Weather Charts and Reports

Relating to weather reports:
Ceiling – Lowest layer of broken or overcast clouds
IFR – Ceilings less than 1,000 feet or visibilities less than three statute miles
MVFR – Ceilings between 1,000 and 3,000 feet AGL or visibilities from three to five statute miles

FAA Weather Reports are discussed in Advisory Circular AC 00-45E.

Weather Briefings

The primary means for obtaining a weather briefing is for the pilot to call Flight Service at 1-800-WX-BRIEF. The first piece of information you give the briefer is your airplane's tail number.

Three types of weather briefing are available.

Standard – This one gives you everything you need for your flight. Generally, prior to a flight you should request a standard briefing.

Abbreviated – This would be requested when you had previously received a standard briefing and simply wanted an update on some specific conditions.

Outlook – This type of briefing is requested six or more hours prior to your departure time.

The first thing given in a standard briefing is **adverse conditions**. If a line of thunderstorms, for example, existed across your flight path, you might choose to cancel the trip altogether and the remainder of the briefing would not be necessary.

Next you are given a **synopsis**. It is an overview of current conditions in the broad geographical area.

Following that, **current conditions** are given at your departure, en route, and destination points.

Forecast conditions are provided next at your departure, en route, and destination points.

Winds aloft are given at three thousand-foot intervals as you request. You may need to interpolate to discern the forecast winds that will affect you.

Finally, the briefer will describe **NOTAMs** that may affect you and will indicate the presence of any TFRs along your route of flight.

AIRMETs

An AIRMET is an advisory of significant weather conditions primarily of interest to smaller aircraft. Issued every six hours, AIRMETs report IFR conditions, moderate turbulence, moderate icing, and surface winds of 30 knots or greater.

SIGMETs

A SIGMET is an advisory of non-convective conditions hazardous to *all* aircraft. SIGMETs report severe turbulence, severe icing, and obscurations due to duststorms or volcanic ash. SIGMETs forecast conditions for a maximum of four hours.

Convective SIGMETs

A Convective SIGMET is basically a SIGMET associated with thunderstorms. The text of the bulletin contains either an observation and a forecast, or only a forecast. Forecasts are valid for a maximum of two hours.

METARs

A METAR is a routine weather report. It is an hourly observation at an airport. It is one of the more common types of textual weather reports that pilots and briefers consult.

TAFs

A TAF (Terminal Aerodrome Forecast) is a 24-hour forecast of conditions expected within five statute miles of an airport. Issued every six hours: 00, 06, 12, and 18 Zulu.

Aviation Area Forecasts

An Aviation Area Forecast (FA) is general weather forecast that covers several states and uses abbreviations similar to those used in TAFs. They are issued three times a day.

Internet Provided Weather Charts

Although pilots used to consult a wide variety of weather depiction and prognostic charts, today most people consult more modern representations of the weather on the Internet.

In general, **radar charts show current conditions of precipitation**. Radar shows rain, hail, and snow, but does not show clouds.

Satellite charts show clouds, but do not show precipitation. Visible satellite depictions only show clouds in daylight. Infrared charts show clouds in day or night, evaluating them based on their temperature.

Many online weather services show composite charts which overlay radar and satellite images for a more complete picture.

Surface Analysis Charts

Generated every three hours, a Surface Analysis Chart shows fronts, winds, and temperature/dewpoints across the contiguous United States. This is the type of overview chart that you usually see in newspapers and on television weather reports.

Significant Weather Prognostic Charts (aka Low Level Prognostic Charts)

The general term "Prognostic Chart" refers to a Surface Analysis Chart shown as a forecast in increments of 12 hours into the future. Significant Weather Progs are valid at the time indicated and are issued four times a day. They (from the surface to FL240) outline areas of IFR, MVFR, and significant turbulence. The FAA written test, at the time of this writing, still assumes that the government meteorologists and Flight Service briefers are using the old style fax charts. They aren't. Thus, the old four-panel black and white Significant Weather Prognostic Chart that you will be tested on is virtually non-existent. There are Internet based four-panel charts, shown in color, but they tend to be used less frequently than other single panel charts.

Weather Depiction Charts

The Weather Depiction Chart shows fronts and cloud coverage at reporting stations across the country, and outlines current areas of IFR and MVFR. It is peppered with small circles that represent reporting stations. The circles are filled in to indicate cloud cover. A very handy chart, generated every three hours.

