/019/ 220 1071 57
APG SA 1153 70 SCT 250 -BKN 7 227/64/59/0000/020=

FIGURE A-5. M1FC OUTPUT OF SURFACE AVIATION OBSERVATIONS

FT REPORTS

MIV FT 160808 CLR 5F OCNL C50 BKN 3F.
 12Z C50 BKN 250 BKN 1706.
 22Z C30 BKN 80 OVC 1408.

16:12:41

PD

05Z C12 BKN 50 OVC 1307 CHC 4R-..

MDT FT CDR 161108 1125Z CLR OCNL C50 BKN.
 13Z C50 BKN 250 BKN.

19Z C25 BKN 50 OVC 1408.

03Z C20 BKN 40 OVC 1506 CHC 4R-..

07Z C12 BKN 30 OVC 1406 CHC CB OVC 3R-..

CXY FT--DATA NOT DISTRIBUTED

ACY FT 160808 250 SCT OCNL C50 BKN.

12Z C50 BKN 250 BKN 1207.

22Z C30 BKN 80 OVC 1407.

06Z C12 BKN 50 OVC 1307 CHC 4R-..

PHL FT 160808 250 -SCT OCNL C50 BKN.

13Z C50 BKN 250 BKN 1706.

23Z C50 BKN 80 OVC 1607.

04Z C25 BKN 50 OVC 1207 CHC C12 BKN 30 OVC 4R-..

DDV 1212 VRB03KT 6000 BR BKN200 QNH3003INS CIGND

BECMG 1314 13007KT 8000 HZ SCT050 SCT120 BKN200 QNH3007INS CIG200

BECMG 1920 17010KT 9000 HZ SCT035 BKN090 OVC200 QNH3005INS CIG090

BECMG 0102 17005KT 6000 BR BKN035 OVC090 QNH3003INS CIG035

VC-SHRA

BECMG 0607 18009KT 4800 -RA BR SCT010 BKN020 OVC035 QNH3000INS

CIG020 SKY -X=

FIGURE A-6. M1FC OUTPUT OF TERMINAL FORECASTS

FAC REPORTS

BOSC FA 160845

SYNOPSIS AND VFR CLDS/WX

SYNOPSIS VALID UNTIL 170300Z

CLDS/WX VALID UNTIL 162100...OTLK VALID 162100-170300Z

ME NH VT MA RI CT NY LD NJ PA OH LE WV MD DC DE VA AND CSTL WTRS

SEE AIRMET SIERRA FOR IFR CONDS AND MTN OBSCN.

TSTMS IMPLY SVR OR GTR TURBC SVR ICG LLWS AND IFR CONDS

NON MSL HGTS DENOTED BY AGL OR CIG.

SYNOPSIS...SFC HI CNTRD OVR PA AT 09Z WL MOV EWD OVR NJ CSTL WTRS
BY 03Z. GSTNRY FNT FM ATLC WWD THRU NC WL CHG LTL THRU 03Z.

PD

NJ ERN PA...SCT CI WITH QCNL 50 SCT-BKN 80 13Z 50 BKN 80

OTLK...VFR.

WRN AND CNTRL PA...CLR. VSBYS SWRN PA 3-5F. 14Z 50 SCT

OTLK...VFR.

MD DC DE VA

MD DC DE AND NRN VA...50 BKN-SCT 100 BKN 150 18Z 30 SCT-BKN 50

OVC 150. OTLK...VFR.

SRN VA...15-25 SCT-BKN 30-50 OVC 150 WITH QCNL VSBYS 3-5R-F.

OTLK...MVFR CIG R F.

CSTL WTRS

N OF SBY...SCT-BKN CI. OTLK...VFR.

S OF SBY...30-50 SCT-BKN 80 BKN-OVC 150 WITH WDLY SCT RW-/TRW-.

CB TOPS TO 400. OTLK...MVFR CIG R F.

FIGURE A-7. M1FC OUTPUT OF AREA FORECASTS

....

			FD	REPORTS						
	FOR USE	3000	6000	9000	12000	18000	24000	30000	34000	39000
ACY	1609-18 F2	9900	2810+10	2818+08	2820+05	2624-09	2628-21	274936	266646	26725
EMI	1609-18 F2	9900	2509+09	2716+08	2716+05	2624-09	2528-21	264836	256446	257
	FOR USE	45000	53000							
ACY	FD--DATA MISSING									

16:12:41

PD

	FOR USE	45000	53000
EMI	1609-18 F9	264560	273461

FIGURE A-8. M1FC OUTPUT OF WINDS ALOFT

UA REPORTS

DDV UA /OV END/TM 1229/FL060/TP PA31/WX FV 4F/TB SMTH/RM S'BD ALG V16

FIGURE A-9. M1FC OUTPUT OF PIREPs

M1FC Abbreviated Text

-40NW AND-DRF-180ESE SBY

REF WW 732.

TS BERYL IS MOVG NNEW 5-10 KTS INTO SWRN GA. A LARGE AREA OF
CNVTN CONTS OVER NERN GFMEX. STGST ACTVTY WILL BE MOVG ONSHR
DURG NEXT SVRL HRS. QSTNRY FNT STRETCHES FM NERN NC TO SWRN NC
AND NRN AL TO CNTRL LA. TSTMS CONT BUT HAVE BEEN WKNG ALG NC CST.

Standard Text

Tropical Storm Beryl is moving North-Northeastward 6 to 10 Knots into Southwestern Georgia. A large area of convection continues over Northeastern Gulf of Mexico. Strongest activity will be moving on shore during next several hours. Quasi-stationary front stretches from Northeastern North Carolina to Southwestern North Carolina and Northern Alabama to Central Alabama. Thunderstorms continue but have been weakening along North Carolina Coast.

FIGURE A-10. CONVERSATIONS OF M1FC ABBREVIATED TEXT

Appendix B
Observation Tools

Observation Notes
Inflight Specialist

1.3.1.1 Obtain Current and Forecasted Weather

1.3.1.1.1 Obtain Current and Forecasted Weather

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Obtain adverse wx conditions	Perform self brief	M1FC and vendor graphic wx		Text and graphics	May cause pilot to change flight plan
Obtain LLWAS	Check for approach and departure	M1FC	Confirm using PIREPS	Text	Light aircraft may be affected by LLWAS
Obtain thunder-storms	Check for Hazardous wx	M1FC, radar, and vendor graphic wx		Text and graphics	May cause change in flight plan
Obtain icing and turbulence	Check for hazardous wx	M1FC, facility graphic wx, and vendor graphics wx	Confirm with PIREPS/verify intensity	Text and graphics	May make change in altitude and flight plan necessary

1.3.1.1 Obtain Current and Forecasted Weather (Continued)

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Obtain weather Advisories	Check for Hazardous wx	M1FC and facility graphic wx	Confirm with radar and PIREPs	Text and graphics	may cause change in flight plan
Obtain weather depiction	Look for areas of VFR/IFR	M1FC and vendor graphic wx	Confirm using GOES and SA	Text and graphics	look for IFR cond./alternate airport
Obtain synopsis	Provide locn and mvmt of wx systems	M1FC and vendor graphic wx	Compare to satellite imagery	Text and graphics	check for new location of frontal zones
Obtain terminal forecast	Provide terminal area wx	M1FC	Compare to SA conditions and radar	Text	update any changes since departure time

1.3.1.1.1 Obtain current and forecasted weather (cont'd.)

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Obtain current conditions	Summarize SA, PIREPs, and RAREPs	M1FC, vendor graphic wx	confirm using M1FC, PIREPs, and GOES	text and graphics	change in cond. May change flight plan
Obtain satellite imagery	Used to verify wx information	Vendor graphic wx	compare to surface chart, SA, prog chart	Graphics	aids in monitoring cloud movement
Obtain en-route wx forecast	Provide forecast along route	M1FC and vendor graphic wx	comparing text and graphic information	text and graphics	wx info needed for en route and descent
Obtain area forecast	Provide forecast along route	M1FC	compare wx from M1FC to radar and GOES	text	summary of forecast for area weather
view prognosis charts	provide forecast along route	Vendor graphic wx		graphics	aids in noting deviations btwn FA and FT

1.3.1.1.1 Obtain Current and Forecasted Weather

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Obtain winds aloft	Provide wind speed and dir	M1FC and vendor graphic wx	Interpolate winds from M1FC btwn alt.	Text and graphics	Provides best altitude for route of flight
Obtain upper air moisture	Provides frzglvl, RH, K index	Vendor graphic wx	Compare to RADAT readings from M1FC	Graphic	May cause change in flight plan
Obtain PIREPs	Request for pilot reports	Radio request and M1FC	Used to confirm M1FC and vendor wx	Verbal info and text	Verifies any unforecasted wx conditions

Appendix C
JTA Instructions

JTA Instructions

The flowcharts found in appendices D through G depict job tasks for Flight Service Station Specialists and Traffic Management Unit Coordinators. Each position (ie., Inflight Specialist, EFAS Specialist, Preflight Specialist, and TMC) job tasks' are organized into its own set of flowcharts.

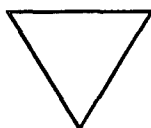
The flowcharts include several different symbols. Each symbol characterizes the task associated with that symbol according to the physical or cognitive process that is required to complete the task. For instance, the rectangle symbol categorizes the information in that symbol as a process or action. A complete list of the flowchart symbology is illustrated figure C-1.

Additionally, some rectangles are divided into two parts. The lower part of this symbol directs the reader to either a more detailed breakdown of the tasks associated with that symbol or a weather table associated with the information in that symbol. For instance, component 1.0 of the Inflight Specialist title chart directs the reader to another chart that further breaks down the subtasks associated with a pre-duty briefing. Similarly, component 1.3.1.1 of flowchart 1.0 for the Inflight Specialist directs the reader to a weather table. The reader will note that the weather table shares the same number as the symbol that refers to the weather table. The weather table outlines the type of weather information required to complete the task and how that information is retrieved.

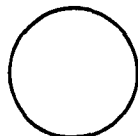
Aviation and meteorology specific terminology is utilized in the Job Task Analysis. Therefore, for the reader's convenience, appendix H contains definitions of aviation specific terms while appendix I contains definitions of meteorology specific terms.



Process or Action (e.g., control operation)



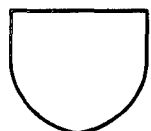
Transmitted Information



Received Information through Weather Sources
(e.g., indicator light, weather display)



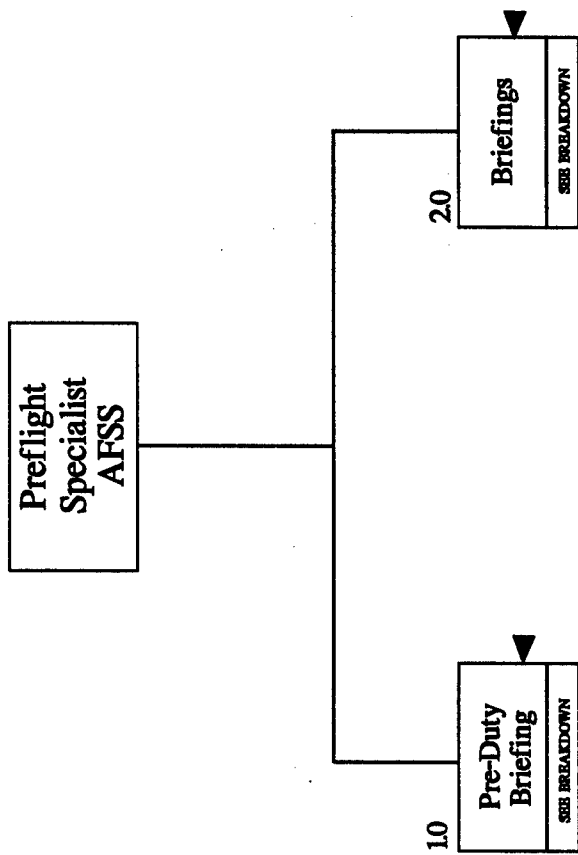
Operator Decision



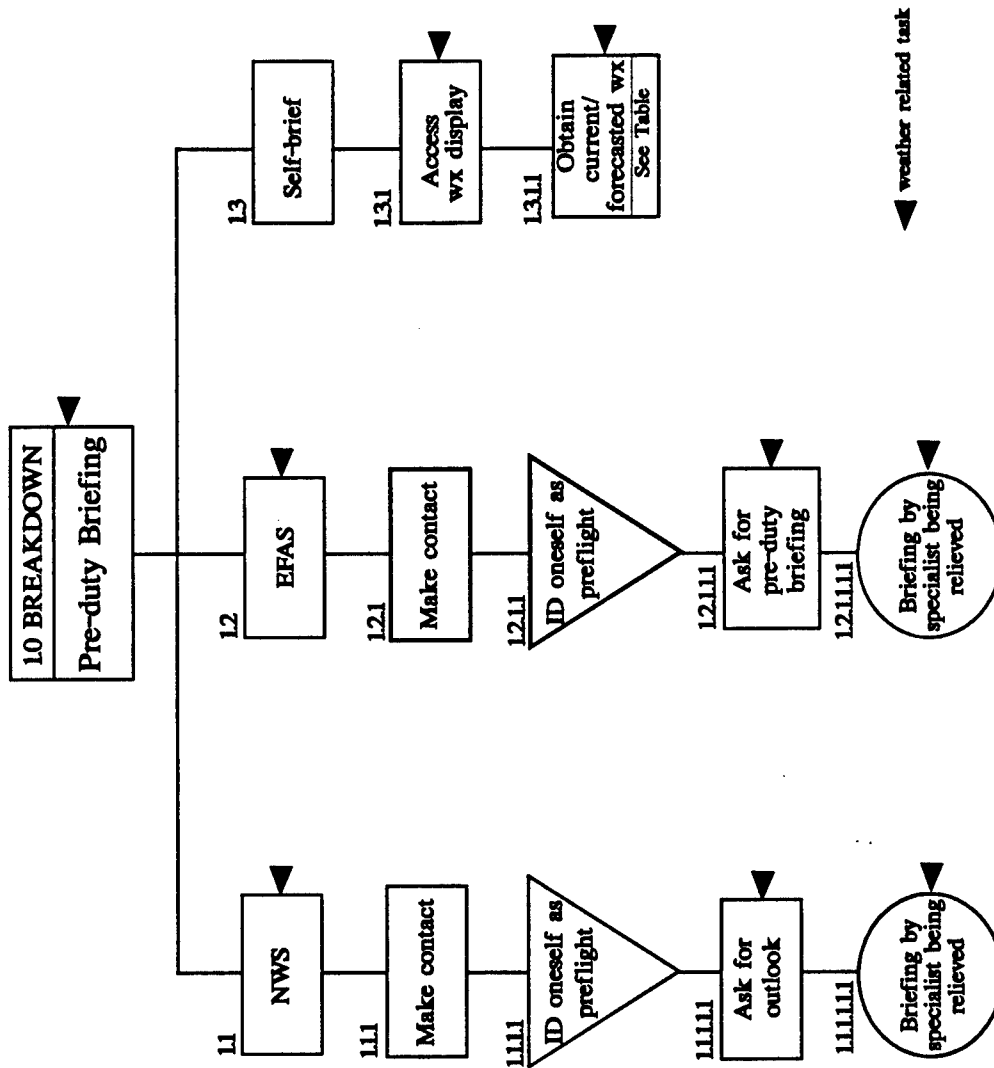
Previously Stored Information (e.g., knowledge)

Figure C-1 - Flowchart Symbolology

Appendix D
Preflight Specialists JTA



▼ weather related task



1.3.1.1.1 Obtain Current and Forecasted Weather

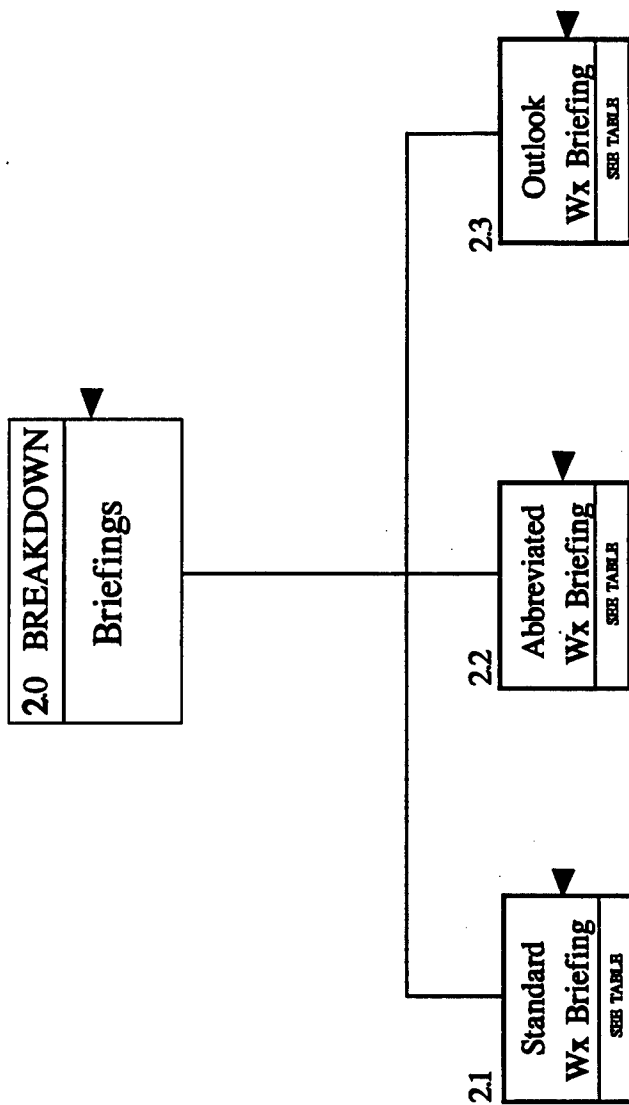
Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Obtain adverse wx conditions	Perform self brief	M1FC and vendor graphic wx		Text and graphics	May cause pilot to change flight plan
Obtain LLWAS	Check for approach and departure	M1FC	Confirm using PIREPs	Text	Light aircraft may be affected by LLWAS
Obtain thunder-Storms	Check for hazardous wx	M1FC, radar, and vendor graphic wx		Text and graphics	May cause change in flight plan
Obtain icing and turbulence	Check for hazardous wx	M1FC, facility graphic wx and vendor graphic wx	Confirm with PIREPs/verify intensity	Text and graphics	May make change in altitude and flight plan necessary
Obtain weather Advisories	Check for hazardous wx	M1FC and facility graphic wx	Confirm with radar and PIREPs	Text and graphics	May cause change in flight plan
Obtain weather depiction	Look for areas of VFR/IFR	M1FC and vendor graphic wx	Confirm using GOES and SA	Text and graphics	Look for IFR cond./alternate airport

