AC 00-45B

AVIATION WEATHER SERVICES

AC 00-45B

AVIATION WEATHER SERVICES

(A Supplement to Aviation Weather AC 00-6A)

Revised 1979

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
Flight Standards Service

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
National Weather Service

Washington, D.C.

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INTRODUCTION

The rapid expansion of air transportation makes necessary a move toward mass briefing to meet aviation demands. As a result, you, the pilot, must become increasingly self-reliant in getting your weather information. On occasion, you may need to rely entirely on self-briefing.

AVIATION WEATHER,* AC 00–6A, tells about weather, what to look for, and weather impact on flying. This advisory circular supplements AVIATION WEATHER explaining weather service in general and the details of interpreting and using reports, forecasts, weather maps, and prognostic charts. Many charts and tables apply directly to flight planning and inflight decisions.

This advisory circular is an excellent source of study for pilot certification examinations. Its 16 sections run the gamut from the student pilot to the airline transport pilot.

AVIATION WEATHER SERVICES, AC 00–45, is updated periodically to reflect changes brought about by the latest service demands, techniques, and capabilities. The purchase of an updated copy is a wise investment for any active pilot.

Advisory Circular, AC 00–45B, supersedes Aviation Weather Services, AC 00–45A, revised 1977.

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* Price and availability to be announced in the FAA Advisory Circular Checklist.

Section 1

THE AVIATION WEATHER SERVICE PROGRAM

Weather service to aviation is a joint effort of the National Weather Service (NWS), the Federal Aviation Administration (FAA), the military weather services, and other aviation oriented groups and individuals. Because of international flights and a need of world-wide weather, foreign weather services also have a vital input into our service. The NWS coordinates weather services, and many NWS products at all echelons are specifically for aviation.

Figure 1–1 is a flow diagram of weather data. This section follows the development and flow of observations, reports, and forecasts through the service to the users.

DATA FLOW

Longline communications providing the flow of data through the system are mostly teletypewriter and facsimile. Teletypewriter circuits collect and distribute weather reports, forecasts, and warnings. Facsimile transmits observed and forecast weather charts.

Each service outlet has a drop on an area teletypewriter circuit which provides complete data within a few hundred miles of the outlet but only sparse data for more remote areas. Reports and forecasts not routinely available on the local area circuit are available on a request/reply circuit.

National Weather Service facsimile distributes graphic weather analyses and prognostic charts. Most service outlets have facsimile.

OBSERVATIONS

Weather observations are measurements and estimates of existing weather. Observations are made at the surface and aloft. When recorded and transmitted, an observation becomes a report. These reports are the basis of all weather analyses and forecasts. Note in figure 1–1 that weather reports flow to all echelons in the aviation weather service.

Surface Observations

Surface aviation observations include weather elements pertinent to flying. A network of airport stations provides routine up-to-date aviation weather reports. Most stations are either NWS or FAA; however, military services and contracted civilians

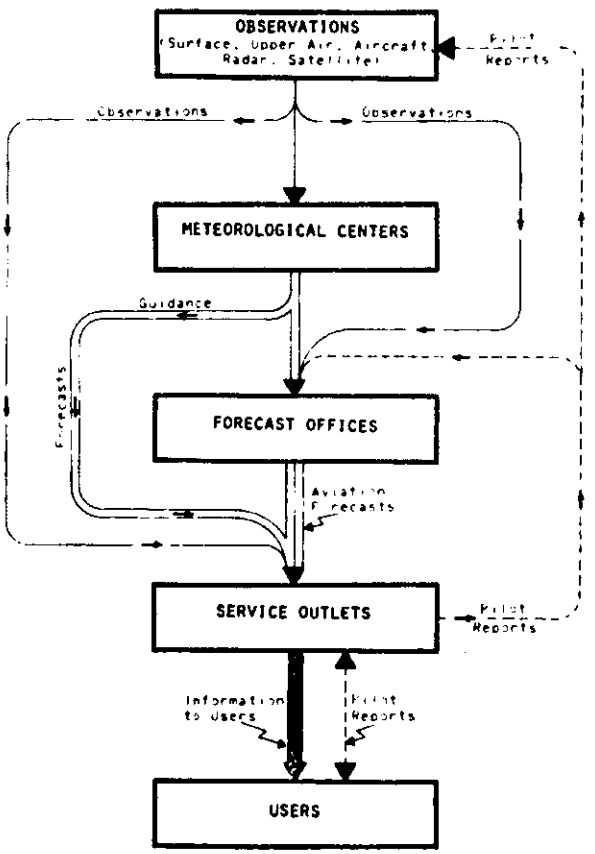


FIGURE 1–1. Data flow in the aviation weather service. All data is available through service outlets. Note the important feedback of pilot reports.

complete the network. All official civilian weather observers must be certified by the National Weather Service.

Radar Observations

Precipitation reflects radar signals, and the reflected signals are displayed as echoes on the radar scope. NWS radar covers nearly all the U.S. east of the Rocky Mountains. Radar coverage over the remainder of the U.S. is largely by Air Route Traffic Control radars. Thus, except for some western mountainous terrain, radar coverage is nearly complete over the contiguous 48 States. Figure 1–2 maps the radar observing network.

Other Observations

Many other observations have a significant input to the aviation weather service. Upper air observations taken twice daily at specified stations furnish temperature, humidity, pressure, and wind, often to heights above 100,000 feet. Weather satellites scan the Earth providing cloud pictures. These pictures are especially useful in remote areas. Pilots themselves are a vital source of weather observations. In fact, aircraft in flight are the only means of directly observing turbulence, icing, and height of cloud tops.

METEOROLOGICAL CENTERS AND FORECAST OFFICES

Meteorological centers collect and analyze data and prepare forecasts on a national, hemispheric, or global basis. NWS forecast offices prepare forecasts which are generally more detailed.

National Meteorological Center (NMC)

The National Meteorological Center (NMC) of the NWS is the hub of all weather processing. From worldwide weather reports it prepares forecasts and charts of observed and forecast weather. Many of the charts are computer prepared. Others are computer outputs adjusted and annotated by meteorologists. A few are manually prepared by forecasters.

Some NMC products are specifically for aviation. For example, NMC prepares the winds and temperatures aloft forecast. Figure 1-3 is the network of forecast winds and temperatures for the contiguous 48 States.

National Hurricane Center (NHC)

The NWS National Hurricane Center (NHC) develops hurricane forecasting techniques and issues hurricane forecasts for the Atlantic, the Caribbean, the Gulf of Mexico, and adjacent land areas. It is located at Miami, Florida. Hurricane warning centers at San Francisco and Honolulu issue warnings for the eastern and central Pacific.

National Severe Storms Forecast Center (NSSFC)

The NWS National Severe Storms Forecast Center (NSSFC) issues convective SIGMETS and prepares forecasts of severe convective storms over the Contiguous 48 States. It is located at Kansas City, Missouri near the heart of the area most frequently affected by severe thunderstorms.

National Environmental Satellite Service (NESS)

The National Environmental Satellite Service (NESS) directs the weather satellite program. Through newly developed radiation measuring techniques, it contributes directly to NMC processing. Satellite cloud photographs are available at field facilities by facsimile and at some stations by direct picture reception.

Weather Service Forecast Office (WSFO)

A Weather Service Forecast Office (WSFO) issues forecasts, advisories and warnings for its area. Figure 1-4 (Alaska, fig. 1-10) shows locations of WSFOs, their areas of responsibility, and the airports for which each office prepares terminal forecasts. Selected WSFOs issue area forecasts. Figure 1-5 (Alaska, fig. 1-10) shows locations of these offices and their forecast areas.

Weather Service Office (WSO)

A Weather Service Office (WSO) prepares local forecasts and warnings and provides general weather service. It shoulders part of the terminal forecast responsibility. A WSO can adjust the local terminal forecast for a period of two hours or less.

SERVICE OUTLETS

A weather service outlet as used here is any facility, either government or non-government, that provides aviation weather service. This section discusses only FAA and NWS outlets.

Flight Service Stations (FSS)

The FAA Flight Service Station (FSS) provides more aviation weather briefing service than any other government service outlet. It provides preflight and inflight briefings, makes scheduled and unscheduled weather broadcasts, and furnishes weather advisories to known flights in the FSS area.

Selected FSSs also provide transcribed weather dissemination to aid inflight and preflight briefing. By listening to the transcriptions, you can assess any further need for more detailed briefing. There are two types of transcriptions--(1) Transcribed Weather Broadcast (TWEB) and (2) Pilot's Automatic Telephone Weather Answering Service (PATWAS).

The TWEB is a continuous broadcast on low/medium frequencies (200 to 415 kHz) and selected VORs (108.0 to 117.95 mHz). PATWAS is a recorded telephone briefing service. TWEB and PATWAS transcriptions are on a route concept. A few selected stations also prepare transcriptions for a local area—usually within a 50 nautical mile radius of the station.

Order and content of the TWEB transcription are as follows:

1. Synopsis
2. Flight Precautions
3. Route Forecasts
4. Outlook (Optional)
5. Winds Aloft Forecast
6. Radar Reports
7. Surface Weather Reports
8. Pilot Reports
9. Notice to Airmen (NOTAMs)

The first five items are forecasts prepared by the NWS and are discussed in detail in section 4. The synopsis and route forecasts are prepared especially for TWEB. Flight precautions, outlook, and winds aloft are adapted respectively from inflight advisories, area forecasts, and the NMC winds aloft forecast. Radar reports and pilot reports are discussed in section 3. Surface reports are the subject of section 2.

The order and content of the PATWAS recording are as follows:

1. Introduction (describing PATWAS area)
2. Adverse Conditions
3. Recommendation (VFR flight not recommended, if appropriate)
4. Synopsis
5. Current Conditions
6. Surface Winds
7. Forecast
8. Winds Aloft
9. NOTAMs
10. Military Training Activity
11. Closing Announcements

FAA facilities providing PATWAS have operational procedures that place a high operational priority on PATWAS. This insures the information is current and accurate. Data available between 2200 local and 0500 local may be a general outlook for the PATWAS area.

Figure 1-6 lists TWEB outlets by state; and figure 1-7, PATWAS locations. Figure 1-8 shows routes for which forecasts are prepared. The Airman's Information Manual gives basic flight information and Air Traffic Control (ATC) procedures. The Airport Facility Directory lists PATWAS telephone numbers of FSSs and NWS briefing offices.

The enroute flight advisory service (Flight Watch) is a weather service on a common frequency of 122.0 mHz from selected FSSs. The Flight Watch specialist maintains a continuous weather watch, provides time-critical assistance to enroute pilots facing hazardous or unknown weather, and may recommend alternate or diversionary routes. Additionally, Flight Watch is a focal point for rapid receipt and dissemination of pilot weather reports. Figures 1-11 indicates the 44 sites where EFAS and associated outlets are located. To avail yourself of this service, call "FLIGHT WATCH" on 122.0 mHz.

Air Traffic Control Systems Command Center (ATCSCC)

This operational facility is located at FAA headquarters in Washington, D.C. Its objective is to manage the flow of air traffic on a system-wide basis, to minimize delays, by matching capacity and demand and to achieve maximum utilization of the airspace. Because weather is the overwhelming reason for air traffic delays and reroutings, this facility is supported by full-time NWS meteorologists whose function is to advise ATCSCC flow specialists by continuously monitoring the weather throughout the system and anticipating weather developments that might affect system operations.

Air Traffic Control Centers (ARTCCs)

All FAA facilities within an ARTCC boundary are supported by a Center Weather Service Unit (CWSU), 13 units as of FY 79 east of the Continental Divide, consisting of full time NWS meteorologists and FAA weather coordinators. It is their responsibility to detect, screen and disseminate aviation weather intelligence in sufficient detail to permit ATC personnel and pilots to make appropriate decisions pertinent to flight safety and operations.

Terminal Control Facility

The FAA terminal controller becomes familiar with and remains aware of current weather information needed to perform air traffic control duties. He informs arriving and departing aircraft of pertinent local weather conditions. He shares responsibility with the NWS for reporting visibility observations at many facilities. At other facilities he has the full responsibility for observing, reporting, and classifying aviation weather elements.

Weather Service Office

NWS Weather Service Offices provide weather briefings in areas not served by Flight Service Stations and provide local warnings to aviation. They furnish backup assistance to FAA service outlets.

Weather Service Forecast Office

NWS Weather Service Forecast Offices provide some selective pilot briefings and supply backup service to FAA outlets. When getting a briefing from an FSS, you may, if necessary, request a telephone "patch in" to the WSFO forecaster. A few WSFOs make and record PATWAS.

USERS

The ultimate users of the aviation weather service are pilots and dispatchers. Maintenance personnel also may use the service in protecting idle aircraft against storm damage. As a user of the service, you also contribute to it. Send pilot weather reports (PIREPs) to help your fellow pilots, briefers and forecasters. The service can be no better or more complete than the information that goes into it.

In the interest of safety, you should get a complete briefing before each flight. If you have L/MF radio, you can get a preliminary briefing by listening to the TWEB at your home or place of business. If you have no radio and PATWAS is available, dial PATWAS for a briefing. If after listening to the TWEB or PATWAS, the weather situation is complex or you do not completely comprehend the recorded message, it is advisable that you contact an FSS or WSO for a more complete briefing tailored for your specific flight.

How to Get a Good Weather Briefing

When requesting a briefing, make known you are a pilot. Give clear and concise facts about your flight:

1. Type of flight VFR or IFR
2. ACFT Ident or pilot's name
3. ACFT type
4. Departure point
5. Route-of-flight
6. Destination
7. Altitude
8. EST time of departure
9. EST time en route or EST time of arrival

With this background, the briefer can proceed directly with the briefing and concentrate on weather relevant to your flight.

The weather briefing you receive should include:

1. Hazardous weather if any (you may elect to cancel at this point)
2. Weather synopsis (positions of lows, fronts, etc.)
3. Forecast (enroute and destination)
4. Alternate routes (if any)
5. Forecast winds aloft

The FSSs and WSOs are to serve you. You should not hesitate to discuss factors that need elaboration or to ask questions. You have a complete briefing only when you have a clear picture of the weather to expect. It is to your advantage to make a final weather check immediately before departure if at all possible.

Request/Reply Service

The request/reply service mentioned earlier is available at all FSSs, WSOs, and WSFOs. You may request through the service any reports or forecasts not routinely available at your service outlet. These include route forecasts used in TWEB and PATWAS, recorder briefings and RADAR charts (see figure 3-1). You can request a forecast for any numbered route shown in figure 1-8 or any of the longer cross-country routes shown in figure 1-9.

Have an Alternate Plan of Action

When weather is questionable, get a picture of expected weather over a broader area. Preplan a route to take you rapidly away from the weather if it goes sour. When you fly into weather through which you cannot safely continue, you must act quickly. Without preplanning, you may not know the best direction to turn; a wrong turn could lead to disaster. A preplanned diversion beats panic. Better be safe than sorry.

AM WEATHER

A live, fifteen minute weather program is broadcast Monday through Friday mornings nationally on approximately 200 Public Broadcast Television Stations.

Professional meteorologists from the National Weather Service and the National Environmental Satellite Service provide weather information primarily for pilots to enable them to make a better go or no-go flight decision.

National and Regional Weather Maps are provided, along with satellite sequences, radar reports, winds aloft, radar reports and weatherwatches. Extended forecasts are provided daily and on Fridays to cover the weekend. AM WEATHER broadcasts also serve many other interest areas that depend upon accurate forecasting.

The series draws upon the U.S. weather observation network, on geostationary and polar orbiting satelitte data and on computer analysis to produce daily forecasts with 85 to 90% accuracy.

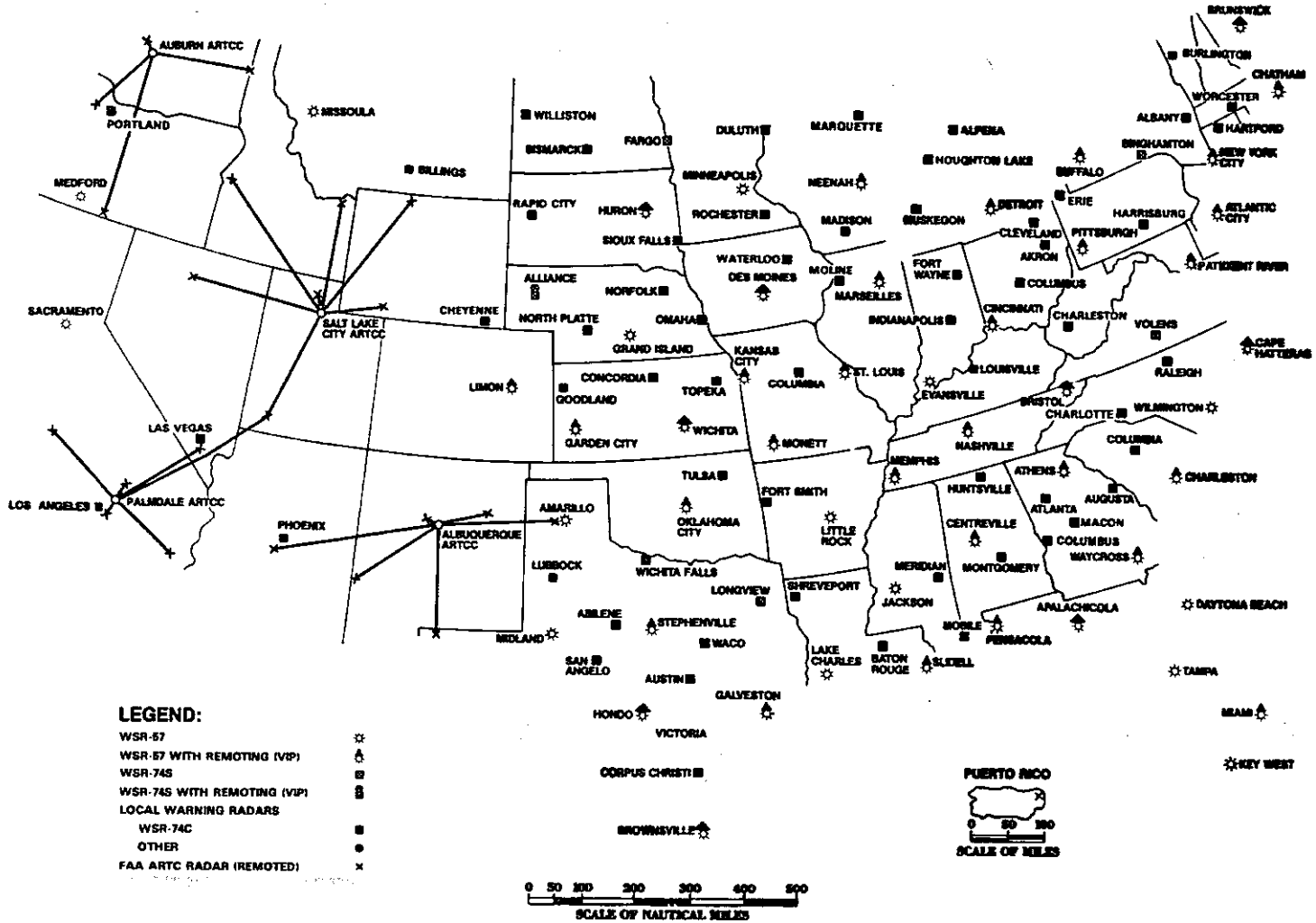


FIGURE 1-2. The radar observing network.

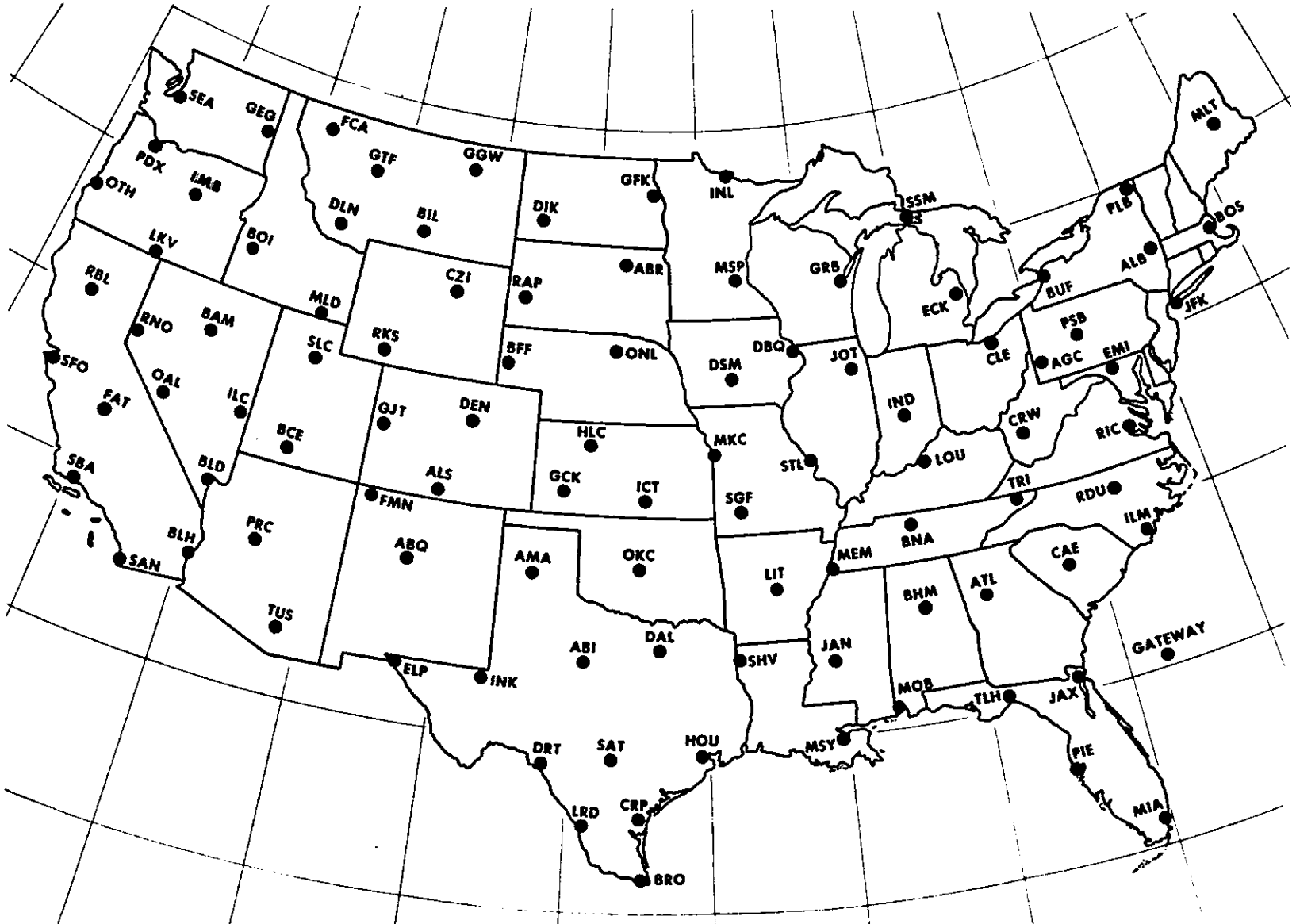


FIGURE 1-3. The forecast winds and temperatures aloft network.

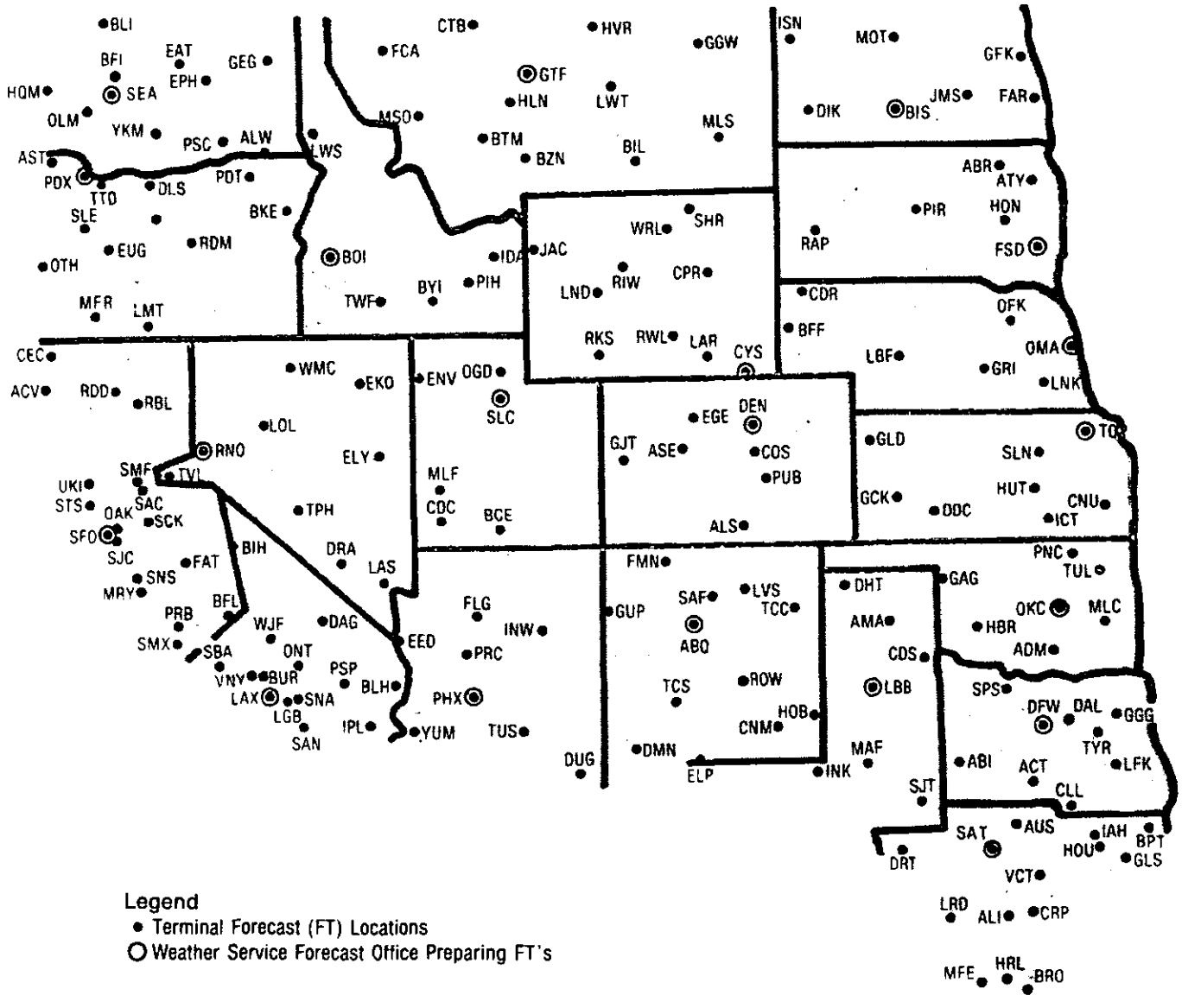


FIGURE 1-4. Locations of WSFOs, their areas of responsibility, and airports for which each prepares terminal forecasts.