Radar Summary Charts

These charts are produced hourly and identify areas of precipitation and discrete cells. Although not as current as the realtime charts available on the internet, these do show maximum altitudes for precipitation echoes. This lets you know that clouds extend at least that high.

In-Flight Weather Information

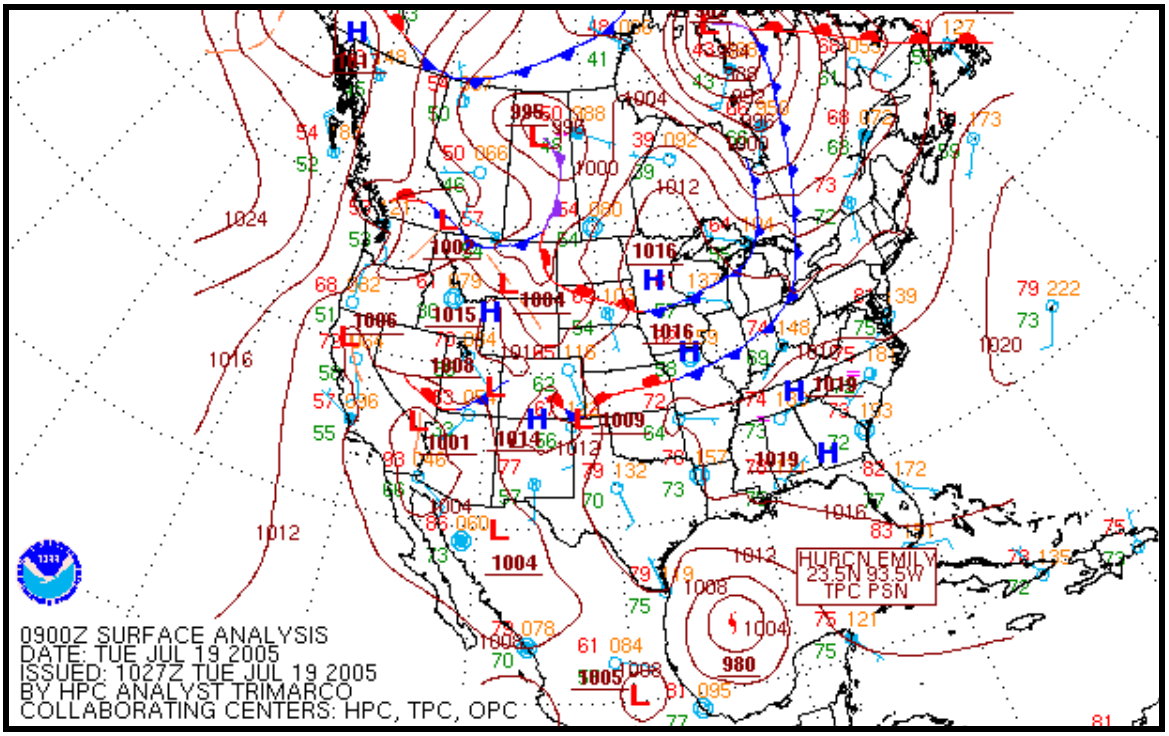
While in flight, you can talk to a weather briefer on 122.0. This facility is called Flight Watch. Tell them your approximate location on your initial call. That will enable the briefer to talk to you via the closest ground transmitter.