1.3.1.1.1 Obtain Current and Forecasted Weather (Continued)

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Obtain synopsis	Provide locn and mvmt of wx systems	M1FC and vendor graphic wx	Compare to satellite imagery	Text and graphics	check for new location of frontal zones
Obtain terminal forecast	Provide terminal area wx	M1FC	Compare to SA conditions and radar	Text	update any changes since departure time
Obtain current conditions	Summarize SA, PIREPs, and RAREPs	M1FC and vendor graphics	Confirm using M1FC, PIREPs, and GOES	Text and graphics	change in cond. may change flight plan
Obtain satellite imagery	Used to verify wx information	Vendor graphic wx	Compare to surface chart, SA, prog chart	Graphics	aids in monitoring cloud movement
Obtain en-route wx forecast	Provide forecast along route	M1FC and vendor graphic wx	Comparing text and graphic information	Text and graphics	wx info needed for en route and descent
Obtain area forecast	Provide forecast along route	M1FC	Compare wx from M1FC to radar and GOES	Text	summary of forecast for area weather

1.3.1.1.1 Obtain Current and Forecasted Weather (Continued)

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
View prognosis Charts	Provide forecast along route	Vendor graphic wx		Graphics	Aids in noting deviations btwn FA and FT
Obtain winds aloft	Provide wind speed and dir	M1FC and vendor graphic wx	Interpolate winds from M1FC btwn alt.	Text and graphics	Provides best altitude for route of flight
Obtain upper air moisture	Provides frzglvl, RH, K index	Vendor graphic wx	Compare to RADAT readings from M1FC	Graphic	May cause change in flight plan
Obtain PIREPS	Request for pilot reports	Radio request and M1FC	Used to confirm M1FC and vendor wx	Verbal info and text	Verifies any unforecasted wx conditions



◀ weather related task

2.1 Standard Weather briefing

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
obtain adverse wx conditions	Check adverse Wx that would affect flight	M1FC		Text	Adverse wx may alter flight plan
obtain LLWAS	Check for Approach and Departure	M1FC	Confirm with PIREPs	Text	Light aircraft may be unable to navigate
obtain thunder-storms	Check for Hazardous wx	M1FC, radars, And vendor graphic wx		Text and graphics	May cause delay or alter flight plan
obtain icing	Check for Hazardous wx	M1FC and facility graphic wx	Confirm with PIREPs and verify info	Text and graphics	May make change in alt. Necessary
obtain weather advisories	Check for hazardous wx	M1FC and vendor graphic wx	Confirm with radar and PIREPs	Text and graphics	May cause delay or alter flight plan
obtain weather depiction	Look for areas of VFR/IFR	Vendor graphic wx	Confirm using GOES and SA	Graphics	Look for IFR cond./alternate airport

2.1 Standard Weather Briefing (Continued)

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Obtain satellite imagery	Used to verify wx information	Vendor graphic wx	Compare to surface chart, SA, prog chart	Graphics	Monitoring of cloud coverage/ frontal zones
Obtain terminal forecast	Provides terminal area forecast	M1FC	Compare to SA conditions, and radar	Text	Provides wx in terminal area and airports
Obtain synopsis	Provide locn and mvmt of wx systems	M1FC and vendor graphic wx	Compare to satellite imagery	Text and graphics	Used for short and long range briefing
Obtain current Conditions	Summarize SA's, PIREPs, RAREPs	M1FC	Confirm using M1FC and PIREPs	Text	Used to create a summary of current wx
Obtain en-route wx forecast	Provide forecast along route	M1FC and vendor graphic wx	Comparing text and graphic information	Text and graphics	Provide wx for climb, en route, descent
Obtain area forecast	Provide forecast along route	M1FC	Compare wx from M1FC to radar	Text	Summarizes hazardous wx over area

2.1 Standard Weather Briefing (Continued)

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Look at prognosis Charts	Provide forecast along route	Vendor graphic wx		Graphics	Note deviations from FA and FT
Check destination forecast	Provide forecast wx for dstn.	M1FC		Text	Provides expected wx at destination
Obtain winds aloft	Provide wind speed and direction	M1FC and vendor graphic wx	Interpolate winds from M1FC btwn alt.	Text and graphics	Provide best altitude for flight
Obtain PIREPs	Request for pilot reports	Radio and M1FC	Used to confirm M1FC and vendor wx	Verbal info and text	Used to compare actual vs. forecast

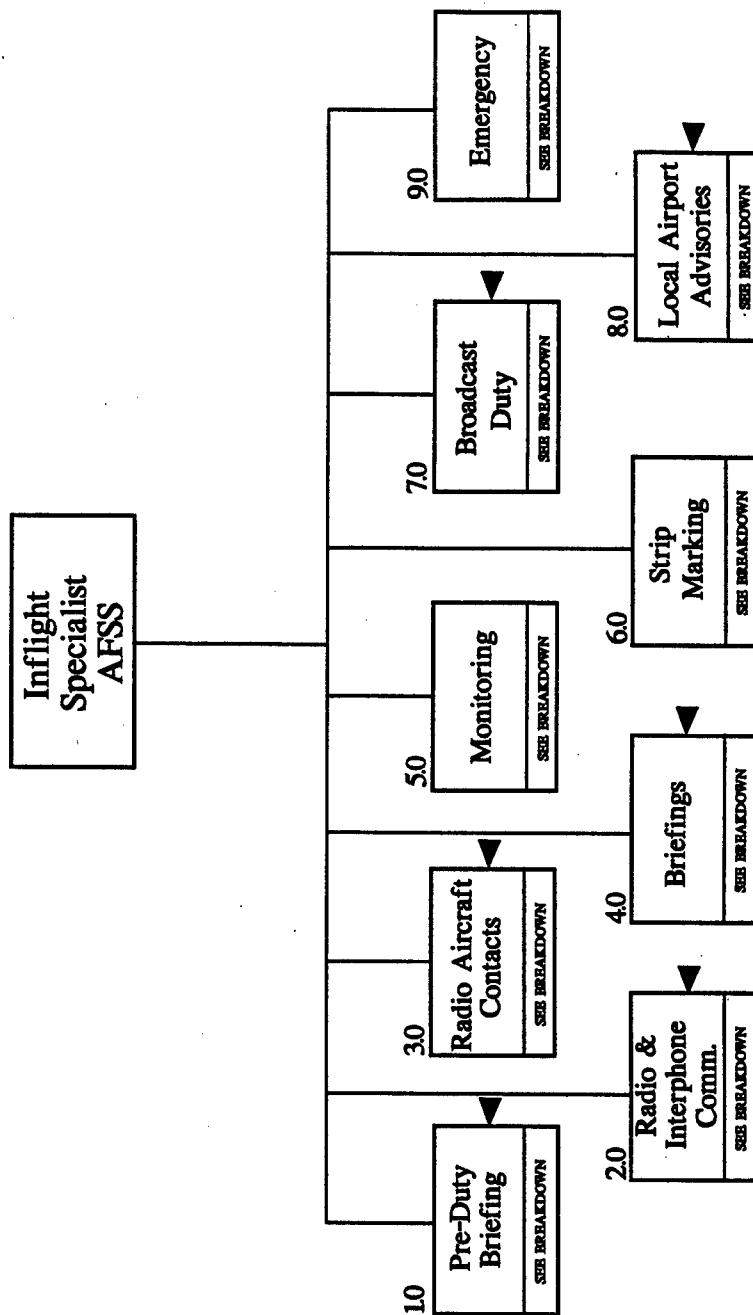
2.2 Abbreviated Weather Briefing

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Brief pilot On requested info	Provide pilot with requested wx	M1FC, vendor graphic wx, and radars		Text and graphics	Give data not received in earlier brief
Obtain adverse wx information	Provide pilot with adverse wx conditions	M1FC and vendor graphic wx		Text and graphics	May cause change in flight plan
Update pilot info if new info avail.	Provide new wx since last brief.	M1FC and vendor graphic wx		Text and graphics	May cause change in flight plan
Solicit pilot reports	Need for pilot reported wx	M1FC and radio contact	Used to confirm M1FC and vendor wx	Text and verbal information	Used to check for un- forecasted wx

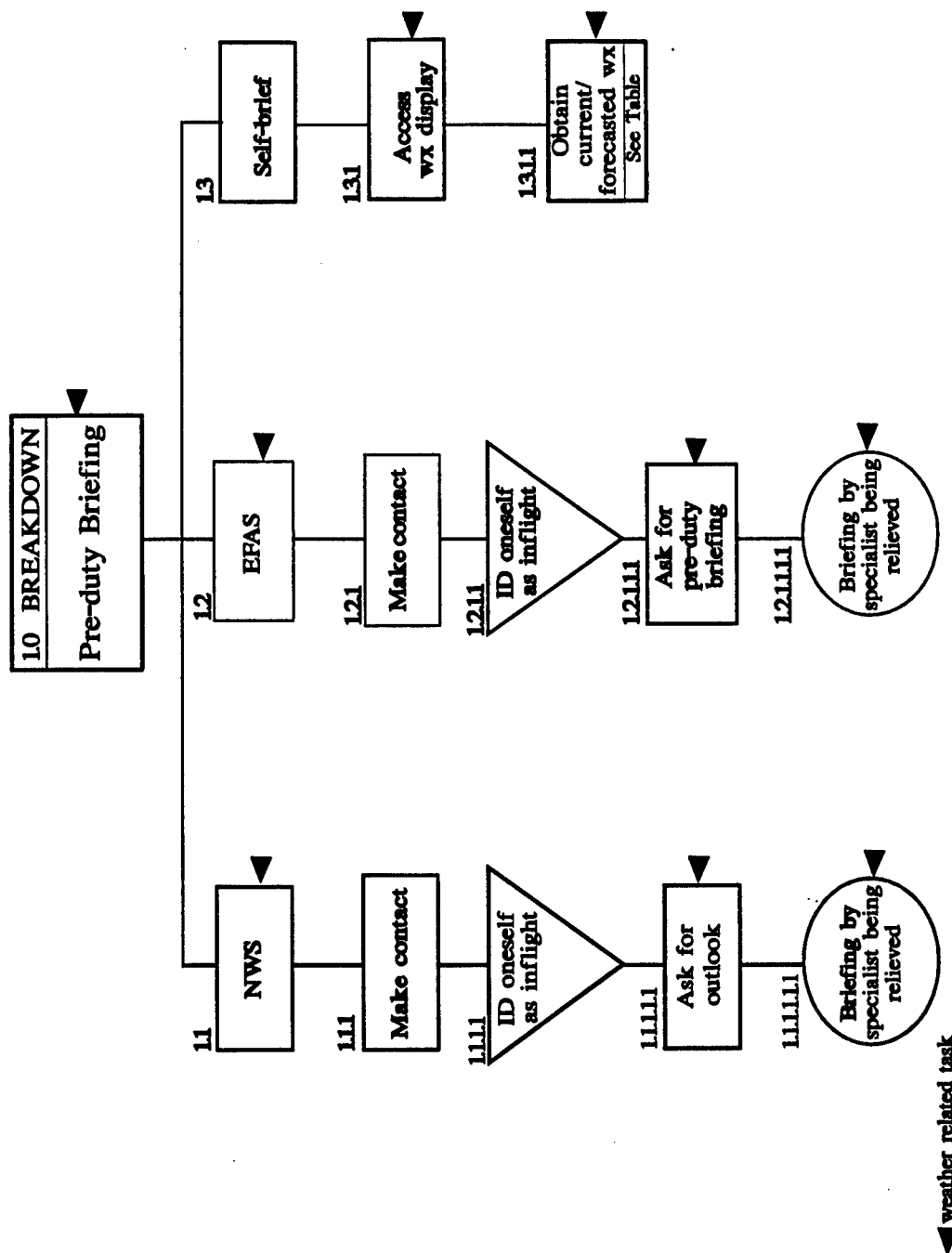
2.3 Outlook Briefing

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Obtain adverse weather	Provide pilot with forecast adverse wx	M1FC and vendor graphic wx		Text and graphics	Provide pilot with weather update
Obtain weather depiction	Recommend VFR/IFR	M1FC and vendor graphic wx	Confirm with GOES and SA	Text and graphics	Look for area IFR/VFR conditions
Obtain synopsis	Statement of locn and mvmt of wx masses	M1FC and vendor graphic wx		Text and graphics	Check for frontal zone/alter flight
Obtain en-route forecast	Provide forecast along route	M1FC and vendor graphic wx	Comparing text and graphic wx information	Text and graphics	May cause change in flight plan
Check destination forecast	Provide forecast for destination	M1FC and vendor graphic wx		Text and graphics	May need alternate airport

Appendix E
Inflight Specialists JTA



▼ weather related task



1.3.1.1.1 Obtain Current and Forecasted Weather

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Obtain adverse wx conditions	Perform self brief	M1FC and vendor graphic wx		Text and graphics	May cause pilot to change flight plan
Obtain LLWAS	Check for approach and departure	M1FC	Confirm using PIREPs	Text	Light aircraft may be affected by LLWAS
Obtain thunder-Storms	Check for hazardous wx	M1FC, radar, and vendor graphic wx		Text and graphics	May cause change in flight plan
Obtain icing and turbulence	Check for hazardous wx	M1FC, facility graphic wx and vendor graphics weather	Confirm with PIREPs/verify intensity	Text and graphics	May make change in altitude and flight plan necessary
Obtain weather Advisories	Check for hazardous wx	M1FC and facility graphic wx	Confirm with radar and PIREPs	Text and graphics	May cause change in flight plan

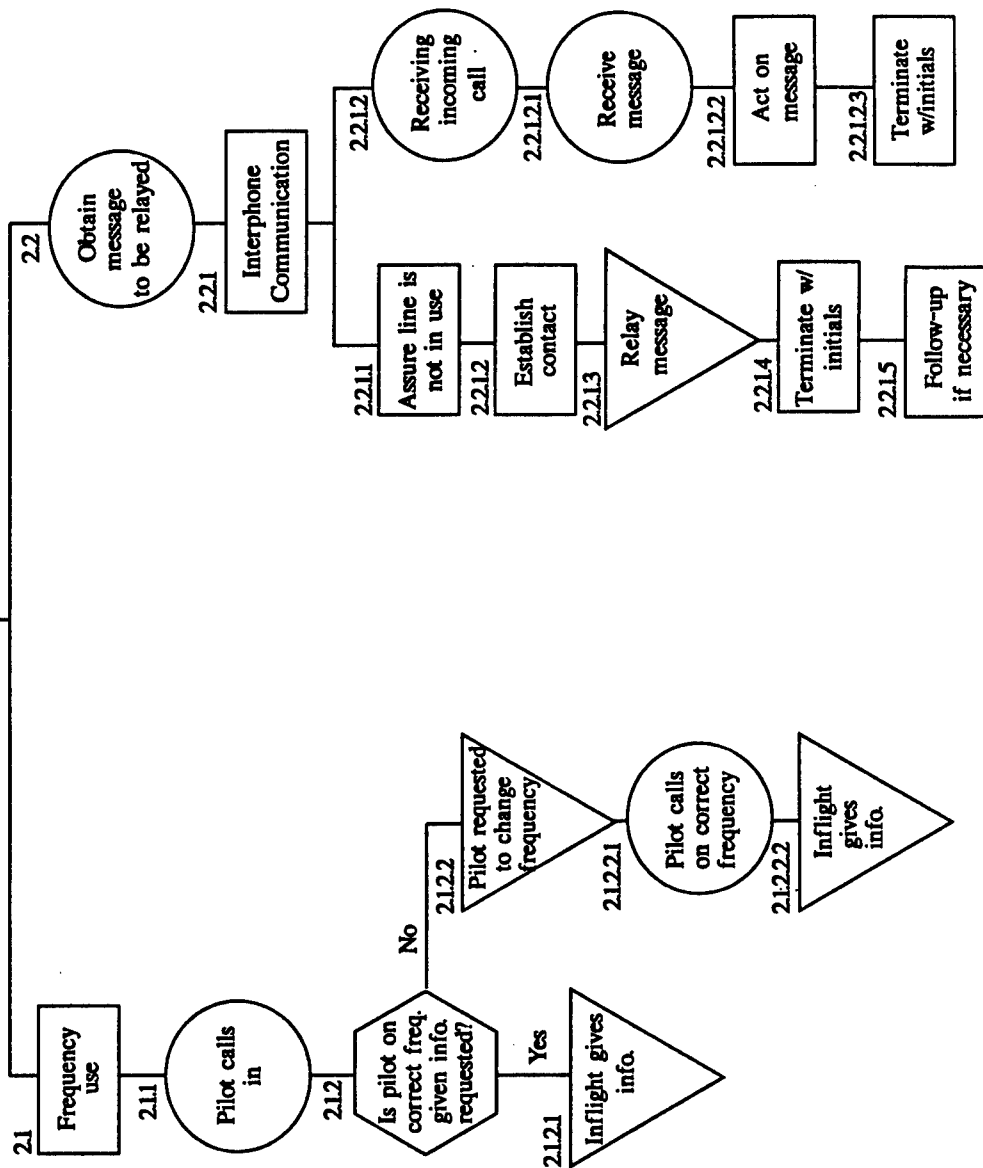
1.3.1.1 Obtain Current and Forecasted Weather (Continued)