FIGURE 1-4. Continued.

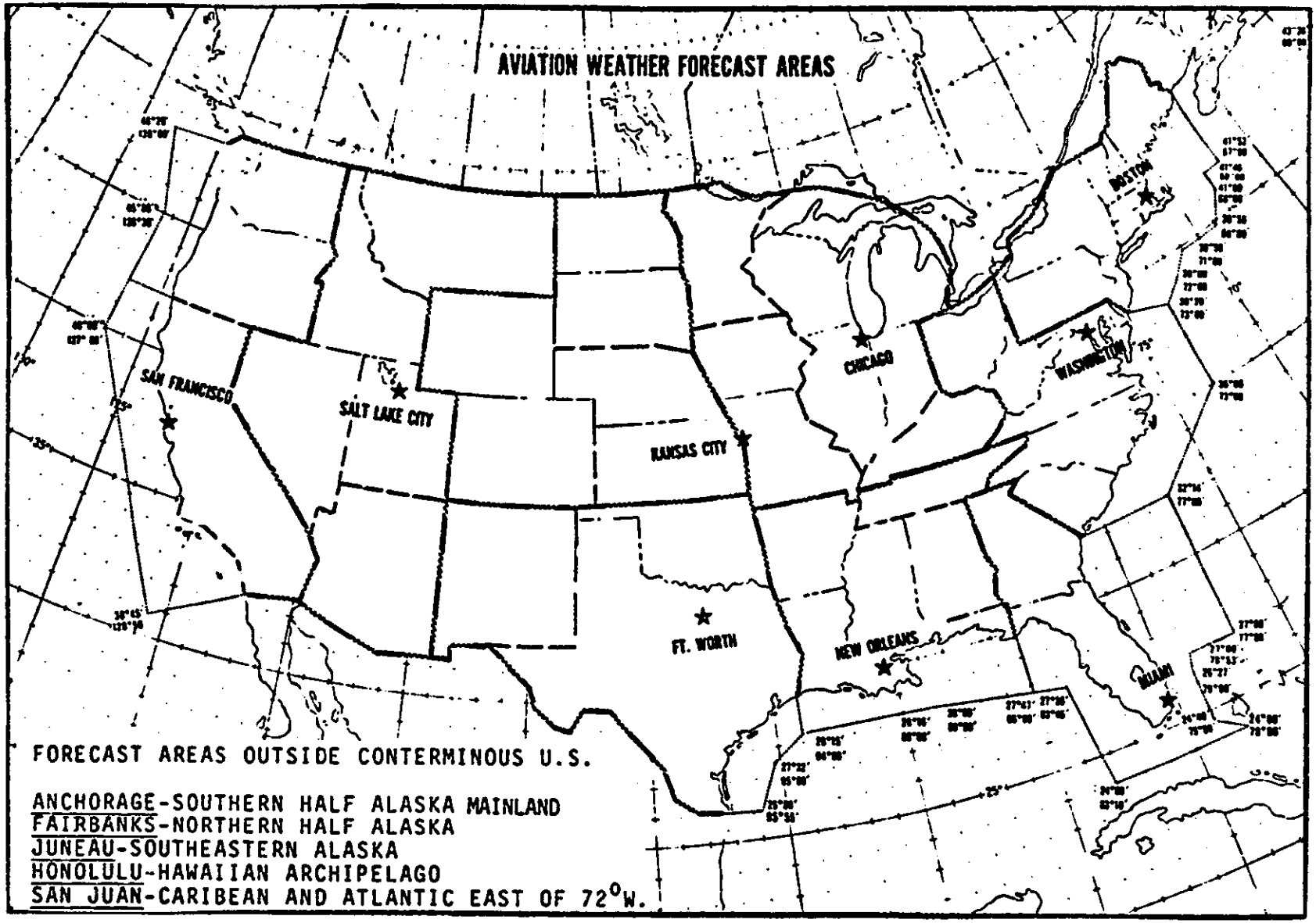


FIGURE 1-5. Locations of selected WSFOs preparing area forecasts and the areas for which they forecast.

NDB FREQUENCIES ARE KHZ
VOR FREQUENCIES ARE MHZ

ALABAMA

BH	224
MSL	116.5

ARIZONA

CZG	114.8
DUG	108.8
PQO	326
RYN	338

ARKANSAS

LI	353

CALIFORNIA

ACV	110.2
BFL	115.4
DAG	113.2
EED	115.2
FAT	112.9
FCH	344
FJS	109.6
FOT	114.0
GFS	114.4
IPL	115.9
MOG	382
MZB	117.8
ONT	112.2
PRB	114.3
RBL	115.7
RPY	251
SAC	115.2
SAU	116.2
SBA	114.9
SNS	117.3
SXC	109.4
VIS	109.4

COLORADO

DEN	116.3
EKR	115.2
FRU	396
GJT	112.4
IOC	117.5
RLG	113.8
TAD	329

DISTRICT OF COLUMBIA

DC	332

FLORIDA

AM	388
JA	344
MF	365
PKZ	326
TL	379
VRB	117.3

GEORGIA

ABY	116.1
BR	266

IDAHO

BO	359
BOI	113.3
BYI	114.1
DBS	116.9
IDA	109.0
LKT	113.5
LWS	108.2
MLP	117.8
MYL	116.2
PIH	112.6
SWU	350
TWF	115.8

ILLINOIS

DEC	117.2
DPA	108.4
ME	350
UIN	113.1

INDIANA

IN	266
SBN	115.4
SHB	112.0

IOWA

BCC	244
DSM	114.1
MCW	114.9

KANSAS

ANY	112.9
GLD	115.1
HLC	113.7
HMB	257
IC	332
SLN	115.3

LOUISIANA

GNI	236
LCH	113.4
SH	230

MAINE

SRX	344

MASSACHUSETTS

HYA	114.7
LQ	382

MICHIGAN

CPW	400
CUT	227
DT	388
MBS	112.9
MQT	109.0
SVM	114.3
TV	365
TVC	114.6

MINNESOTA

DL	379
FCM	111.8
HIB	110.8
IN	353
MS	266
ODI	117.9
ORB	341

MISSISSIPPI

HKS	260

MISSOURI

ANX	114.0
CBI	111.2
CGI	112.9
DO	359
FTZ	110.8
ILI	254
LM	338

MONTANA

AMD	329
DST	308
GT	371
GTF	115.1
HTN	320
LKO	400

NEBRASKA

BGN	224
GRI	112.0
OM	320

NEVADA

BLD	116.7
BTY	114.7
RNO	117.9
SPK	254

NEW JERSEY

EWR	379

NEW MEXICO

AKH	305
ILT	230

NEW YORK

ALB	117.8
ELM	375
IGN	117.6
RVH	117.2
UCA	108.6

NORTH CAROLINA

BZM	110.8
LE	350

NORTH DAKOTA

BI	230
GFK	109.4
HAW	365
MOT	117.1

OHIO

APE	116.7
CL	344
CMH	391
FDY	108.2
LUK	335

OKLAHOMA

DW	375
MLC	112.0
OKC	350

OREGON

CVO	108.4
DLS	112.3
EUG	112.9
IMB	115.6
MFR	113.6
OBT	368
ONP	117.1
OTH	112.1
PDT	114.7
PDX	116.6
RBG	108.2
RDM	117.6
REO	112.5
SVY	332
UBG	117.4

PENNSYLVANIA

AVP	112.4
CCZ	254
CIP	112.9
PTW	116.5
RAV	114.6

SOUTH CAROLINA

CH	329
FLO	115.2
FRT	248

SOUTH DAKOTA

FS	245
HON	117.6
PIR	112.5

TENNESSEE

BN	304
SGK	281
TS	371

TEXAS

AM	251
AUS	114.6
EL	242
FT	365
GLS	206
LBB	110.8
MA	326
SPS	112.7

UTAH

OGD	115.7
SLC	116.8

VIRGINIA

HPW	112.0
ROA	371

WASHINGTON

ALW	111.8
CLM	108.4
EAT	111.0
ELN	117.9
GEG	115.5
MZS	365
OLM	113.4
PAE	114.2
PSC	108.4
POW	109.0
SEA	116.8

WEST VIRGINIA

MRB	112.1

WISCONSIN

GM	242
GRB	117.0
MIU	116.4

WYOMING

AOP	290
CPR	116.2
JAC	108.4
RKS	114.7

FIGURE 1-6. TWEB Outlets By State.

FAA TRANSCRIBED WEATHER INFORMATION

TELEPHONE DIAL-UP SERVICES

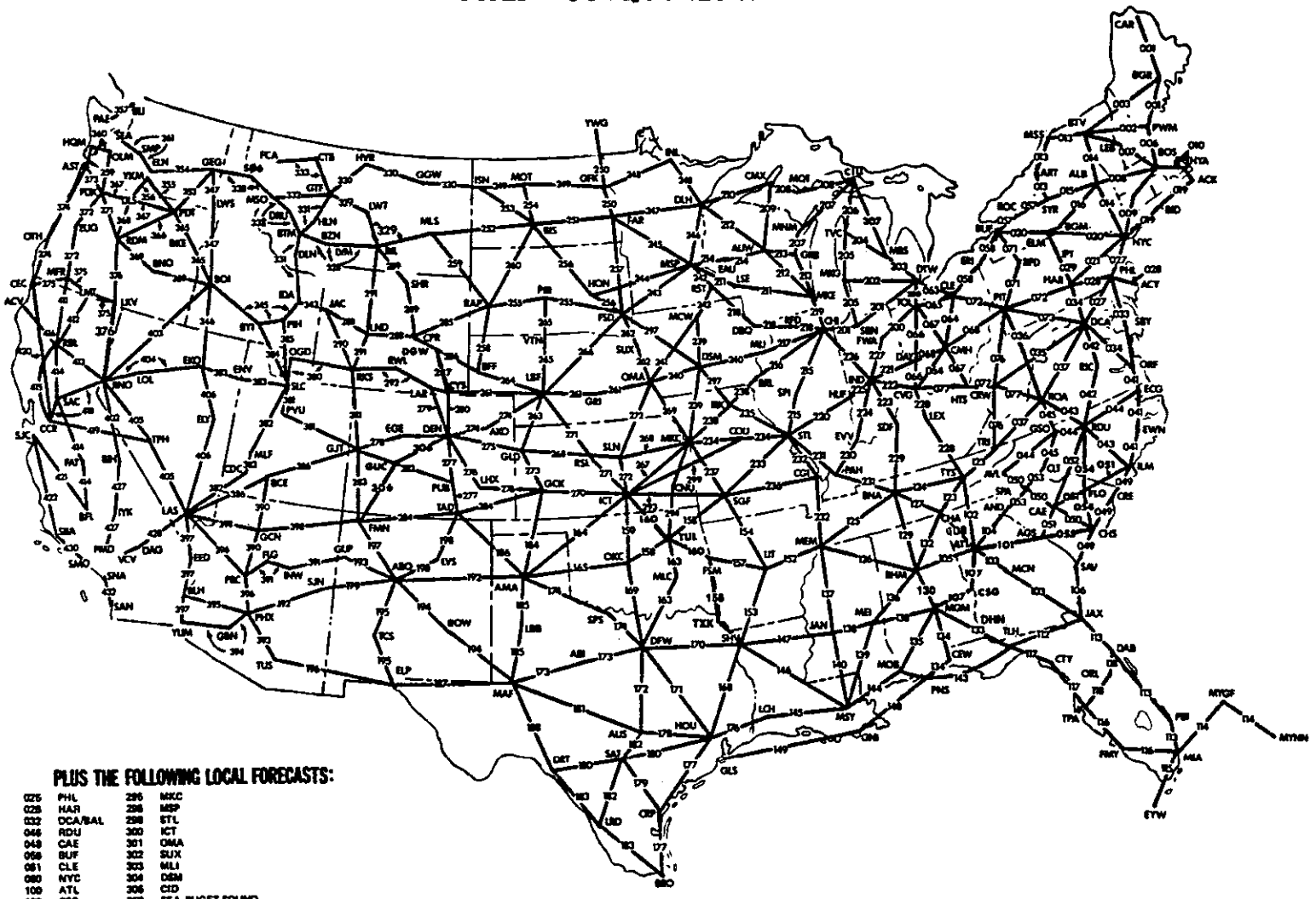
FSS	TEL-TWEB	PATWAS
Boston, MA (BOS)		X
Montpelier, VT (MPV)		X
Albany, NY (ALB)		X
Buffalo, NY (BUF)		X
Islip, NY (ISP)	X	
Poughkeepsie, NY (POU)		X
Millville, NJ (MIV)		X
Teterboro, NY (TEB)	X	
Harrisburg, PA (HAR)		X
Philadelphia, PA (PNE)	X	X
Pittsburgh, PA (AGC)		X
* Washington, D.C. (DCA)	X	
Charleston, WV (CRW)		X
Roanoke, VA (ROA)	X	
Elmira, NY (ELM)	X	
Birmingham, AL (BHM)		X
Muscle Shoals, AL (MSL)		X
Jacksonville, FL (JAX)		X
Miami, FL (MIA)		X
Orlando, FL (ORL)		X
St. Petersburg, FL (PIE)		X
Atlanta, GA (ATL)		X
Jackson, MS (JAN)	X	
Hickory, NC (HKY)		X
Raleigh-Durham, NC (RDU)		X
Charleston, SC (CHS)		X
Columbia, SC (CAE-NWS)		X
Florence, SC (FLO)		X
Memphis, TN (MEM)		X
Nashville, TN (BNA)		X
Chicago, IL (CHI)		X
Indianapolis, IN (IND)		X
South Bend, IN (SBN)		X
Detroit, MI (DET)	X	
Hibbing, MN (HIB)	X	
Minneapolis, MN (MSP)		X

FSS	TEL-TWEB	PATWAS
Cincinnati, OH (LUK)		X
Cleveland, OH (CLE)		X
Columbus, OH (CMH)		X
Dayton, OH (DAY)		X
Milwaukee, WI (MKE)		X
Cedar Rapids, IA (CID)		X
Des Moines, IA (DSM)		X
Wichita, KS (ICT)		X
Kansas City, MO (MKC)		X
Springfield, MO (SGF)	X	
St. Louis, MO (STL)		X
Omaha, NE (OMA)		X
Denver, CO (DEN)	X	X
Huron, SD (HON)	X	
Salt Lake City, UT (SLC)	X	X
Little Rock, AR (LIT)		X
New Orleans, LA (NEW)		X
Shreveport, LA (SHV)		X
Albuquerque, NM (ABQ)		X
Dallas, TX (DAL)		*X
El Paso, TX (ELP)		X
Fort Worth, TX (FTW)		X
Houston, TX (HOU)		X
Oklahoma City, OK (OKC)		X
Tulsa, OK (TUL)		X
Phoenix, AZ (PHX)		X
Tucson, AZ (TUS)	X	X
Fresno, CA (FAT)		X
* Los Angeles, CA (LAX)		
* Oakland, CA (OAK)		
Red Bluff, CA (RBL)	X	
Las Vegas, NV (LAS)	X	X
Boise, ID (BOI)	X	
Portland, OR (PDX)-(NWS)		X
Seattle, WA (SEA)	X	
Walla Walla, WA (ALW)	X	

FIGURE 1-7. TEL-TWEB (Telephone Connected To The Transcribed Weather Broadcast)
PATWAS (Pilot's Automatic Telephone Weather Answering Service)
* TABS (Telephone Aviation Briefing System)

NOTE: For telephone numbers, refer to the FSS-CS/T and NWS Telephone Numbers section of the Airport Facility Directory.

TWEB ROUTE FORECASTS

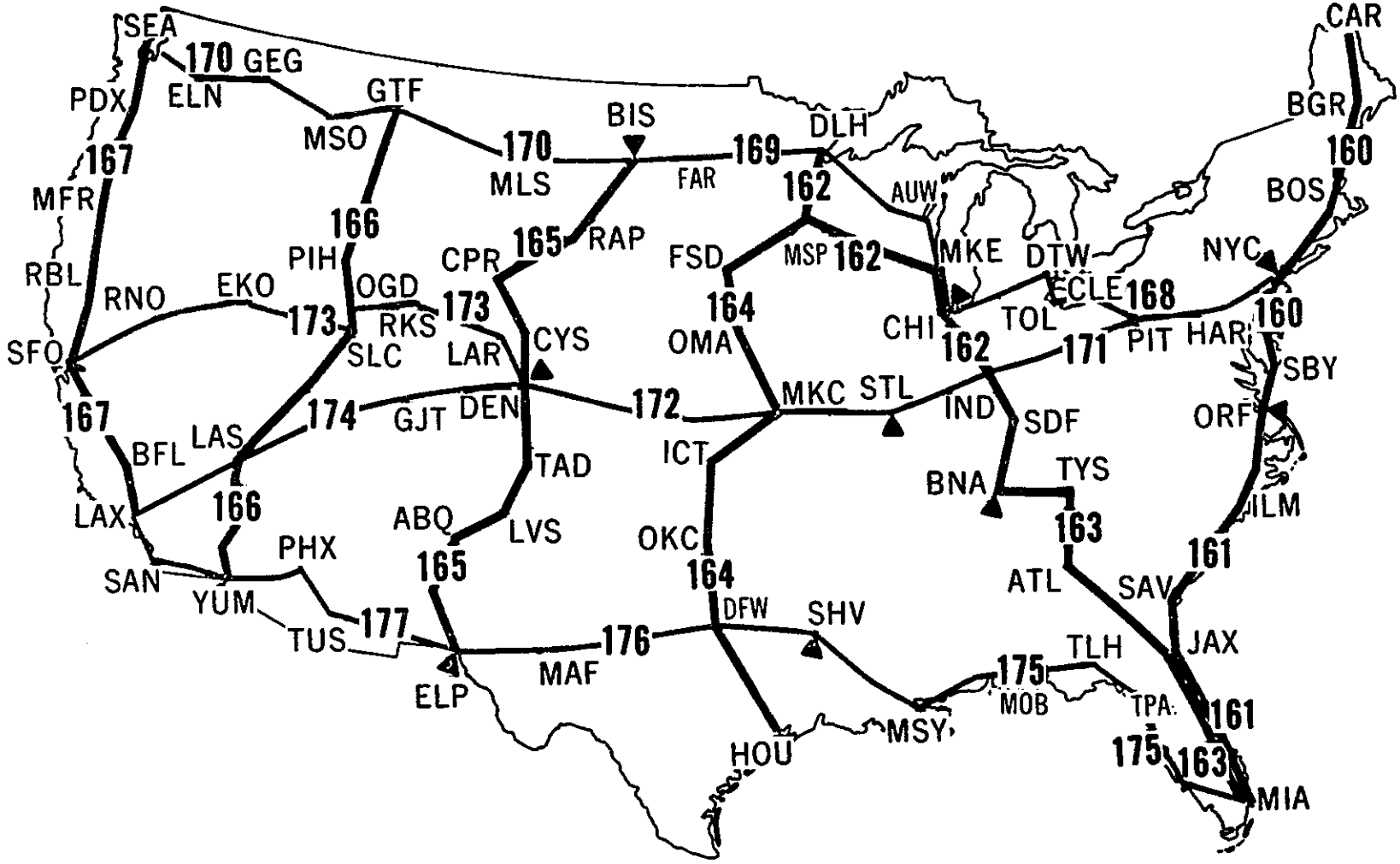


PLUS THE FOLLOWING LOCAL FORECASTS:

025	PHL	295	MKC
028	HAR	296	MSP
032	DCA/BAL	298	STL
046	RDU	300	ICT
048	CAE	301	OMA
056	BUF	302	SUX
081	CLE	303	MLI
080	NYC	304	DSM
100	ATL	306	CID
108	CSG	368	SEA-PUGET SOUND
128	MEM	417	SFO-OAK BAY AREA
131	BHM	428	TSP MTNS-SOLEDAD-CAJON-BANNING
141	NEW		PASSES AND ADJ MTNS
142	SHV	429	SRN CALIF DESERTS PSP-EED SWD
151	LIT	431	LAX BASIN

FIGURE 1–8. Numbered routes for which TWEB route forecasts are prepared. Route forecasts may be requested through request/reply service.

CROSS COUNTRY TWEB ROUTES AND RL REQUEST REPLY NUMBERS



▲ SEPARATES SEGMENTS OF CROSS COUNTRY ROUTES

FIGURE 1-9. Cross country numbered routes for which route forecasts are available through request/reply service.

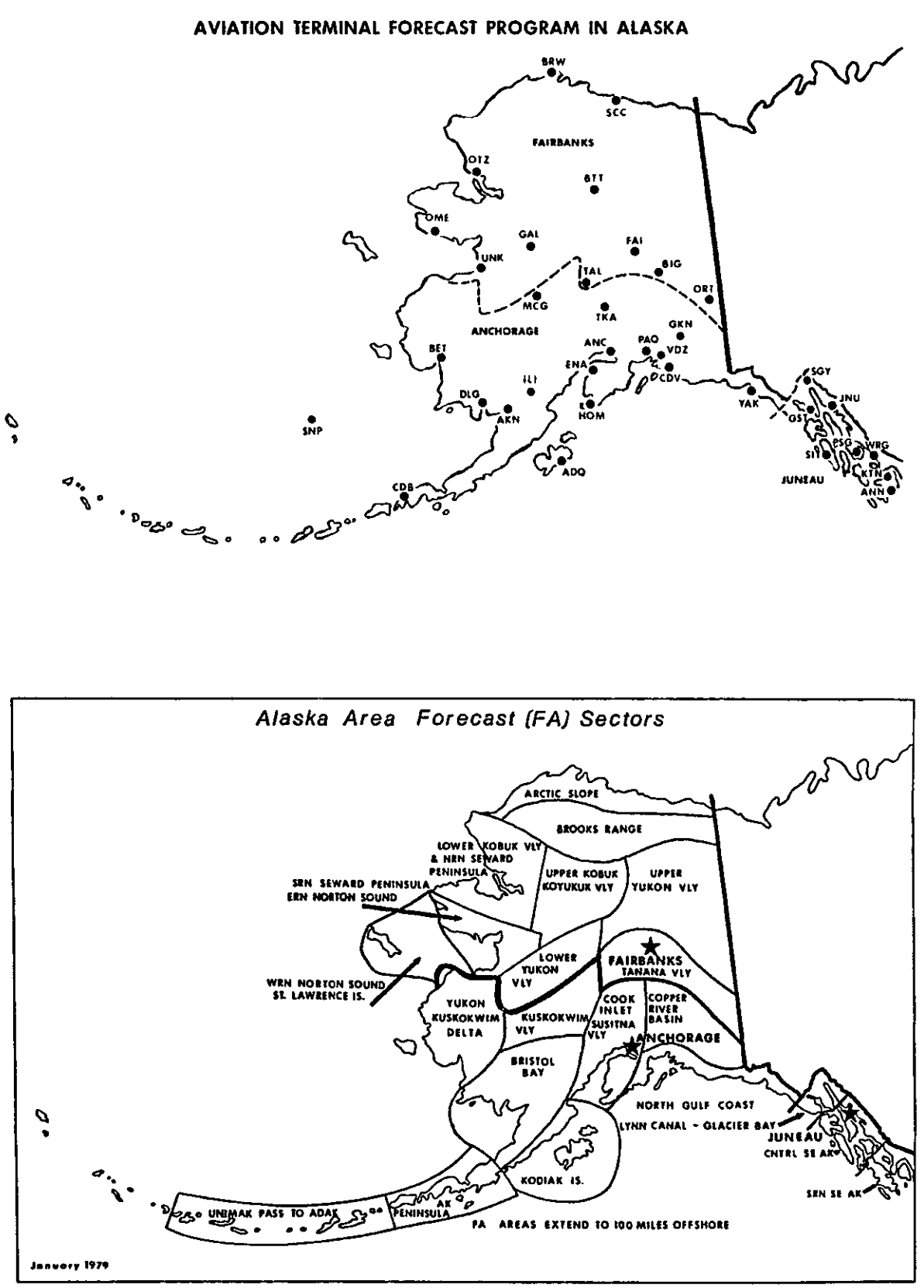


FIGURE 1-10. Alaska WSFOs, locations for which terminal forecasts are prepared (top) and forecast areas (bottom).