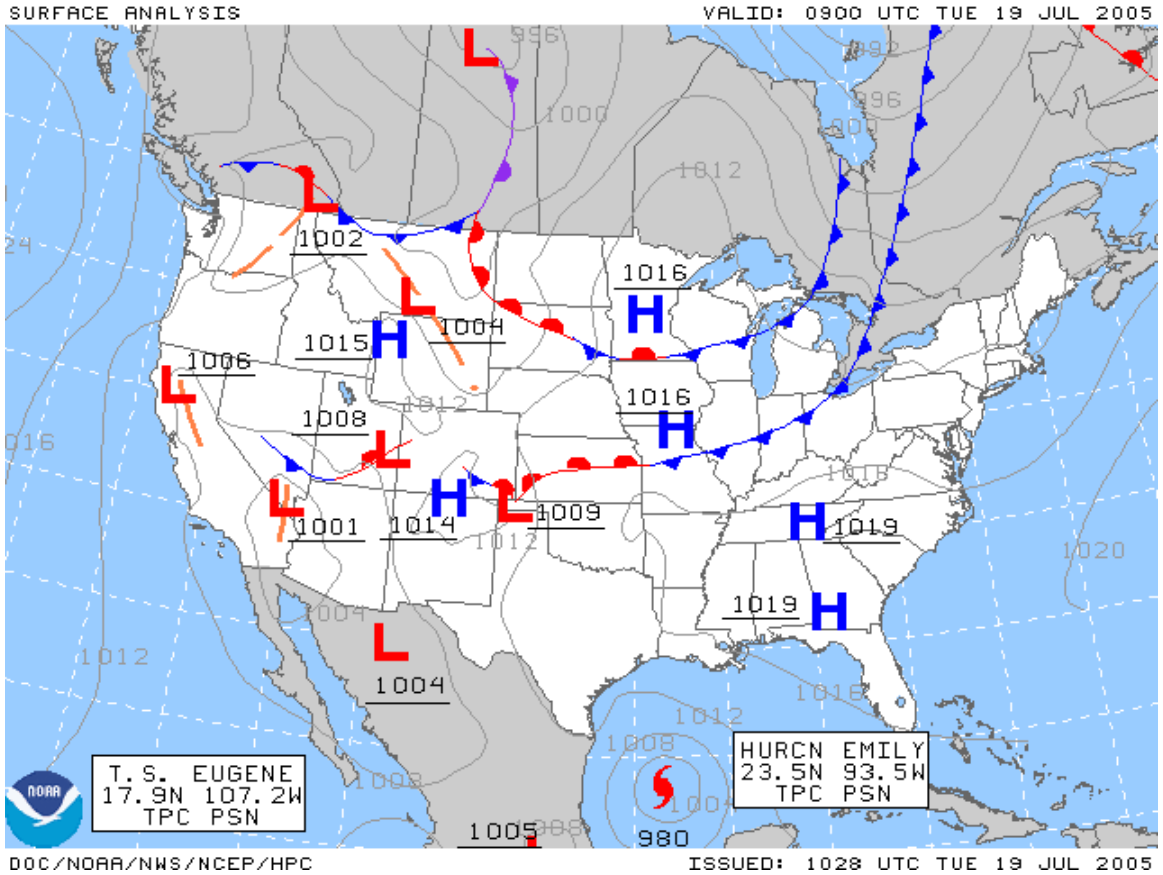
HIWAS is a recorded broadcast of hazardous weather transmitted over the voice channel of some VOR stations. You can locate them on your sectional. The availability of HIWAS will be indicated by a small circle with the letter "H" in it within the VOR information box.

If you are being tracked by Flight Following, ATC controllers may be able to tell you about precipitation that is close to you. For weather further away, you'll have to check with Flight Watch.