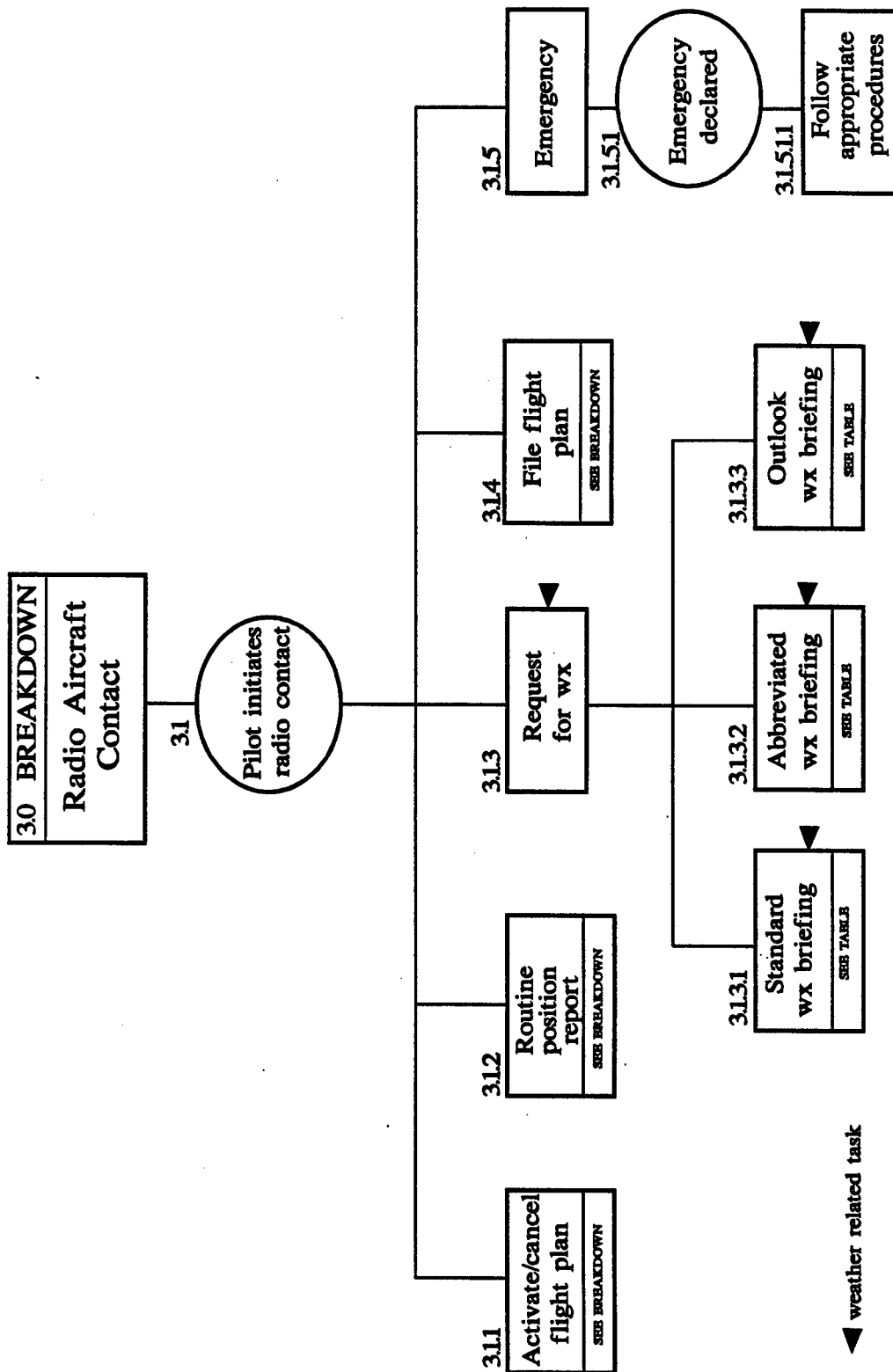
Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Obtain weather depiction	Look for areas of VFR/IFR	M1FC and vendor graphic wx	Confirm using GOES and SA	Text and graphics	Look for IFR cond./alternate airport
Obtain synopsis	Provide locn and mvmt of wx systems	M1FC and vendor graphic wx	Compare to satellite imagery	Text and graphics	Check for new location of frontal zones
Obtain terminal forecast	Provide terminal area wx	M1FC	Compare to SA conditions and radar	Text	Update any changes since departure time
Obtain current conditions	Summarize SA, PIREPs, and RAREPs	M1FC and vendor graphics	Confirm using M1FC, PIREPs, and GOES	Text and graphics	Change in cond. May change flight plan
Obtain satellite imagery	Used to verify wx information	Vendor graphic wx	Compare to surface chart, SA, prog chart	Graphics	Aids in monitoring cloud movement
Obtain en-route wx forecast	Provide forecast along route	M1FC and vendor graphic wx	Comparing text and graphic information	Text and graphics	Wx info needed for en route and descent

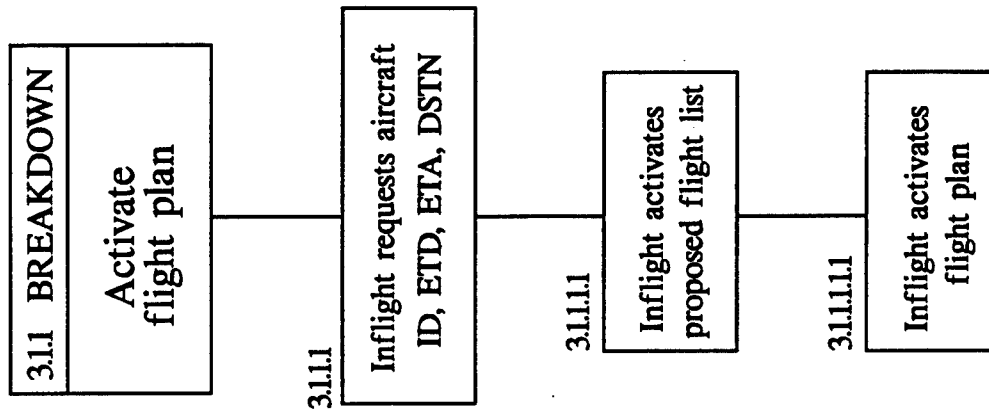
1.3.1.1.1 Obtain Current and Forecasted Weather (Continued)

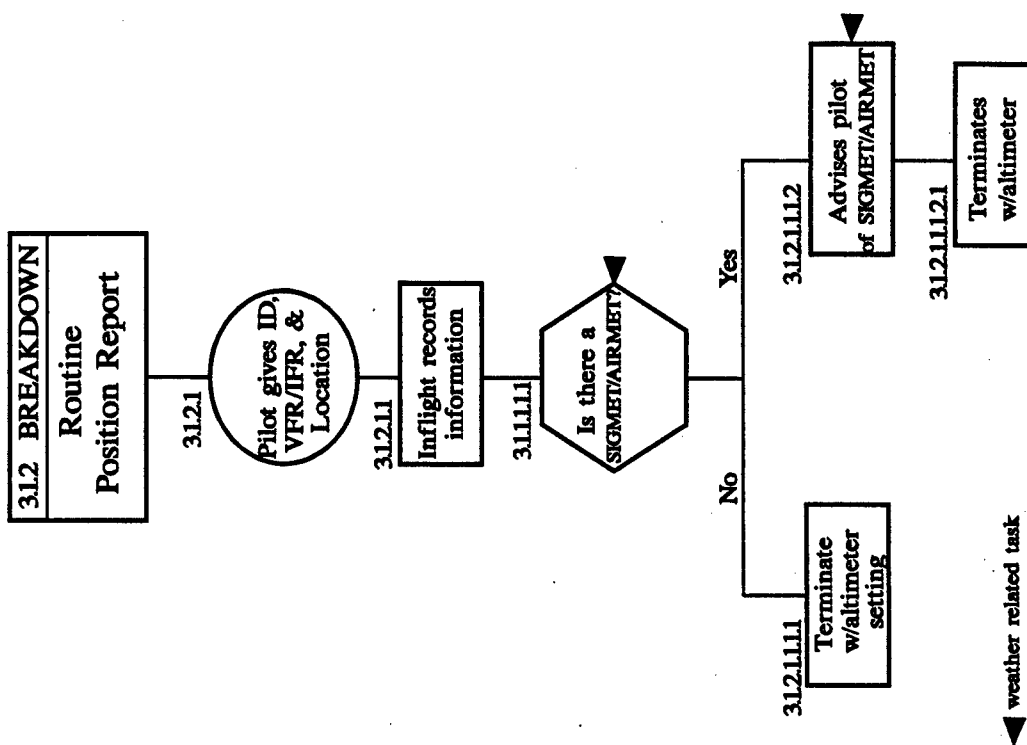
Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Obtain area forecast	Provide forecast along route	M1FC	Compare wx from M1FC to radar and GOES	Text	Summary of forecast for area weather
View prognosis Charts	Provide forecast along route	Vendor graphic wx		Graphics	Aids in noting deviations btwn FA and FT
Obtain winds aloft	Provide wind speed and dir	M1FC and vendor graphic wx	Interpolate winds from M1FC btwn alt.	Text and graphics	Provides best altitude for route of flight
Obtain upper air moisture	Provides frzglvl, RH, K index	Vendor graphic wx	Compare to RADAT readings from M1FC	Graphic	May cause change in flight plan
Obtain PIREPs	Request for pilot reports	Radio request and M1FC	Used to confirm M1FC and vendor wx	Verbal info and text	Verifies any unforecasted wx conditions

20 BREAKDOWN
Radio & Interphone Communications









Standard Weather briefing

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Obtain adverse wx conditions	Check adverse wx that would affect flight	M1FC		Text	Adverse wx may alter flight plan
Obtain LLWAS	Check for approach and departure	M1FC	Confirm with PIREPs	Text	Light aircraft may be unable to navigate
Obtain thunder-storms	Check for hazardous wx	M1FC, radars, and vendor graphic wx		Text and graphics	May cause delay or alter flight plan
Obtain icing	Check for hazardous wx	M1FC and facility graphic wx	Confirm with PIREPs and verify info	Text and graphics	May make change in alt. Necessary
Obtain weather advisories	Check for hazardous wx	M1FC and vendor graphic wx	Confirm with radar and PIREPs	Text and graphics	May cause delay or alter flight plan
Obtain weather depiction	Look for areas of VFR/IFR	Vendor graphic wx	Confirm using GOES and SA	Graphics	Look for IFR cond./alternate airport

3.1.3.1 Standard Weather Briefing (Continued)

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Obtain satellite imagery	Used to verify wx information	Vendor graphic wx	Compare to surface chart, SA, prog chart	Graphics	Monitoring of cloud coverage/ frontal zones
Obtain terminal forecast	Provides terminal area forecast	M1FC	Compare to SA conditions, and radar	Text	Provides wx in terminal area and airports
Obtain synopsis	Provide locn and mvmt of wx systems	M1FC and vendor graphic wx	Compare to satellite imagery	Text and graphics	Used for short and long range briefing
Obtain current Conditions	Summarize SA's, PIREPs, RAREPs	M1FC	Confirm using M1FC and PIREPs	Text	Used to create a summary of current wx
Obtain en-route wx forecast	Provide forecast along route	M1FC and vendor graphic wx	Comparing text and graphic information	Text and graphics	Provide wx for climb, en route, descent
Obtain area forecast	Provide forecast along route	M1FC	Compare wx from M1FC to radar	Text	Summarizes hazardous wx over area

3.1.3.1 Standard Weather Briefing (Continued)

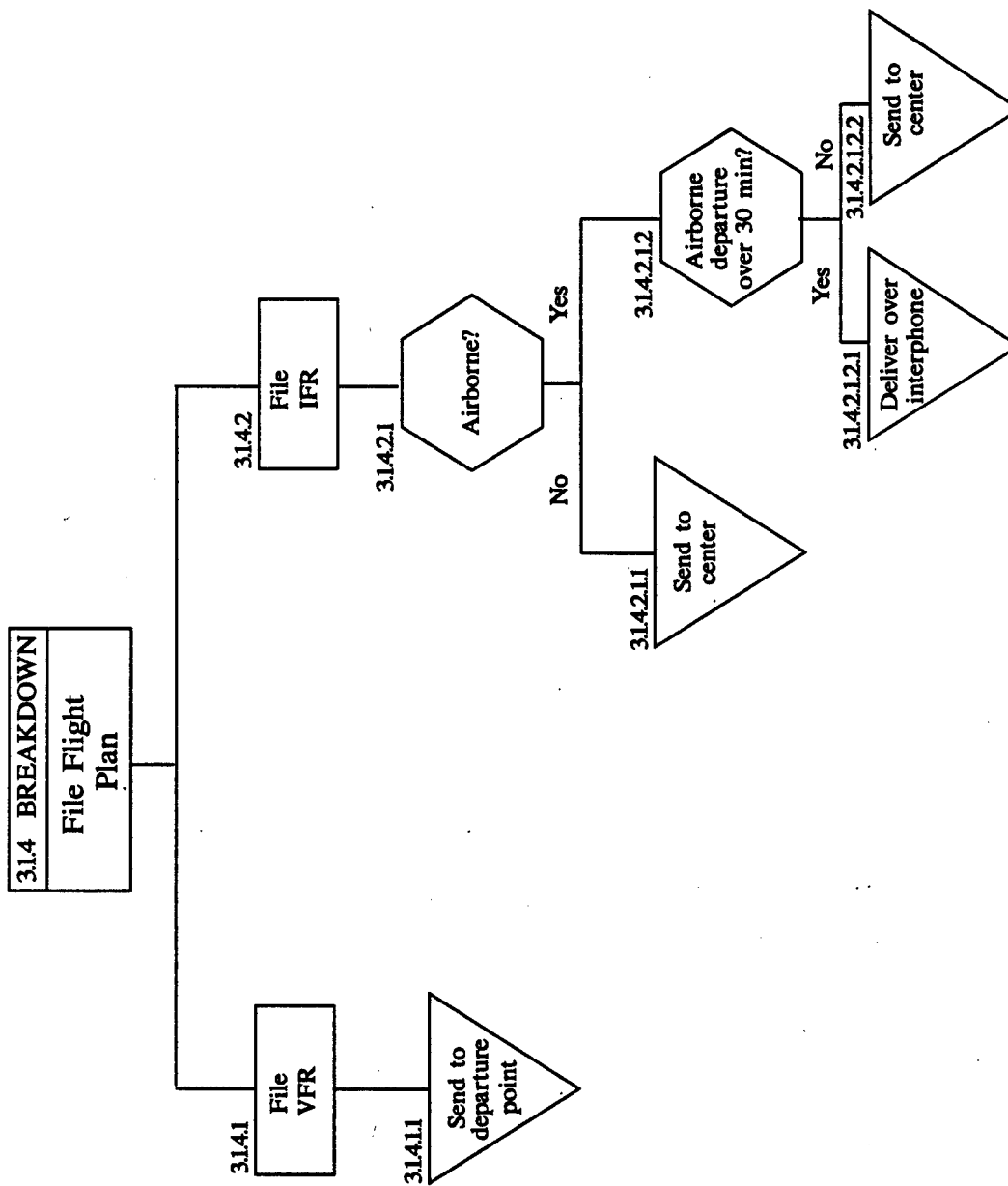
Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Look at prognosis Charts	Provide forecast along route	Vendor graphic wx		Graphics	Note deviations from FA and FT
Check destination forecast	Provide forecast wx for dstn.	M1FC		Text	Provides expected wx at destination
Obtain winds aloft	Provide wind speed and direction	M1FC and vendor graphic wx	Interpolate winds from M1FC btwn alt.	Text and graphics	Provide best altitude for flight
Obtain PIREPs	Request for pilot reports	Radio and M1FC	Used to confirm M1FC and vendor wx	Verbal info and text	Used to compare actual vs. forecast

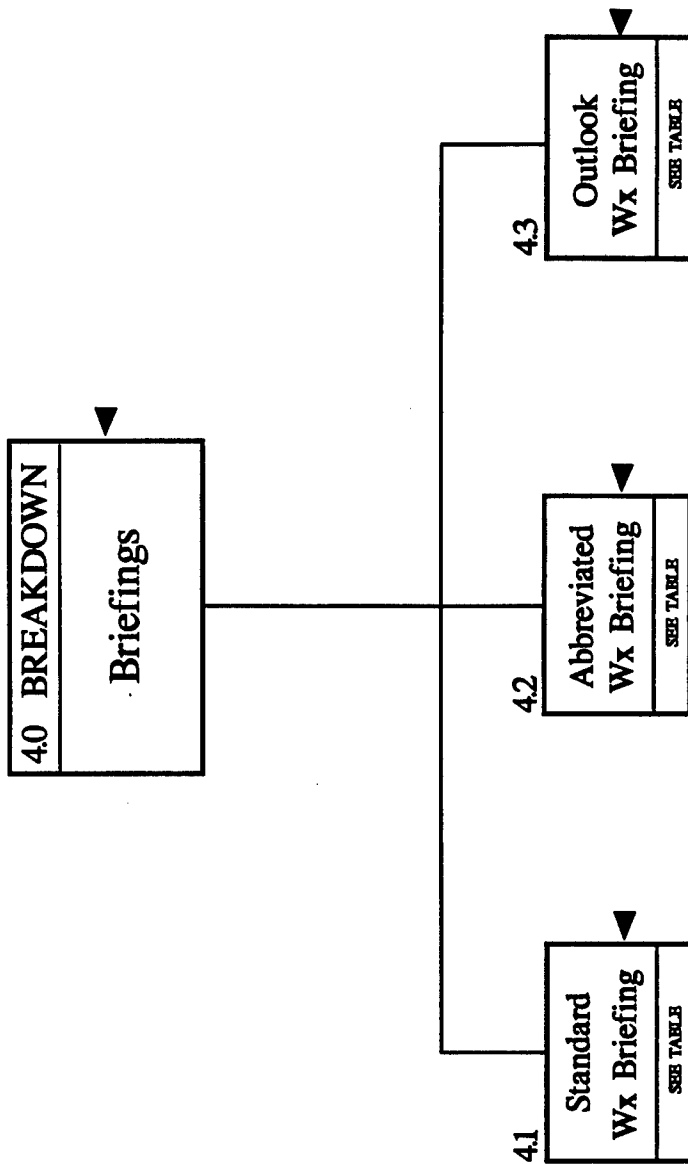
3.1.3.2 Abbreviated Weather Briefing

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Brief pilot On requested info	Provide pilot with requested wx	M1FC, vendor graphic wx, and radars		Text and graphics	Give data not recieved in earlier brief
Obtain adverse wx information	Provide pilot with adverse wx conditions	M1FC and vendor graphic wx		Text and graphics	May cause change in flight plan
Update pilot info if new info avail.	Provide new wx since last brief	M1FC and vendor graphic wx		Text and graphics	May cause change in flight plan
Solicit pilot reports	Need for pilot reported wx	M1FC and radio contact	Used to confirm M1FC and vendor wx	Text and verbal information	Used to check for un- forecasted wx