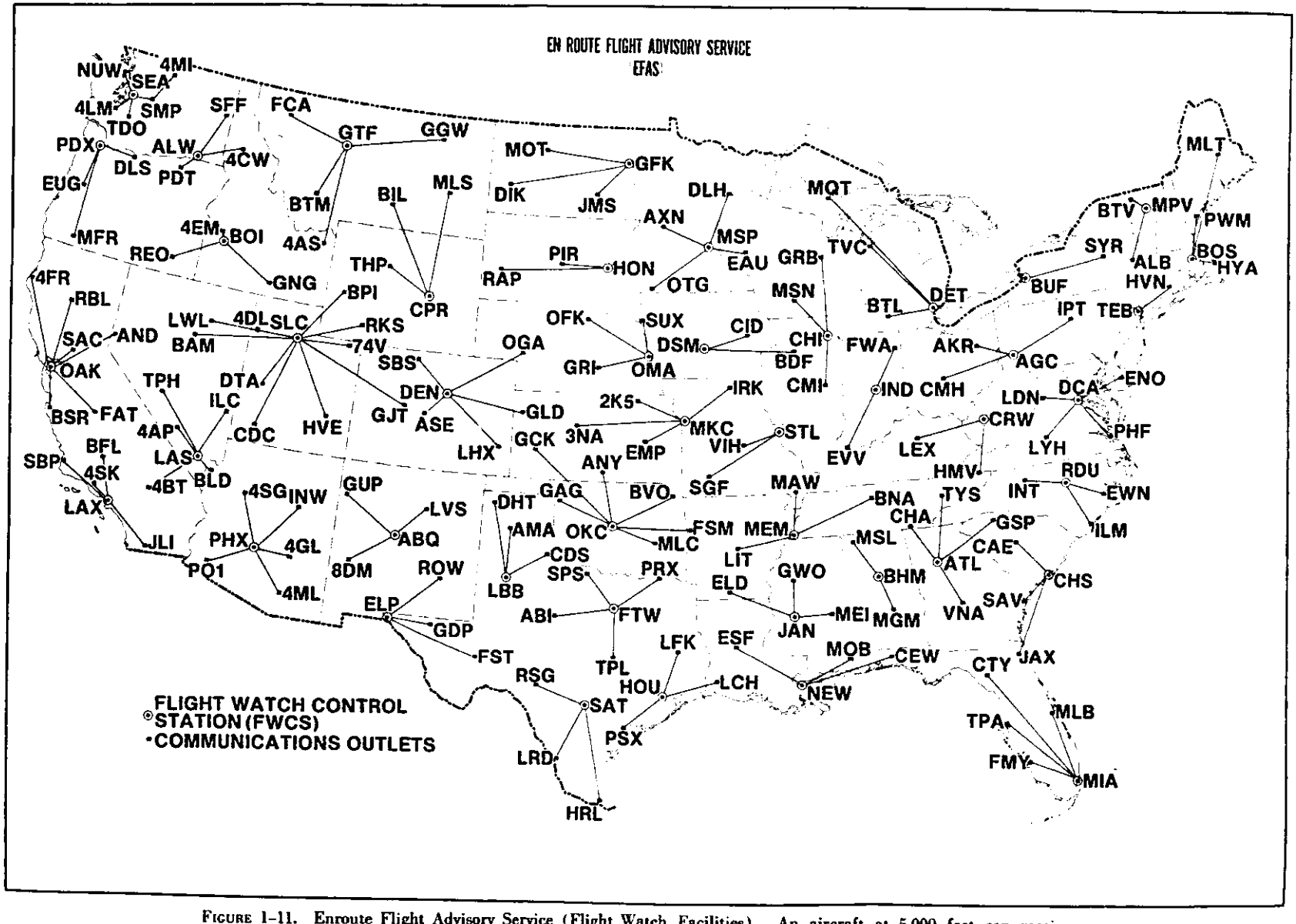


FIGURE 1-11. Enroute Flight Advisory Service (Flight Watch Facilities). An aircraft at 5,000 feet can receive a transmission to a distance of about 80 miles from any central or remote site.

Section 2

SURFACE AVIATION WEATHER REPORTS

When an observation is recorded and transmitted, it is a weather *report*. A surface aviation weather report contains some or all of the following elements:

1. Station Designator
2. Type and Time of Report
3. Sky Condition and Ceiling
4. Visibility
5. Weather and Obstructions to Vision
6. Sea Level Pressure
7. Temperature and Dew Point
8. Wind Direction, Speed, and Character
9. Altimeter Setting
10. Remarks and coded data

Those elements not occurring at observation time or not pertinent to the observation are omitted from the report. When an element should be included but is unavailable, the letter "M" is transmitted in lieu of the missing element. Those elements that are included are transmitted in the above sequence.

Following are five reports as transmitted on teletypewriter. These reports are used in discussing the above 10 elements. If you have this reference in a loose leaf binder, you will find it helpful to remove this page and keep it before you as you proceed through the discussion.

INK SA 1854 CLR 15 106/77/63/1112G18/000
BOI SA 1854 150 SCT 30 181/62/42/1304/015
LAX SA 1852 7 SCT 250 SCT 6HK 129/60/59/2504/991→LAX↘6/38
MDW RS 1856 −X M7 OVC 11/2R+F 990/63/61/3205/980/RF2 RB12
JFK RS 1853 W5 X 1/2F 180/68/64/1804/006/R04RVR22V30 TWR VSBY 1/4

STATION DESIGNATOR

The station designator is the three-letter location identifier for the reporting station. These five reports are from Wink, Texas (INK); Boise, Idaho (BOI); Los Angeles, California (LAX); Chicago Midway Airport, Illinois (MDW); and John F. Kennedy Airport, New York City (JFK).

TABLE 2-1. Summary of sky cover designators

Designator	Meaning	Spoken
CLR	CLEAR. (Less than 0.1 sky cover.)	CLEAR
SCT	SCATTERED LAYER ALOFT. (0.1 through 0.5 sky cover.)	SCATTERED
BKN*	BROKEN LAYER ALOFT. (0.6 through 0.9 sky cover.)	BROKEN
OVC*	OVERCAST LAYER ALOFT. (More than 0.9, or 1.0 sky cover.)	OVERCAST
−SCT	THIN SCATTERED. (At least ½ of the sky cover aloft is transparent at and below the level of the layer aloft.)	THIN SCATTERED
−BKN	THIN BROKEN. (At least ½ of the sky cover aloft is transparent at and below the level of the layer aloft.)	THIN BROKEN
−OVC	THIN OVERCAST. (At least ½ of the sky cover aloft is transparent at and below the level of the layer aloft.)	THIN OVERCAST
X*	SURFACE BASED OBSTRUCTION. (All of sky is hidden by surface based phenomena.)	SKY OBSCURED
−X	SURFACE BASED PARTIAL OBSCURATION. (0.1 or more, but not all, of sky is hidden by surface based phenomena.)	SKY PARTIALLY OBSCURED

* Sky condition represented by this designator may constitute a ceiling layer.

314-952 0 - 80 - 2

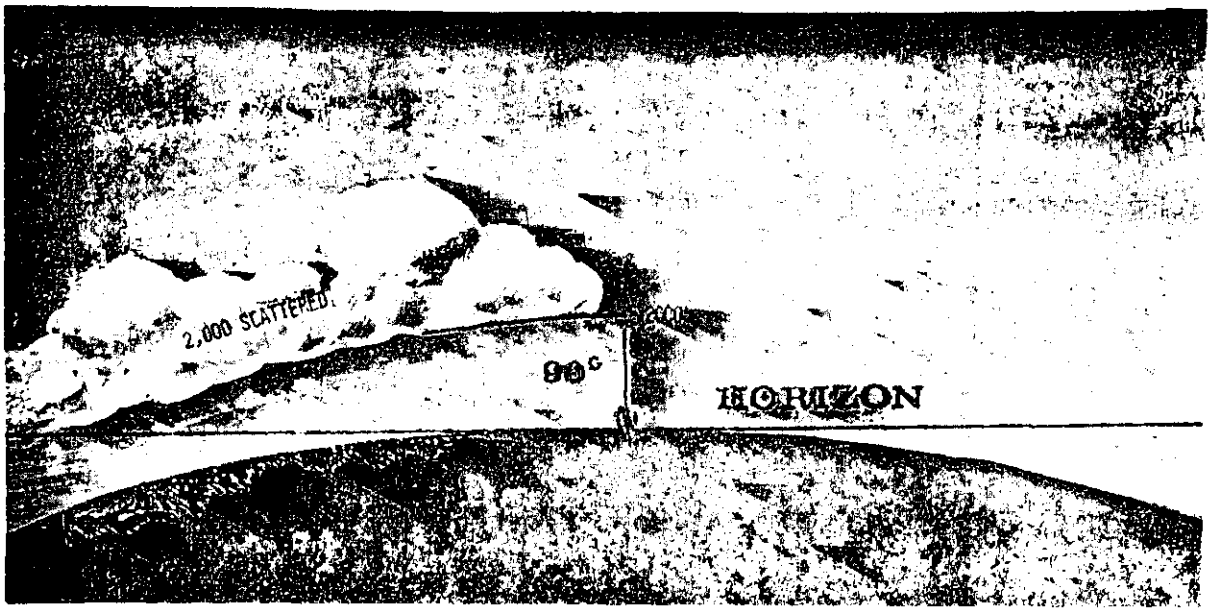


FIGURE 2-1. Scattered sky cover by a single advancing layer. Scattered is 5/10 or less sky cover (5/10 in this example).

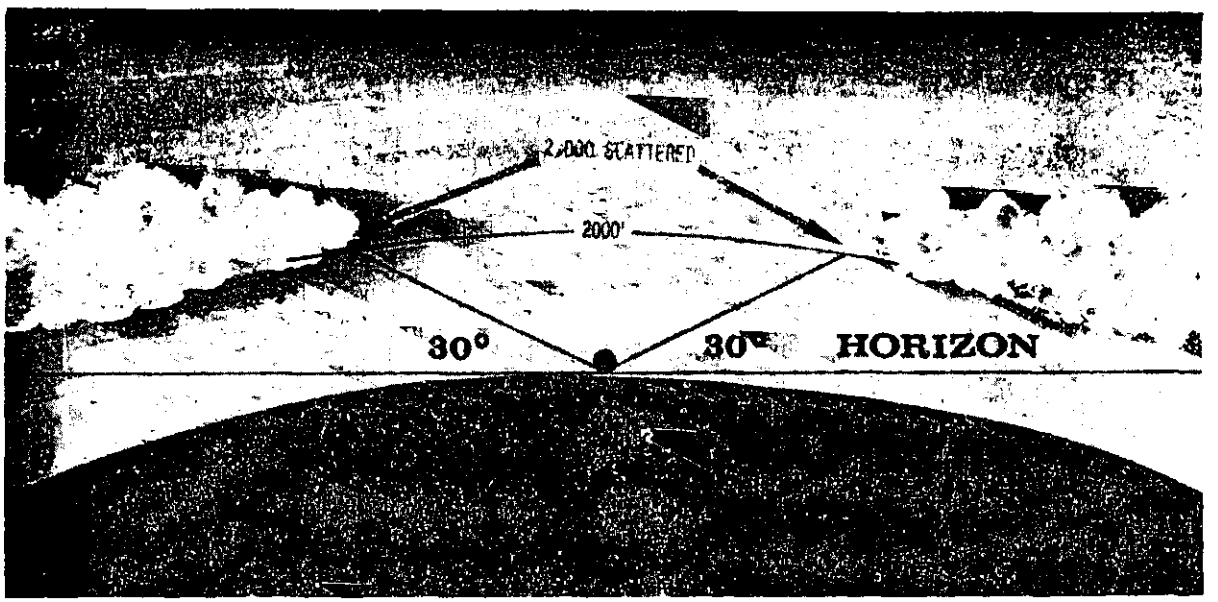


FIGURE 2-2. Scattered sky cover by a single layer surrounding the station (5/10 covered in this example).

TYPE AND TIME OF REPORT

The two basic types of reports are:

1. Record observation (SA), reports taken on the hour and

2. Special reports (RS or SP), observations taken when needed to report significant changes in weather.

Record observations (SA) are transmitted in sequenced collectives and are identified by sequence headings. The first three reports are of this type (INK, BOI, and LAX). A record special is a record observation that reports a significant change in weather. It is identified by the letters "RS" as shown in the reports from MDW and JFK. All reports transmitted must convey the time in Greenwich Mean Time and the type of observation.

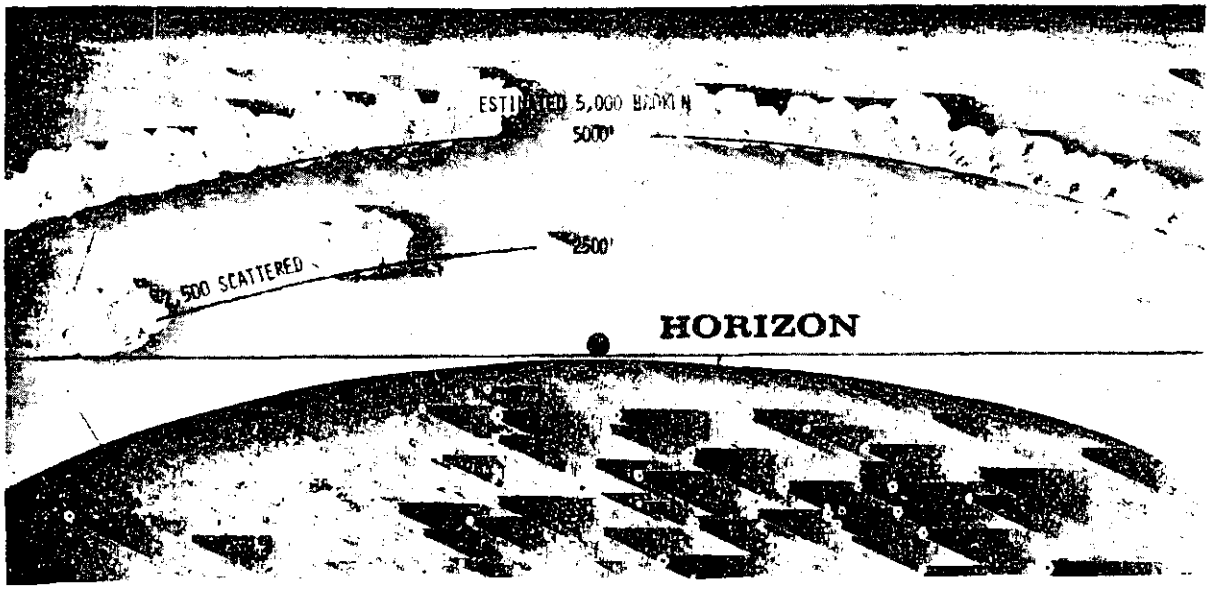


FIGURE 2-3. Summation of cloud cover in multiple layers.

SKY CONDITION AND CEILING

A clear sky or a layer of clouds or obscuring phenomena *aloft* is reported by one of the first seven *sky cover designators* in table 2-1. A layer is defined as clouds or obscuring phenomena with the base at approximately the same level. Height of the base of a layer precedes the sky cover designator. Height is in hundreds of feet *above ground level.*

Note that INK is reporting sky clear. No height precedes the designator since no sky cover is reported. BOI reports a scattered layer at 15,000 feet above the station. Figures 2-1 and 2-2 illustrate single layers of scattered clouds.

When more than one layer is reported, layers are in ascending order of height. For each layer above a lower layer or layers, the sky cover designator for that layer represents the *total sky* covered by that layer and all lower layers. LAX reports two layers—a scattered layer at 700 feet and a higher layer at 25,000 feet. Total coverage of the two layers does not exceed 5/10 coverage, so the upper layer also is reported as scattered. Figures 2-3 and 2-4 illustrate cloud cover of multiple layers.

"Transparent" sky cover is clouds or obscuring phenomena aloft through which blue sky or higher sky cover is visible. As explained in table 2-1, a scattered, broken, or overcast layer may be reported as "thin". To be classified as thin, a layer must be half or more transparent, and remember that sky cover of a layer includes all sky cover below the layer. For example, if at LAX the sky had been visible through half or more of the total sky cover reported by the higher layer, the report would have been

LAX SA 1854 7 SCT 250-SCT etc.

Any phenomena *based at the surface* and hiding all or part of the sky is reported as SKY OBSCURED* or SKY PARTIALLY OBSCURED* as explained in table 2-1. An obscuration or partial obscuration may be caused by precipitation, fog, dust, blowing snow, etc. No height value precedes the designator for partial obscuration since vertical visibility is not restricted overhead. A height value precedes the designator for an obscuration and denotes vertical visibility into the phenomena.

Ceiling is defined as:

1. Height of the lowest layer of clouds or obscuring phenomena aloft that is reported as broken or overcast and not classified as thin, or
2. Vertical visibility into a surface-based obscuring phenomena that hides all the sky.

Now look at the reports from MDW and JFK. MDW reports a partial obscuration and an overcast at 700 feet. The overcast constitutes a ceiling at 700 feet. Note also that the height of this ceiling layer is preceded by the letter "M". JFK reports a total obscuration, and the height value preceding the sky cover designator represents 500 feet vertical visibility into the obscuring phenomenon. Height of the ceiling value is preceded by the letter "W". The "M" and "W" are "ceiling designators".

* Descriptions in capital letters are the usual phraseology in which these reports are broadcast.

TABLE 2-2. Ceiling designators

Coded	Meaning	Spoken
M	MEASURED. Heights determined by ceilometer, ceiling light, cloud detection radar, or by the unobscured portion of a landmark protruding into ceiling layer. (Figure 2-5 illustrates the principle of the ceilometer.)	MEASURED CEILING
E	ESTIMATED. Heights determined from pilot reports, balloons, or other measurements not meeting criteria for measured ceiling.	ESTIMATED CEILING
W	INDEFINITE. Vertical visibility into a surface based obstruction. Regardless of method of determination, vertical visibility is classified as an indefinite ceiling.	INDEFINITE CEILING

A *ceiling designator* always precedes the height of the ceiling layer. Table 2-2 lists and explains ceiling designators. At MDW the ceiling height was measured. JFK had an indefinite ceiling which was vertical visibility into a surface based obscuration.

The sky cover and ceiling as determined from the ground represent as nearly as possible what the pilot should experience in flight. In other words, a pilot flying at or above the reported ceiling layer aloft should see less than half the surface below him. The pilot descending through a surface

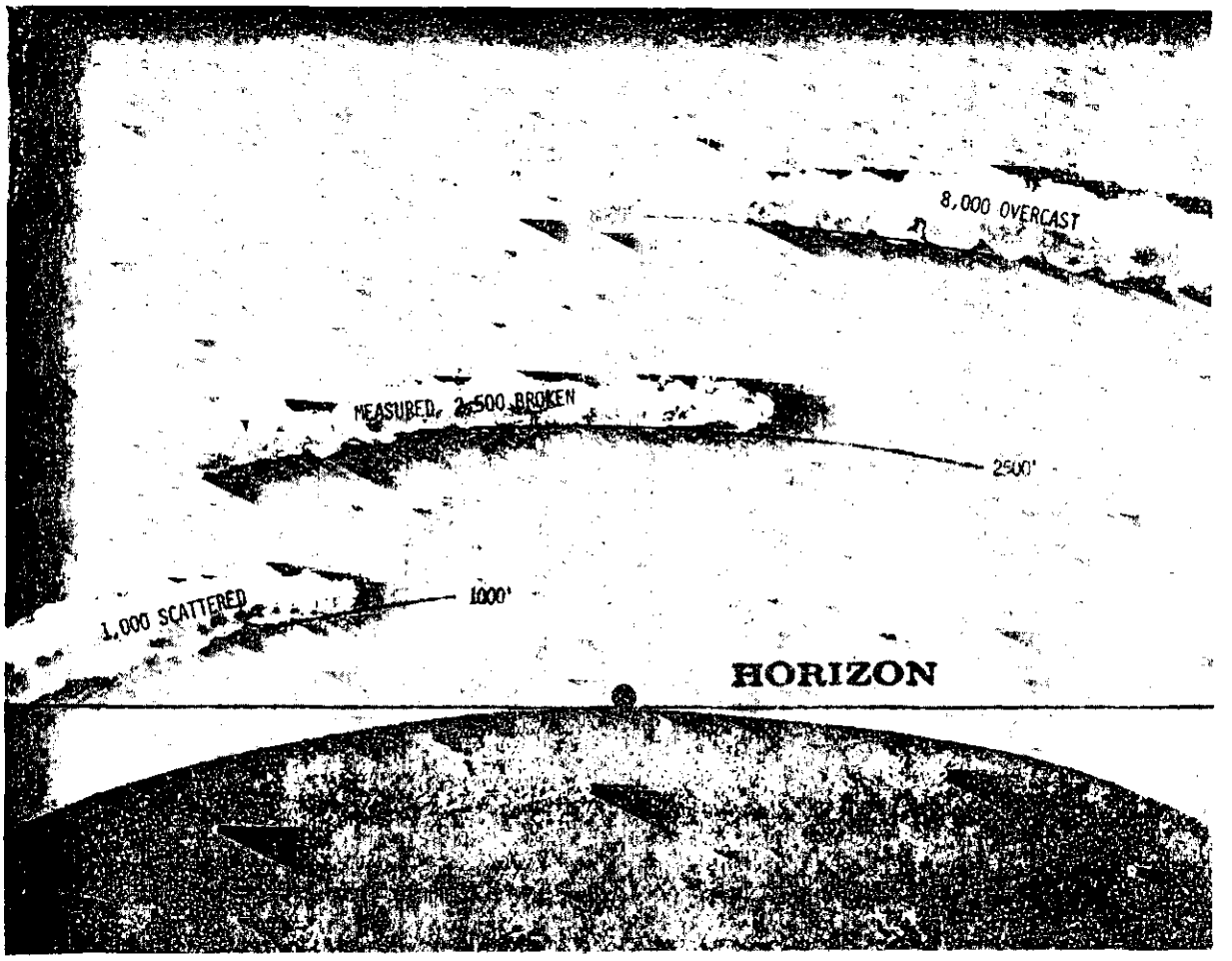


FIGURE 2-4. Summation of cloud cover in multiple layers. Note that at the height of the upper layer, sky cover is reported as overcast even though the upper layer itself covers less than ½ of the sky.

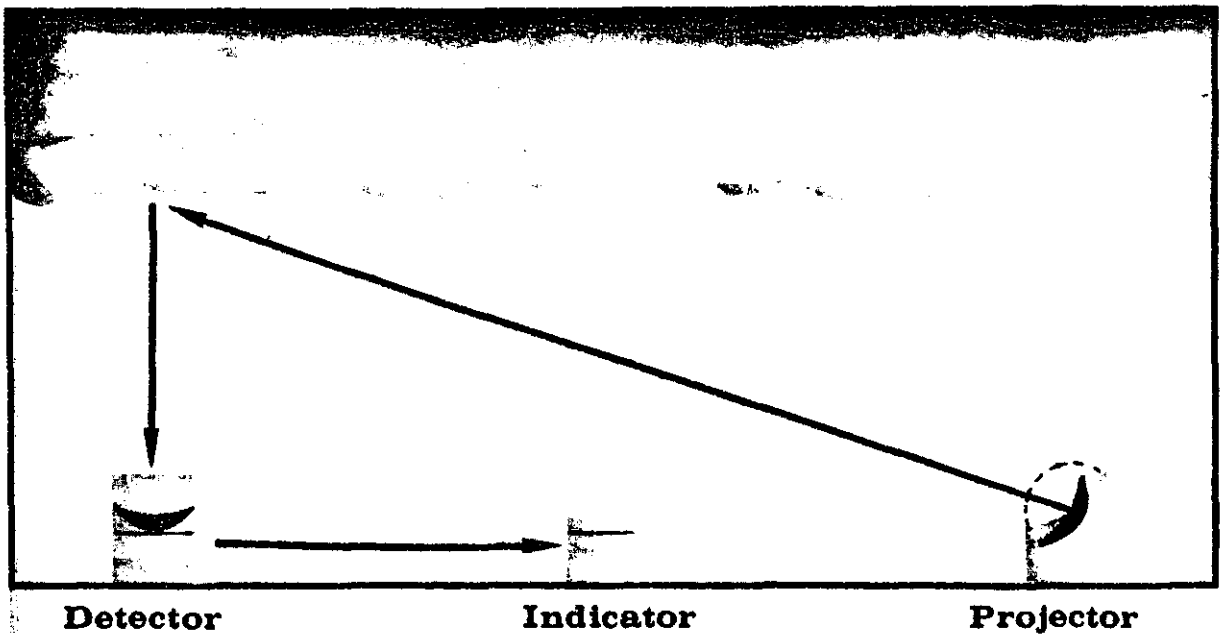


FIGURE 2–5. The rotating beam ceilometer. The projector beams a spot of modulated light on the cloud. The modulated light can be detected day or night. As the projector rotates, the spot moves along the cloud base. When the spot is directly over the detector, it excites a photoelectric cell measuring the angle of the light beam. Height of the cloud is then determined automatically by triangulation. This instrument scans much more rapidly than the older fixed beam ceilometer which is being phased out.

based total obscuration should first see the ground directly below him from the height reported as vertical visibility into the obscuration. However, because of the differing viewing points of the pilot and the observer, these surface reported values do not always exactly agree with what the pilot sees. Figure 2–6 illustrates the effect of an obscured sky on the vision from a descending aircraft.

The letter "V" appended to the ceiling height indicates variable ceiling; the range of variability is shown in remarks. Variable ceiling is reported only when it is critical to terminal operations. As an example,

M12V OVC and in remarks CIG10V13

means MEASURED CEILING ONE THOUSAND TWO HUNDRED VARIABLE OVERCAST, CEILING VARIABLE BETWEEN ONE THOUSAND AND ONE THOUSAND THREE HUNDRED.

Now, let's go back to our five reports and read them through sky and ceiling:

INK SA 1854 CLR	WINK, 1854 GREENWICH, CLEAR
BOI SA 1853 150 SCT	BOISE, 1853 GREENWICH, ONE FIVE THOUSAND SCATTERED
LAX SA 1854 7 SCT 250 SCT	LOS ANGELES, 1854 GREENWICH, SEVEN HUNDRED SCATTERED, TWO FIVE THOUSAND SCATTERED
MDW RS 1856 –X M7 OVC	CHICAGO MIDWAY, RECORD SPECIAL, 1856 GREENWICH, SKY PARTIALLY OBSCURED, MEASURED CEILING SEVEN HUNDRED OVERCAST
JFK RS 1853 W5 X	NEW YORK KENNEDY, RECORD SPECIAL, 1853 GREENWICH, INDEFINITE CEILING FIVE HUNDRED SKY OBSCURED

VISIBILITY

Prevailing visibility at the observation site immediately follows sky and ceiling in the report. Prevailing visibility is the greatest distance objects can be seen and identified through at least 180° of the horizon. It is reported in statute miles and fractions.