Surface Analysis Charts

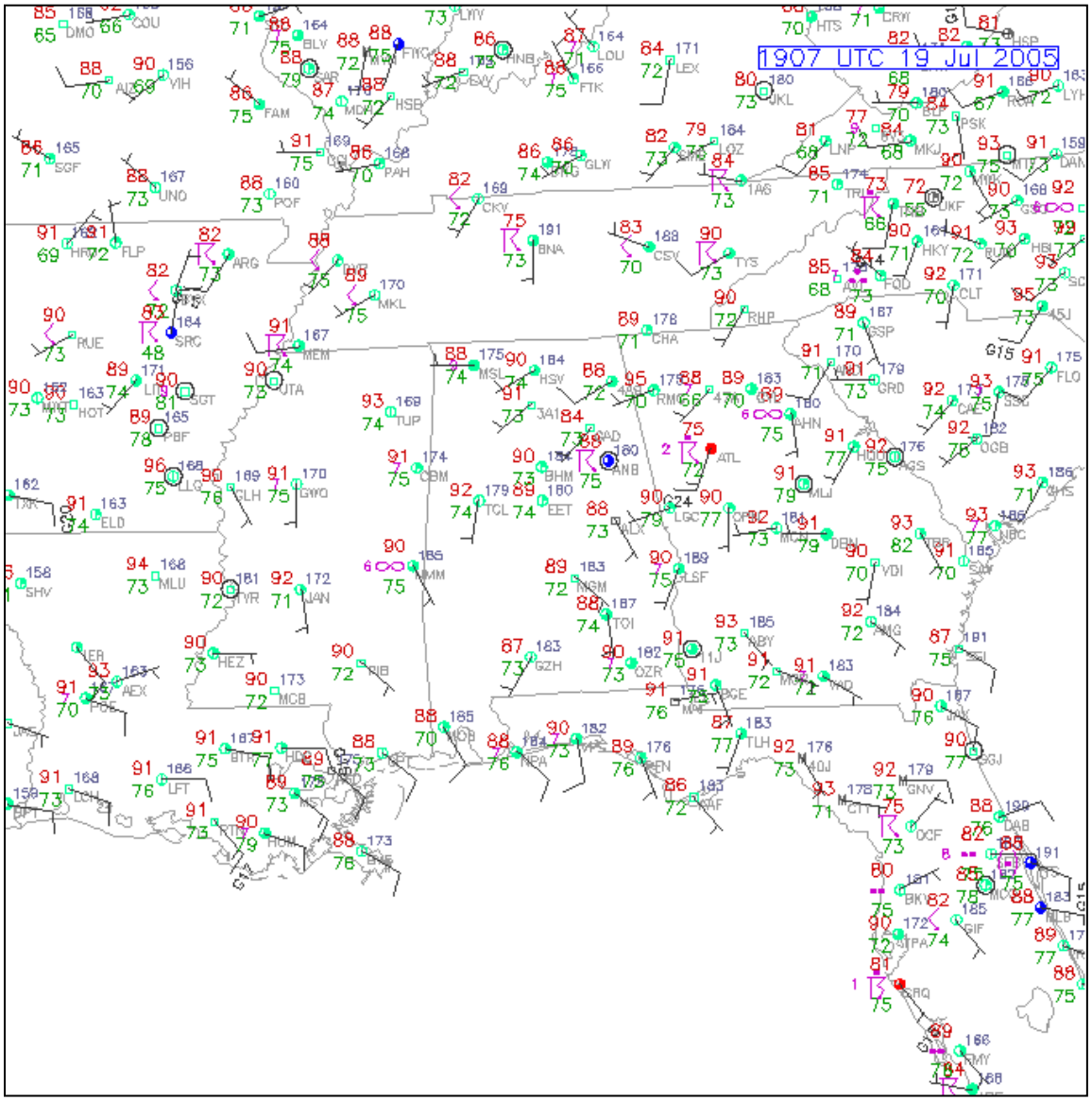
Both charts are different graphical representations of the same thing, although the top chart shows more detail from specific weather reporting stations (including temp/dewpoint and winds).





Another Surface Analysis Chart – Southeastern United States

This is one you probably won't see on an FAA test, but it is commonly used by meteorologists.



METAR - *A METAR is an observation.*

METAR KPDK 151645Z 12010G18KT 10SM SKC 24/15 A3001

METAR KLAX 101212Z 08004KT 6SM BR SCT008 BKN090 17/16 A2996

Interpretation:

(1) METAR: Reporting station is KPDK, observation on the 15th of the month at 1645 Zulu. Winds – from 120 at 10 knots, gusting to 18 knots.
Visibility – ten statute miles.
Sky clear.
Temperature 24 degrees Celsius, dewpoint 15 degrees Celsius.
Altimeter – 30.01 Hg.

(2) METAR: Reporting station is KLAX, observation on the 10th day of the month at 1212 Zulu. Winds – from 080 at 4 knots.
Visibility – six statute miles in mist. ("BR" = mist, "HZ" = haze, "SHRA" = showers, "TSRA" = thunderstorms)
Scattered clouds at 800 feet AGL, broken clouds at 9,000 feet AGL.
Temperature 17 degrees Celsius, dewpoint 16 degrees Celsius.
Altimeter - 29.96 Hg.

TAF - A TAF is a forecast.

TAF KCLT 290530Z 290606 VRB06KT P6SM SCT060 OVC120 TEMPO 2124 SHRA FM0200 09010KT 3SM OVC015

Interpretation:

TAF: Forecast within 5 statute miles of KCLT. Prepared on the 29th day of the month at 0530 Zulu. Valid from 0600 Zulu on the 29th until 0600 on the following day.