3.1.3.3 Outlook Briefing

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Obtain adverse weather	Provide pilot with forecast adverse wx	M1FC and vendor graphic wx		Text and graphics	Provide pilot with weather update
Obtain weather depiction	Recommend VFR/IFR	M1FC and vendor graphic wx	Confirm with GOES and SA	Text and graphics	Look for area IFR/VFR conditions
Obtain synopsis	Statement of locn and mvmt of wx masses	M1FC and vendor graphic wx		Text and graphics	Check for frontal zone/alter flight
Obtain en-route forecast	Provide forecast along route	M1FC and vendor graphic wx	Comparing text and graphic wx information	Text and graphics	May cause change in flight plan
Check destination forecast	Provide forecast for destination	M1FC and vendor graphic wx		Text and graphics	May need alternate airport





▼ weather related task

4.1 Standard Weather briefing

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Obtain adverse wx conditions	Check adverse Wx that would affect flight	M1FC		Text	Adverse wx may alter flight plan
Obtain LLWAS	Check for Approach and Departure	M1FC	Confirm with PIREPs	Text	Light aircraft may be unable to navigate
Obtain thunder-storms	Check for Hazardous wx	M1FC, radars, And vendor graphic wx		Text and graphics	May cause delay or alter flight plan
Obtain icing	Check for Hazardous wx	M1FC and facility graphic wx	Confirm with PIREPs and verify info	Text and graphics	May make change in alt. Necessary
Obtain weather advisories	Check for hazardous wx	M1FC and vendor graphic wx	Confirm with radar and PIREPs	Text and graphics	May cause delay or alter flight plan
Obtain weather depiction	Look for areas of VFR/IFR	Vendor graphic wx	Confirm using GOES and SA	Graphics	Look for IFR cond./alternate airport

4.1 Standard Weather Briefing (Continued)

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Obtain satellite imagery	Used to verify wx information	Vendor graphic wx	Compare to surface chart, SA, prog chart	Graphics	Monitoring of cloud coverage/ frontal zones
Obtain terminal forecast	Provides terminal area forecast	M1FC	Compare to SA conditions, and radar	Text	Provides wx in terminal area and airports
Obtain synopsis	Provide locn and mvmt of wx systems	M1FC and vendor graphic wx	Compare to satellite imagery	Text and graphics	Used for short and long range briefing
Obtain current Conditions	Summarize SA's, PIREPs, RAREPs	M1FC	Confirm using M1FC and PIREPs	Text	Used to create a summary of current wx
Obtain en-route wx forecast	Provide forecast along route	M1FC and vendor graphic wx	Comparing text and graphic information	Text and graphics	Provide wx for climb, en route, descent
Obtain area forecast	Provide forecast along route	M1FC	Compare wx from M1FC to radar	Text	Summarizes hazardous wx over area

4.1 Standard Weather Briefing (Continued)

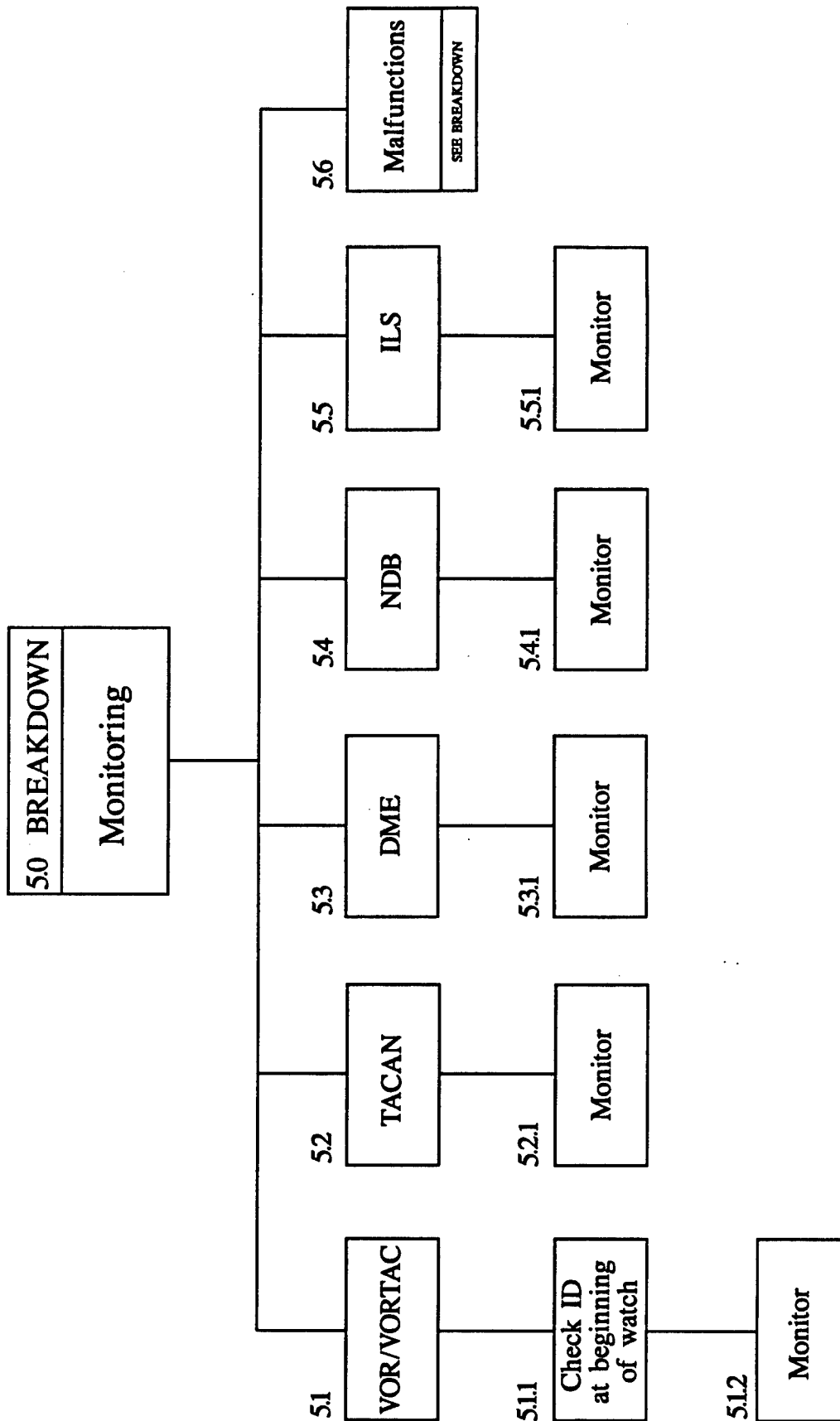
Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Look at prognosis Charts	Provide forecast along route	Vendor graphic wx		Graphics	Note deviations from FA and FT
Check destination forecast	Provide forecast wx for dstn.	M1FC		Text	Provides expected wx at destination
Obtain winds aloft	Provide wind speed and direction	M1FC and vendor graphic wx	Interpolate winds from M1FC btwn alt..	Text and graphics	Provide best altitude for flight
Obtain PIREPS	Request for pilot reports	Radio and M1FC	Used to confirm M1FC and vendor wx	Verbal info and text	Used to compare actual vs. forecast

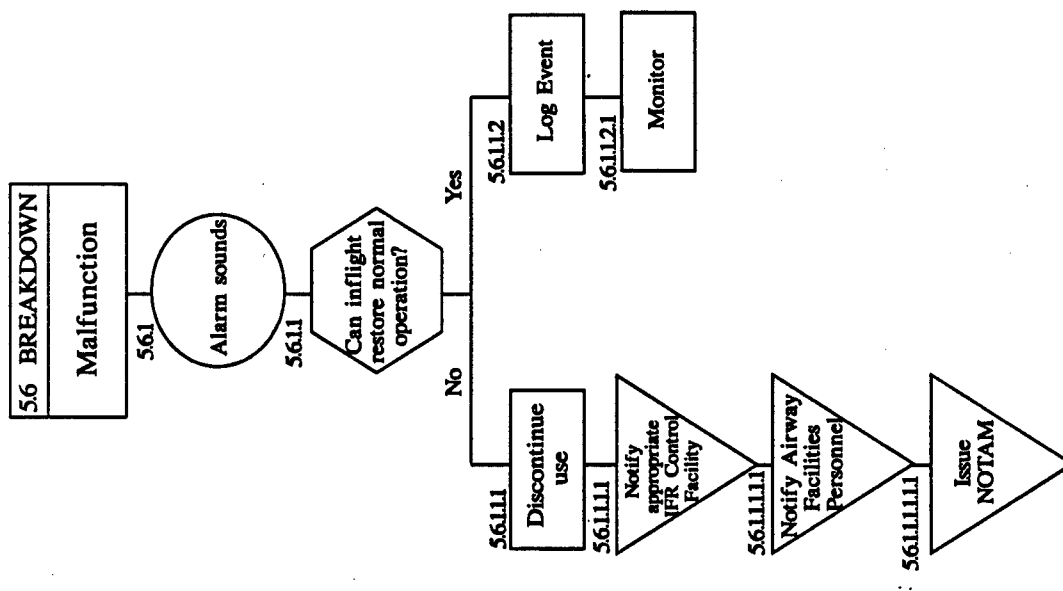
4.2 Abbreviated Weather Briefing

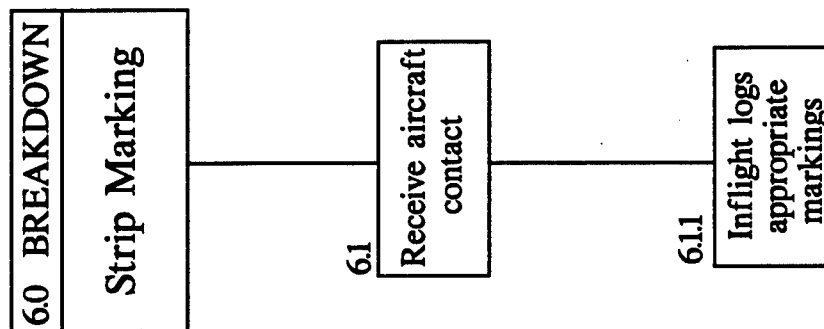
Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Brief pilot On requested info	Provide pilot with requested wx	M1FC, vendor graphic wx, and radars		Text and graphics	Give data not recieved in earlier brief
Obtain adverse wx information	Provide pilot with adverse wx conditions	M1FC and vendor graphic wx		Text and graphics	May cause change in flight plan
Update pilot info if new info avail.	Provide new wx since last brief	M1FC and vendor graphic wx		Text and graphics	May cause change in flight plan
Solicit pilot reports	Need for pilot reported wx	M1FC and radio contact	Used to confirm M1FC and vendor wx	Text and verbal information	Used to check for un- forecasted wx

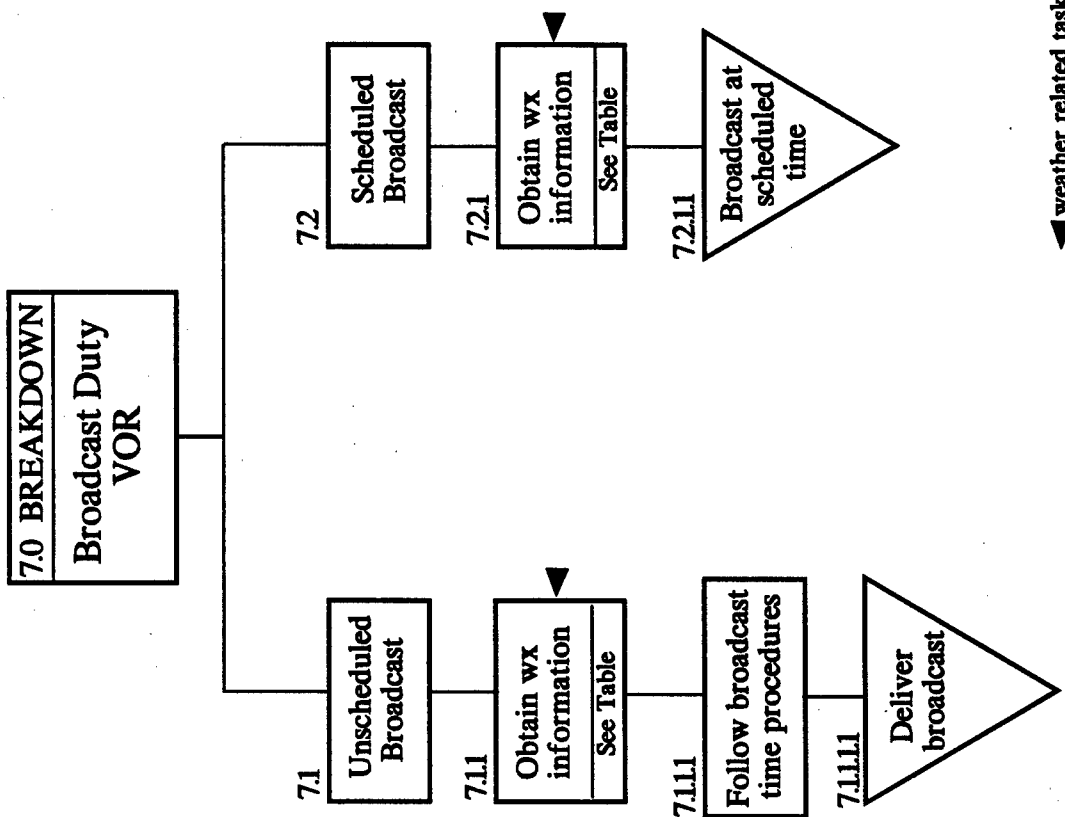
4.3 Outlook Briefing

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Obtain adverse weather	Provide pilot with forecast adverse wx	M1FC and vendor graphic wx		Text and graphics	Provide pilot with weather update
Obtain weather depiction	Recommend VFR/IFR	M1FC and vendor graphic wx	Confirm with GOES and SA	Text and graphics	Look for area IFR/VFR conditions
Obtain synopsis	Statement of locn and mvmt of wx masses	M1FC and vendor graphic wx		Text and graphics	Check for frontal zone/alter flight
Obtain en-route forecast	Provide forecast along route	M1FC and vendor graphic wx	Comparing text and graphic wx information	Text and graphics	May cause change in flight plan
Check destination forecast	Provide forecast for destination	M1FC and vendor graphic wx		Text and graphics	May need alternate airport









7.1.1.1 Obtain weather information

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Obtain convective SIGMET	Issue hazardous wx	M1FC and facility made graphic wx		Text and graphics	Data is disseminated in broadcast
Obtain SIGMET	Issue hazardous wx	M1FC and facility made graphic wx		Text and graphics	Data is disseminated in broadcast
Obtain AIRMET	Issue hazardous wx	M1FC and facility made graphic wx		Text and graphics	Data is disseminated in broadcast
Obtain Center Wx Advisory	Issue hazardous wx	M1FC and facility made graphic wx		Text and graphics	Data is disseminated in broadcast
Obtain Severe Wx Watch	Issue hazardous wx	M1FC and facility made graphic wx		Text and graphics	Data is disseminated in broadcast

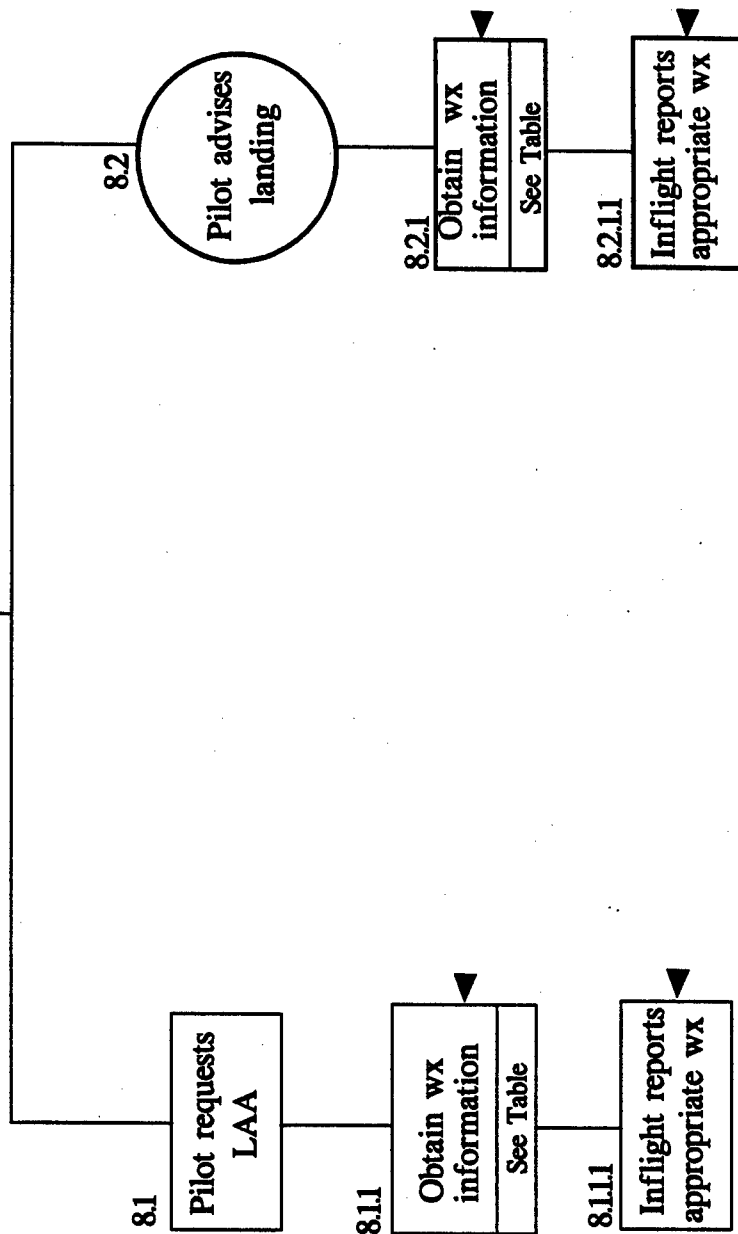
7.2.1 Obtain Weather Information

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Obtain Synopsis	Issue hazardous wx	M1FC and vendor graphic wx		Text and graphics	Provides hazardous wx for broadcast
Obtain convective SIGMET	Issue hazardous wx	M1FC and facility made graphic wx		Text and graphics	Provides hazardous wx for broadcast
Obtain SIGMET	Issue hazardous wx	M1FC and facility made graphic wx		Text and graphics	Provides hazardous wx for broadcast
Obtain AIRMET	Issue hazardous wx	M1FC and facility made graphic wx		Text and graphics	Provides hazardous wx for broadcast
Obtain Center Wx Advisory	Issue hazardous wx	M1FC and facility made graphic wx		Text and graphics	Provides hazardous wx for broadcast
Obtain Severe Wx Watch	Issue hazardous wx	M1FC and facility made graphic wx		Text and graphics	Provides hazardous wx for broadcast