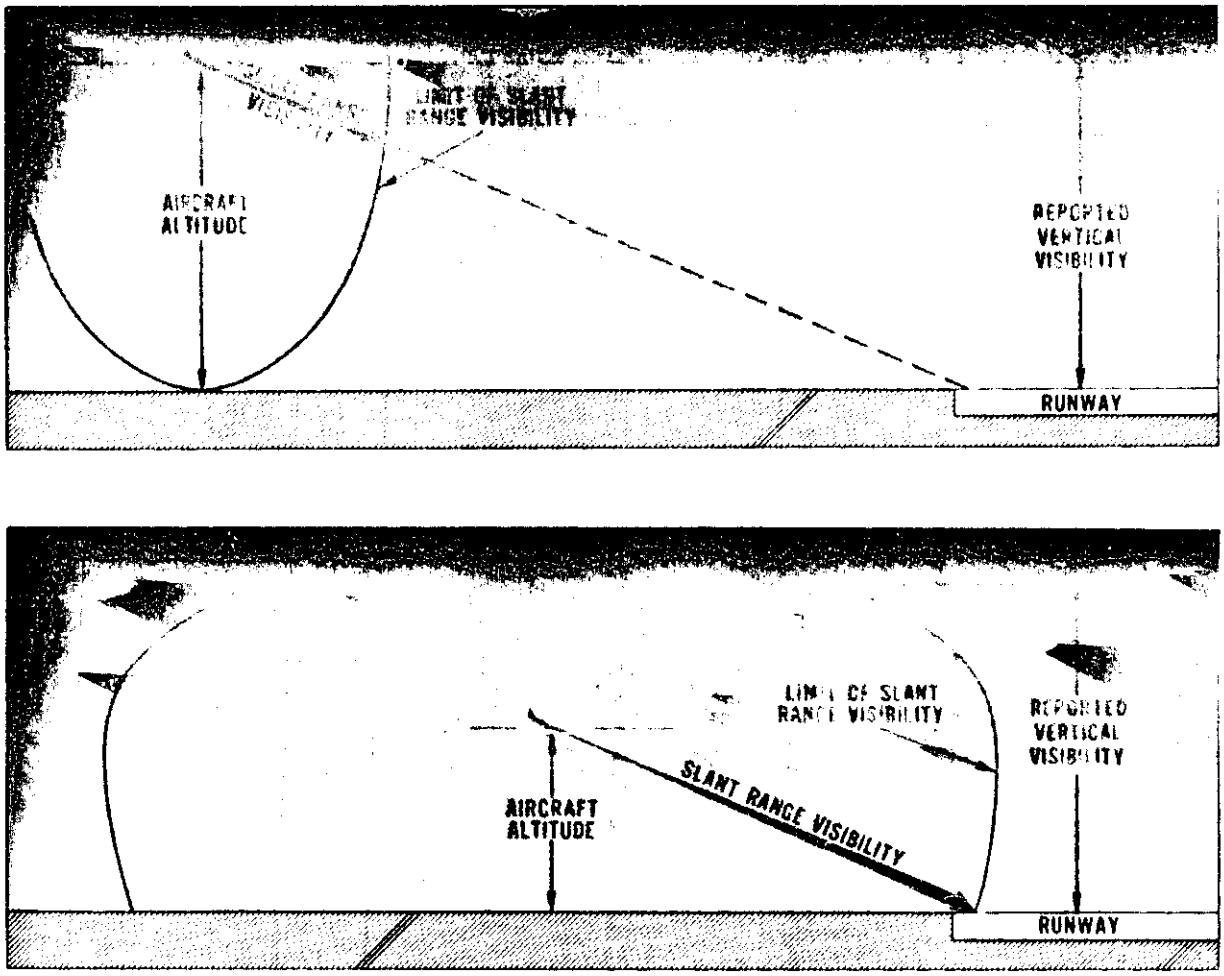


FIGURE 2-6. Vertical visibility is the altitude above the ground from which a pilot should first see the ground directly below him (top). His real concern is slant range visibility which most often is less than vertical visibility. He usually must descend to a lower altitude (bottom) before he sees a representative surface and can fly by visual reference to the ground.

Prevailing visibilities in the five reports are:

INK	VISIBILITY ONE FIVE
BOI	VISIBILITY THREE ZERO
LAX	VISIBILITY SIX
MDW	VISIBILITY ONE AND ONE-HALF
JFK	VISIBILITY ONE-HALF

When visibility is critical at an airport with a weather observing station and a control tower, both take visibility observations. Of the two observations, the lowest reported is prevailing visibility. The other is reported in remarks. Note that the report from JFK has a remark,

TWR VSBY1/4

meaning TOWER VISIBILITY ONE-QUARTER.

The letter "V" suffixed to prevailing visibility denotes variable visibility; the range of visibility is shown in remarks. Variable visibility is reported only when critical to aircraft operations. As an example,

¾V and in remarks VSBY1/2V1

means VISIBILITY THREE QUARTERS VARIABLE . . . VISIBILITY VARIABLE BETWEEN ONE-HALF AND ONE.

Visibility in some directions may differ significantly from prevailing visibility. These significant differences are reported in remarks. For example, prevailing visibility is reported as 1½ miles with a remark,

VSBY NE2 1/2SW3/4

which means visibility to the northeast is 2½ miles; and to the southwest, it is ¾ of a mile.

WEATHER AND OBSTRUCTIONS TO VISION

Weather and obstructions to vision when occurring at the station at observation time are reported immediately following visibility. If observed at a distance from the station, they are reported in remarks.

The term *weather* as used for this element refers only to those items listed in table 2-3 rather than to the more general meaning of all atmospheric phenomena. Weather includes all forms of precipitation plus thunderstorm, tornado, funnel cloud, and waterspout.

Precipitation is reported in one of three intensities. The intensity symbol follows the weather symbol with meanings as follows:

Light	−
Moderate	(no sign)
Heavy	+

No intensity is reported for hail (A) or ice crystals (IC).

A thunderstorm is reported as "T" and a severe thunderstorm, as "T+". A *severe thunderstorm* is one in which surface wind is 50 knots or greater and/or hail is ¾ inch or more in diameter.

Obstructions to vision include the phenomena listed in table 2-4. No intensities are reported for obstructions to vision.

Now referring back to our initial five reports, INK and BOI report no weather or obstructions to vision, and no entries appear in the reports. LAX reports two obstructions to vision, haze and smoke. MDW reports heavy rain as weather and fog as an obstruction to vision. JFK reports fog; is this weather or obstruction to vision?

There are two types of remarks concerning either a surface based obscuration or an obscuring phenomena aloft. These remarks are discussed here.

When obscuring phenomena is surface based and partially obscures the sky, a remark reports tenths of sky hidden. For example,

K6

means 6/10 of the sky is hidden by smoke. Now look at the report from MDW; how much of the sky is hidden and by what obscuring phenomena? Note the remark

RF2

which means 2/10 of the sky is hidden by rain and fog.

A layer of obscuring phenomena aloft is reported in the sky and ceiling portion the same as a layer of cloud cover. A remark identifies the layer as obscuring phenomena. For example,

20 −BKN and a remark K20 −BKN

means a broken layer of smoke based on 2,000 feet above the surface and not concealing the sky (thin).

TABLE 2-3. Weather symbols and meanings

Coded	Spoken
Tornado	TORNADO
Funnel Cloud	FUNNEL CLOUD
Waterspout	WATERSPOUT
T	THUNDERSTORM
T+	SEVERE THUNDERSTORM
R	RAIN
RW	RAIN SHOWER
L	DRIZZLE
ZR	FREEZING RAIN
ZL	FREEZING DRIZZLE
A	HAIL
IP	ICE PELLETS
IPW	ICE PELLET SHOWERS
S	SNOW
SW	SNOW SHOWERS
SP	SNOW PELLETS
SG	SNOW GRAINS
IC	ICE CRYSTALS

TABLE 2-4. Obstructions to vision —symbols and meanings

Coded	Spoken
BD	BLOWING DUST
BN	BLOWING SAND
BS	BLOWING SNOW
BY	BLOWING SPRAY
D	DUST
F	FOG
GF	GROUND FOG
H	HAZE
IF	ICE FOG
K	SMOKE

SEA LEVEL PRESSURE

Sea level pressure is separated from the preceding elements by a space. It is transmitted in record hourly reports only. It is in three digits to the nearest tenth millibar with the decimal point omitted. Sea level pressure usually is greater than 960.0 millibars and less than 1050.0 millibars. The first 9 or 10 is omitted. To decode, prefix a 9 or 10 whichever brings it closer to 1000.0 millibars. Again going back to our five reports, sea level pressures are:

INK	1010.6	millibars
BOI	1018.1	"
LAX	1012.9	"
MDW	999.0	"
JFK	1018.0	"

TEMPERATURE AND DEW POINT

Temperature and dew point are in whole degrees Fahrenheit. They are separated from sea level pressure by a slash (/). If sea level pressure is not transmitted, temperature is separated from preceding elements by a space. Temperature and dew point are separated also by a slash. A minus sign precedes a temperature or dew point when below 0°F. From our five reports, we have:

INK . . . 77/63	WINK . . . TEMPERATURE SEVEN SEVEN, DEW POINT SIX THREE
BOI . . . 62/42	BOISE . . . TEMPERATURE SIX TWO, DEW POINT FOUR TWO
LAX . . . 60/59	LOS ANGELES . . . TEMPERATURE SIX ZERO, DEW POINT FIVE NINER
MDW . . . 63/61	CHICAGO MIDWAY . . . TEMPERATURE SIX THREE, DEW POINT SIX ONE
JFK . . . 68/64	NEW YORK KENNEDY . . . TEMPERATURE SIX EIGHT DEW POINT SIX FOUR

WIND

Wind follows dew point and is separated from it by a slash. Average one minute direction and speed are in four digits. The first two digits are direction *from* which the wind is blowing. It is in tens of degrees referenced to true North*, i.e., 01 is 10°; 21 is 210°; 36 is 360° or North. The second two digits are speed in knots. A calm wind is reported as 0000.

If windspeed is 100 knots or greater, 50 is added to the direction code and the hundreds digit of speed is omitted. Example,

5908

means

090° (09+50=59) at 108 knots.

A *gust* is a variation in windspeed of at least 10 knots between peaks and lulls. A *squall* is a sudden increase in speed of at least 15 knots to a sustained speed of 20 knots or more lasting for at least one minute. Gusts or squalls are reported by the letter "G" or "Q" respectively following the average one-minute speed and followed by the peak speed in knots. For example,

1522Q37

means

wind 150° at 22 knots with peak speed in squalls to 37 knots.

Winds decoded from our five reports are

INK	WIND ONE ONE ZERO DEGREES AT ONE TWO PEAK GUSTS ONE EIGHT
BOI	WIND ONE THREE ZERO DEGREES AT FOUR
LAX	WIND TWO FIVE ZERO DEGREES AT FOUR
MDW	WIND THREE TWO ZERO DEGREES AT FIVE
JFK	WIND ONE EIGHT ZERO DEGREES AT FOUR

When any part of the wind report is *estimated* (direction, speed, peak speed in gusts or squalls), the letter "E" precedes the wind group. Example,

E1522G28

is decoded WIND ONE FIVE ZERO DEGREES ESTIMATED TWO TWO PEAK GUSTS ESTIMATED TWO EIGHT.

A few stations do not transmit sea level pressure, temperature, and dew point; and these elements usually are not included in a special. When the elements are not transmitted, the wind group is separated from the preceding element by a space; i.e.,

CSM SP W5 X 2F 1705/990

is a record special from Clinton-Sherman Oklahoma (CSM) *not* transmitting sea level pressure, temperature, or dew point.

ALTIMETER SETTING

Altimeter setting follows the wind group and is separated from it by a slash. Normal range of altimeter settings is from 28.00 inches to 31.00 inches of mercury. The last three digits are transmitted with the decimal point omitted. To decode, prefix to the coded value either a 2 or a 3 whichever brings it closer to 30.00 inches. Examples,

996 means ALTIMETER TWO NINER NINER SIX, (29.96 inches)

013 means ALTIMETER THREE ZERO ONE THREE (30.13 inches)

An estimated altimeter is read from an instrument not compared to a standard instrument as recently as required (see AVIATION WEATHER, Chapter 3). It is reported by prefixing an "E" to the coded value. Example,

E035 means ALTIMETER ESTIMATED THREE ZERO THREE FIVE

REMARKS

Remarks, if any, follow altimeter setting separated from it by a slash. Certain remarks should be reported routinely; others the observer may in-

* Wind direction for the local station is *broadcast* in degrees magnetic.

clude when considered significant to aviation. Often, some of the most important information in an observation may be the remarks portion.

Runway Visibility and Runway Visual Range

The first remark, when transmitted, should be runway visibility or runway visual range. Figure 2-7 illustrates the difference. The terms are defined as follows:

Runway visibility—the visibility from a particular location along an identified runway, usually determined by transmissometer instrument. It is in miles and fractions. Figure 2-8 diagrams the principle of the transmissometer.

Runway visual range—the maximum horizontal distance down a specified instrument runway at which a pilot can see and identify standard high intensity runway lights. It is always determined using a transmissometer and is reported in hundreds of feet.

The report consists of a runway designator and the contraction "VV" or "VR" followed by the appropriate visibility or visual range. Both the VV and the VR report are for a 10-minute period preceding observation time. The remark usually reports the 10-minute extremes separated by the letter "V". However, if the visual range or visibility has not changed significantly during the 10 minutes, a single value is sent indicating that the value has remained constant.

The following examples show several reports and their decoding:

R36VV11/2	RUNWAY THREE SIX, VISIBILITY ONE AND ONE-HALF. (Visibility remained constant during the 10-minute period.)
R05LVV1V2	RUNWAY FIVE LEFT, VISIBILITY VARIABLE BETWEEN ONE AND TWO.
R18VR20V30	RUNWAY ONE EIGHT, VISUAL RANGE VARIABLE BETWEEN TWO THOUSAND FEET AND THREE THOUSAND FEET.
R26RVR24	RUNWAY TWO SIX RIGHT, VISUAL RANGE TWO THOUSAND FOUR HUNDRED FEET. (Visual range remained constant during the 10-minute period.)

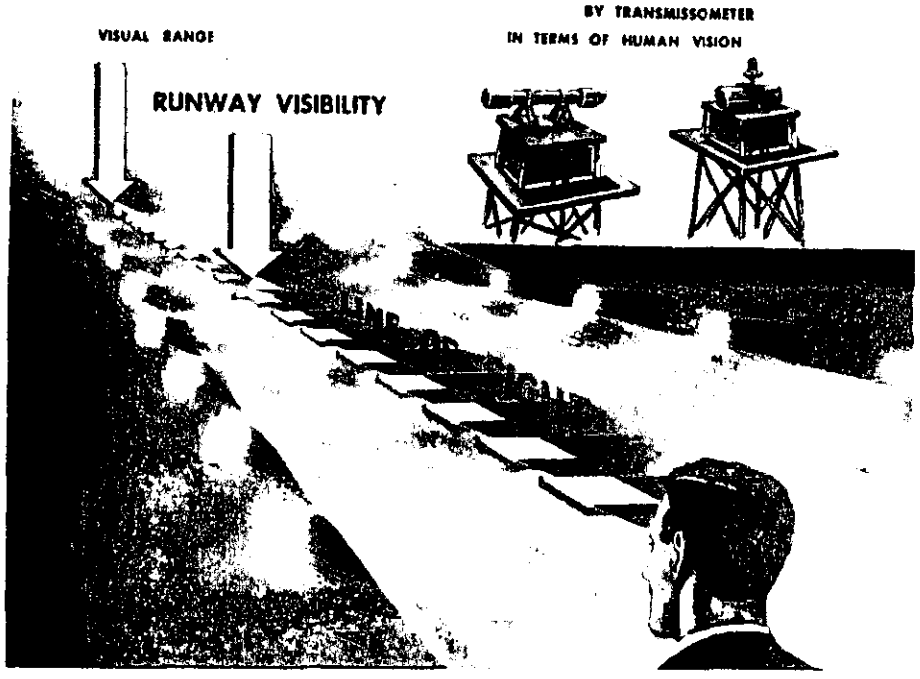


FIGURE 2-7. Difference between *runway visibility* and *runway visual range*. Runway visibility is the distance down the runway the pilot can see unlighted objects or unfocused lights of moderate intensity. Runway visual range is the distance he can see high intensity runway lights. Visual range usually is greater than visibility because the high intensity lights penetrate farther into the obscuring phenomena.

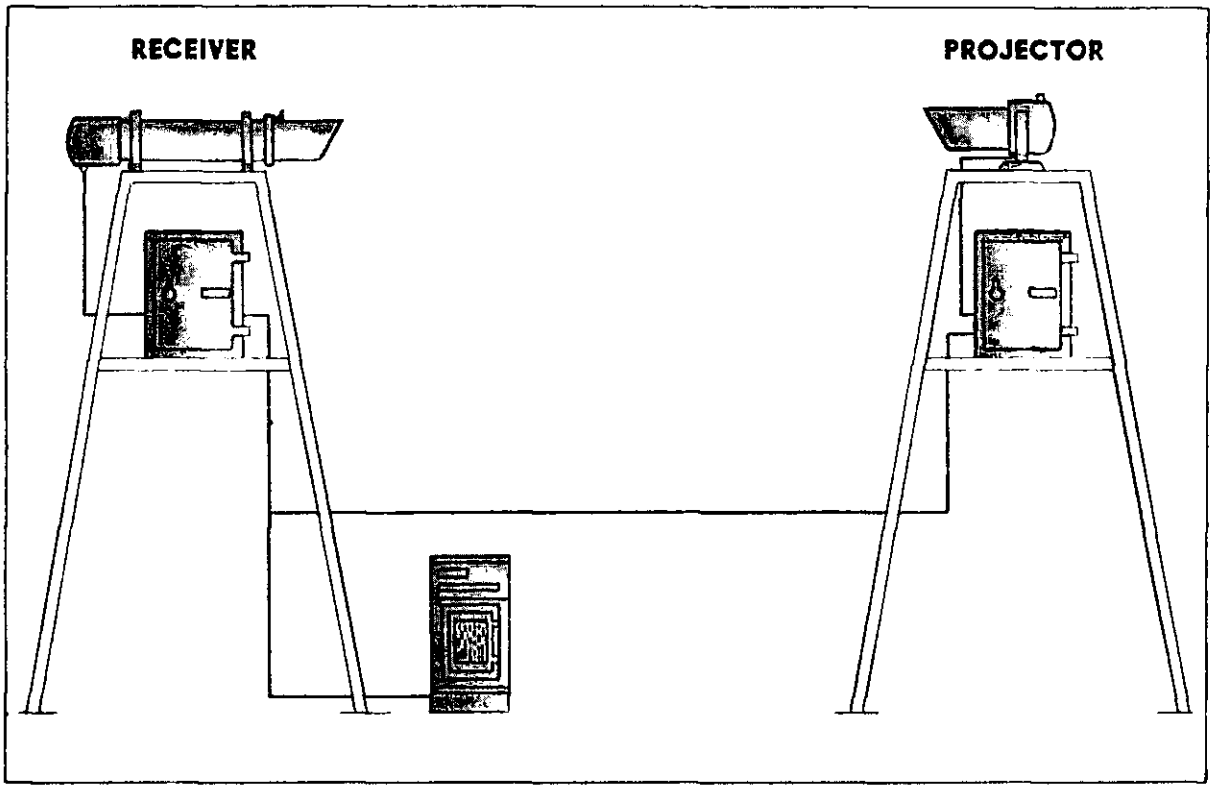


FIGURE 2-8. The transmissometer. The projector beams light toward the receiver. Obscuring phenomena in the path of the beam absorbs some of the light. A photoelectric cell in the receiver measures the amount of light penetrating through the obscuring phenomena. The amount received is converted into visibility.

Runway visual range in excess of 6,000 feet is written 60+. VR less than the minimum value that can be observed by the instrument is encoded as the minimum suffixed by a minus sign. For example:

R36L/VR10−V25

is decoded RUNWAY THREE SIX LEFT, VISUAL RANGE VARIABLE FROM LESS THAN ONE THOUSAND FEET TO TWO THOUSAND FIVE HUNDRED FEET.

Heights of Bases and Tops of Sky Cover Layers

Bases and tops of clouds or obscuring phenomena may be reported. These remarks originate from pilots. Heights are above MSL.

/UA . . ./SK BKN 50	Top broken layer 5,000 feet (MSL)
/UA . . ./SK OVC 30/60 OVC	Top lower overcast 3,000 feet, base of higher overcast 6,000 feet.

Clarification of Coded Data

Following, by category, are coded remarks clarifying or expanding on coded elements:

SKY AND CEILING

Coded Elements	*Coded Remarks*	*Coded Elements*	*Coded Remarks*
FEW CU	Few cumulus clouds	30 SCT V BKN	Scattered layer at 3000 feet variable to broken
HIR CLDS VSB	Higher clouds visible		
BRKHIC	Breaks in higher overcast	SC BANK NW	Stratocumulus cloud bank northwest
BINOVC	Breaks in overcast		
BRKS N	Breaks north	TCU W*	Towering cumulus clouds west
BKN V OVC	Broken layer variable to overcast	CB N MOVG E*	Cumulonimbus north moving east
CIG 14V19	Ceiling variable between 1400 feet and 1900 feet	CBMAM OVHD-W*	Cumulonimbus mamma overhead to west

Sky and Ceiling—Continued

Coded Elements	*Coded Remarks*	*Coded Elements*	*Coded Remarks*
ACCAS ALQDS*	Altocumulus castellanus all quadrants	CONTRAILS N 420 MSL	Condensation trails north at 42,000 feet MSL
ACSL SW-NW*	Standing lenticular altocumulus southwest to northwest	CLDS TPG MTNS SW	Clouds topping mountains southwest
ROTOR CLDS NW*	Rotor clouds northwest	RDGS OBSCD W-N	Ridges obscured west through north
VIRGA E-SE*	Virga (precipitation not reaching the ground) east through southeast	CUFRA W APCHG STN	Cumulus fractus clouds west approaching station
		LWR CLDS NE	Lower clouds northeast

Obscuring Phenomena

D5	Dust obscuring 5/10 of the sky	K20 SCT	Scattered layer of smoke aloft based at 2000 feet above the surface
S7	Snow obscuring 7/10 of the sky		
BS3	Blowing snow obscuring 3/10 of the sky	THN F NW	Thin fog northwest (from reporting station)
FK4	Fog and smoke obscuring 4/10 of the sky		

Visibility (Statute Miles)

VSBY S1W1/4	Visibility south 1, west 1/4	TWR VSBY 3/4	Tower visibility 3/4
VSBY 1V3	Visibility variable between 1 and 3	SFC VSBY 1/2	Surface visibility 1/2

Weather and Obstructions To Vision

T W FQT LTGCG	Thunderstorm west, frequent lightning cloud to ground	OCNL RW	Occasional moderate rain shower
RB30	Rain began 30 minutes after the hour	WET SNW	Wet snow
SB15E40	Snow began 15, ended 40 minutes after the hour	SNOINCR 5	Snow increase 5 inches during past hour
UNCONFIRMED TORNADO 15W OKC MOVG NE 2000	Unconfirmed tornado 15 (nautical miles) west of Oklahoma City, moving northeast, sighted at 2000Z	R— OCNLY R+	Light rain occasionally heavy rain
		RWU	Rain showers of unknown intensity
T OVHD MOVG E	Thunderstorm overhead, moving east	F DSIPTG	Fog dissipating
OCNL DSNT LTG NW	Occasional distant lightning northwest	K DRFTG OVR FLD	Smoke drifting over field
		KOCTY	Smoke over city
HLSTO 2	Hailstones 2 inches in diameter	SHLW GFDEP 4	Shallow ground fog 4 feet deep
INTMT R-	Intermittent light rain	DUST DEVILS NW	Dust devils northwest
		PATCH GF S	Patch ground fog south

Wind

WSHFT 30	Wind shifted at 30 minutes past the hour	PK WND 3348/22	Peak wind within the past hour from 330° at 48 knots occurred 22 minutes past the hour
WND 27V33	Wind variable between 270° and 330°		

Pressure

PRESRR	Pressure rising rapidly	PRJMP 8/1012/18	Pressure jump (sudden increase) .08 inches began 1012 GMT, ended 1018 GMT
PRESFR	Pressure falling rapidly		
LOWEST PRES 631 1745	Lowest pressure (sea level) 963.1 millibars at 1745 GMT		

* These cloud types are highly significant, and the observer should always report them. Figures 2-9 through 2-14 are photographs of these clouds and explain their significance. A pilot in flight should also report them when observed.

FIGURE 2-9. Towering Cumulus (TCU). The most direct significance of this cloud is that atmosphere in the lower altitudes is unstable and conducive to turbulence.