Winds variable at 6 knots. Visibility greater than 6 statute miles ("P" means plus or greater than). Scattered clouds at 6,000 feet AGL, overcast at 12,000 AGL.

Temporarily, between 2100Z and 2400Z, rain showers are expected.

Beginning at 0200 Zulu, winds from 090 at 10 knots. Visibility 3 statute miles. Overcast at 1,500 feet AGL.

FIGURE 12.—Aviation Routine Weather Reports (METAR).

These METARs are taken directly from the FAA Computer Test Supplement, current as of the year end 2013.

At KINK, on the 12th day of the month at 18:45 Zulu, winds are reported out of 110 degrees (true, not magnetic) at 12 knots, gusting to 18 knots. Visibility is 15 statute miles, with clear skies. Temperature is 25° C and the dew point is 17° C. The altimeter setting (i.e. the barometric pressure) is 30.00 Hg (inches of mercury).

At KBOI, on the 12th at 18:45Z, winds are out of 130 at 4 knots. Visibility is 30 statute miles, with scattered clouds at 15,000 feet AGL. Temperature is 17° C and the dew point is 6° C. The altimeter setting is 30.15.

At KLAX, on the 12th at 18:52Z, winds are out of 250 at 4 knots. Visibility is 6 statute miles in mist (BR). Scattered clouds at 700 feet and more scattered clouds at 25,000 feet.

At KMDW, on the 12th at 18:56Z, winds are out of 320 at 5 knots. Visibility is 1½ miles in rain (RA). Sky is overcast at 700 feet AGL. Temperature is 17° C and the dew point is 16° C (note the very narrow temperature/dew point spread). Altimeter is 29.80. A remark terminates this Special METAR. It indicates that the rain began 35 minutes past the hour.

At KJFK, on the 12th at 18:53Z, winds are out of 180 at 4 knots. Visibility is ½ mile in fog. The visibility on runway 4 is 2200 feet. The sky is overcast at 500 feet AGL.