7.2.1 Obtain Weather Information (Continued)

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Obtain TWEB route forecast	Issue hazardous wx	M1FC and vendor graphic wx		Text and graphics	Provide route wx for broadcast
Obtain winds aloft	Issue hazardous wx	M1FC and vendor graphic wx	No interpolation performed	Text and graphics	Provide winds at 3000-18000 ft.
Obtain radar reports	Issue hazardous wx	M1FC		Text	Provide precip. For broadcast area
Obtain surface wx reports	Issue hazardous wx	M1FC		Text	Provides surface obs for broadcast area
Obtain PIREPs	Issue hazardous wx	M1FC	Used to confirm wx information	Text	Used to alert pilots of conditions
Obtain density altitude	Issue wx info	Text table from book		Text/ Numerical	Conditional info given wx

8.0 BREAKDOWN
Local Airport Advisory (LAA)



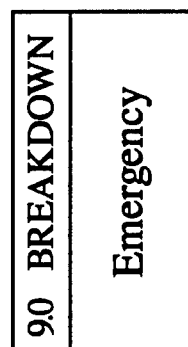
▼ weather related task

8.1.1/8.2.1 Obtain Weather Information

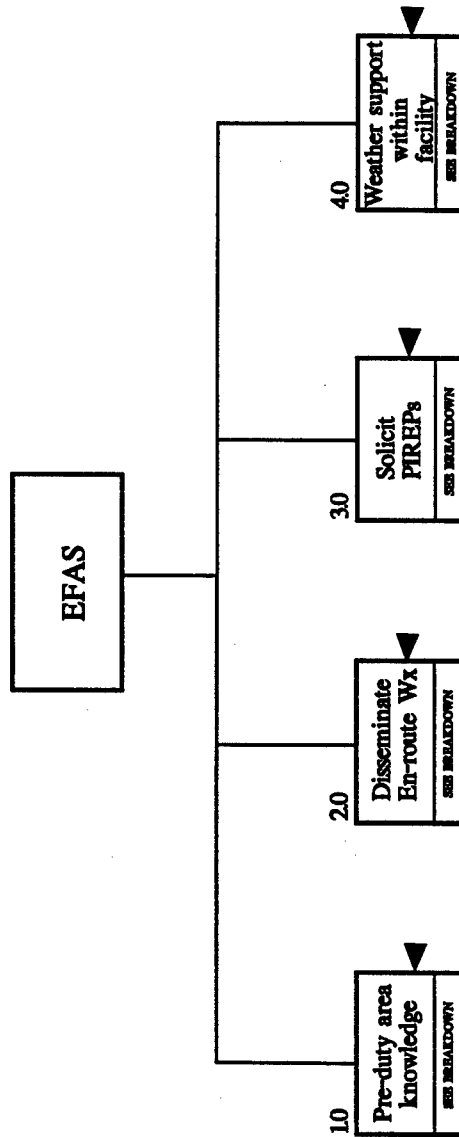
Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Obtain wind direction and speed	Provide pilot with airport weather	Direct read (instrument)		text	provide info for current traffic flow
Determine favored runway	Provide pilot with airport info	Direct read from wind instrument		text	provide info for current traffic flow
Determine altimeter setting	Provide pilot with info	Direct read (instrument) M1FC		text	provide info for current traffic flow
Obtain weather	Provide pilot with airport weather	M1FC	use terminal forecast to obtain wx	text	provide info for current traffic flow
Obtain ceiling and visibility	Provide pilot with airport weather	M1FC	use SA to obtain ceiling and visibility	text	provide info for current traffic flow
Obtain RVR/RVV	Provide pilot with runway visibility	Direct read (instrument)		text	issued to IFR traffic for approach mins

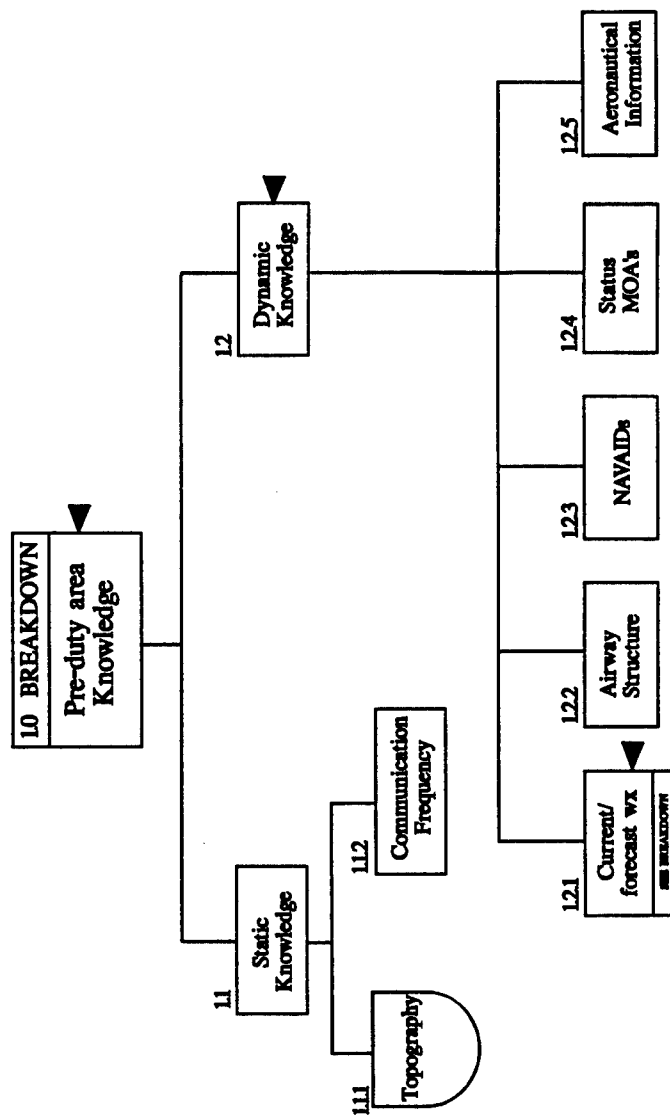
8.1.1/8.2.1 Obtain Weather Information

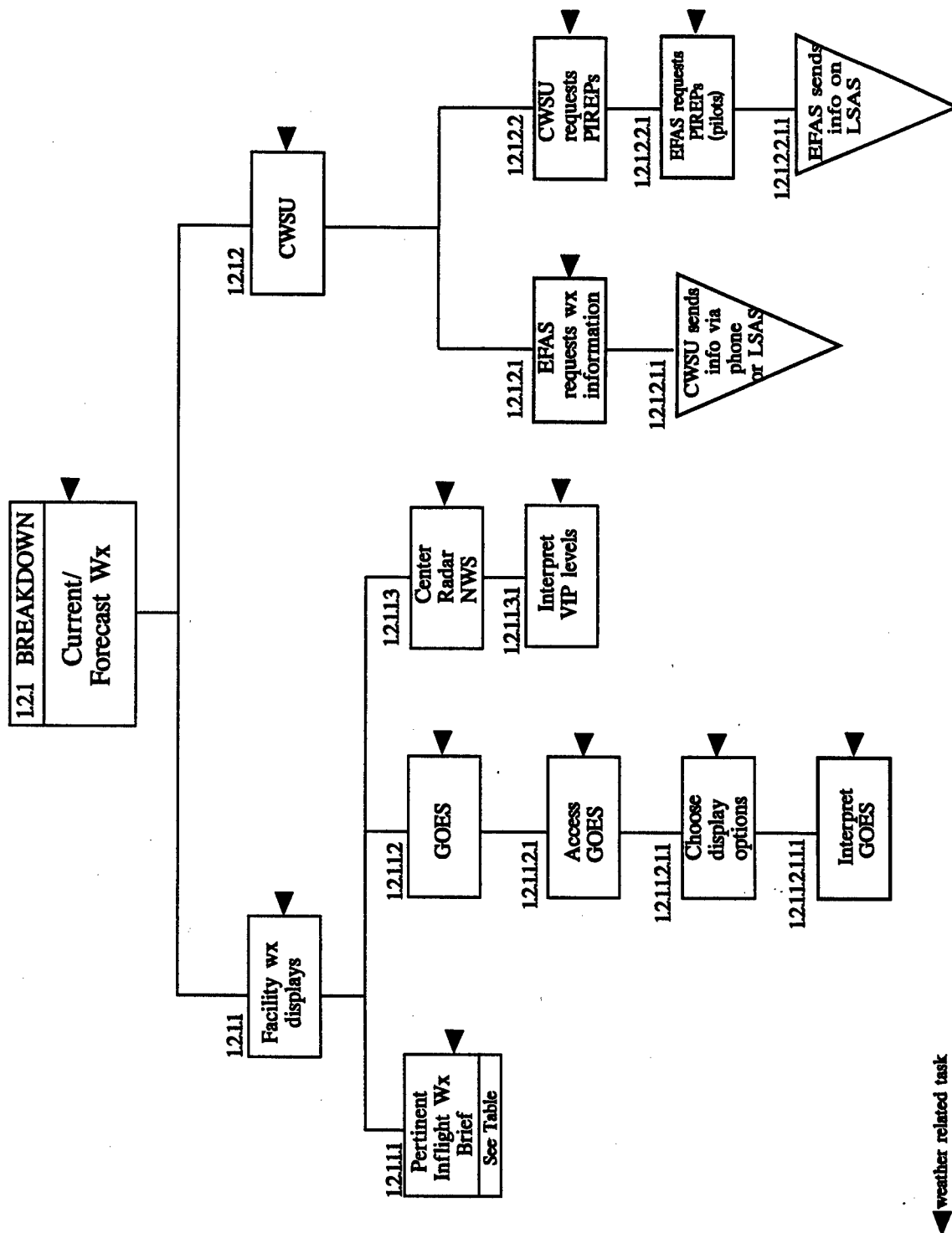
Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
obtain hazardous weather	provide pilot with weather info	M1FC		Text	Issue new hazardous wx
obtain wake turbulence	provide pilot with runway turbulence	Info based on type of arcft on rnwy prior		Verbal	Issue if wake turbc is a factor



Appendix F
EFAS Specialists JTA







1.2.1.1.1 Pertinent Inflight Wx Brief

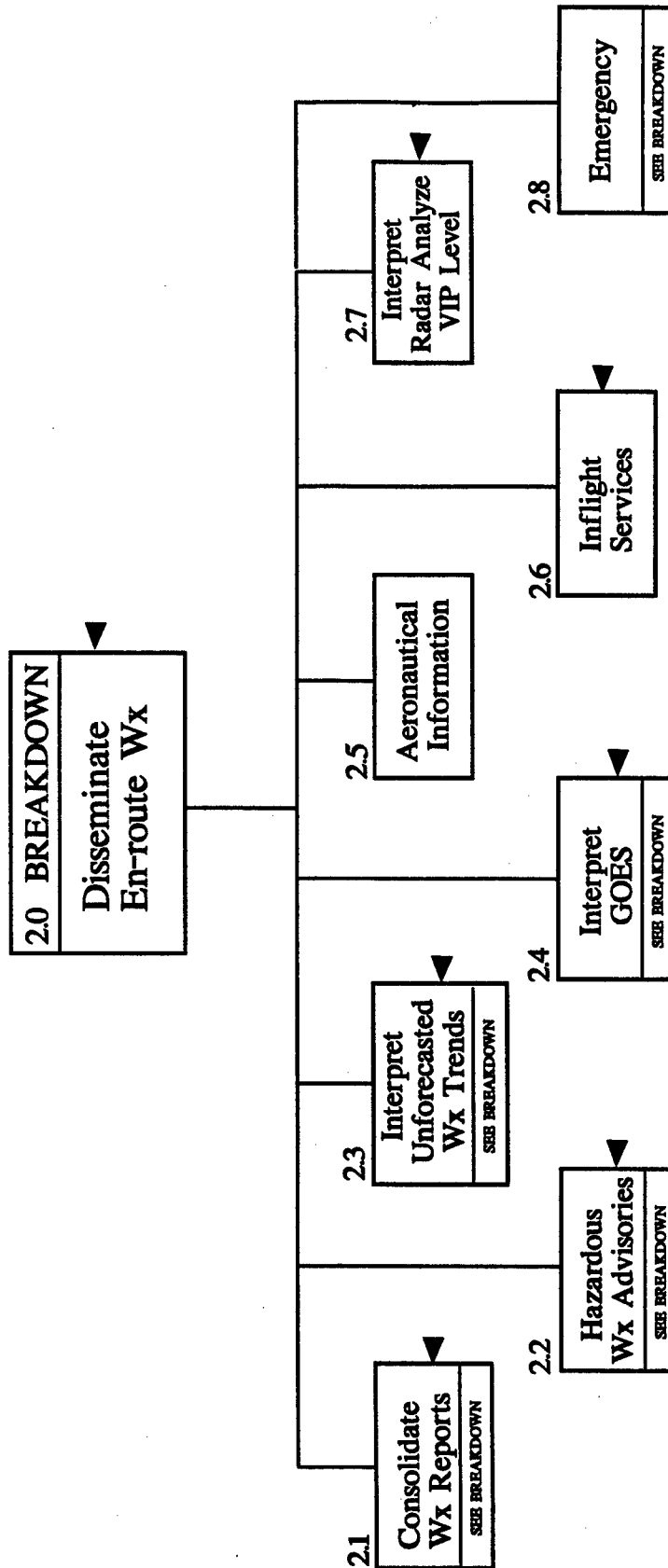
Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Obtain adverse wx conditions	Perform self brief	M1FC and vendor graphic wx		Text and graphics	May cause pilot to change flight plan
Obtain LLWAS	Check for approach and departure	M1FC	Confirm using PIREPS	Text	Light aircraft may be affected by LLWAS
Obtain thunder-storms	Check for hazardous wx	M1FC, radar, and vendor graphic wx		Text and graphics	May cause change in flight plan
Obtain icing and turbulence	Check for hazardous wx	M1FC and facility graphic wx	Confirm with PIREPS/verify intensity	Text and graphics	May make change in altitude necessary
Obtain weather Advisories	Check for hazardous wx	M1FC and facility graphic wx	Confirm with radar and PIREPS	Text and graphics	May cause change in flight plan
Obtain weather depiction	Look for areas of VFR/IFR	M1FC and vendor graphic wx	Confirm using GOES and SA	Text and graphics	Look for IFR cond./alternate airport

1.2.1.1.1.1 Pertinent Inflight Wx Brief (Continued)

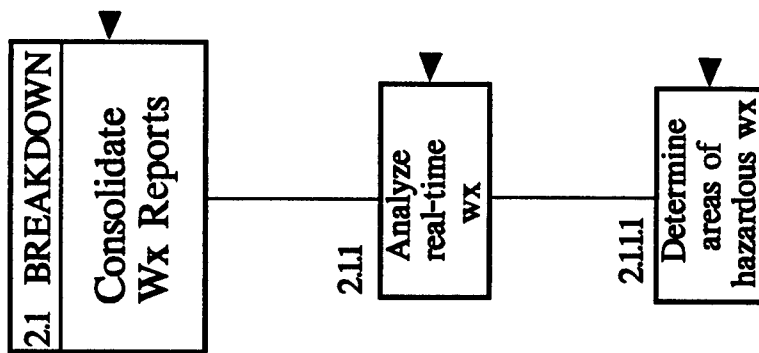
Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Obtain synopsis	Provide locn and mvmt of wx systems	M1FC and vendor graphic wx	Compare to satellite imagery	Text and graphics	Check for new location of frontal zones
Obtain terminal forecast	Provide terminal area wx	M1FC	Compare to SA conditions and radar	Text	Update any changes since departure time
Obtain current conditions	Summarize SA, PIREPs, and RAREPs	M1FC	Confirm using M1FC, PIREPs, and GOES	Text	Change in cond. May change flight plan
Obtain satellite imagery	Used to verify wx information	Vendor graphic wx	Compare to surface chart, SA, prog chart	Graphics	Aids in monitoring cloud movement
Obtain en-route wx forecast	Provide forecast along route	M1FC and vendor graphic wx	Comparing text and graphic information	Text and graphics	Wx info needed for en route and descent
Obtain area forecast	Provide forecast along route	M1FC	Compare wx from M1FC to radar and GOES	Text	Summary of forecast for area weather