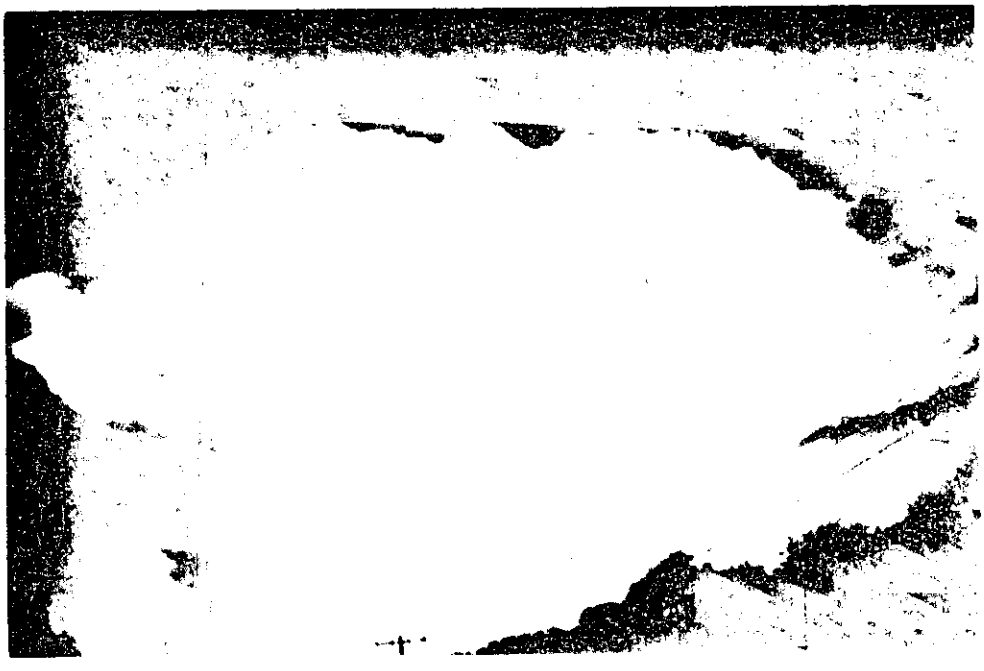


FIGURE 2-10. Cumulonimbus (CB). The anvil portion of a CB is composed of ice crystals. The CB or thunderstorm cloud contains most types of aviation weather hazards; particularly turbulence, icing, and hail.

Freezing Level Data

Upper air (rawinsonde) observation stations append in remarks *freezing level data*. The coded remark is appended to the first record report transmitted after the information becomes available. Code for the remark is as follows:

RADAT UU (D) ($h_ph_ph_p$) ($h_ph_ph_p$) (/n)

(a) RADAT—a contraction identifying the remark as "freezing level data".

(b) UU—relative humidity at the freezing level in percent. When more than one level is sent, "UU" is highest relative humidity observed at any of the levels transmitted.

(c) (D)—a coded letter "L", "M", or "H" to indicate that relative humidity is for the "lowest", "middle", or "highest" level coded. This letter is omitted when only one level is sent.

(d) ($h_ph_ph_p$)—a height in hundreds of feet above MSL at which the upper air sounding crossed the 0° C isotherm. No more than three levels are coded. If the sounding crosses the 0° C isotherm more than three times, the levels coded are the lowest and the top two levels.

(e) (/n)—indicator to show the number of crossings of the 0° C isotherm, other than those coded. The indicator is omitted when all levels are coded.

Examples:

RADAT 87045	Relative humidity 87%, only crossing of 0° C isotherm was 4,500 feet MSL.
RADAT 87L024105	Relative humidity 87% at the lowest (L) crossing. Two crossings occurred at 2,400 and 10,500 feet MSL.
RADAT 84M019045051/1	Relative humidity 84% at the middle (M) crossing of the three coded crossings. Coded crossings were at 1,900, 4,500, and 5,100 feet. The 84% humidity was at 4,500 feet MSL. "/1" indicates one additional crossing and it was between 1,900 and 4,500 feet.
RADAT MISG	The sounding terminated below the first crossing of the 0° C isotherm—temperatures were all above freezing.
RADAT ZERO	The entire sounding was below 0° C.

Icing Data

When the rawinsonde observer determines definitely that icing was occurring on his instruments, he enters the data in the following code:

RAICG HHMSL (SNW)

(a) RAICG—indicates icing data follows.

(b) HH—height in hundreds of feet at which icing occurred. "MSL" is always appended to the height.

(c) (SNW)—used to indicate that snow is causing a reduced balloon ascension rate. (Omitted otherwise.)

Examples:

RAICG 12MSL—Icing at 1,200 feet MSL.

RAICG 24MSL SNW—Icing at 2,400 feet MSL in snow.

Other Information

A group or groups of numerically coded data may appear in remarks. These data are primarily of concern to the meteorologist and are not discussed here.

A printed arrow marks the end of weather information and signifies that the rest of the report is notice(s) to airmen (NOTAM). The NOTAM code is explained in the AIRMAN'S INFORMATION MANUAL.

REPORT IDENTIFIERS

A heading begins the record hourly collective on the local circuit identifying the type of message, the circuit number, and the date and time of observations making up the collective reports. For example,

SA21 271900

means surface aviation reports (SA); 21 is the circuit number; 27 is the day of the month; and the observations were made at 1900 GMT.

A slightly different heading begins each relay. It identifies the location of reporting stations by states and indicates the time the relay began. Example,

MO201912

means the relay is from Missouri; day of the month is the 20th (20); time of observations is 1900 GMT (19); and the relay began 12 minutes past the hour (12).

Relay designators other than States are INTERMEDIATE EAST, FAR EAST, NEAR NORTH, etc. The relay collectives are assembled by a centralized computer and are unique to each circuit.

Individual reports must each convey the time and type of report. These reports include specials, corrected reports, and supplemental reports. Following are examples:

Example 1

INK 1100.....

indicates a relayed report from Wink, Texas for 1100 GMT (all times transmitted in teletypewriter reports are GMT). Since the time is on the hour, it signifies a record hourly so that further identification is unnecessary.

Example 2

INK COR 1100.....

signifies a correction to the 1100 GMT record hourly report as originally transmitted. The correction may transmit the complete corrected report, or it may contain only the corrected element or elements.

Example 3

INK SP 2315.....

indicates a special report of an observation taken at 2315 GMT to report a significant change in weather.

Example 4

INK COR SP 2315.....

indicates a correction to the special report in example 3.

Example 5

BVO SW 1130.....

indicates a Supplemental Aviation Weather Reporting Station (SAWRS) report by the contraction "SW". SAWRS reports are unscheduled and are made by non-Government observers at airports not served by a regularly reporting weather station. Observations are taken during commercial aircraft operations. Type and time are transmitted. This report was from Bartlesville, Oklahoma at 1130 GMT.

READING THE SURFACE AVIATION WEATHER REPORT

Now that we have studied the individual elements and their decoding, let's read completely each of the five reports. Capitalized phrases are those elements which *normally* are broadcast by the station at or near the airport where the observation was made:

INK SA 1851 CLR 15 106/77/63/1112G18/000

WINK, WINK, 1851 GREENWICH, CLEAR, VISIBILITY ONE FIVE, pressure 1010.6 millibars, TEMPERATURE SEVEN SEVEN, dew point six three, WIND ONE ONE ZERO DEGREES AT ONE TWO PEAK GUSTS ONE EIGHT, ALTIMETER THREE ZERO ZERO ZERO.

BOI SA 1853 150 SCT 30 181/62/42/1304/015

BOISE, BOISE, 1853 GREENWICH, ONE FIVE THOUSAND SCATTERED, VISIBILITY THREE ZERO, pressure 1018.1 millibars, TEMPERATURE SIX TWO, dew point four two, WIND ONE THREE ZERO DEGREES AT FOUR, ALTIMETER THREE ZERO ONE FIVE.

LAX SA 1854 7 SCT 250 SCT 6HK 129/60/59/2504/991→LAX↘6/38

LOS ANGELES, LOS ANGELES, 1854 GREENWICH, SEVEN HUNDRED SCATTERED TWO FIVE THOUSAND SCATTERED, VISIBILITY SIX, HAZE, SMOKE, pressure 1012.9 millibars, TEMPERATURE SIX ZERO, DEW POINT FIVE NINER, WIND TWO FIVE ZERO DEGREES AT FOUR, ALTIMETER TWO NINER NINER ONE.

Note that nothing past the arrow was read. The arrow indicates that NOTAM information follows and is not part of the *weather* report.

MDW RS 1856 SP −X M7 OVC 1 1/2 R+F 990/63/61/3205/950/RF2 RB12

CHICAGO, CHICAGO MIDWAY, SPECIAL, 1856 GREENWICH, SKY PARTIALLY OBSCURED, MEASURED CEILING SEVEN HUNDRED OVERCAST, VISIBILITY ONE AND ONE-HALF, HEAVY RAIN, FOG, pressure 999.0 millibars, TEMPERATURE SIX THREE, DEW POINT SIX ONE, WIND THREE TWO ZERO DEGREES AT FIVE, ALTIMETER TWO NINER FIVE ZERO, TWO TENTHS SKY OBSCURED BY RAIN AND FOG, rain began 12 minutes past the hour.

JFK RS 1853 W5 X 1/2F 180/68/64/1804/006/R04RVR22V30 TWR VSBY 1/4

NEW YORK, NEW YORK KENNEDY, SPECIAL, 1853 GREENWICH, INDEFINITE CEILING FIVE HUNDRED SKY OBSCURED, VISIBILITY ONE-HALF, FOG, pressure 1018.0 millibars, TEMPERATURE SIX EIGHT, DEW POINT SIX FOUR, WIND ONE EIGHT ZERO DEGREES AT FOUR, ALTIMETER THREE ZERO ZERO SIX, RUNWAY FOUR RIGHT VISUAL RANGE VARIABLE BETWEEN TWO THOUSAND TWO HUNDRED FEET AND THREE THOUSAND FEET, TOWER VISIBILITY ONE QUARTER.

Section 3

PILOT AND RADAR REPORTS AND SATELLITE PICTURES

The preceding section explained the decoding of surface aviation weather reports. However, these spot reports only sample the total weather picture. Pilot and radar reports help fill the gaps between stations.

PILOT WEATHER REPORTS (PIREPS)

No observation is more timely than the one you make from your cockpit. In fact, aircraft in flight are the only means of directly observing cloud tops, icing, and turbulence. Your fellow pilots welcome your PIREP as well as do the briefer and forecaster. Help yourself and the aviation weather service by sending pilot reports!

A PIREP usually is transmitted by teletypewriter in a prescribed format. The letters "UA" identify the message as a pilot report. Next in order are location; time; phenomena encountered; altitude; and, if the report is turbulence or icing, the type of aircraft. All altitude references are MSL unless noted, distances are in nautical miles, and time is in GMT.

A PIREP is transmitted over teletypewriter as a single message, in a group of PIREPs collated by States, or as a remark appended to a surface aviation weather report. The phenomena is coded in contractions and symbols.

UA /OV MRB–PIT 1600 FLO80 /TP BE55 /SK 004 BKN 012/022 BKN-OVC /TA 01 /IC LGT-MDT RIME 035–060 /RM WIND COMP HEAD 020 MH310 TAS 180

The PIREP decodes as follows:

Pilot report, Martinsburg to Pittsburgh at 1600Z at 8000 feet. A Beechcraft Baron; cloud base 400 broken tops 1200, second layer 2200 broken variable overcast; outside air temperature +1 degree Celsius; light to moderate rime icing 3500–6000 feet; headwind component 20 knots, magnetic heading 310°, true air speed 180 knots.

Most contractions in PIREP messages are self-explanatory. Icing and turbulence reports state intensities using standard terminology when possible. Intensity tables for turbulence and icing are in section 16. If a pilot's description of an icing or turbulence encounter cannot readily be translated into standard terminology, the pilot's description is transmitted verbatim.

The following excerpts may assist you in reading transmitted pilot weather reports:

UA /OV RDU . . . /RM DURGD OAOI 150 OI 80 . . .

means ". . . during descent on and off instruments at 15,000 feet; on instruments at 8,000 feet . . ."

UA /OV MGW . . . FL100/WV 25015/TA −2

is decoded ". . . wind at 10,000 feet 250° at 15; temperature −2° C . . ."

UA /OV MRB . . . FL060/SK INTMTLY BL/TB MDT/RM R TURBC INCRS WIND . . .

states ". . . at 6000 feet, intermittently between layers (contraction BL); increases westward . . ."

UA /OV ABQ 1845 TIJERAS PASS CLOSED DUE TO FOG AND LOW CLDS. UNABLE VFR RTNG ABQ.

is self-explanatory. Information of this type is helpful to others planning VFR flight in the area.

UA /OV TOL 2200/TP B707/TB MDT CAT 350–390

means ". . . over Toledo at 2200 GMT a Boeing 707 reported moderate clear air turbulence from 35,000 to 39,000.

To lessen the chance of misinterpretation by others, you are urged to report icing and turbulence in standard terminology (intensity tables for turbulence and icing, section 16). If your report cannot be translated into standard terminology, it is transmitted verbatim. This PIREP stated,

. . . PRETTY ROUGH AT 6,500, SMOOTH AT 8,500 PA24

Would a report of "light", "moderate", or "severe" turbulence at 6,500 have meant more to you?

Pilot reports of cloud bases and tops are usually in symbols and are often appended to surface aviation weather reports. Height of cloud base precedes the sky cover symbol, and top follows the symbol. For example,

38 BKN 70

means base of a broken layer at 3,800 feet and top 7,000 feet (all MSL).

The following example appended to an aviation weather report,

DSM SA 1755 M8 OVC 3R-F 132/15/44/3213/992 UA /OV DSM 320012 1735/SK OVC 065/080 OVC 140.

is decoded " . . . . pilot reports at 1735 GMT 12 (nautical miles) northwest of Des Moines, top of the lower overcast 6,500 MSL; base of a second layer (overcast) at 8,000 and top, 14,000 feet MSL."

Pilot reports of a non-meteorological nature sometimes help air traffic controllers. This "plain language" report stated:

. . . 3N PNS LRG FLOCK OF GOOSEY LOOKING BIRDS HDG ONLY NORTH MAY BE SEAGULLS FORMATION LOUSY COURSE ERRATIC . . . .

While in humorous vein, this PIREP alerted pilots and controllers to a bird hazard.

Your PIREP always helps someone else and becomes a part of the aviation weather service. Please report anything you observe that may be of concern to other pilots.

RADAR WEATHER REPORTS (RAREPS)

Thunderstorms and general areas of precipitation can be observed by radar. Radar weather reports are routinely transmitted by teletypewriter and some are included in scheduled weather broadcasts by Flight Service Stations.

Most radar stations report each hour with intervening special reports as required. They report location of precipitation along with type, intensity and trend. Table 3-1 explains symbols denoting intensity and trend. Table 3-2 summarizes the order and content of a radar weather report.

To assist you in interpreting RAREPs, five examples are decoded into plain language:

IMI 1133 AREA 4TRW+/+ 22/100 88/170 196/180 220/115 C2425 MT 310 AT 162/110

Little Rock, Arkansas radar weather observation at 1133 GMT
An area of echoes, four-tenths coverage, containing thunderstorms and heavy rainshowers, increasing in intensity

Area is defined by points (referenced IMI radar) at 22°, 100 NM (nautical miles); 88°, 170 NM; 196°, 180 NM; and 220°, 115 NM. (These points plotted on a map and connected with a line outline the area of echoes.)
Individual cells are moving from 240° at 25 knots
Maximum tops (MT) are 31,000 feet located at 162° and 110 NM from LIT

JAN 1935 SPL LN 10TRWX/NC 86/40 164/60 199/115 12W C2430 MT 440 AT 159/65 D10

Jackson, Mississippi, a 1935 special radar report
Line of echoes, ten-tenths coverage, thunderstorm, intense rainshowers, no change in intensity
Center of the line extends from 86°, 40 NM; 164°, 60 NM; and 199°, 115 NM. The line is 12 NM wide (12W). (To display graphically, plot the center points on a map and connect the points with a line; since the thunderstorm line is 12 miles wide, it extends 6 miles either side of your plotted line.)
Thunderstorm cells are moving from 240° at 30 knots
Maximum tops are 44,000 feet, centered at 159°, 65 NM from Jackson. Diameter of this cell is 10 NM (D10)

MAF 1130 AREA 2S 27/80 90/125 196/50 268/100 2410 MT U100

Midland, Texas radar weather report at 1130 GMT
An area, two-tenths coverage, of snow
Area is bounded by points 27°, 80 NM; 90°, 125 NM; 196°, 50 NM; and 268°, 100 NM
Movement is from 240° at 10 knots
Maximum tops are 10,000 feet; tops are uniform (smooth)

HDO 1132 AREA 2TRW– + 6R– /NC 67/130 308/45 105W C2240 MT 380 at 66/51

Hondo, Texas radar weather report at 1132 GMT

An area of echoes containing two-tenths coverage of thunderstorms, very heavy rainshowers, and six-tenths coverage light rain. No intensity change. (This report suggests thunderstorms embedded in a general area of light rain.)

Although the pattern is an "area", only two points are given followed by "105W". This means the area lies 52½ miles either side of the line defined by the two points—67°, 130 NM and 308°, 45 NM

Thunderstorm cells are moving from 220° at 40 knots

Maximum tops are 38,000 feet at 66°, 51 NM

TABLE 3-1. Precipitation intensity and intensity trend

Intensity		Intensity Trend	
Symbol	Intensity	Symbol	Trend
–	Light	+	Increasing
(none)	Moderate		
+	Heavy	–	Decreasing
++	Very heavy		
X	Intense	NC	No change
XX	Extreme		
U	Unknown	NEW	New echo

TABLE 3-2. Order and content of a radar weather report

OKC 1934 LN 8TRW++/+ 86/40 164/60/ 199/115 15W 2425
MT 570 AT 159/65 2 INCH HAIL RPRTD THIS ECHO M01 N02 ON3 PM31 QM3 RL2 SL9

OKC 1934	LN	8	TRW++/+	86/40 164/60 199/115	15W	2425
a.	b.	c.	d.	e.	f.	g.

MT 570 AT 159/65	2 INCH HAIL RPRTD THIS ECHO	M01 N02 ON3 PM31 QM3 RL2 SL9
h.	i.	j.

a. Location identifier and time of radar observation (GMT)

b. Echo pattern[1] (line in this example)

c. Coverage in tenths (8/10 of this example)

d. Type, intensity, and trend of weather[2] (thunderstorm (T), very heavy rainshowers (RW++), increasing in intensity (/+))

e. Azimuth (reference true N) and range in nautical miles (NM) of points defining the echo pattern

f. Dimension of echo pattern[3] (15 NM wide)

g. Pattern movement (line moving from 240° at 25 knots); may also show movement of individual storms or "cells"

h. Maximum tops and location (57,000 feet)

i. Remarks; self-explanatory in plain language contractions.

j. Digital section; used for radar summary chart. see Section 7, page 61.

[1] Echo pattern may be a line (LN), fine line (FINE LN), area (AREA), spiral band area (SPRL BAND AREA) or single cell (CELL).

[2] Teletypewriter weather symbols are used. See Table 3-1 for intensity and intensity trend symbols.

[3] Dimension of an echo pattern is given when azimuth and range define only the center or center line of the pattern.

Another chart provided for the use of the pilot in flight planning is the teletypewriter digital plot. (See Figure 3-1.). The Digital Plot may be obtained through the request/reply circuit. The chart has digitized intensity (See Table 7-1) plotted over a sectional map of several states. The numbers on the plot refer to RADAR echo intensity and represent the strongest return found in a twenty-two nautical mile square area. From this plot the briefer/pilot may obtain the location of the strongest RADAR returns in the area of interest.

When a radar report is transmitted but contains no encoded weather observation, a contraction is sent which indicates operational status of the radar. Table 3-3 explains the contractions.

OKC 1135 PPINE

Oklahoma City, Oklahoma radar at 1135 GMT detects no echoes

Radar weather reports also contain groups of digits, i.e., M01 N02 ON3 PM34, etc., which are entered on a line following the RAREP. This manually digitized radar information is omitted from the foregoing examples since it is used primarily by meteorologists and hydrologists for estimating amount of rainfall.

A radar weather report may contain remarks in addition to the coded observation. Certain types of severe storms produce distinctive patterns on the radar scope. For example, a hook-shaped echo may be associated with a tornado; and a spiral band with a hurricane. If hail, strong winds, tornado activity, or other adverse weather is known to be associated with identified echoes on the radar scope, the location and type of phenomena are included as a remark. Examples of remarks are: "HAIL REPORTED THIS ECHO"; "TORNADO ON GROUND AT 338/15"; and "HOOK ECHO 243/18".

When using hourly and special radar weather reports in preflight planning, note the location and coverage of echoes, the type of weather reported, the intensity trend, and especially the direction of movement. A word of caution—remember that radar detects only thunderstorms and general areas of precipitation; it is *not* designed to detect enroute ceiling and visibility. An area may be blanketed with fog or low stratus, but unless precipitation is also present, the radar scope will be clear of echoes. Use radar reports along with PIREPs and aviation weather reports and forecasts.

RAREPs help you to plan ahead to avoid thunderstorm areas. Once airborne, however, you must depend on visual sighting or airborne radar to evade individual storms.

TABLE 3-3. Contractions reporting operational status of radar

Contraction	Operational status
PPINE	Equipment normal and operating in PPI (Plan Position Indicator) mode; no echoes observed.
PPIOM	Radar inoperative or out of service for preventative maintenance.
PPINA	Observations omitted or not available for reasons other than PPINE or PPIOM.
ROBEPS	Radar operating below performance standards.
ARNO	"A" scope or azimuth/range indicator inoperative.
RHINO	Radar cannot be operated in RHI (Range-height indicator) mode. Height data not available.

GOES Satellite Pictures

Prior to the space age, weather observations were made only at distinct points within the atmosphere and complemented by pilots observations (PIREPs) of en route clouds and weather. These PIREPs give a "sense" of weather as viewed from above. However, with the advent of weather satellites a whole new dimension to weather observing and reporting has emerged.

There are two U.S. GOES satellites used for picture taking. One stationed over the equator at 75° W and the other at 135° W. Together they cover North and South America and surrounding waters. They normally each transmit a picture of the earth, pole-to-pole each half hour. When disastrous weather threatens the U.S., the satellites can scan small areas rapidly so that we can receive a picture as often as every three minutes. Data from these rapid scans is used at national warning centers.

Infra-red sensors on the spacecraft measure heat radiation, and the resultant images show the temperature differences between clouds and the ground, as well temperature gradations in the clouds and along the earth surface. These pictures can be produced during darkness as well as daylight. Ordinarily, cold temperatures are displayed as light gray or white, making high clouds appear whitest (See Fig. 3-2) but various enhancements are sometimes used to sharply illustrate important temperature changes.

Operationally, at WSFOs and FSSs, pictures are received once every 30 minutes. In these they can see development and dissipation of weather, such as fog and convection, all over the country. Much of this is not visible from reporting points.

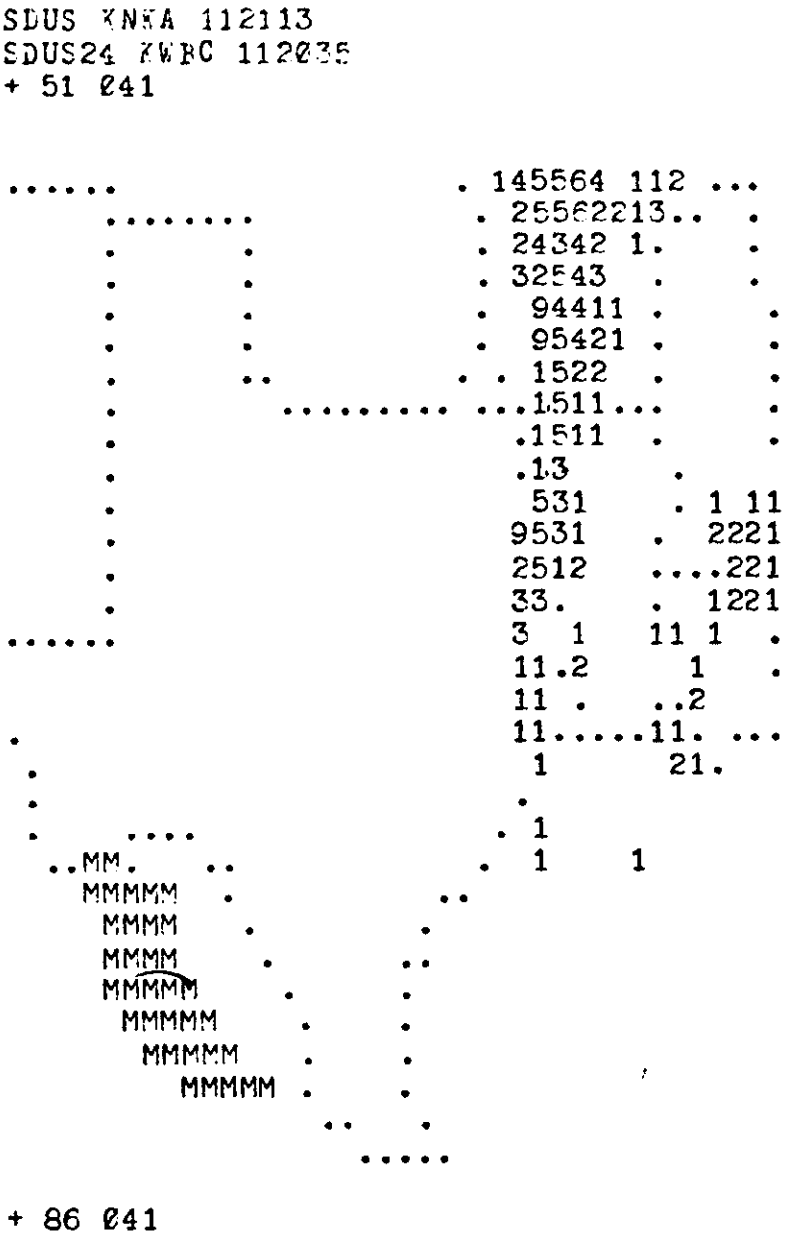


FIGURE 3-1. Teletypewriter plot of echo intensities for the South Central United States.