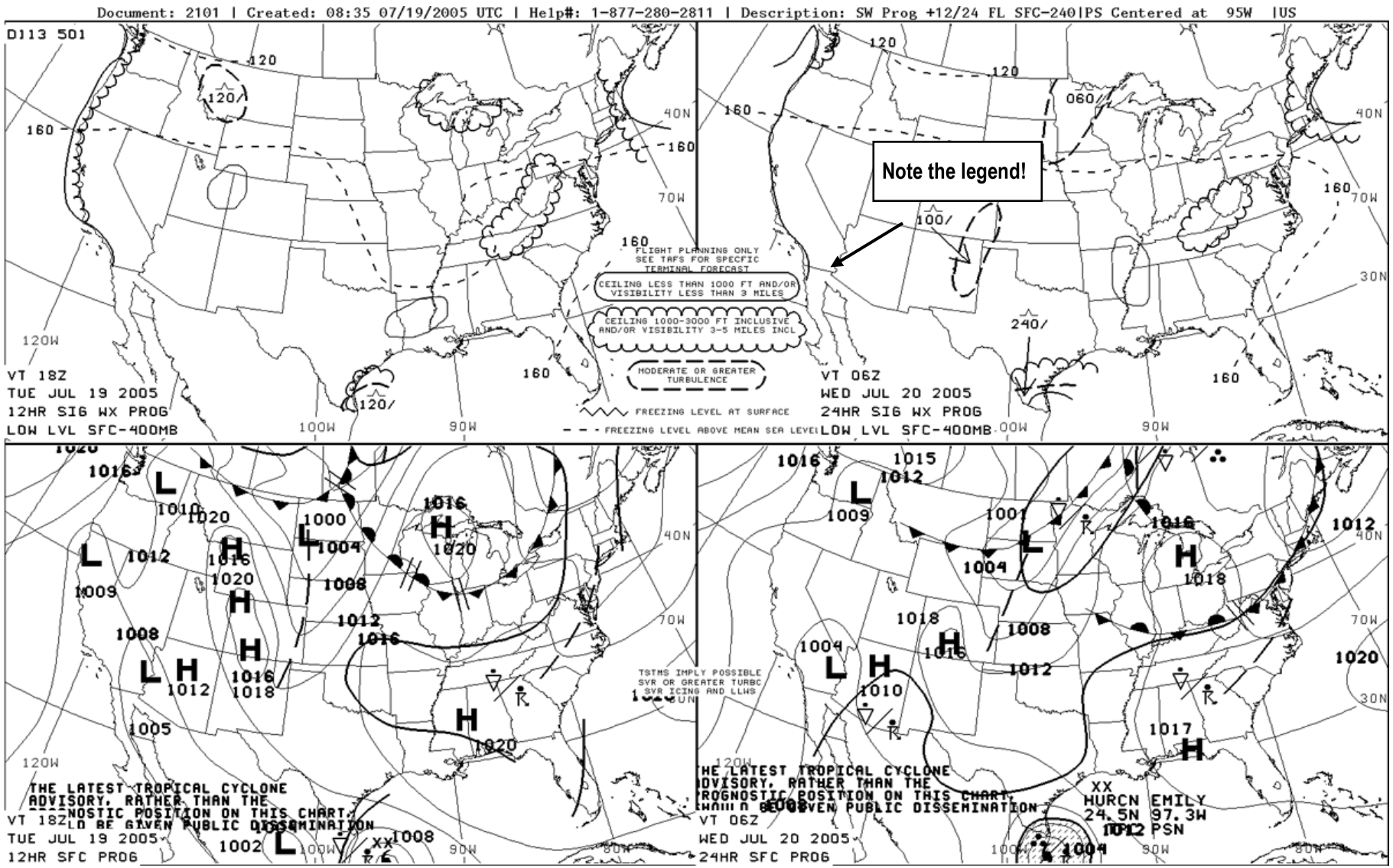
PIREPS – Pilot Weather Reports

A **pilot report** or **PIREP** is a report of actual weather conditions encountered by an aircraft in flight. This information is usually relayed via radio by the pilot to the nearest ground station. The message would then be encoded and relayed to other weather offices and air traffic service units. PIREPs are easy to file and a standard form outlines the manner in which they should be filed.

Encoding Pilot Weather Reports (PIREPS)			
1	XXX	3-letter station identifier	Nearest weather reporting location to the reported phenomenon
2	UA	Routine PIREP, UUA-Urgent PIREP.	
3	/OV	Location	Use 3-letter NAVAID idents only. a. Fix: /OV ABC, /OV ABC 090025. b. Fix: /OV ABC 045020-DEF, /OV ABC-DEF-GHI
4	/TM	Time	4 digits in UTC: /TM 0915.
5	/FL	Altitude/Flight level	3 digits for hundreds of feet. If not known, use UNKN: /FL095, /FL310, /FLUNKN.
6	/TP	Type Aircraft	4 digits maximum. If not known, use UNKN: /TP L329, /TP B727, /TP UNKN.
7	/SK	Sky cover/Cloud layers	Describe as follows: a. Height of cloud base in hundreds of feet. If unknown, use UNKN. b. Cloud cover symbol. c. Height of cloud tops in hundreds of feet.
8	/WX	Weather	Flight visibility reported first: Use standard weather symbols; intensity is not reported: /WX FV02 R H, /WX FV01 TRW.
9	/TA	Air temperature in Celsius (C)	If below zero, prefix with a hyphen: /TA 15, /TA -06.
10	/WV	Wind	Direction in degrees magnetic north and speed in six digits: /WV 270045, WV 280110.
11	/TB	Turbulence	Use standard contractions for intensity and type (use CAT or CHOP when appropriate). Include altitude only if different from /FL, /TB EXTREME, /TB LGT-MDT BLO 090.
12	/IC	Icing	Describe using standard intensity and type contractions. Include altitude only if different than /FL: /IC LGT-MDT RIME, /IC SVR CLR 028-045.
13	/RM	Remarks	Use free from to clarify the report and type hazardous elements first: /RM LLWS -15KT SFC-030 DURC RNWY 22 JFK.