1.2.1.1.1 Pertinent Inflight Wx Brief (Continued)

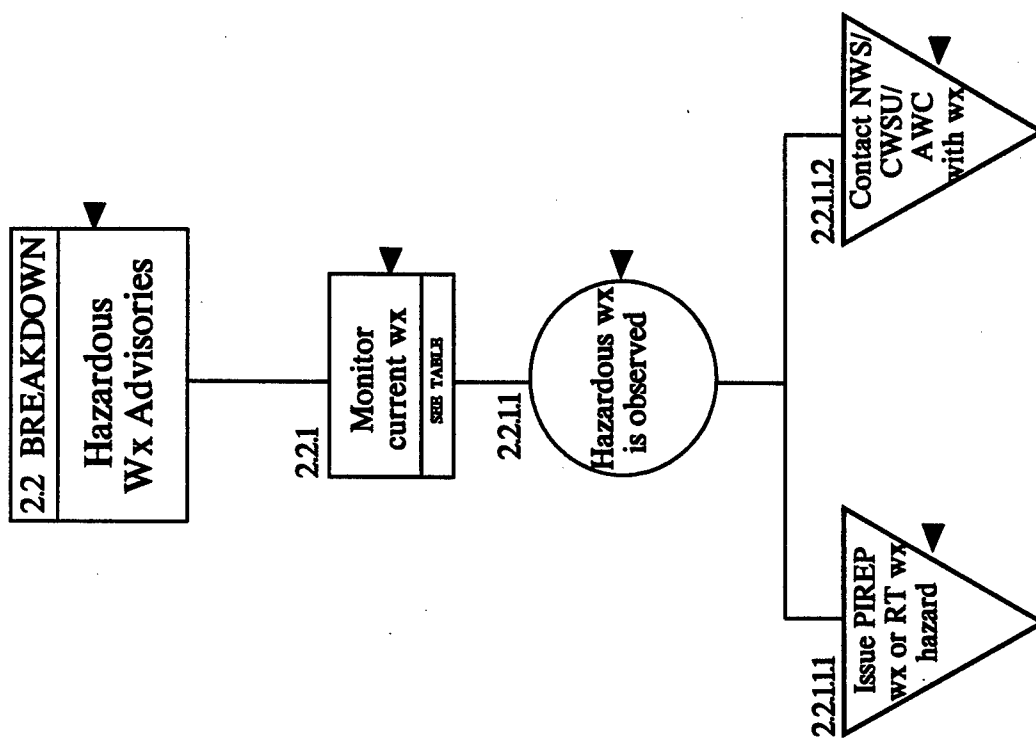
Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
View prognosis Charts	Provide forecast along route	Vendor graphic wx		Graphics	Aids in noting deviations btwn FA and FT
Obtain winds aloft	Provide wind speed and dir	M1FC and vendor graphic wx	Interpolate winds from M1FC btwn alt.	Text and graphics	Provides best altitude for route of flight
Obtain upper air moisture	Provides frzglvl, RH, K index	Vendor graphic wx	Compare to RADAT readings from M1FC	Graphic	May cause change in flight plan
Obtain PIREPs	Request for pilot reports	Radio request and M1FC	Used to confirm M1FC and vendor wx	Verbal info and text	Verifies any unforecasted wx conditions



▼ weather related task



▼ weather related task



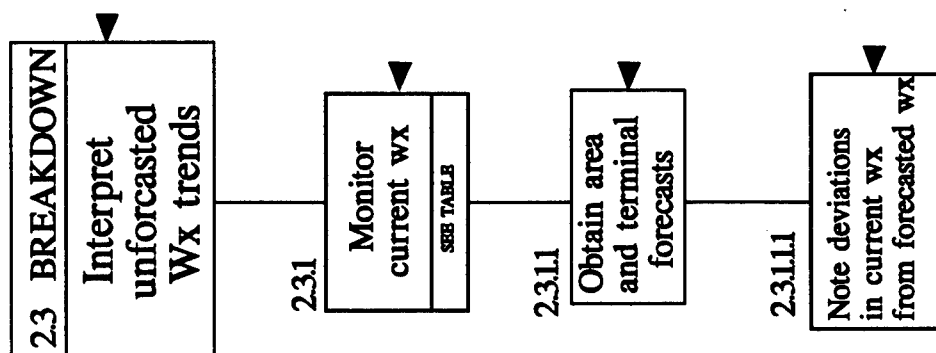
◀ weather related task

2.2.1 Monitor current weather

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Obtain adverse wx conditions	Perform self brief	M1FC and vendor graphic wx		Text and graphics	Monitor changing wx
Obtain LLWAS	Check for approach and departure	M1FC	Confirm with PIREPs	Text	Monitor changing wind shear
Obtain thunder-Storms	Check for hazardous wx	M1FC, radar, and vendor graphic wx		Text and graphics	Monitor for change or new advisories
Obtain icing	Check for hazardous wx	M1FC and facility graphic wx	Confirm with PIREPs/verify intensities	Text and graphics	Monitor for change or new advisories
Obtain weather Advisories	Check for hazardous wx	M1FC and vendor graphic wx	Confirm with radar and PIREPs	Text and graphics	Monitor for new advisories issued
Obtain weather depiction	Look for areas of VFR/IFR	M1FC and vendor graphic wx	Confirm using GOES and SA	Text and graphics	Monitor IFR/VFR conditions
Obtain synopsis	Provide locn and mvmt of wx system	M1FC and vendor graphic wx	Compare to satellite imagery	Text and graphics	Monitor movement of wx systems

2.2.1 Monitor Current Weather (Continued)

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Obtain satellite imagery	Used to verify wx information	Vendor graphic wx	Compare to surface chart, SA, prog chart	Graphics	Monitor cloud coverage/ frontal mvmt.
Obtain current conditions	Summarize SAs, PIREPs, and RAREPs	M1FC	Confirm using M1FC, PIREPs, and GOES	Text	Monitor surface observations
Obtain en-route wx forecast	Provide forecast along route	M1FC and vendor graphic wx	Compare text and graphic wx information	Text and graphics	Monitor wx along common routes
Obtain area forecast	Provide forecast along route	M1FC	Compare wx from M1FC to radar and GOES	Text	Monitor FA for changes in forecast
View prognosis Charts	Provide forecast along route	Vendor graphic wx		Graphics	
Obtain winds aloft	Provide wind speed and direction	M1FC and vendor graphic wx	Interpolate winds from M1FC btwn alt.	Text and graphics	Monitor winds for changes aloft
Obtain PIREPs	Request for pilot reports	Radio request and M1FC	Used to confirm M1FC and vendor wx	Verbal info and text	Monitor PIREPs to confirm current wx

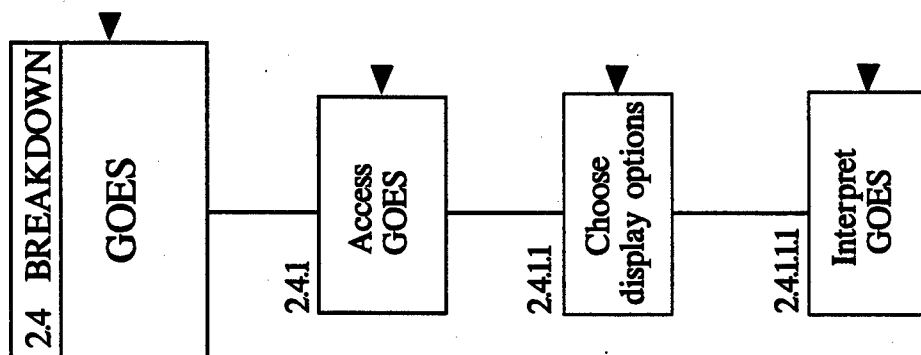


2.3.1.1 Monitor current weather

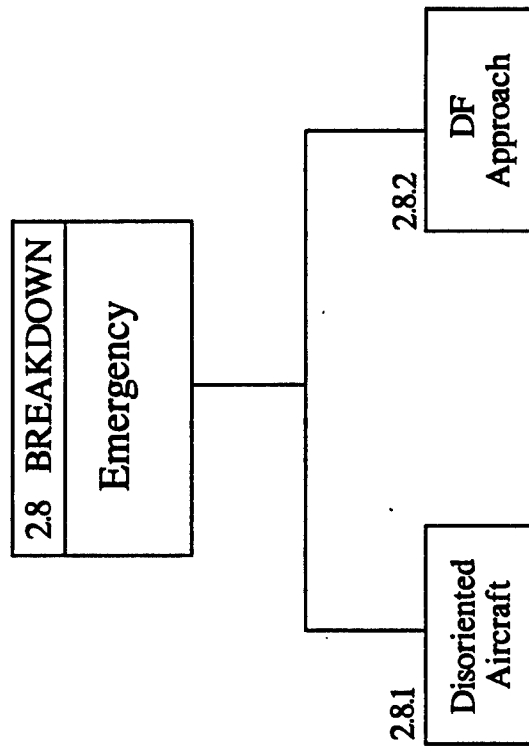
Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Obtain adverse wx conditions	Perform self brief	M1FC and vendor graphic wx		Text and graphics	Monitor changing wx
Obtain LLWAS	Check for approach and departure	M1FC	Confirm with PIREPs	Text	Monitor changing wind shear
Obtain thunder-Storms	Check for hazardous wx	M1FC, radar, and vendor graphic wx		Text and graphics	Monitor for change or new advisories
Obtain icing	Check for hazardous wx	M1FC and facility graphic wx	Confirm with PIREPs/verify intensities	Text and graphics	Monitor for change or new advisories
Obtain weather Advisories	Check for hazardous wx	M1FC and vendor graphic wx	Confirm with radar and PIREPs	Text and graphics	Monitor for new advisories issued
Obtain weather depiction	Look for areas of VFR/IFR	M1FC and vendor graphic wx	Confirm using GOES and SA	Text and graphics	Monitor IFR/VFR conditions
Obtain synopsis	Provide locn and mvmt of wx system	M1FC and vendor graphic wx	Compare to satellite imagery	Text and graphics	Monitor movement of wx systems

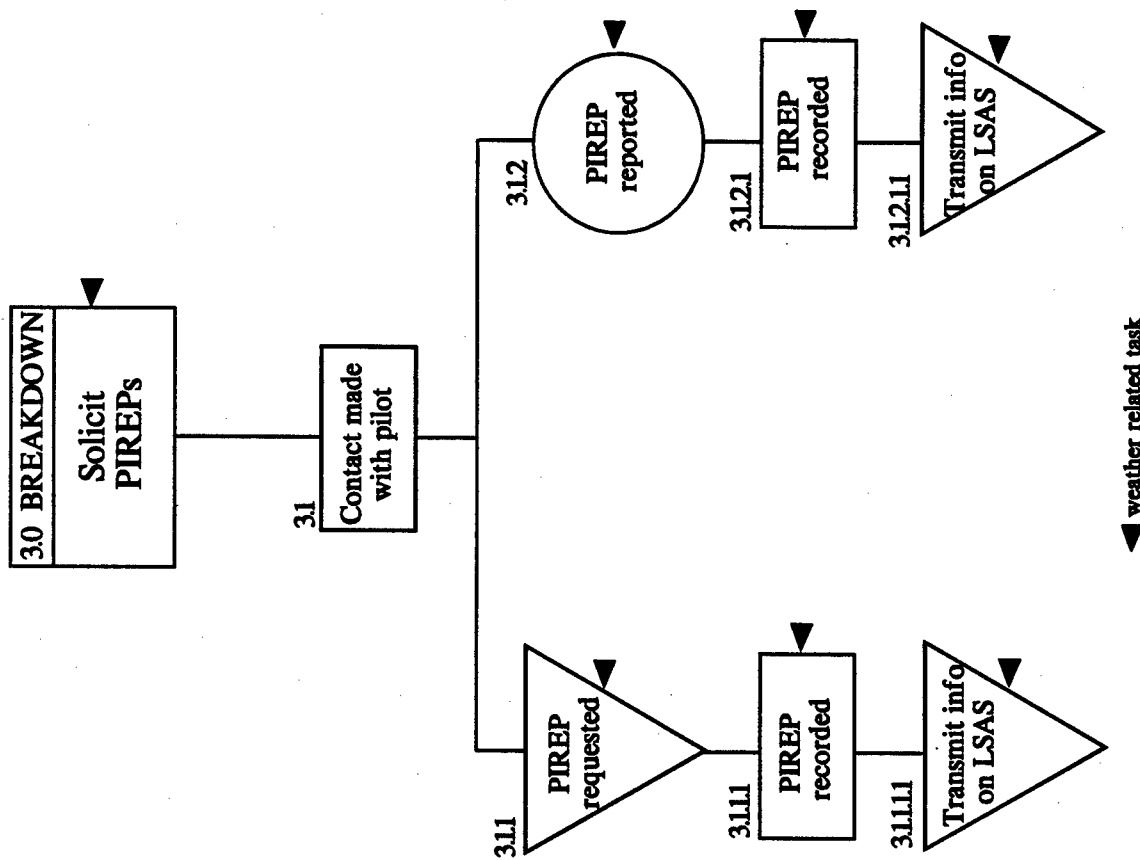
2.3.3.1 Monitor Current Weather (Continued)

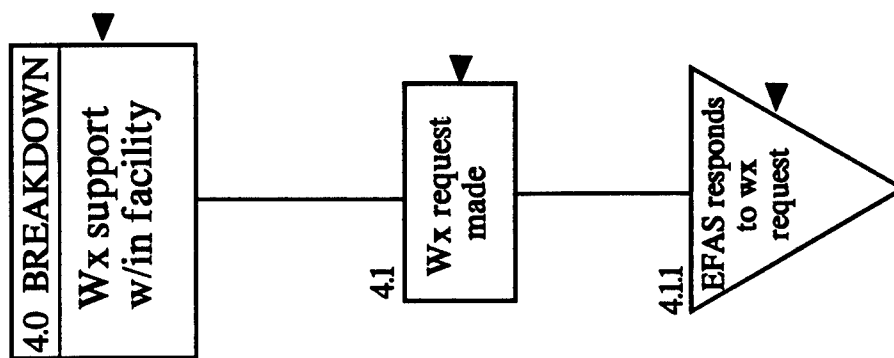
Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
Obtain satellite imagery	Used to verify wx information	Vendor graphic wx	Compare to surface chart, SA, prog chart	Graphics	Monitor cloud coverage/ frontal mvmt.
Obtain current conditions	Summarize Sas, PIREPs, and RAREPs	M1FC	Confirm using M1FC, PIREPs, and GOES	Text	Monitor surface observations
Obtain en-route wx forecast	Provide forecast along route	M1FC and vendor graphic wx	Compare text and graphic wx information	Text and graphics	Monitor wx along common routes
Obtain area forecast	Provide forecast along route	M1FC	Compare wx from M1FC to radar and GOES	Text	Monitor FA for changes in forecast
View prognosis Charts	Provide forecast along route	Vendor graphic wx		Graphics	
Obtain winds aloft	Provide wind speed and direction	M1FC and vendor graphic wx	Interpolate winds from M1FC btwn alt.	Text and graphics	Monitor winds for changes aloft
Obtain PIREPs	Request for pilot reports	radio request and M1FC	Used to confirm M1FC and vendor wx	Verbal info and text	Monitor PIREPs to confirm current wx