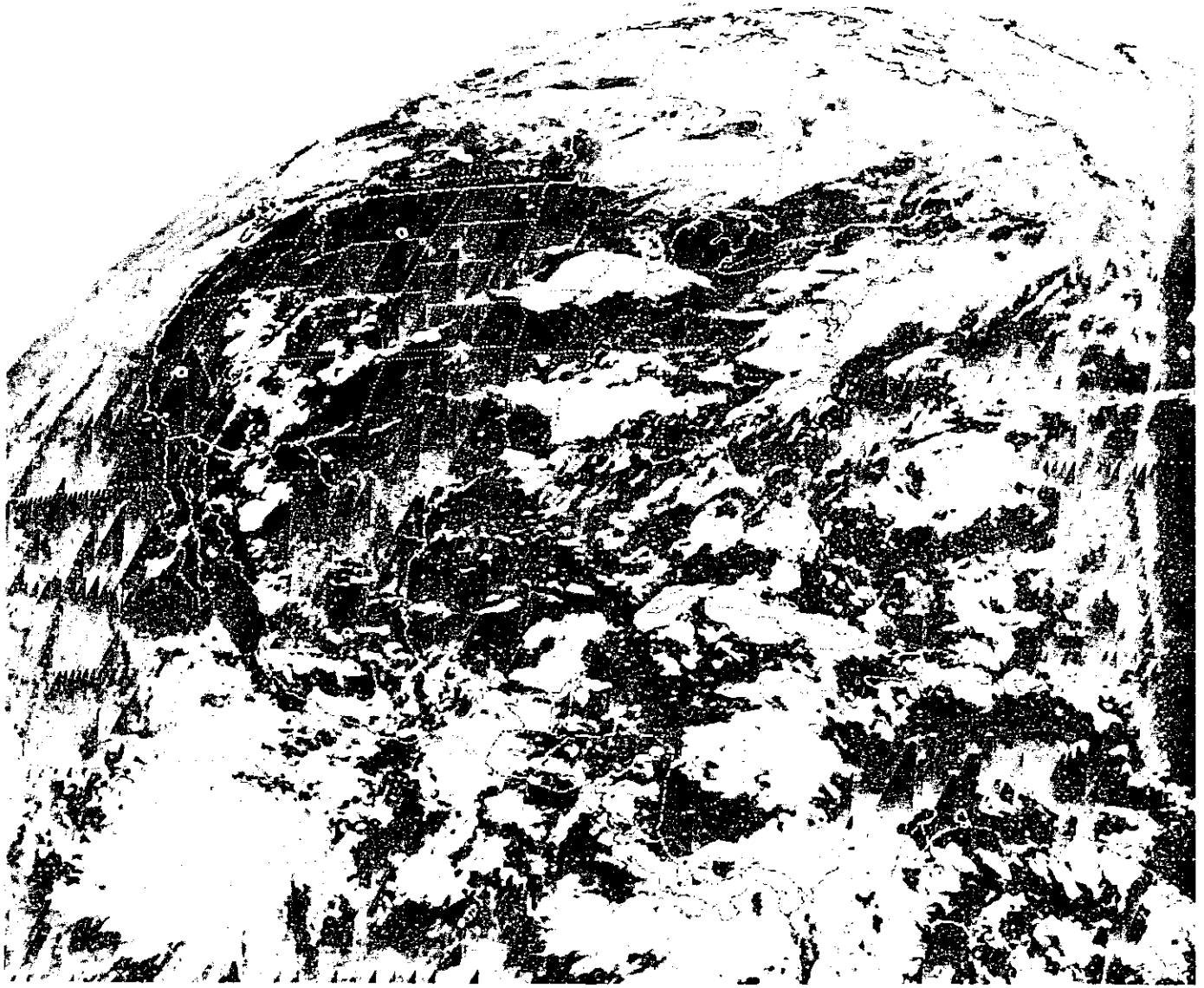


FIGURE 3-2. GOES satellite picture.

Section 4

AVIATION WEATHER FORECASTS

Good flight planning considers forecast weather. This section explains the following aviation forecasts:

1. Terminal Forecasts
   (a) Domestic (FT)
   (b) International (ICAO TAF)
2. Area Forecast (FA)
3. TWEB Route Forecast and Synopsis
4. Convective SIGMET (WST)
5. SIGMET and AIRMET (WS and WA)
6. Winds and Temperatures Aloft Forecast (FD)
7. Special Flight Forecasts

Also discussed are the following general forecasts which may aid in flight planning:

1. Hurricane Advisory (WH)
2. Convective Outlook (AC)
3. Severe Weather Watch Bulletin (WW)

U.S. terminal and area forecasts group ceiling and visibility into the following categories:

LIFR (Low IFR)	—Ceiling less than 500 feet and/or visibility less than 1 mile.
IFR	—Ceiling 500 to less than 1,000 feet and/or visibility 1 to less than 3 miles.
MVFR (Marginal VFR)	—Ceiling 1,000 to 3,000 feet and/or visibility 3 to 5 miles inclusive.
VFR	—Ceiling greater than 3,000 feet and visibility greater than 5 miles; includes sky clear.

These categorical groupings are used for the outlook portions of the forecasts extending beyond 18 hours. They enable the forecaster to more realistically describe conditions in the outlook period intended primarily for advanced operational planning.

The cause of LIFR, IFR, or MVFR is also given by either ceiling or visibility restrictions or both. The contraction "CIG" and/or weather and obstruction to vision symbols are used. If winds or gusts of 25 knots or greater are forecast for the outlook period, the word "WIND" is also included for all categories including VFR. Examples:

LIFR CIG	—Low IFR due to low ceiling.
IFR F	—IFR due to visibility restricted by fog.
MVFR CIG H K	—Marginal VFR due both to ceiling and to visibility restricted by haze and smoke.
IFR CIG R WIND	—IFR due both to low ceiling and to visibility restricted by rain; wind expected to be 25 knots or greater.

You should memorize the categories and their defining ceiling and visibility limits. Knowing them is mandatory to readily interpreting an outlook into operational planning.

Forecasts are regularly scheduled in collectives; but occasionally an unscheduled forecast must be transmitted out of collective. A forecast transmitted out of a collective must be identified by one of the following contractions with meaning as noted:

RTD—Routine delayed weather bulletin
COR—Correction bulletin
AMD—Amendment bulletin

TERMINAL FORECASTS (TF)

In the U.S., the body of the FT is for an area within a 5-mile radius of the runway complex while the remarks section is for a 10-mile radius. Terminal forecasts are in both the domestic U.S.

code (FT) and the ICAO (TAF) code. Scheduled terminal forecasts are valid for 24 hours.

U.S. Terminal Forecast Code (FT)

Terminal forecasts in the U.S. code (FT) are issued three times daily by WSFOs. Figure 1-4, section 1, shows the FT network. Issue and valid times are according to time zones of the issuing WSFO (see table in the next column).

WSFO Location (time zone)	*Issue time*	*Valid period*
Eastern/Central	0940Z	10Z–10Z
	1440Z	15Z–15Z
	2140Z	22Z–22Z
Mountain/Pacific	0940Z	10Z–10Z
	1540Z	16Z–16Z
	2240Z	23Z–23Z

Format of the FT is essentially the same as that of the SA report. Following is an FT:

STL 251010 C5 X 1/2S-BS 3325G35 OCNL C0 X 0S+BS. 16Z C30 BKN 3BS BRF SW—. 22Z 30 SCT 3315. 00Z CLR 04Z VFR WIND.

To aid in the discussion, we have divided the forecast into the following elements lettered "a" through "i"

STL (a.) 251010 (b.) C5 X (c.) 1/2 (d.) S-BS (e.) 3325G35 (f.) OCNL C0 X 0S+BS. (g.)

16Z C30 BKN 3BS 3320 BRF SW—. 22Z 30SCT 3315. 00Z CLR. (h.)

04Z VFR WIND . . (i.)

a. *Station identifier.* "STL" identifies St. Louis, Missouri. The forecast is for St. Louis.

b. *Date-time group.* "251010" is date and valid times. The forecast is valid beginning on the 25th day of the month at 1000Z valid until 1000Z the following day.

c. *Sky and ceiling.* "C5 X" means ceiling 500 feet, sky obscured. The letter "C" always identifies a *forecast* ceiling layer.

d. *Visibility.* "1/2" means visibility ½ mile. Visibility is in statute miles and fractions. Absence of a visibility entry specifically implies visibility more than 6 miles.

e. *Weather and obstructions to vision.* "S-BS" means light snow and blowing snow. These elements are in symbols identical to those used in SA reports and entered only when expected.

f. *Wind.* "3325G35" means wind from 330° at 25 knots gusting to 35 knots—the same as in SAs. Omission of a wind entry specifically implies wind less than 10 knots.

g. *Remarks.* "OCNL C0 X 0S+BS" means occasional ceiling zero, sky obscured, visibility zero, heavy snow and blowing snow. Remarks may be added to more completely describe expected weather. In aviation forecasts "BRF" means a change existing for less than one hour in each instance and "OCNL" means for shorter periods in time and more frequent instances than brief. Both "BRF" and "OCNL" means the condition is expected to persist less than half the time period.

h. *Expected changes.* When changes are expected, preceding conditions are followed by a period and the time and conditions of the expected change. "16Z C30 BKN 3BS 3320 BRF SW—. 22Z 30 SCT 3315. 00Z CLR." means by 1600Z, ceiling 3,000 broken, visibility 3, blowing snow, wind 330° at 20 knots, brief light snow showers. By 2200Z, 3,000 scattered, visibility more than 6 (implied), wind 330° at 15 knots. By 0000Z sky clear, visibility more than 6, wind less than 10 knots (implied).

i. *6-hour categorical outlook.* The last 6 hours of the forecast is a categorical outlook as explained on page 35. "04Z VFR WIND . ." means that from 0400Z until 1000Z—the end of the forecast period—weather will be ceiling more than 3,000 and visibility greater than 5 (VFR); wind will be 25 knots or stronger. The double period (. .) signifies the end of the forecast for the specific terminal.

Scheduled FT Collectives and Relays. Scheduled FTs are collected on area teletypewriter circuits. Selected FTs are then relayed to the area circuit from surrounding areas. The coverage of FTs becomes more sparse as the relays become more remote from the circuit area.

The heading of an FT collective identifies the message as an FT with a 6-digit date-time group giving the transmission time. For example, "FT130940" means a collective transmitted on the 13th at 0940Z.

Relay headings on some circuits are by States. On other circuits a relay heading identifies location relative to the area circuit. For example, "FT NEAR WEST 130911" means the terminals are just west of the circuit area; the relay was transmitted on the 13th at 0911Z. Other relay areas are NEAR EAST, NEAR NORTH, INTERMEDIATE SOUTH, FAR WEST, etc. These FT relay areas are the same as covered by SA relays whether by State or by areas relative to the local circuit. For example, if the SA report for station XYZ is in the FAR EAST relay, the FT for XYZ also will be found in the FAR EAST relay of FTs. The relays are assembled by computer and are unique to each circuit; they do not coincide with adjacent circuit collectives and relays.

Out of Sequence FTs. A delayed, corrected, or amended FT is identified in the message rather than in the heading. Following are a delayed FT for Binghamton, New York, a corrected FT for Memphis, Tennessee, and an amended FT for Lufkin, Texas:

BGM FT RTD 131615 1620Z 100 SCT 250 SCT 1810. 18Z 50 SCT 100 SCT 1913 CHC C30 BKN 3TRW AFT 20Z. 03Z 100 SCT C250 BKN. 09Z VFR . .

MEM FT COR 132222 2230Z 40 SCT 300 SCT CHC TRW. 02Z CLR. 16Z VFR . .

LFK FT AMD 1 131410 1425Z C8 OVC 4F OVC V BKN. 15Z 20 SCT 250– BKN. 19Z 40 SCT 120 SCT CHC C30 BKN 3TRW. 04Z MVFR CIG F . .

Note in each forecast a time group following the valid period; this is the issue time. Note also that the amended forecast for LFK has the entry "AMD 1". Amended FTs for each terminal are numbered sequentially starting after each scheduled forecast.

ICAO Terminal Forecast (TAF)

Terminal forecasts for long overwater international flights (TAF) are in an alphanumeric code. They are scheduled four times daily for 24-hour periods beginning at 0000Z, 0600Z, 1200Z and 1800Z.

Format. The TAF is a series of groups made up of digits and letters. An individual group is identified by its position in the sequence, by its alphanumeric coding, by its length, or by a numerical indicator. Listed below are a few contractions used in the TAF. Some of the contractions are followed by time entries indicated by "tt" or "tttt" or by probability, "pp":

GRADU tttt—A gradual change occurring during a period in excess of one-half hour. "tttt" are the beginning and ending times of the expected change to the nearest hour; i.e., "GRADU 1213" means the transition will occur between 1200Z and 1300Z.

RAPID tt —A rapid change occurring in one-half hour or less. "tt" is the time to the nearest hour of the change; i.e., "RAPID 23" means the change will occur about 2300Z.

TEMPO tttt—Temporary changes from prevailing conditions lasting less than one hour. "tttt" are the earliest and latest times during which the temporary changes are expected: i.e., "TEMPO 0107" means the temporary changes may occur between 0100Z and 0700Z.

INTER tttt —Changes from prevailing conditions are expected to occur frequently and briefly. "tttt" are the earliest and latest times the brief changes are expected; i.e., "INTER 1518" means that the brief changes may occur between 1500Z and 1800Z, the changes to persist for less than one-half the time period.

PROB pp —Probability of conditions occurring. "pp" is the probability in percent; i.e., "PROB 20" means a 20% probability of the conditions occurring.

CAVOK —No clouds below 5,000 feet or below the highest minimum sector altitude, whichever is greater, and no cumulonibus. Visibility 6 miles or greater. No precipitation, thunderstorms, shallow fog or low drifting snow.

WX NIL —No significant weather or obstructions to vision.

SKC —Sky clear.

Following is a St. Louis forecast in TAF code. It is the same as the preceding FT example except that it begins 2 hours later.

KSTL 1212 33025/35 0800 71SN 9//005 INTER 1215 0000 39BLSN 9//000 GRADU 1516 33020 4800 38BLSN 7SC030 TEMPO 1620 85SNSH GRADU 2122 33015 9999 WX NIL 3SC030 RAPID 00 VRB05 9999 SKC

The forecast is broken down into the elements lettered "a" to "k" to aid in the discussion. Not included in the example but explained at the end are three optional forecast groups for "l" icing, "m" turbulence, and "n" temperature.

KSTL 1212 33025/35 0800 71SN 9//005
a. b. c. d. e. f.

INTER 1215 0000 39BLSN 9//000
g.

GRADU 1516 33020 4800 38BLSN 7SC030
h.

TEMPO 1620 85SNSH
i.

GRADU 2122 33015 9999 WX NIL 3SC030
j.

RAPID 00 VRB05 9999 SKC
k.

a. *Station identifier.* The TAF code uses ICAO 4-letter station identifiers. In the contiguous 48 States the 3-letter identifier is prefixed with a "K"; i.e., the 3-letter identifier for Seattle is SEA while the ICAO identifier is KSEA. Elsewhere, the first two letters of the ICAO identifier tell what region the station is in. "MB" means Panama/Canal Zone (MBHO is Howard AFB); "MI" means Virgin Islands (MISX is St. Croix); "MJ" is Puerto Rico (MJSJ is San Juan); "PA" is Alaska (PACD is Cold Bay); "PH" is Hawaii (PHTO is Hilo).

b. *Valid time.* Valid time of the forecast follows station identifier. "1212" means a 24-hour forecast valid from 1200Z until 1200Z the following day.

c. *Wind.* Wind is forecast usually by a 5-digit group giving degrees in 3 digits and speed in 2 digits. When wind is expected to be 100 knots or more, the group is 6 digits with speed given in 3 digits. When speed is gusty or variable, peak speed is separated from average speed with a slash. For example, in the KSTL TAF, "33025/35" means wind 330°, average speed 25 knots, peak speed 35 knots. A group "160115/130" means wind 160°, 115 knots, peak speed 130 knots. "00000" means calm; "VRB" followed by speed indicates direction variable; i.e., "VRB10" means wind direction variable at 10 knots.

d. *Visibility.* Visibility is in meters. Table 4–2 is a table for converting meters to miles and fractions. "0800" means 800 meters converted from the table to ½ mile.

e. *Significant weather.* Significant weather is decoded using table 4–1. Groups in the table are numbered sequentially. Each number is followed by an acronym suggestive of the weather; you can soon learn to read most of the acronyms without reference to the table. Examples: "17TS", thunderstorm; "18SQ", squall; "31SA", sandstorm; "60RA", rain; "85SNSH", snow shower. "XX" between the number and acronym means "heavy". Examples: "33XXSA", heavy sandstorm; "67XXFZRA", heavy freezing rain. In the KSTL forecast, "71SN" means light snow. The TAF encodes only the single most significant type of weather; the U.S. domestic FT permits encoding of multiple weather types.

f. *Clouds.* A cloud group is a 6-character group. The first digit is coverage in octas (eighths) as shown in the top of table 4–3. The two letters identify cloud type as shown in the bottom of the table. The last three digits are cloud height in hundreds of feet. In the KSTL TAF, "9//005" means sky obscured (9), clouds not observed (//), vertical visibility 500 feet (005). The TAF may include as many cloud groups as necessary to describe expected sky condition.

g. and i. *Variation from prevailing conditions.* Variations from prevailing conditions are identified by the contractions INTER and TEMPO as defined earlier. In the KSTL TAF, "INTER 1215 0000 39BLSN 9//000" means intermittently from 1200Z to 1500Z (1215) visibility zero meters (0000) or zero miles, blowing snow (39BLSN), sky obscured, clouds not observed, vertical visibility zero (9//000). "TEMPO 1620 85SNSH" means between 1600Z and 2000Z, temporary, or brief, snow showers. Omission of other groups imply no significant change in wind, visibility, or cloud cover.

h, j, and k. *An expected change in prevailing conditions.* An expected change in prevailing conditions is indicated by the contraction GRADU, RAPID, or FRONT as defined earlier. In the KSTL TAF, "GRADU 1516 33020 4800 38BLSN 7SC030" means a gradual change between 1500Z and 1600Z to wind 330° at 20 knots, visibility 4,800 meters or 3 miles (table 4–2), blowing snow, ⅞ stratocumulus (table 4–3) at 3,000 feet. "GRADU 2122 33015 9999 WX NIL 3SC030" means a gradual change between 2100Z and 2200Z to wind 330° at 15 knots, visibility 10 kilometers

or more (more than 6 miles), no significant weather, 3/8 stratocumulus at 3,000 feet. "RAPID 00 VRB05 9999 SKC" means a rapid change about 0000Z to wind direction variable at 5 knots, visibility more than 6 miles, sky clear.

l. *Icing.* An icing group may be included. It is a 6-digit group. The first digit is 6 identifying it as an icing group. The second digit is the type of ice accretion from table 4-1, top. The next three digits are height of the base of the icing layer in hundreds of feet. The last digit is the thickness of the layer in *thousands* of feet. For example, let's decode the group "680304". "6" indicates an icing forecast; "8" indicates severe icing in cloud (table 4-4); "030" says the base of the icing is at 3,000 feet; and "4" specifies a layer 4,000 feet thick.

m. *Turbulence.* A turbulence group also may be included. It also is a 6-digit group coded the same as the icing group except a "5" identifies the group as a turbulence forecast, and type of turbulence is from table 4-1, bottom. Decode the group "590359". "5" identifies a turbulence forecast; "9" specifies frequent severe turbulence in cloud; (table 4-4) "035" says the base of the turbulent layer is 3,500 feet; "9" specifies that the turbulence layer is 9,000 feet thick.

When either an icing layer or a turbulent layer is expected to be more than 9,000 feet thick, multiple groups are used; the top specified in one group is coincident with the base in the following group. Let's assume a cloud base at 5,000 feet and the forecaster expects frequent turbulence in thunderstorms from the surface to 45,000 feet; the most hazardous turbulence is at mid-levels. This could be encoded 530005 550509 591409 592309 553209 554101. While you most likely will never see such a complex coding with this many groups, the flexible TAF code permits it.

n. *Temperature.* A temperature code is seldom included in a terminal forecast. However, it may be included if critical to aviation. It may be used to alert the pilot to high density altitude or possible frost when on the ground. The temperature group is identified by the digit "0". The next two digits are time to the nearest hour GMT at which the temperature will occur. The last two digits are temperature in degrees Celsius. A minus temperature is preceded by the letter "M". Examples: "02137" means temperature at 2100Z is expected to be 37° C, about 99° F; "012M02" means temperature at 1200Z is expected to be minus 2° C. A forecast may include more than one temperature group.

TABLE 4-1. TAF weather codes

Code	*Decode*	*Code*	*Decode*
04FU	Smoke. Visibility reduced by smoke, e.g., veldt or forest fires, industrial smoke or volcanic ashes	17TS	Thunderstorms. Thunderstorm, but no precipitation at the time of observation
06HZ	Dust haze. Widespread dust in suspension in the air, not raised by wind at or near the station at the time of observation	18SQ	Squall. Squalls at or within sight of the station during the preceding hour or at the time of observation
08PO	Dust devils. Well-developed dust whirl(s) or sand whirl(s) seen at or near the station during the preceding hour or at the time of observation, but no duststorm or sandstorm	19FC	Funnel cloud. Funnel cloud(s) (tornado cloud or waterspout) at or within sight of the station during the preceding hour or at the time of observation
11MIFG	Shallow fog. Patches of shallow fog or ice fog at the station, whether on land or sea, not deeper than about 2 metres on land or 10 metres at sea	30SA	Duststorm or sandstorm. Slight or moderate duststorm or sandstorm—has decreased during the preceding hour
12MIFG	Shallow fog. More or less continuous shallow fog or ice fog at the station, whether on land or sea, not deeper than about 2 metres on land or 10 metres at sea	31SA	Duststorm or sandstorm. Slight or moderate duststorm or sandstorm—no appreciable change during the preceding hour

TABLE 4-1. TAF weather codes—Continued

Code	*Decode*
32SA	Duststorm or sandstorm. Slight or moderate duststorm or sandstorm—has begun or has increased during the preceding hour
33XXSA	Heavy duststorm or sandstorm. Severe duststorm or sandstorm—has decreased during the preceding hour
34XXSA	Heavy duststorm or sandstorm. Severe duststorm or sandstorm—no appreciable change during the preceding hour
35XXSA	Heavy duststorm or sandstorm. Severe duststorm or sandstorm—has begun or has increased during the preceding hour
36DRSN	Low drifting snow. Slight or moderate drifting snow—generally low (below eye level)
37DRSN	Low drifting snow. Heavy drifting snow generally low (below eye level)
38BLSN	Blowing snow. Slight or moderate blowing snow—generally high (above eye level)
39BLSN	Blowing snow. Heavy blowing snow—generally high (above eye level)
40BCFG	Fog patches. Fog or ice fog at a distance at the time of observation, but not at the station during the preceding hour, the fog or ice fog extending to a level above that of the observer
41BCFG	Fog patches. Fog or ice fog in patches
42FG	Fog. Fog or ice fog, sky visible—has become thinner during the preceding hour
43FG	Fog. Fog or ice fog, sky invisible—has become thinner during the preceding hour
44FG	Fog. Fog or ice fog, sky visible—no appreciable change during the preceding hour
45FG	Fog. Fog or ice fog, sky invisible—no appreciable change during the preceding hour
46FG	Fog. Fog or ice fog, sky visible—has begun or has become thicker during the preceding hour
47FG	Fog. Fog or ice fog, sky invisible—has begun or has become thicker during the preceding hour
48FZFG	Freezing fog. Fog, depositing rime, sky visible
49FZFG	Freezing fog. Fog, depositing rime, sky invisible
50DZ	Drizzle. Drizzle, not freezing, intermittent—slight at time of observation
51DZ	Drizzle. Drizzle, not freezing, continuous—slight at time of observation
52DZ	Drizzle. Drizzle, not freezing, intermittent—moderate at time of observation
53DZ	Drizzle. Drizzle, not freezing, continuous—moderate at time of observation
54XXDZ	Heavy drizzle. Drizzle, not freezing, intermittent—heavy (dense) at time of observation
55XXDZ	Heavy drizzle. Drizzle, not freezing, continuous—heavy (dense) at time of observation
56FZDZ	Freezing drizzle. Drizzle, freezing, slight
57XXFZDZ	Heavy freezing drizzle. Drizzle, freezing, moderate or heavy (dense)
58RA	Rain. Drizzle and rain, slight
59RA	Rain. Drizzle and rain, moderate or heavy
60RA	Rain. Rain, not freezing, intermittent—slight at time of observation
61RA	Rain. Rain, not freezing, continuous—slight at time of observation
62RA	Rain. Rain, not freezing, intermittent—moderate at time of observation
63RA	Rain. Rain, not freezing, continuous—moderate at time of observation
64XXRA	Heavy rain. Rain, not freezing, intermittent—heavy at time of observation
65XXRA	Heavy rain. Rain, not freezing, continuous—heavy at time of observation
66FZRA	Freezing rain. Rain, freezing, slight