Example:
UA/OV GGG 090025/TM 1450/FL 060/TP C182/SK
080 OVC/WX FV 04R/TA 05/WV 270030/TB LGT/RM
HVY RAIN

Explanation:
Type: .....Routine pilot report
Location: ..... 25 NM out on the 090° radial,
Gregg County VOR
Time: ..... 1450 Zulu
Altitude or Flight Level: 6,000 feet
Aircraft Type: .....Cessna 182
Sky Cover: .....8,000 overcast
Visibility/Weather: .....4 miles in rain
Temperature: .....5 °Celsius
Wind: .....270° at 30 knots
Turbulence: .....Light
Icing: ..... None reported
Remarks: ..... Rain is heavy



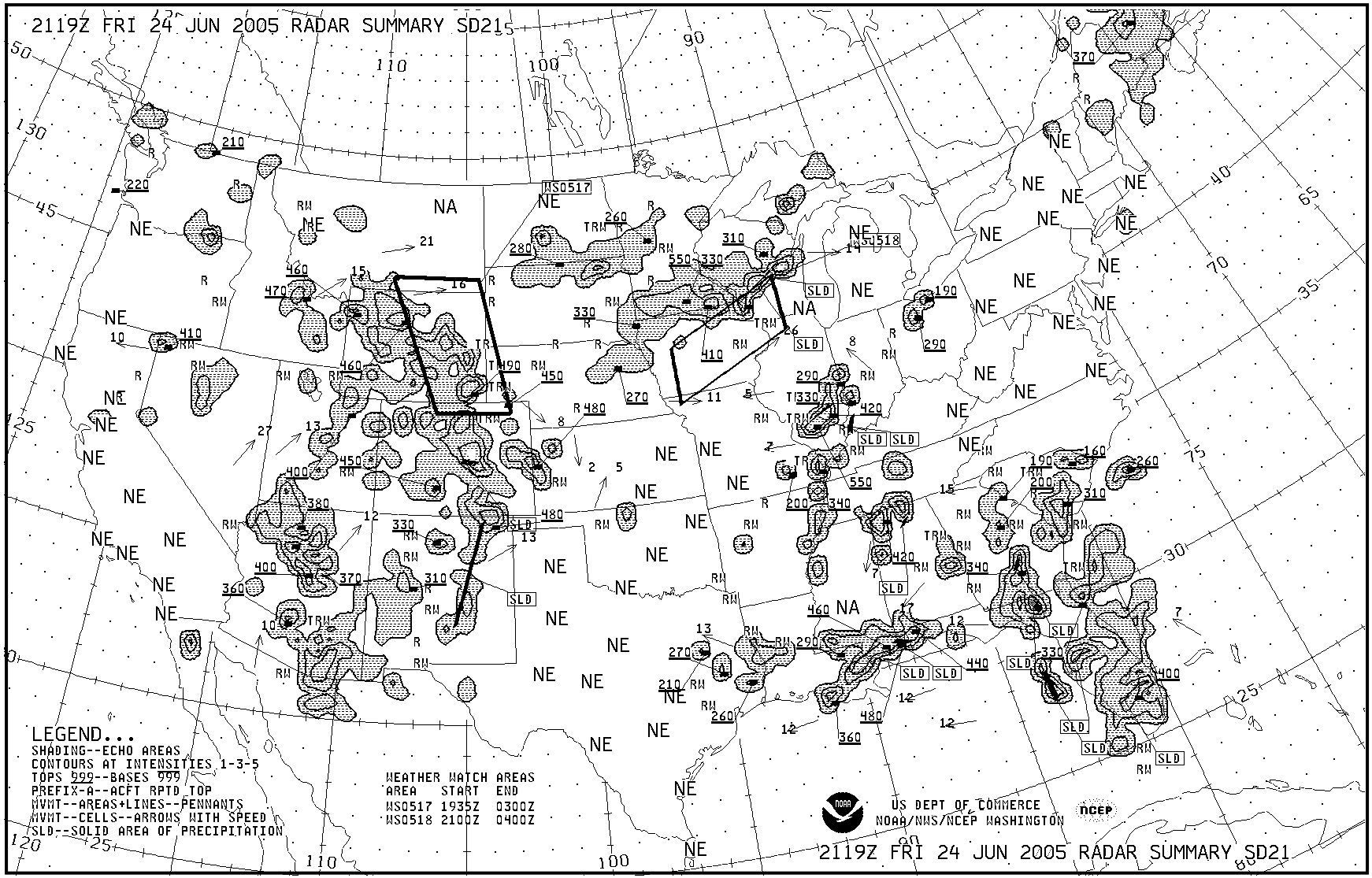
The Significant Weather Prognostic Chart is broken up into four panels. Modern Internet-distributed charts are in color, but the ones on the FAA test are black and white like this one.