▼ weather related task

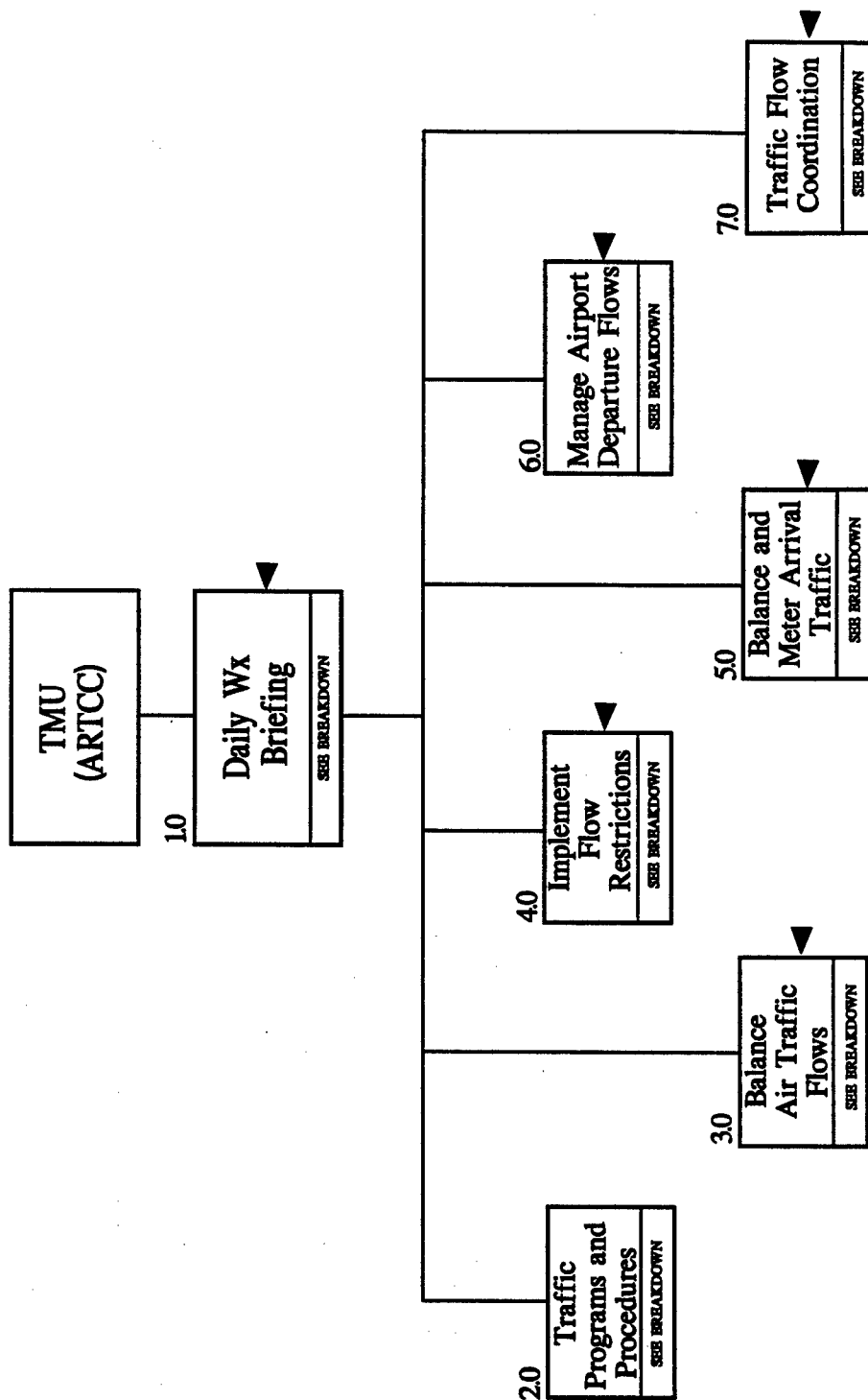






▼ weather related task

Appendix G
TMC JTA

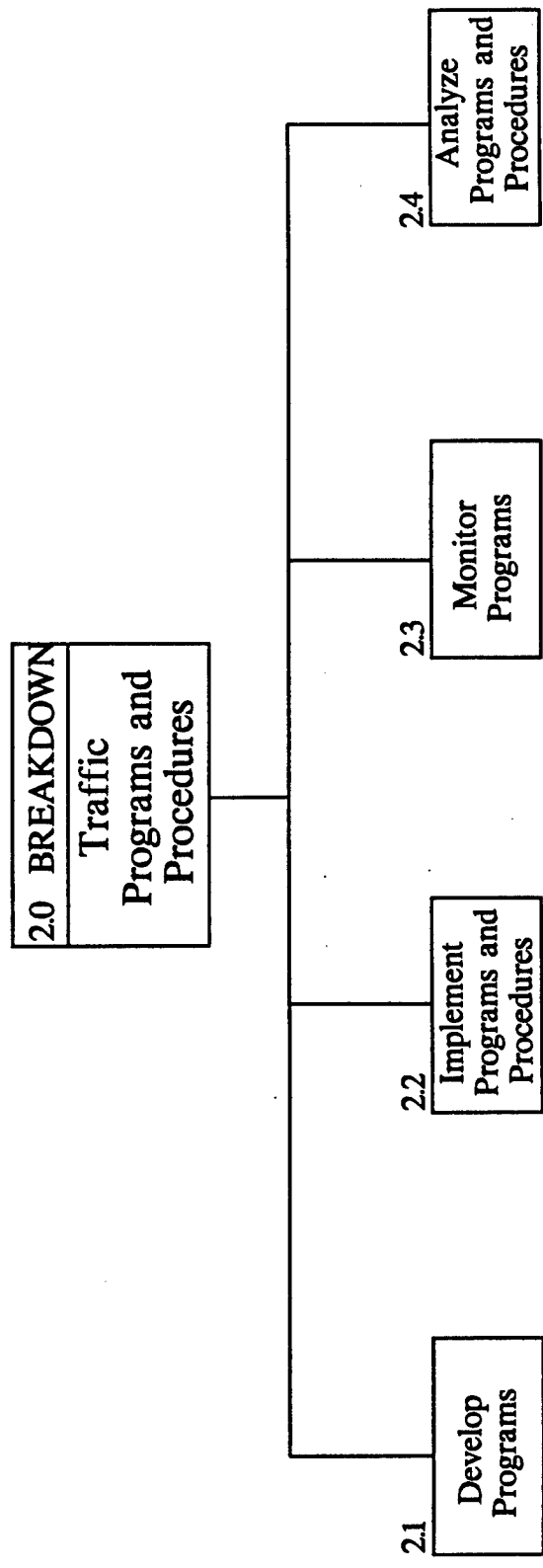


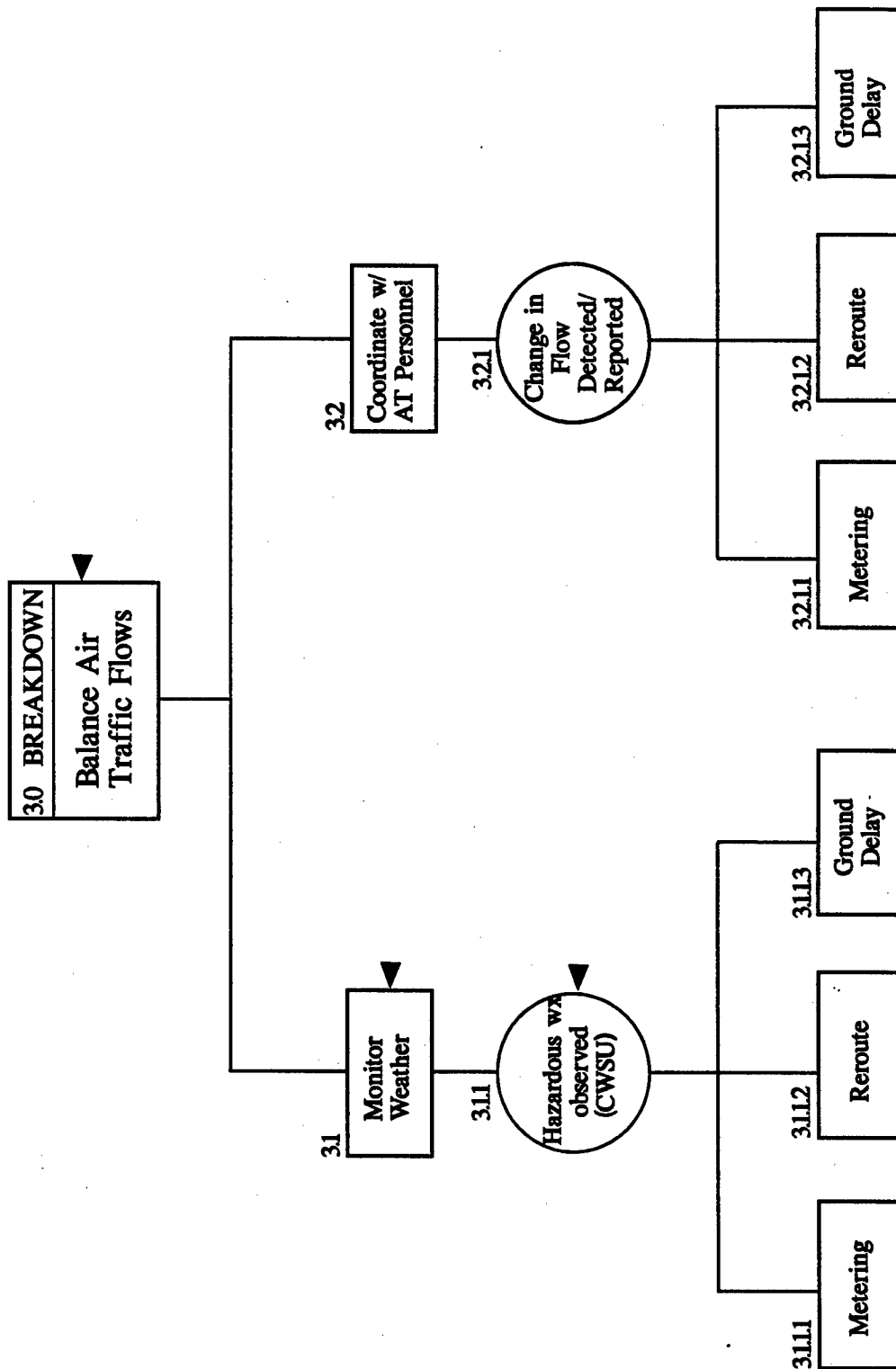
1.0 Daily Weather Briefing

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
View convective activity	To watch for convective activity	MWP		Graphics	Reroute and balance AT flow
Obtain ceilings and visibility	To note areas of cloud coverage	MWP		Graphics	Metering / flow restriction
Obtain icing	To note areas of icing	CWSU/PIREPS		Text and briefing (verbal info)	
Obtain lightning	To note areas of hazardous wx	ASD, NEXRAD		Graphics	
Obtain precip.	To watch for areas of hazardous wx	Radar, ASD, MWP, NEXRAD		Graphics/text	
Obtain surface wind	Obtain wind information	KBVT host/ASD		Text	Implement flow restriction
Obtain turbulence	Obtain turb. information	CWSU/PIREPS		Text and briefing (verbal info)	

1.0 Daily Weather Briefing (Continued)

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Usability
Obtain jet stream	View jet stream Information	CWSU/ASD		Text and briefing (verbal info)	Implement flow restriction
Obtain microbursts	Obtain hazardous wx information	CWSU		Text and briefing (verbal info)	Reroute traffic
Obtain volcanic ash	Obtain wx information	CWSU		Text and briefing (verbal info)	Reroute traffic
Obtain mountain wave	Obtain hazardous wx information	CWSU		Text and briefing (verbal info)	Reroute traffic





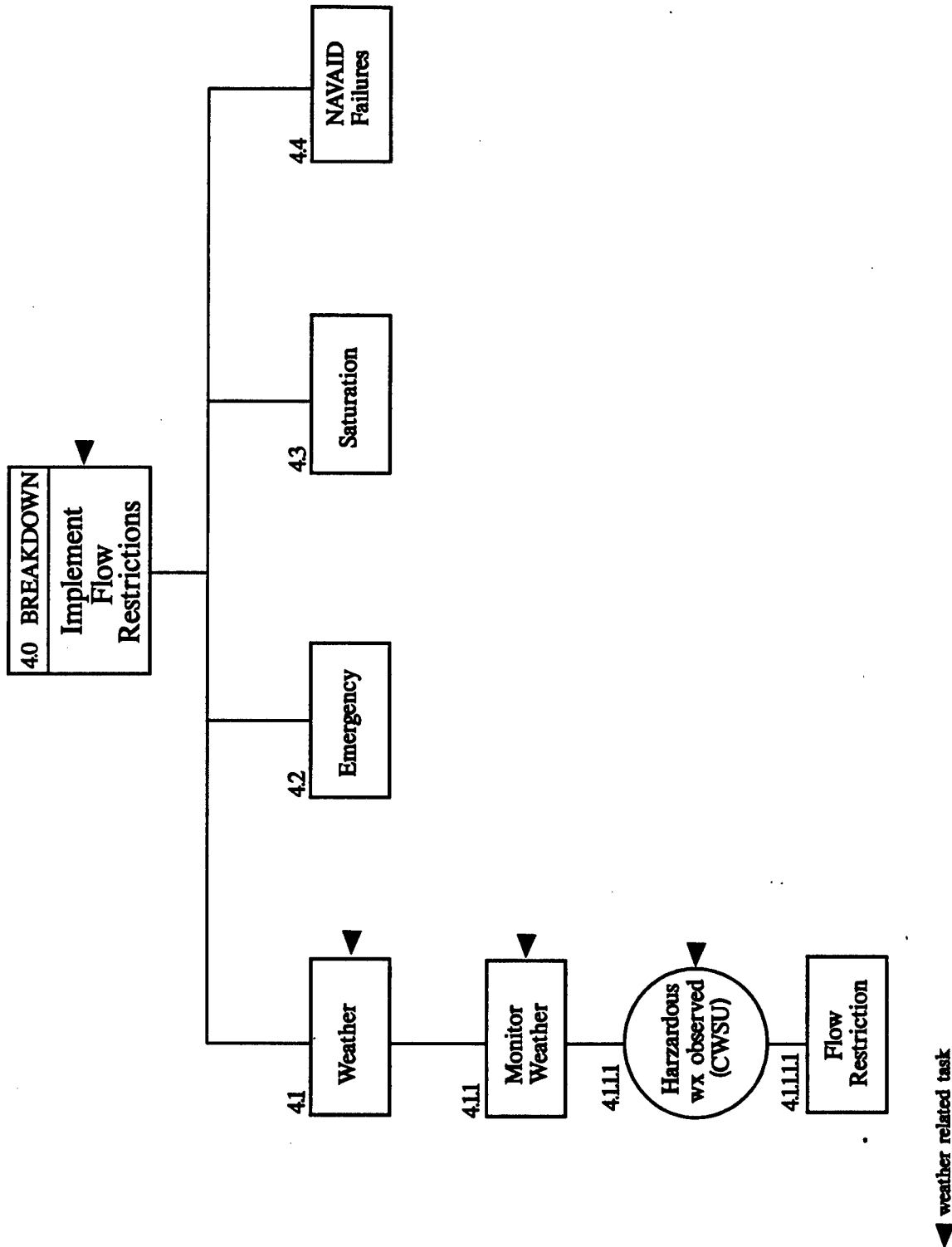
◀ weather related task

3.1 Monitor Weather

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
View convective activity	To watch for convective activity	MWP		Graphics	Reroute and balance AT flow
Obtain ceilings and visibility	To note areas of cloud coverage	MWP		Graphics	Metering / flow restriction
Obtain icing	To note areas of icing	CWSU/PIREPs		Text and briefing (verbal info)	
Obtain lightning	To note areas of hazardous wx	ASD, NEXRAD		Graphics	
Obtain precip.	To watch for areas of hazardous wx	Radar, ASD, MWP, NEXRAD		Graphics/text	
Obtain surface wind	Obtain wind information	KBVT host/ASD		Text	Implement flow restriction
Obtain turbulence	Obtain turb. information	CWSU/PIREPs		Text and briefing (verbal info)	

3.1 Monitor Weather (Continued)

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Usability
Obtain jet stream	View jet stream Information	CWSU/ASD		Text and briefing (verbal info)	Implement flow restriction
Obtain microbursts	Obtain hazardous wx information	CWSU		Text and briefing (verbal info)	Reroute traffic
Obtain volcanic ash	Obtain wx information	CWSU		Text and briefing (verbal info)	Reroute traffic
Obtain mountain wave	Obtain hazardous wx information	CWSU		Text and briefing (verbal info)	Reroute traffic

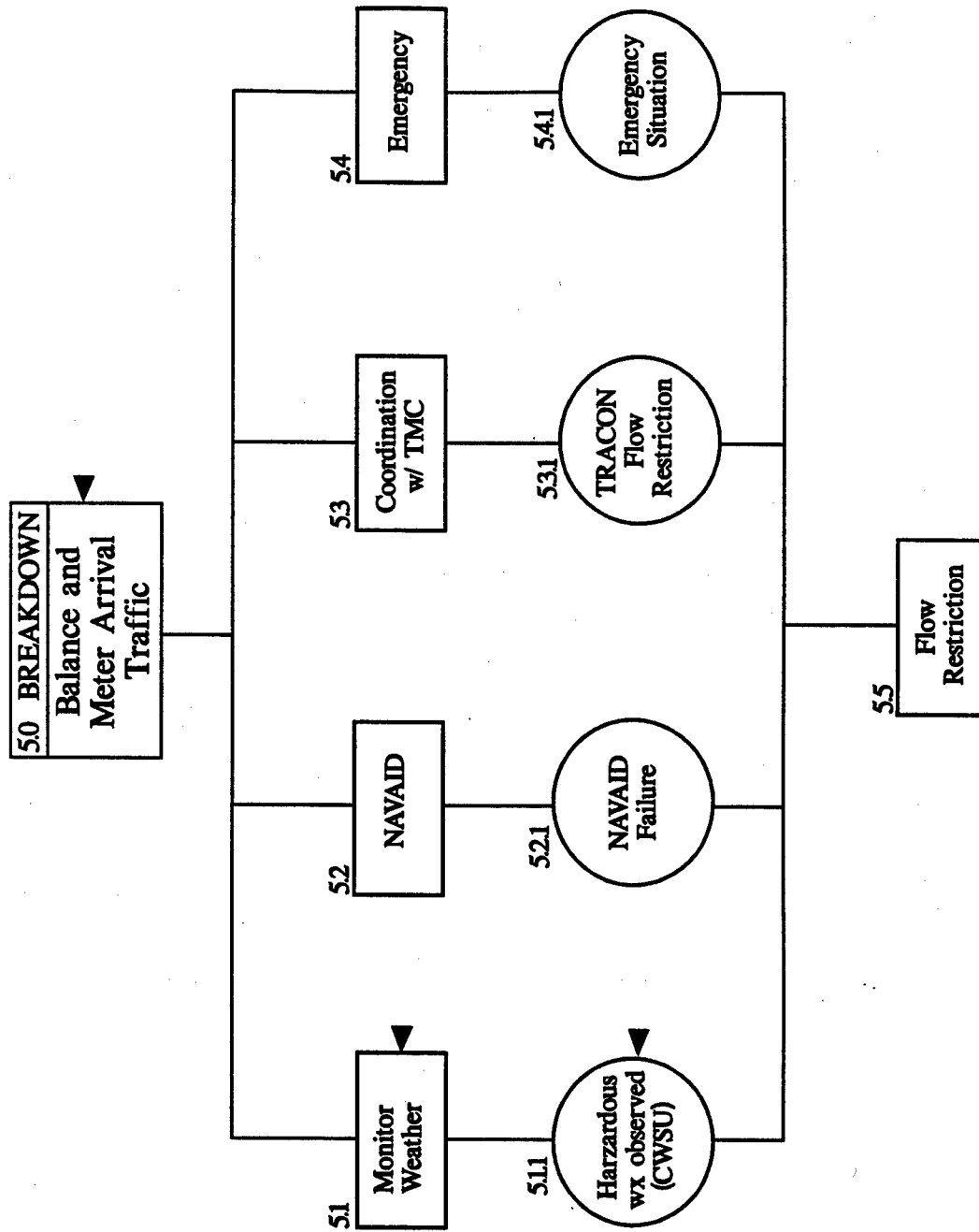


4.1.1.1 Monitor Weather

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
View convective activity	To watch for convective activity	MWP		Graphics	Reroute and balance AT flow
Obtain ceilings and visibility	To note areas of cloud coverage	MWP		Graphics	Metering / flow restriction
Obtain icing	To note areas of icing	CWSU/PIREPs		Text and briefing (verbal info)	
Obtain lightning	To note areas of hazardous wx	ASD, NEXRAD		Graphics	
Obtain precip.	To watch for areas of hazardous wx	Radar, ASD, MWP, NEXRAD		Graphics/text	
Obtain surface wind	Obtain wind information	KBVT host/ASD		Text	Implement flow restriction
Obtain turbulence	Obtain turb. information	CWSU/PIREPs		Text and briefing (verbal info)	