TABLE 4–1. TAF weather codes—Continued

Code	*Decode*
67XXFZRA	Heavy freezing rain. Rain, freezing, moderate or heavy
68RASN	Rain and snow. Rain or drizzle and snow, slight
69XXRASN	Heavy rain and snow. Rain or drizzle and snow, moderate or heavy
70SN	Snow. Intermittent fall of snowflakes—slight at time of observation
71SN	Snow. Continuous fall of snowflakes—slight at time of observation
72SN	Snow. Intermittent fall of snowflakes—moderate at time of observation
73SN	Snow. Continuous fall of snowflakes—moderate at time of observation
74XXSN	Heavy snow. Intermittent fall of snowflakes—heavy at time of observation
75XXSN	Heavy snow. Continuous fall of snowflakes—heavy at time of observation
77SN	Snow. Snow grains (with or without fog)
79PE	Ice pellets. Ice pellets, type (a)
80RASH	Showers. Rain shower(s), slight
81XXSH	Heavy showers. Rain shower(s), moderate or heavy
82XXSH	Heavy showers. Rain shower(s), violent
83RASN	Shower(s) of rain and snow mixed, slight
84XXRASN	Heavy showers of rain and snow. Shower(s) of rain and snow mixed, moderate or heavy
85SNSH	Snow showers. Snow shower(s), slight
86XXSN	Heavy snow showers. Snow shower(s), moderate or heavy
87GR	Soft hail. Shower(s) of snow pellets or ice pellets, type (b), with or without rain or rain and snow mixed—slight
88GR	Soft hail. Shower(s) of snow pellets or ice pellets, type (b), with or without rain or rain and snow mixed—moderate or heavy
89GR	Hail. Shower(s) of hail (hail, ice pellets, type (b), snow pellets), with or without rain and snow mixed, not associated with thunder—slight
90XXGR	Heavy hail. Shower(s) of hail (hail, ice pellets, type (b), snow pellets), with or without rain or rain and snow mixed, not associated with thunder—moderate or heavy
91RA	Rain. Slight rain at time of observation—thunderstorm during the preceding hour but not at time of observation
92XXRA	Heavy rain. Moderate or heavy rain at time of observation—thunderstorm during the preceding hour but not at time of observation
93GR	Hail. Slight snow, or rain and snow mixed or hail (hail, ice pellets, type (b), snow pellets) at time of observation—thunderstorm during the preceding hour but not at time of observation
94XXGR	Heavy hail. Moderate or heavy snow, or rain and snow mixed or hail (hail, ice pellets, type (b), snow pellets) at time of observation—thunderstorm during the preceding hour but not at time of observation
95TS	Thunderstorm. Thunderstorm, slight or moderate, without hail (hail, ice pellets, type (b), snow pellets) but with rain and/or snow at time of observation
96TSGR	Thunderstorm with hail. Thunderstorm slight or moderate with hail (hail, ice pellets, type (b), snow pellets) at time of observation
97XXTS	Heavy thunderstorm. Thunderstorm, heavy, without hail (hail, ice pellets, type (b), snow pellets) but with rain and/or snow at time of observation
98TSSA	Thunderstorm with duststorm or sandstorm. Thunderstorm combined with duststorm or sandstorm at time of observation
99XXTSGR	Heavy thunderstorm with hail. Thunderstorm, heavy, with hail (hail, ice pellets, type (b), snow pellets) at time of observation

TABLE 4-2. Visibility conversion -TAF code to miles

Meters	*Miles*
0000	0
0100	1/16
0200	1/8
0300	3/16
0400	1/4
0500	5/16
0600	3/8
0800	1/2
1000	5/8
1200	3/4
1400	7/8
1600	1
1800	1 1/8
2000	1 1/4
2200	1 3/8
2400	1 1/2
2600	1 5/8
2800	1 3/4
3000	1 7/8
3200	2
3600	2 1/4
4000	2 1/2
4800	3
6000	4
8000	5
9000	6
9999	more than 6

TABLE 4 3. TAF cloud code

Cloud amount		*Cloud type*	
0	0 (Clear)	CI	Cirrus
1	1 octa or less but not zero	CC	Cirrocumulus
		CS	Cirrostratus
2	2 octas	AC	Altocumulus
3	3 octas	AS	Altostratus
4	4 octas	NS	Nimbostratus
5	5 octas	SC	Stratocumulus
6	6 octas	ST	Stratus
7	7 octas or more but not 8 octas	CU	Cumulus
		CB	Cumulonimbus
8	8 octas (Overcast)	//	Cloud not visible due to darkness or obscuring phenomena
9	Sky obscured, or cloud amount not estimated		

TABLE 4 4. TAF icing and turbulence

Figure Code	*Amount of ice accretion (TAF group 6)*
0	No icing
1	Light icing
2	Light icing in cloud
3	Light icing in precipitation
4	Moderate icing
5	Moderate icing in cloud
6	Moderate icing in precipitation
7	Severe icing
8	Severe icing in cloud
9	Severe icing in precipitation

Figure Code	*Turbulence (TAF group 5)*
0	None
1	Light turbulence
2	Moderate turbulence in clear air, infrequent
3	Moderate turbulence in clear air, frequent
4	Moderate turbulence in cloud, infrequent
5	Moderate turbulence in cloud, frequent
6	Severe turbulence in clear air, infrequent
7	Severe turbulence in clear air, frequent
8	Severe turbulence in cloud, infrequent
9	Severe turbulence in cloud, frequent

AREA FORECAST (FA)

An area forecast (FA) is a forecast of general weather conditions over an area the size of several States. It is used to determine forecast enroute weather and to interpolate conditions at an airport for which no FT is issued. Figure 1-5, section 1, maps FA areas.

Example of an FA:

DFW FA 131240
131300Z-140700Z
OTLK 140700Z-141900Z
NM OK TX AND CSTL WTRS . . .
HGTS MSL UNLESS NOTED . .
TSTMS IMPLY PSBL SVR OR GRT TURBC . . . SVR ICG. AND LOW-LVL WIND SHEAR . . .
FLT PRCTN . . . E OF PNC-SPS-LRD LN FOR TSTMS AND ICG. ERN HLF TX FOR CIGS BLO 10 . . .
SYNS . . . AT 13Z CDFNT NR A GCK-SPS-DLF LN MOVG EWD ABT 20 KTS TO NR A SHV-BRO LN . . .
SIG CLDS AND WX . . .
OK AND TX ALG AND AHD OF FNT . . .
WDSPRD CIGS BLO 10 OVC VSBYS LCLY BLO 3L-F OVR TX PTN AND CIGS 15-25 OVC . . . OTLK . . . MVFR CIG.
ICG AND FRZLVL . . . MDT MXD ICGICIP ABV FRZLVL AHD CDFNT. LGT RIME ICIG BHND . . . FRLZ 70 NRN NM SLPG TO 100 SWRN TX AND 90 NERN OK SLPG TO 120 SRN TX.
TURBC . . . OCNL MDT TURBC SERN NM AND OVR WRN TX MAINLY 17Z-02Z. ELSW GENLY LGT . . .
THIS FA ISSUANCE INCORPORATES THE FOLLOWING AIRMETS STILL IN EFFECT . . . QUEBEC 1 ROMEO 1. AZ

FAs are scheduled every 12 hours. They cover an 18-hour period with an additional 12-hour outlook. All times are GMT in whole hours (two digits), i.e., 13Z. Wind speed is in knots; and wind direction, in degrees true. All distances except visibility are in nautical miles; visibility is in statute miles.

Each FA has the sections:

1. Heading. (Includes area and date-time group)
2. HGTS MSL UNLESS NOTED
3. TSTMS IMPLY PSBL SVR OR GTR TURBC, SVR ICG, AND LOW-LVL WIND SHEAR . . .
4. FLT PRCTN (Flight precaution)
5. SYNS . . . (Synopsis)
6. SIG CLDS AND WX . . . (Significant clouds and Weather) and OTLK (12-Hour Categorical Outlook)
7. Location Headline
8. MTN PASSES (Mountain passes, Alaska only)
9. ICG AND FRZLVL (Icing and freezing level)
10. TURBC (Turbulence)
11. THIS FA ISSUANCE INCORPORATES THE FOLLOWING AIRMETS STILL IN EFFECT (If applicable)
12. Forecaster's initials

Heading

The heading identifies an area forecast, the originating WSFO, the date and time of issue, and the valid periods of the forecast and outlook. For example,

DFW FA 131240
131300Z-140700Z
OTLK 140700Z-141900Z

states that the FA was issued by Fort Worth (DFW) on the 13th day of the month at 1240Z. The forecast is valid from 1300Z Thursday until 0700Z Friday with a categorical outlook from 0700Z Friday until 1900Z Friday.

Forecast Area

The area is in contractions identifying States; portions of States; and, where applicable, adjacent waters. For example,

NM OK TX AND CSTL WTRS

means New Mexico, Oklahoma, Texas and coastal waters adjacent to the area.

Height Statement

Each FA contains the statement,

HGTS MSL UNLESS NOTED

to alert the user that heights for the most part are above sea level. For example, "3 THSD BKN TOPS 100 HIR TRRN OBSCD" means broken clouds 3,000 feet tops 10,000 feet—all heights MSL; terrain above 3,000 feet will be obscured. Tops of clouds and bases and tops of icing are always MSL.

Heights *above ground level* may be denoted in either of two ways. (1) Ceiling by definition is above ground. Therefore, the contraction "CIG" indicates above ground. For example "CIGS GENLY BLO 1 THSD" means that ceilings are expected to be generally below 1,000 feet. (2) The contraction "AGL" means above ground level. "SCT 2 THSD AGL" means scattered clouds, bases 2,000 feet above ground level.

Flight Precaution

Covers hazardous weather expected to occur during the first 12 hours of the forecast period, including low level wind shear. If no hazards expected a negative statement is inserted, i.e., "No hazus wx expct".

Synopsis

The synopsis briefly summarizes locations and movements of fronts, pressure systems, and circulation patterns. It also may give moisture and stability conditions.

Significant Clouds And Weather

The significant clouds and weather section, identified by the contraction,

SIG CLDS AND WX

forecasts, in broad terms, cloudiness and weather significant to flight operations. Table 4–5 defines the contractions and compares them to the designators used in the FT.

Obstructions to vision are included when forecast visibility is 6 miles or less. Expected precipitation and thunderstorms are always included. Table 4–6 gives expected coverage indicated by the terms "isolated," "widely scattered," "scattered," and "numerous."

The SIG CLDS AND WX section usually is several paragraphs. The breakdown may be by States, by well known geographical areas, or in reference to location and movement of a pressure system or front. Figure 4–1 is a map to assist in identifying geographical areas.

A categorical outlook, identified by "OTLK", is included for each area breakdown. Examples "OTLK. VFR BCMG MVFR CIG F AFT 09Z" means that weather is expected to be VFR becoming marginal VFR due to low ceiling and to visibility restricted by fog after 0900Z.

TABLE 4–5. Contractions in FA

Contraction	*FT Designator*	*Definition*
CLR	CLR	Sky clear
SCT	SCT	Scattered
BKN	BKN	Broken
OVC	OVC	Overcast
OBSC	X	Obscured, obscure, or obscuring
PTLY OBSC	–X	Partly obscured
THN	–	Thin
VRBL	V	Variable
CIG	C	Ceiling
INDEF	W	Indefinite

TABLE 4–6. Areal coverage of showers and thunderstorms

Adjective	*Coverage*
Isolated	Single cells (no percentage)
Widely Scattered	Less than 25% of area affected
Scattered	25% to 54% of area
Numerous	55% or more of area affected

Icing

The contraction,

ICG and FRZLVL

identifies the icing section which gives location, type, and extent of expected icing. It always includes the freezing level in hundreds of feet MSL. It may contain qualifying terms such as "ICG LKLY", icing likely; "MDT MXD ICGIC ABV FRZLVL", moderate mixed icing in clouds above the freezing level.

Turbulence

A statement will be included delineating any areas where turbulence of more than light intensity is expected.

Amended Area Forecasts

Amendments to the FA are issued as needed. Only that portion of the FA being revised is transmitted as an amendment. Area forecasts are also amended and updated by inflight advisories.

TWEB ROUTE FORECASTS AND SYNOPSIS

The TWEB Route Forecast is similar to the Area Forecast (FA) except more specific information is contained in a route format. Forecast sky cover (height and amount of cloud bases), cloud tops, visibility (including vertical visibility), weather and obstructions to vision are described for a corridor 25 miles either side of the route. Cloud bases and tops are always ASL unless noted. Ceilings are always above ground.

The Synopsis is a brief statement of frontal and pressure systems affecting the route during the forecast validity period.

The TWEB Route Forecasts are prepared by the WSFOs for more than 300 selected short-leg and cross-country routes over the contiguous U.S., figure 1–8, section 1. WSFOs prepare synopses for the routes in their areas. These forecasts go into

the Transcribed Weather Broadcasts (TWEB) and the Pilot's Automatic Telephone Weather Answering Service (PATWAS) transcriptions described in section 1. Individual route forecasts and synopses are also available by request/reply teletypewriter through any FSS or WSO.

The TWEB Route Forecasts and Synopses are issued by the WSFOs three times per day according to time zone. The early morning and midday forecasts are valid for 12 hours; the evening forecast, for 18 hours:

WSFO Location (time zone)	*Issue time*	*Valid period*
Eastern/Central	1040Z	11Z–23Z
	1740Z	18Z–06Z
	2240Z	23Z–17Z
Mountain/Pacific	1140Z	12Z–00Z
	1840Z	19Z–07Z
	2340Z	00Z–18Z

This schedule provides 24-hour coverage with most frequent updating during the hours of greatest general aviation activity.

Example of a TWEB Synopsis:

BIS SYNS 252317. LO PRESS TROF MVG ACRS ND TDA AND TNGT. HI PRESS MVG SEWD FM CANADA INTO NWRN ND BY TNGT AND OVR MST OF ND BY WED MRNG.

BIS—Bismarck, N.D. WSFO issuing Synopsis and Route Forecasts

SYNS—Synopsis for the area covered by the Route Forecasts

25—25th day of the month

2317—Valid 23Z on the 25th to 17Z on the 26th (18 hours)

(Rest of Message)—LOW PRESSURE TROUGH MOVING ACROSS N. DAKOTA TODAY AND TONIGHT. HIGH PRESSURE MOVING SOUTHEASTWARD FROM CANADA INTO NORTHWESTERN N. DAKOTA BY TONIGHT AND MOST OF N. DAKOTA BY WEDNESDAY MORNING.

Example of a TWEB Route Forecast:

249 TWEB 252317 GFK MOT ISN. GFK VCNTY CIGS AOA 5 THSD TILL 12Z OTRW OVR RTE CIGS 1 TO 3 THSD VSBY 3 TO 5 MI IN LGT SNW WITH CONDS BRFLY LWR IN HVYR SNW SHWRS

249—Route number

TWEB—TWEB Route Forecast

25—25th day of month

2317—Valid 23Z on the 25th to 17Z on the 26th (18 hours)

GFK MOT ISN—Route: Grand Forks to Minot to Williston, N.D.

(Rest of Message)—GRAND FORKS VICINITY CEILINGS AT OR ABOVE 5000 FEET UNTIL 1200Z OTHERWISE OVER ROUTE CEILINGS 1 TO 3 THOUSAND FEET VISIBILITY 3 TO 5 MILES IN LIGHT SNOW WITH CONDITIONS BRIEFLY LOWER IN HEAVIER SNOW SHOWERS.

When visibility is not stated it is implied to be 7 miles or greater.

Because of their varied accessibility and route format, these forecasts perhaps are the most important and useful weather information available to the pilot today for flight operations and planning. You should become familiar with them and use them regularly.

INFLIGHT ADVISORIES (WST, WS, WA)

Inflight advisories are unscheduled forecasts to advise enroute aircraft of development of potentially hazardous weather. They are also excellent for preflight planning and briefing. All heights are MSL unless noted except that ceiling heights are always AGL. The advisories are of three types—CONVECTIVE SIGMET (WST), SIGMET (WS), and AIRMET (WA), see figure 4–1.

All inflight advisories use the same location identifier (either VOR's or well known locations) to describe the hazardous weather area. Occasionally, well known geographic areas may also be used when a weather phenomena is unique to that area.

Convective SIGMET (WST)

Convective SIGMETS are issued by the National Severe Storms Forecast Center (NSSFC) for the following:

a. Tornadoes

b. Lines of thunderstorms

c. Embedded thunderstorms

d. Thunderstorm areas of 40% coverage or more and greater than or equal to VIP level 4.

e. Hail greater than or equal to ¾" in diameter

Any Convective SIGMET (WST) implies severe or greater turbulence, severe icing, and low level

314-952 O - 80 - 3

wind shear. A Convective SIGMET may be issued for any convective situation which the forecaster feels is a hazard to flight.

Convective SIGMET Bulletins

Three bulletins are issued specifying the Eastern, Central and Western U.S. They separate at 87 and 107 Degrees West with sufficient overlap to cover the cases when a SIGMET may cross the boundaries. The bulletins are issued hourly. The text consists of either an observation and a forecast or just a forecast. The forecast is valid for up to two hours. The bulletins are composed of one or more individually numbered Convective SIGMETS and are automatically removed from the system at H+40.

Examples. The following are examples of Convective SIGMET bulletins for the Central U.S. For the Western U.S. they would be numbered 17W, 18W, etc. while the Eastern portion would be numbered 17E, 18E, etc.

ZCZC
MKCC WST 221655
CONVECTIVE SIGMET 17C
KS OK TX
(WRN KS OK AND TX PNHDL) OR (VCNTY GLD-CDS LN)
NO SIG TSTMS RPRTD
FCST TO 1855Z
LN TSTMS DVLPG BY 1755Z WL MOV EWD 30-35 KTS.
HAIL TO 1½ IN PSBL
ADP
NNNN
ZCZC
MKCC WST 221855
CONVECTIVE SIGMET 19C
KS OK
FROM 30E GCK TO 20E GAG
LN TSTMS 25 MI WIDE MOVG FROM 2315. MAX TOPS TO 450
HAIL TO 1 IN . . . WIND GUSTS TO 55
FCST TO 2055Z
DSIPTG LN WL CONT MOVG NEWD 25-30 KTS THRU 2055Z
CONVECTIVE SIGMET 20C
ND SD
FROM 90W MOT TO GFK TO ABR TO RAP
AREA TSTMS MOVG FROM 2530. MAX TOPS TO 450
TORNADO RPRTD 1820Z 20NE RAP . . . HAIL TO 1 IN . . . WIND GUSTS TO 55
FCST TO 2055Z
INTSFYG AREA WL MOV NWD 15 KTS THRU 2055Z
HAIL TO ¾ IN PSBL
ADP
NNNN

SIGMET (WS)

A SIGMET advises of weather potentially hazardous to all aircraft and not covered in a Convective SIGMET. In the conterminous U.S. items covered are:

1. Severe icing
2. Severe or extreme turbulence
3. Widespread sand or dust storms lowering visibilities to less than 3 miles

In Alaska and Hawaii there are no Convective SIGMETS. In these states we add:

4. Tornadoes
5. Lines of thunderstorms
6. Embedded thunderstorms
7. Hail of ¾ in or greater in diameter

AIRMET (WA)

An AIRMET is for weather that may be hazardous to single engine and other light aircraft. AIRMETs should be read by all pilots. The items covered are:

1. Moderate icing
2. Moderate turbulence
3. Sustained winds of 30 knots or greater at the surface
4. Widespread areas of visibility below 3 miles and/or ceilings less than 1,000 feet
5. Extensive mountain obscurement

Text. The text of the advisory contains a message identifier and the body of the message.

Message Identifier. A WSFO identifies each SIGMET and AIRMET by a phonetic identifier, ALPHA through November for SIGMETs and Oscar through Zebra for AIRMETs. The phonetic identifier indicates a certain phenomenon. Alpha 1 is the first issuance for a SIGMET phenomena, Alpha 2 the second for the same phenomenon, etc. The first issuance of a SIGMET will be labeled UWS (Urgent Weather SIGMET). UWS will also be used in subsequent issuances that the forecaster determines is of urgent nature. For an AIRMET the first issuance will be OSCAR 1, etc.

Message Body. The body of the message contains a description of the hazard. If the hazard is expected to continue beyond the valid period shown in the heading of a WS or WA, the fact is stated. An example is "CONDS CONTG BYD 02Z".

Following are examples of nonconvective SIGMETS and AIRMETS:

MSY UWS 051710
SIGMET ALFA 1 051710-052110
AR LA MS
FM MEM TO 30N MEI TO BTR TO MLU
OCNL SVR ICG ABV FRZLVL EXPCD. FRZLVL 080 E TO 120 W.
CONDS CONTG BYD 2100.
AB

SFO WS 100130
SIGMET BRAVO 2 100130-030530
AR LA MS
FM SEA TO 4BW TO EUG
OCNL MOGR CAT EXPCD BTN 280 AND 350 DUE TO JTSTR.
CONDS CONTG BYD 0530Z AND SPRDG OVR ERN WA BY 0400Z.
CD

CHI WA 300300
AIRMET OSCAR 1 300300-030900
IA MO
FM FOD TO CID TO CBI TO MKC
CIG BLO 010 AND VSBY BLO 3 EXPCD DUE TO S. CONDS CONTG BYD 0900 AND SPRDG OVR ERN IA ERN MO AND IL.
OP

WINDS AND TEMPERATURES ALOFT FORECAST (FD)

Winds and temperatures aloft are forecast for specific locations in the contiguous U.S. as shown in figure 1-3, section 1. FD forecasts are also prepared for a network of locations in Alaska.

Below is a sample FD message containing a heading and six FD locations. The heading always includes time during which the FD may be used (1800-0300Z in the example) and a notation "TEMPS NEG ABV 24000". Since temperatures above 24,000 are always negative, the minus sign is omitted.

FD WBC 151745
BASED ON 151200Z DATA
VALID 1600Z FOR USE 1800-0300Z. TEMPS NEG ABV 24000

FT	3000	6000	9000	12000	18000	24000	30000	34000	39000
ALS			2420	2635-08	2535-18	2444-30	245945	246755	246862
AMA		2714	2725+00	2625-04	2531-15	2542-27	265842	256352	256762
DEN			2321-04	2532-08	2434-19	2441-31	235347	236056	236262
HLC		1707-01	2113-03	2219-07	2330-17	2435-30	244145	244854	245561
MKC	0507	2006+03	2215-01	2322-06	2338-17	2348-29	236143	237252	238160
STL	2113	2325+07	2332+02	2339-04	2356-16	2373-27	239440	730649	731960

Forecast Levels

The line labelled "FT" shows 9 of 11 standard FD levels. The 45,000 and 53,000-foot levels are not transmitted on teletypewriter circuits, but are available in the communications system. The pilot may request these levels from the FSS or WSO briefer. Through 12,000 feet the levels are true altitude; 18,000 feet and above are pressure altitude. The FD locations are transmitted in alphabetical order.

Note that some lower level groups are omitted. No winds are forecast within 1,500 feet of station

elevation. No temperatures are forecast for the 3,000-foot level or for a level within 2,500 feet of station elevation.

Decoding

A 4-digit group shows wind direction (reference true North) and windspeed. Look at the St. Louis (STL) forecast for 3,000 feet. The group 2113 means wind from 210° at 13 knots. The first two digits give direction in tens of degrees; the second two, speed in knots.

A 6-digit group includes forecast temperature. In the STL forecast, the coded group for 9,000 feet is 2332+02; wind is 230° at 32 knots temperature +2° C.

Encoded windspeed 100 to 199 knots have 50 added to the direction code and 100 subtracted from the speed. The STL forecast for 39,000 feet is "731960". Wind is 230° at 119 knots, temperature −60.

How do you recognize when coded direction has been increased by 50? Coded direction (in tens of degrees) ranges from 01 (010°) to 36 (360°). Thus, a coded direction of more than "36" indicates winds 100 knots or more; the coded direction will range from 51 through 86.

If windspeed is forecast at 200 knots or greater, the wind group is coded as 199 knots; i.e., "7799" is decoded 270° at 199 knots or greater. When forecast speed is less than 5 knots, the coded group is "9900" and read, "LIGHT AND VARIABLE."

Examples of decoding FD winds and temperatures:

Coded	*Decoded*
9900+00	Wind light and variable, temperature 0° C
2707	270° at 7 knots
850552	350° (85−50=35) at 105 knots (05+100=105), temperature −52° C.

SPECIAL FLIGHT FORECAST

When planning a *special category* flight and scheduled forecasts are insufficient to meet your needs, you may request a special flight forecast through any FSS or WSO. The contact forwards the request to a WSFO and receives the printed forecast via teletypewriter. Special category flights are hospital or rescue flights; experimental, photographic, or test flight; record attempts; and mass flights such as air tours, air races, and fly-aways from special events.

Make your request far enough in advance to allow ample time for preparing and transmitting the forecast. Advance notice of 6 hours is desirable. In making a request, give the:

1. Aircraft mission
2. Number and type of aircraft
3. Point of departure
4. Route of flight (including intermediate stops, destination, alternates)
5. Estimated time of departure
6. Time enroute
7. Flight restrictions (such as VFR, below certain altitudes, etc.)
8. Time forecast is needed

The forecast is written in plain language contractions as in the examples:

SPL FLT FCST ABQ-PHOTO MISSION-ABQ 121500Z. THIN CI CLDS AVGG LESS THAN TWO TENTHS CVR. VSBY MORE THAN 30. WNDS AND TEMPS ALF 10-2320+03. ABQ WSFO 121300Z.

SPL FLT OTLK MKC-RST 062100Z-062400Z. CIG 2 THSD OVC OR BTR. WNDS ALF 3-2320. MKC WSFO 052300Z.

HURRICANE ADVISORY (WH)

When a hurricane threatens, an abbreviated hurricane advisory (WH) is issued to alert aviation interests. The advisory gives location of the storm center, its expected movement and maximum winds in and near the storm center. It does not contain details of associated weather; specific ceilings, visibilities, weather, and hazards are in area and terminal forecasts and inflight advisories.

An example of an abbreviated aviation hurricane advisory:

WH MIA 181010
HURCN IONE AT 1105Z CNTRD 29.4N 75.2W OR 400 NMI E OF JACKSONVILLE FLA EXPCTD TO MOV N ABT 12 KT. MAX WNDS 110 KT OVR SML AREA NEAR CNTR AND HURCN WNDS WITHIN 55-75 MIS.

CONVECTIVE OUTLOOK (AC)

A convective outlook (AC) describes prospects of both severe and general thunderstorms during the following 24 hours. Use the outlook primarily for planning flights later in the day. Outlooks are transmitted by the National Severe Storms Forecast Center (NSSFC) about 0900Z and 1500Z.