4.1.1.1 Monitor Weather (Continued)

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Usability
Obtain jet stream	View jet stream Information	CWSU/ASD		Text and briefing (verbal info)	Implement flow restriction
Obtain microbursts	Obtain hazardous wx information	CWSU		Text and briefing (verbal info)	Reroute traffic
Obtain volcanic ash	Obtain wx information	CWSU		Text and briefing (verbal info)	Reroute traffic
Obtain mountain wave	Obtain hazardous wx information	CWSU		Text and briefing (verbal info)	Reroute traffic

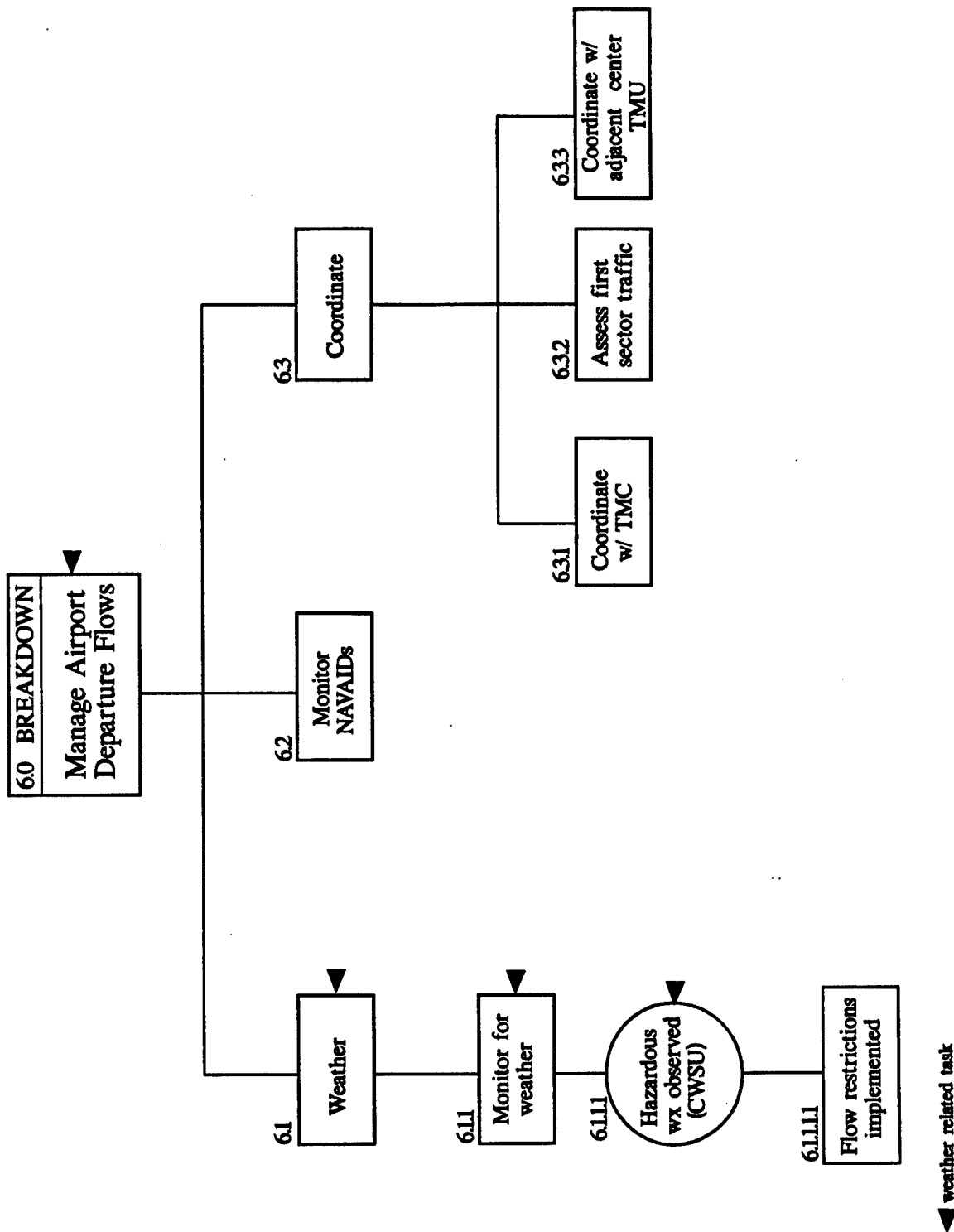


5.1 Monitor Weather

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
View convective activity	To watch for convective activity	MWP		Graphics	Reroute and balance AT flow
Obtain ceilings and visibility	To note areas of cloud coverage	MWP		Graphics	Metering / flow restriction
Obtain icing	To note areas of icing	CWSU/PIREPS		Text and briefing (verbal info)	
Obtain lightning	To note areas of hazardous wx	ASD, NEXRAD		Graphics	
Obtain precip.	To watch for areas of hazardous wx	Radar, ASD, MWP, NEXRAD		Graphics/text	
Obtain surface wind	Obtain wind information	KBVT host/ASD		Text	Implement flow restriction
Obtain turbulence	Obtain turb. information	CWSU/PIREPS		Text and briefing (verbal info)	

5.1 Monitor Weather (Continued)

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Usability
Obtain jet stream	View jet stream Information	CWSU/ASD		Text and briefing (verbal info)	Implement flow restriction
Obtain microbursts	Obtain hazardous wx information	CWSU		Text and briefing (verbal info)	Reroute traffic
Obtain volcanic ash	Obtain wx information	CWSU		Text and briefing (verbal info)	Reroute traffic
Obtain mountain wave	Obtain hazardous wx information	CWSU		Text and briefing (verbal info)	Reroute traffic

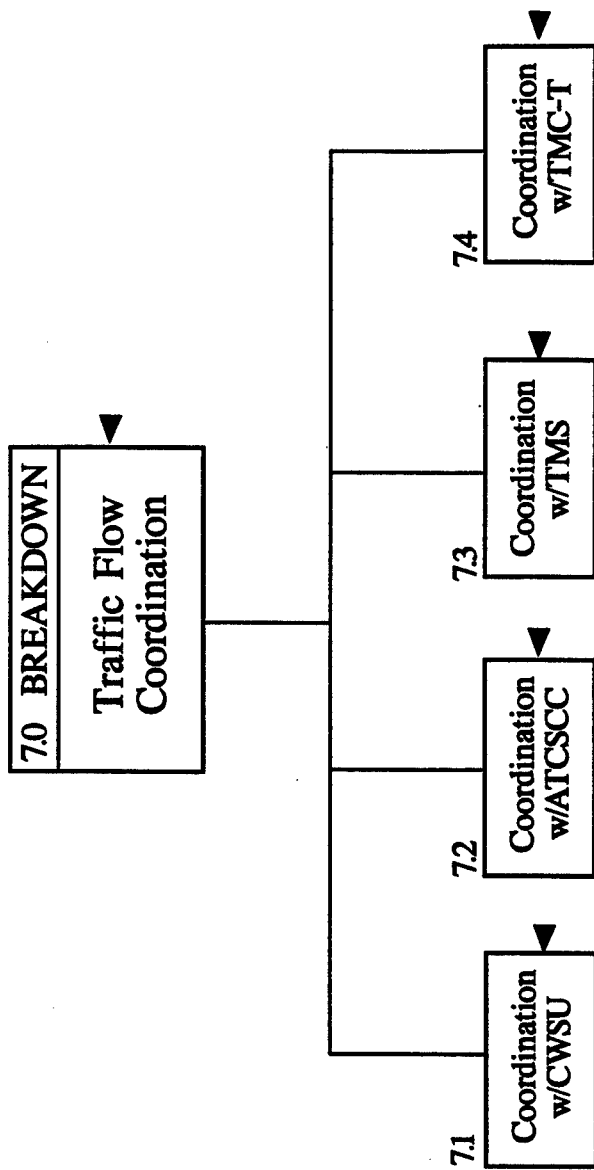


6.1.1.1 Monitor Weather

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Utility
View convective activity	To watch for convective activity	MWP		Graphics	Reroute and balance AT flow
Obtain ceilings and visibility	To note areas of cloud coverage	MWP		Graphics	Metering / flow restriction
Obtain icing	To note areas of icing	CWSU/PIREPS		Text and briefing (verbal info)	
Obtain lightning	To note areas of hazardous wx	ASD, NEXRAD		Graphics	
Obtain precip.	To watch for areas of hazardous wx	Radar, ASD, MWP, NEXRAD		Graphics/text	
Obtain surface wind	Obtain wind information	KBVT host/ASD		Text	Implement flow restriction
Obtain turbulence	Obtain turb. information	CWSU/PIREPS		Text and briefing (verbal info)	

6.1.1.1 Monitor Weather (Continued)

Task Elements	Purpose	Information Source	User Interpretation	Information Format	Usability
Obtain jet stream	View jet stream Information	CWSU/ASD		Text and briefing (verbal info)	Implement flow restriction
Obtain microbursts	Obtain hazardous wx information	CWSU		Text and briefing (verbal info)	Reroute traffic
Obtain volcanic ash	Obtain wx information	CWSU		Text and briefing (verbal info)	Reroute traffic
Obtain mountain wave	Obtain hazardous wx information	CWSU		Text and briefing (verbal info)	Reroute traffic



◀ weather related task

Appendix H
Job Task Definitions

Inflight Specialist

Pre-duty Briefing - Before assuming pilot briefing duties, the specialist familiarizes himself with aeronautical and weather conditions to effectively provide briefing service.

Interphone Communication - Communication between a specialist within AFSS and another ATCF remote from the AFSS.

Radio Aircraft Contacts - Contact made between the flight service specialist and an aircraft on a radio frequency.

Monitoring - To check periodically, keep track of, or scrutinize the status of an item of equipment (ie., monitoring the status of a questionable NAVAID).

Strip Marking - Standard hand-printed characters to prevent misinterpretation of data printed on flight progress strips.

Broadcast Duty - A scheduled or unscheduled broadcast of weather and other flight information.

Local Airport Advisories - A service provided by flight service stations at airports not serviced by an operating control tower. A Local Airport Advisory provides the following information to an arriving or departing aircraft:

1. wind direction and speed,
2. favored runway,
3. altimeter setting,
4. pertinent known traffic,
5. pertinent known field conditions,
6. airport taxi routes and traffic patterns, and
7. authorized instrument approach procedures.

Emergency - A distress or an urgency condition.

Standard Weather Briefing - Using all sources of weather and aeronautical information, the specialist provides the following data for a pilot briefing:

1. adverse conditions,
2. synopsis,
3. current conditions,
4. enroute forecast,
5. destination forecast,
6. winds aloft,
7. notices to airmen (NOTAM),
8. ATC delays, and
9. any other aeronautical data requested.

Abbreviated Weather Briefing - The specialist provides an abbreviated briefing when a pilot requests information to supplement mass disseminated data, update a previous briefing, or when the pilot requests that the briefing be limited to specific information.

Outlook Weather Briefing - The specialist provides an outlook briefing when the proposed departure is 6 or more hours from the time of the briefing. The briefing is limited to forecast data as applicable to the proposed flight.

EFAS

Pre-duty Area of Knowledge - The flight watch specialist is responsible for an in-depth comprehensive knowledge of static and dynamic factors within an approximate 600 nautical mile radius of the assigned facility.

Disseminate Enroute Weather - The specialist provides enroute aircraft with timely and pertinent weather data tailored to a specific altitude and route using the most current available sources of aviation meteorological information.

Solicit PIREPs - Solicit PIREPs for the affected area(s) when one or more of the following weather conditions exists, are reported, or are forecasted to occur:

1. ceiling at or below 5,000 feet;
2. visibility reported on the surface or aloft is 5 miles or less;
3. thunderstorms and related phenomenon;
4. turbulence of moderate degree or greater;
5. icing of light degree or greater;
6. wind shear;
7. an NWS or an ATC facility indicates a need because of a specific weather or flight assistance situation;
8. necessary to determine flying condition pertinent to natural hazards (mountain passes, ridges, peaks) between the weather reporting stations;
9. the station is designated as responsible for PIREPs in an offshore coastal area; and
10. flight watch specialists shall solicit sufficient PIREPs to remain aware of flight condition.

Static Knowledge - Static knowledge factors include:

1. topography, and
2. communications frequencies.

Dynamic Knowledge - Dynamic knowledge factors frequently interrelate so that change in one causes others to change. These factors include:

1. current and forecast weather,
2. airway structure,
3. navigational aids,
4. special military operations areas, and
5. aeronautical information.

Topography - The accurate and detailed description of terrain factors within an approximate 600 nautical mile radius of the assigned facility, an area of over 1 million square miles.

Airway Structure - A control area or portion established in the form of a corridor the centerline of which is defined by radio navigational aids.

Aeronautical Information - Aeronautical information generally refers to NOTAMs, but may consist of any of the following:

1. information concerning the establishment, condition, or change in any component of the NAS (ie., airports, NAVAIDs),
2. information regarding the boundaries and effective times of restricted or special use airspace,
3. information regarding preferred or fuel efficient routes, and
4. traffic management information.

Disorientated Aircraft - Aircraft that is either unsure of his or her position or is lost.

DF Approach - A Direction Finder approach is used under emergency conditions where other instrument approach procedures cannot be executed. DF guidance for an instrument approach is given by ATC facilities with DF capability.

Preflight

Pre-duty Briefing - Before assuming pilot briefing duties, the specialist familiarizes himself with aeronautical and weather conditions to effectively provide briefing service.

Standard Weather Briefing - Using all sources of weather and aeronautical information, the specialist provides the following data for pilot weather briefings:

1. adverse conditions,
2. synopsis,
3. current conditions,
4. enroute forecast,
5. destination forecast,
6. winds aloft,
7. notices to airmen (NOTAM),
8. ATC delays, and
9. any other aeronautical data requested.

Abbreviated Weather Briefing - The specialist provides an abbreviated briefing when a pilot requests information to supplement mass disseminated data, update a previous briefing, or when the pilot requests that the briefing be limited to specific information.

Outlook Weather Briefing - The specialist provides an outlook briefing when the proposed departure is 6 or more hours from the time of the briefing. The briefing is limited to forecast data as applicable to the proposed flight.

TMU

Traffic Programs and Procedures - Programs and procedures that develop and initiate flow control procedures as required between intracenter areas and between adjacent enroute facilities to regulate the flow of aircraft to the maximum number of aircraft that can be expeditiously and safely handled by the system.

Balance Air Traffic Flows - Controllers maintain a continuous awareness of the traffic flow, status of NAVAID's, weather conditions, and traffic forecast to preclude situations which would cause sector saturation, excessive enroute and terminal

Appendix I
Weather Product Definitions

Surface Observation (SAO) - Report of current surface weather at an observation point at an airport. It may be made up of manually observed and entered weather, automatically sensed weather, or a combination of both. This information is contained in a surface aviation weather report/SAO.

Terminal Forecast (FT) - A terminal forecast (FT) is a description of the surface weather expected to occur at an airport. It forecasts cloud heights and amounts, visibility, weather and wind relate to flight operations within 5 nautical miles of the center of the runway complex.

Area Forecast (FA) - An area forecast (FA) is a forecast of general weather conditions over an area encompassing several states. It is used to determine forecast enroute weather and to interpolate conditions at airports which do not have Fts issued.

Winds and Temperature Aloft (FD) - Winds and temperature aloft (FD) are 6, 12, and 24-hour forecast of wind direction (nearest 10° true north) and speed (knots) for selected flight levels. Forecast temperatures aloft (0° centigrade) are included for all but the 3000-foot level.

Significant Meteorological Information (SIGMET) - A weather advisory issued concerning weather significant to the safety of all aircraft. SIGMET advisories cover severe and extreme turbulence, severe icing and widespread dust or sand storms that reduce visibility to less than 3 miles.

Airman's Meteorological Information (AIRMET) - In flight weather advisories issued only to amend the area forecast concerning weather phenomena which are of operational interest to all aircraft and potentially hazardous to aircraft having limited capability because of lack of equipment, instrumentation, or pilot qualifications

Convective SIGMET (WST) - A weather advisory concerning convective weather significant to the safety of all aircraft. Convective SIGMET's are issued for tornados, lines of thunderstorms, embedded thunderstorms of any intensity level, areas of thunderstorms greater than or equal to VIP

level 4 with an areal coverage of 4/10 (40 percent) or more, and hail 3/4 inch or greater.

Center Weather Advisory (CWA) - A Center Weather Advisory (CWA) is an unscheduled inflight flow control, air traffic, and air crew advisory for use in anticipating and avoiding adverse weather conditions in the enroute and terminal areas.

Severe Weather Watch Bulletin (WW) - A severe weather watch bulletin (WW) defines areas of possible severe thunderstorms or tornado activity.

Satellite Data - A visible and infrared earth-sensing satellite used for weather observation.

Low Level Significant Prognostic Chart (12-24 hour forecast) - Significant weather prognostic charts, called "progs" for brevity, portray forecast weather which may influence flight planning. Some of forecasted weather are turbulence, icing, rain, snow, thunderstorm, freezing rain, tropical storm, and hurricane.

Composite Moisture Stability Chart (upper air) - The Composite Moisture Stability Chart is an analysis chart using observed upper air data. It is composed of the following four panels: stability, freezing level, precipitable water, and average relative humidity.

Tropopause Data Chart - A four-panel chart containing observed tropopause data, a maximum wind prog, a vertical wind shear prog, and a high level significant weather prog is prepared for the contiguous 48 states.

Weather Depiction Chart - The weather depiction chart is computer prepared from surface aviation (SAO) reports to give a broad overview of observed flying category conditions (e.g., VFR/IFR) as of the valid time of the chart.

Pilot Weather Reports (PIREP) - A report of meteorological phenomena encountered by aircraft in flight and issued by pilots.

Adverse Conditions - Significant meteorological and aeronautical information that might influence the pilot to alter the proposed flight.