A notation, "ABV SELS LIMITS", means activity probably will meet the criteria for a severe weather watch. Expected conditions requiring a severe weather watch are:

1. Severe thunderstorms—one or both of the following:

   (a) Damaging surface wind with gusts of 50 knots or more

   (b) Hail ¾ inch or more in diameter

2. Tornado activity

Following is a convective outlook:

AC MKC 020840

MKC AC 020840
VALID 021200-031200Z

SQLN CRNTLY IN ECNTRL TX PNHDL EXTNDS NWD INTO NRN TX PNHDL AND SW KS AS LN OF OVRRNG TSTMS. THIS LN MOVG EWD 30 KT WILL GRDLY INTSFY DURG THE FRNN WITH SVR TSTM ACTVTY WELL ABV SELS LIMITS EXPCD BGN BY LATE FRNN CNTRL OK TO N CNTRL TX MOVG EWD DURG AFTN THRU ERN OK SE KS AND NE TX INTO MOST OF AR SW AND SRN MO DURG AFTN AND EVE BFR DMNSHG. INTSFY LATE EVE NE AR SE MO W KY AND W TN.

TSTMS DURG PRD EXPCD TO RT OF LN DRT INK HOB GCK STJ BRL DAY HTS LOZ BNA LFK SAT DRT. FEW TSHWRS CRNTLY IN NEW ENG WILL DMNSH DURG FRNN HWVR ISOLD TSHWRS ALSO EXPCD DURG THE PRD TO RT OF LN DOV IPT MSS.

FORECASTER (NAME)

SEVERE WEATHER WATCH BULLETIN (WW)

A severe weather watch bulletin (WW) defines areas of possible severe thunderstorms or tornado activity. The bulletins are issued by the National Severe Storms Forecast Center at Kansas City, Mo. WWs are unscheduled and are issued as required. On the next page is a severe weather watch bulletin.

A severe thunderstorm watch describes expected areal coverage of thunderstorms using the density adjectives listed in table 4-6. A tornado watch simply states that the threat of tornadoes exists in the designated watch area. Forecasters do not attempt to indicate areal coverage of these extremely localized storms.

Status reports are issued as needed to show progress of storms and to delineate areas no longer under the threat of severe storm activity. Cancellation bulletins are issued when it becomes evident that no severe weather will develop or that storms have subsided and are no longer severe. The bulletins are self-explanatory.

When tornadoes or severe thunderstorms have developed, local WSOs and WSFOs issue local warnings.

MKC WW 171843
BULLETIN—IMMEDIATE BROADCAST REQUESTED
TORNADO WATCH NUMBER 104
NATIONAL WEATHER SERVICE KANSAS CITY MO
143 PM CDT THU APR 17 1975

A . . . THE NATIONAL SEVERE STORMS FORECAST CENTER SAYS THERE IS A POSSIBILITY OF TORNADOES AND SEVERE THUNDERSTORMS WITH LARGE HAIL AND DAMAGING WINDS FOR

THE SOUTHEASTERN HALF OF MISSOURI

NORTHWESTERN ARKANSAS

EXTREME NORTHEASTERN OKLAHOMA

AND A SMALL PART OF SOUTHWESTERN ILLINOIS

FROM 2 PM CDT UNTIL 8 PM CDT THIS THURSDAY AFTERNOON AND EVENING.

THE WATCH AREA IS ALONG AND 70 STATUTE MILES EITHER SIDE OF A LINE FROM 10 MILES NORTH OF ST. LOUIS MISSOURI TO 20 MILES WEST OF FORT SMITH ARKANSAS.

REMEMBER . . . A T O R N A D O WATCH MEANS THAT TORNADOES AND SEVERE THUNDERSTORMS ARE POSSIBLE IN AND CLOSE TO THE WATCH AREA. PERSONS IN THESE AREAS SHOULD BE ON THE LOOKOUT FOR THREATENING WEATHER CONDITIONS AND LISTEN FOR LATER STATEMENTS AND POSSIBLE WARNINGS.

B . . . THIS TORNADO WATCH REPLACES TORNADO WATCH NUMBER 101 ISSUED AT 945 AM CDT . . . WATCH NUMBER 101 WILL NOT BE IN EFFECT AFTER 2 PM CDT.

C . . . TORNADOES AND NMRS SVR TSTMS WITH HAIL SFC AND ALF TO 2 IN . . . EXTRM TURBC AND SFC WIND GUSTS TO 70 KT . . . NMRS CBS MAX TOPS TO 600. MEAN WIND VECTOR 23050.

D . . . INSTBY LN NOW FM NERN MO TO NERN OK MOVG SE 35 KT. STG MSTR CNVGNC AND PRESS FALLS AHD OF LN.

E . . . UPDATE AC TO INCL TSTMS IN SRN FL THIS AFTN.

GALWAY

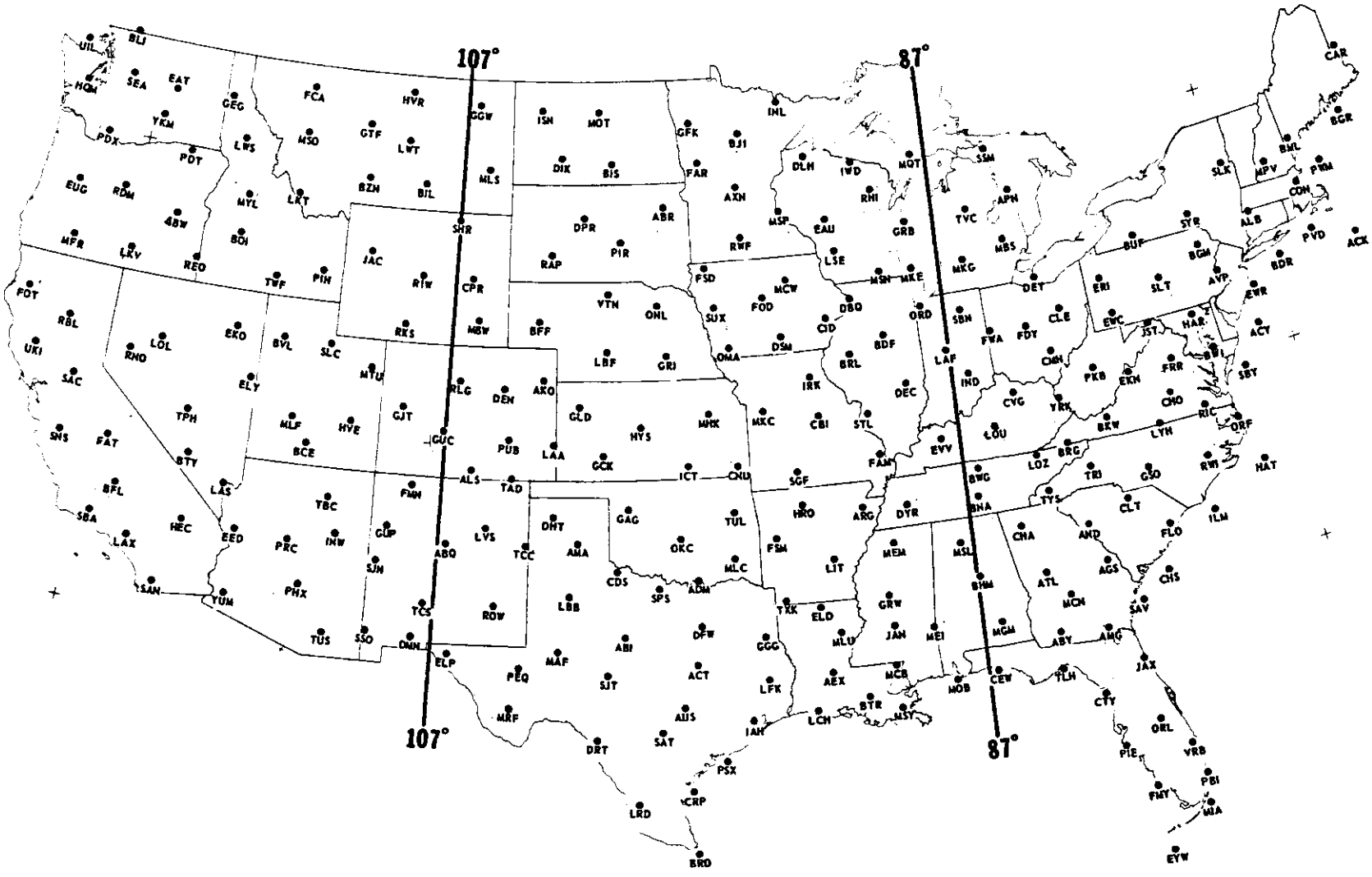


FIGURE 4–1. Inflight Weather Advisory Location Identifiers.

FIGURE 4–2. Geographical areas and terrain features. Forecasts often best locate weather by reference to terrain.

Section 5

SURFACE ANALYSIS

A surface analysis is commonly referred to as a surface weather map. In the contiguous 48 States a map covering these States and adjacent areas is transmitted every three hours. Other areas with facsimile receive surface weather maps appropriate to their areas at regularly scheduled intervals. Figure 5–1 is a section of a surface weather map and figure 5–2 illustrates symbols depicting fronts and pressure centers. The following explains contents of the chart.

VALID TIME

Valid time of the map corresponds to the time of the plotted observations. A date-time group in Greenwich Mean Time tells the user when conditions portrayed on the map were occurring.

ISOBARS

Isobars are solid lines depicting the pressure pattern. They are usually spaced at 4 millibar intervals. When pressure gradient is weak, dashed isobars are sometimes inserted at 2 millibar intervals to more clearly define the pressure pattern. Each isobar is labelled by a two-digit number. For example, 32 signifies 1032.0 mb; 00 is 1000.0 mb; and 92 is 992.0 mb.

PRESSURE SYSTEMS

The letter "L" denotes a low pressure center and an "H" marks a high pressure center. The pressure at each center is indicated by a two-digit underlined number which is interpreted the same as isobar labels.

FRONTS

The analysis shows frontal positions by the symbols in figure 5–2. The "pips" on the frontal symbols indicate the type of front and point the direction of movement. Pips on either side of the symbol of a stationary front suggest little or no movement. Briefing offices sometimes color the symbols to facilitate use of the map.

A three-digit number entered along a frontal symbol classifies the front as to type, table 5–1; intensity, table 5–2; and character, table 5–3. For example, the front running through Arkansas northeast toward Tennessee is labeled "256" meaning a warm front at the surface ("2" in table 5–1), Moderate, little or no change ("5" in table 5–2), and Quasi-stationary ("6" in table 5–3). Two short lines across a front indicate change in classification. Note in figure 5–1 the two lines crossing the front in Northern Mexico indicating a change from "150" to "220".

TABLE 5–1. Type of front

Code Figure	*Description*
0	Quasi-stationary at surface
1	Quasi-stationary above surface
2	Warm front at surface
3	Warm front above surface
4	Cold front at surface
5	Cold front above surface
6	Occlusion
7	Instability line
8	Intertropical front
9	Convergence line

TABLE 5–2. Intensity of front

Code Figure	*Description*
0	No specification
1	Weak, decreasing
2	Weak, little or no change
3	Weak, increasing
4	Moderate, decreasing
5	Moderate, little or no change
6	Moderate, increasing
7	Strong, decreasing
8	Strong, little or no change
9	Strong, increasing

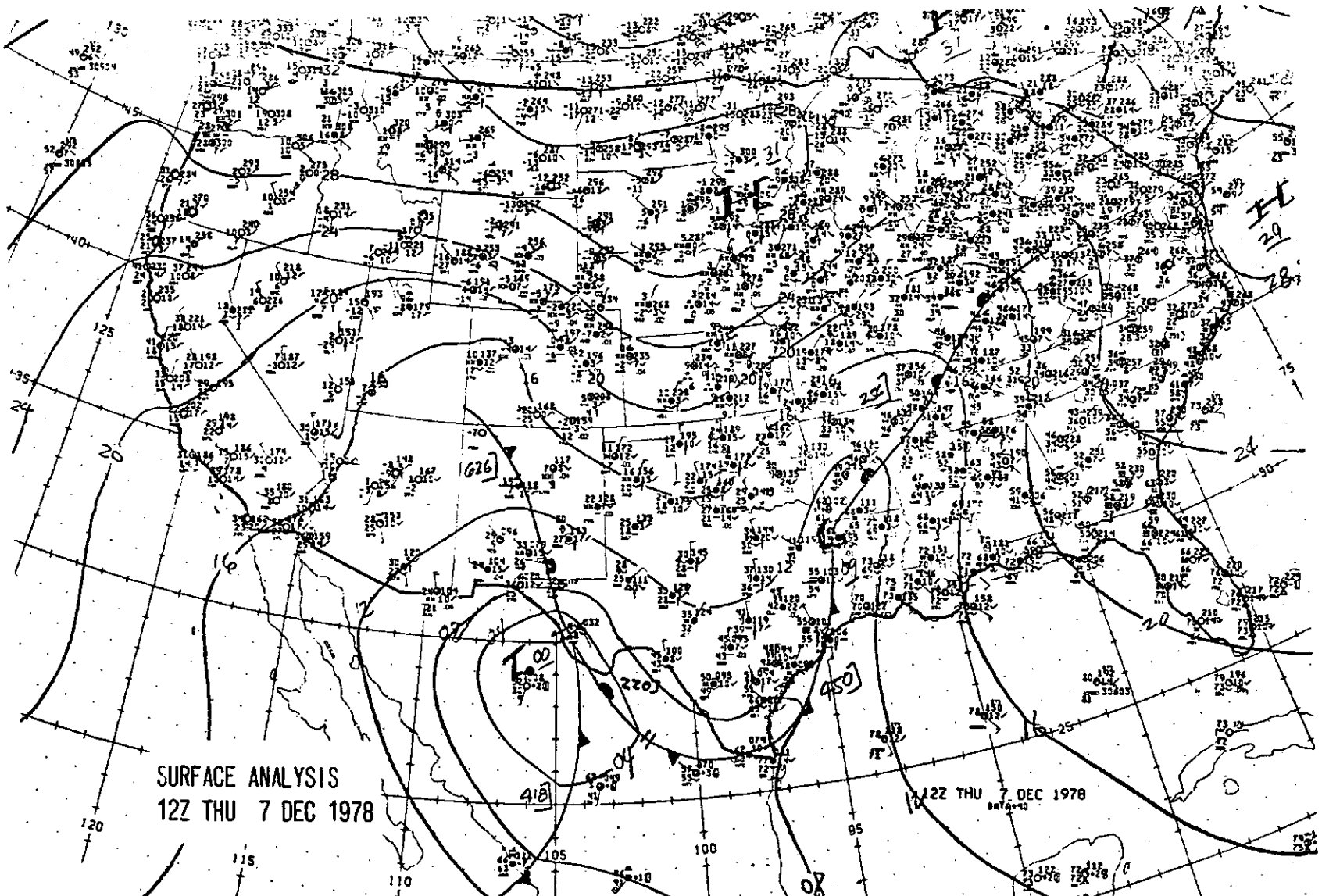


FIGURE 5-1. Surface Weather Analysis.

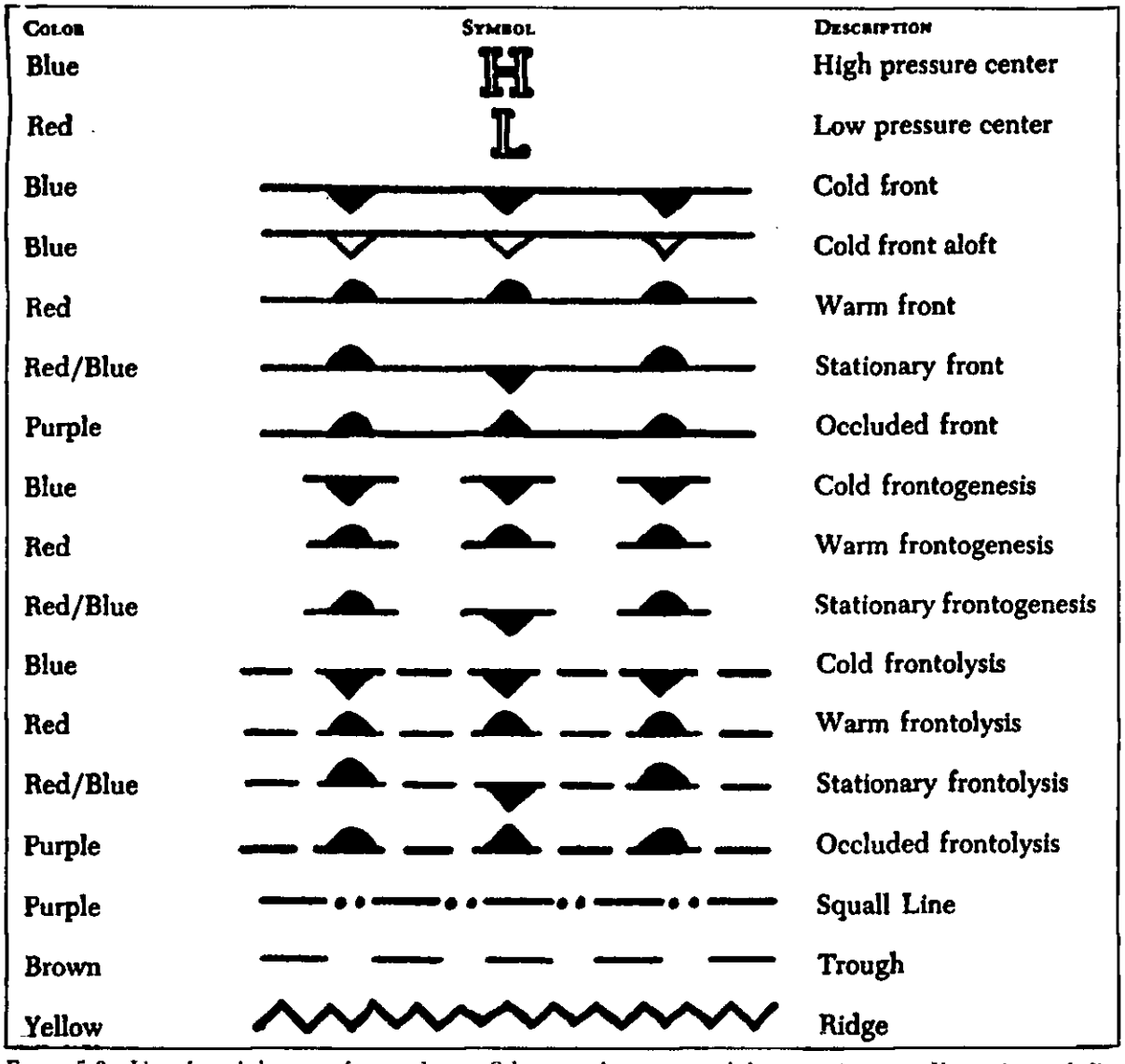


FIGURE 5–2. List of symbols on surface analyses. Colors are those suggested for on-station use. NOTE: A trough line usually is further identified by the coded group "830XX". Do not attempt to decode this group using the tables showing frontal classification. A trough line is not a front.

TABLE 5–3. Character of front

Figure Code	*Description*
0	No specification
1	Frontal area activity decreasing
2	Frontal area activity, little change
3	Frontal area activity increasing
4	Intertropical
5	Forming or existence expected
6	Quasi-stationary
7	With waves
8	Diffuse
9	Position doubtful

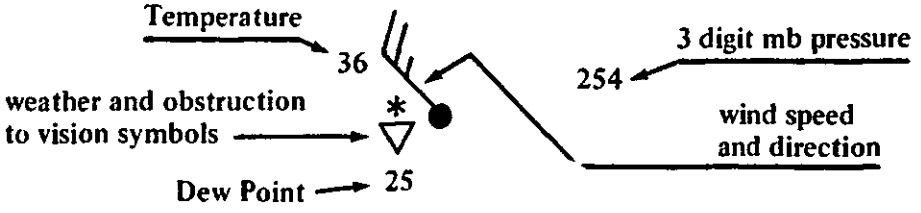
OTHER INFORMATION

Figure 5–3 shows an abbreviated station model which explains how to read temperature, dew point, and wind from the surface map. A complete station model plot contains detailed weather information more conveniently available from other facsimile charts and from teletypewriter data.

USING THE CHART

The surface analysis provides you a ready means of locating pressure systems and fronts and also gives you an overview of winds, temperatures, and

dew points *as of map time*. When using the map, keep in mind that weather moves and conditions change. For example, a front located over northern Kansas may be nearing Oklahoma by the time you see the map. Using the surface map in conjunction with other charts such as weather depiction, radar summary, upper air, and prognostics (forecast charts) gives a more complete weather picture.



Decoded: snow shower

Decoded: Wind from the northwest direction. Wind speed 25 knots. Each full bar on the chart represents 10 knots and each half bar 5 knots.

(254) Decoded: 1025.4 millibars
Three digit millibar pressure always shown to upper right of station. Last digit indicates tenths. 1000 mb or higher pressure reported as 254 and decoded as 1025.4 mb. Lower than 1000 mb reported as 998 and decoded as 999.8 mb

Wind speeds are in knots and are indicated as:

Circle around the station means calm. A half-flag has a value of 5 kts, full flag 10 kts and pennant, 50 kts. These are used in an appropriate combination to represent wind speed; e.g., two pennants indicate wind speed of 100 knots. Wind direction in the above illustration is west, except for calm where direction is indeterminate.

FIGURE 5-3. Abbreviated station model and explanation.

V

VLNT	violent
VR	veer

W

WDSPRD	widespread
WFP	warm frontal passage
WK	weak
WRMFNT	warm front
WSHFT	wind shift
WV	wave

ACRONYMS

AC —Convective Outlook Bulletin; identifies a forecast of probable convective storms.

AIRMET —Airman's Meteorological Information; an inflight advisory forecast of conditions possible hazardous to light aircraft or inexperienced pilots.

ARTCC —Air Route Traffic Control Center, FAA.

CWSU —Center Weather Service Unit, NWS and FAA.

EFAS —Enroute Flight Advisory Service (Flight Watch), FAA.

FA —Area Forecast; identifies a forecast of general aviation weather over a relatively large area.

FD —Winds and Temperatures Aloft Forecast; a forecast identifier.

FSS —Flight Service Station, FAA.

FT —Terminal Forecast; identifies a forecast in the U.S. forecast code.

GOES —Geostationary Operational Environmental Satellite.

HIWAS —Hazardous In-flight Weather Advisory Service, FAA

ICAO —International Civil Aviation Organization.

IFSS —International Flight Service Station, FAA.

LAWRS —Limited Aviation Weather Reporting Station; usually a control tower; reports fewer weather elements than a complete SA.

NAWAU —National Aviation Weather Advisory Unit, NWS.

NESDIS —National Environmental Satellite Data and Information Service.

NHC —National Hurricane Center, NWS.

NMC —National Meteorological Center, NWS.

NOAA —National Oceanic and Atmospheric Administration, Department of Commerce.

NOTAM —Notice to Airmen.

NSSFC —National Severe Storms Forecast Center, NWS.

NWS —National Weather Service, National Oceanic and Atmospheric Administration, Department of Commerce.

PATWAS —Pilot's Automatic Telephone Weather Answering Service; a self-briefing service.

PIREP —Pilot Weather Report.

RAREP —Radar Weather Report.

SA —Surface Aviation Weather Report; a message identifier.

SAWRS —Supplemental Aviation Weather Reporting Station; usually an airline office at a terminal not having NWS or FAA facilities.

SFSS —Satellite Field Service Station.

SIGMET —Significant Meteorological Information; an inflight advisory forecast of weather hazardous to all aircraft.

TAF —Terminal Aviation Forecast; identifies a terminal forecast in the ICAO code.

TWEB —Transcribed Weather Broadcast; a self-briefing radio broadcast service.

UA —Pilot Report (PIREP); a message identifier.

WA —AIRMET valid for a specified period, a message identifier.

WS —SIGMET valid for a specified period, a message identifier.

WSFO —Weather Service Forecast Office, NWS.

WSO —Weather Service Office, NWS.

WST —Convective SIGMET, a message identifier.

WW —Severe Weather Watch; identifies a forecast of probable severe thunderstorms or tornadoes.

TABLE 14-3. Scheduled issuance and valid times of forecast products

FORECAST PRODUCTS	*TIME ZONE*	*AREA*	*ISSUANCE TIME*	*VALID PERIOD*
Terminal Forecast (FT)	Pacific Mountain	—	0940Z	10-10Z
			1540Z	16-16Z
			2240Z	23-23Z
	Central Eastern	—	0940Z	10-10Z
			1440Z	15-15Z
			2140Z	22-22Z
		Anchorage Fairbanks	0440Z	05-05Z
			1140Z	12-12Z
			1640Z	17-17Z
			2140Z	22-22Z
		Juneau	0340Z	04-04Z
			1040Z	11-11Z
			1440Z	15-15Z
			2040Z	21-21Z
		Honolulu	0540Z	06-06Z
			1140Z	12-12Z
			1740Z	18-18Z
			2340Z	00-00Z
ICAO Terminal		All	2340Z	00-00Z
			0540Z	06-06Z
			1140Z	12-12Z
			1740Z	18-18Z
Area Forecast (FA)		Boston Miami	0840Z	09-03Z
			1740Z	18-12Z
			2340Z	00-18Z
		Chicago	1040Z	11-05Z
		Dallas-Fort Worth	1840Z	19-13Z
			0040Z	01-19Z
		San Francisco	1140Z	12-06Z
		Salt Lake City	1940Z	20-14Z
			0140Z	02-20Z
		Anchorage Fairbanks	0640Z	07-01Z
			1540Z	16-10Z
			2340Z	00-18Z
		Juneau	0640Z	07-01Z
			1340Z	14-08Z
			2240Z	23-17Z
		Honolulu	0340Z	04-22Z
			0940Z	10-04Z
			1540Z	16-10Z
			2140Z	22-16Z
Transcribed Weather Broadcast (TWEB)	Pacific Mountain		1140Z	12-00Z
			1840Z	19-07Z
			2340Z	00-18Z
	Central Eastern		1040Z	11-23Z
			1740Z	18-06Z
			2240Z	23-17Z
		Alaska Hawaii	None	
Inflight		All	Not Scheduled	See Section 4

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