The top two panels show forecasts from the surface to 24,000 feet. The bottom two panels show forecasts at the surface. The two left panels give a 12-hour forecast. The two right panels give a 24-hour forecast.

Areas surrounded by solid outlines indicate areas of IFR conditions. Scalloped outlines surround areas of MVFR conditions.

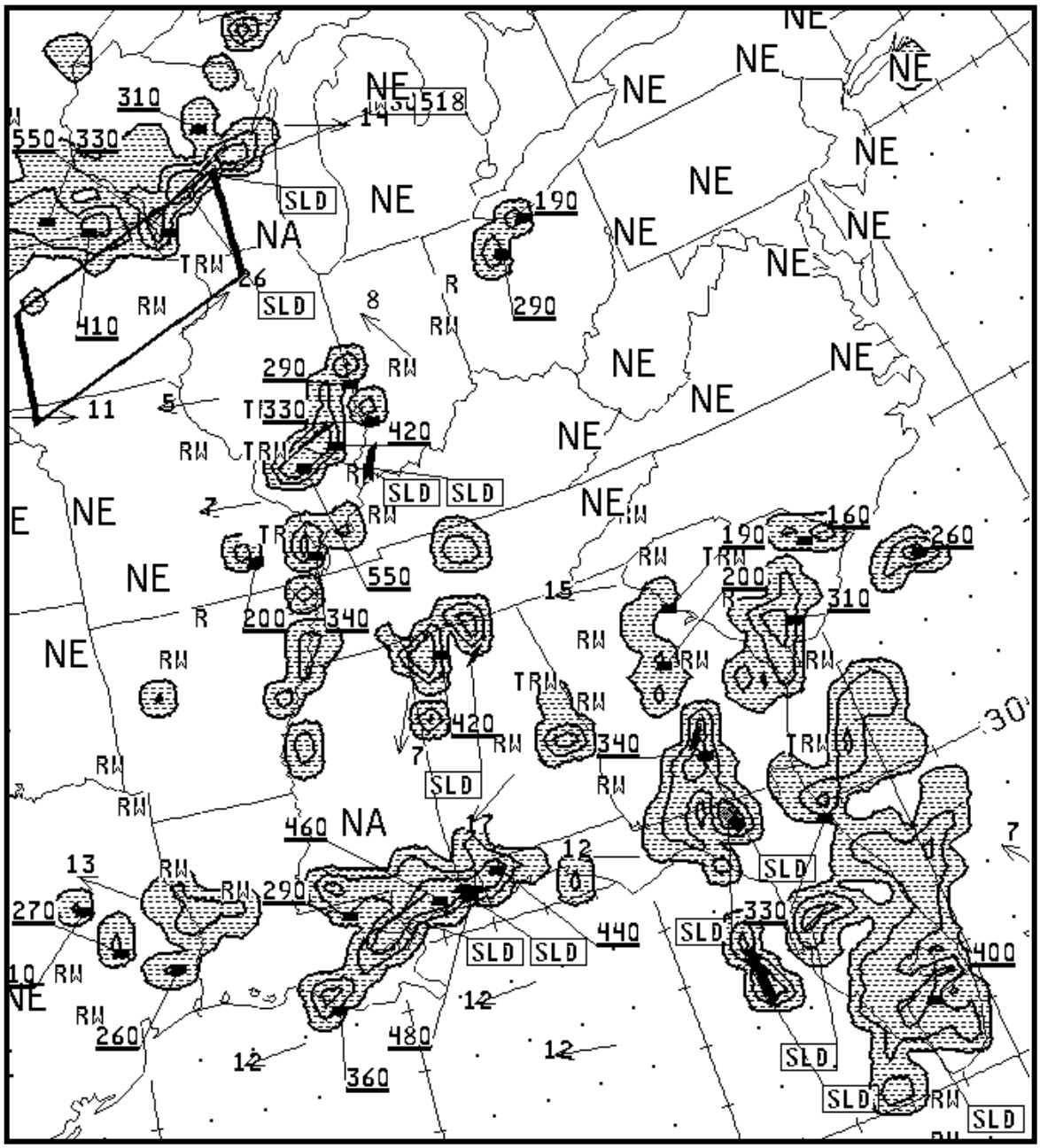
Light dashed lines indicate the freezing level above mean sea level. Heavy dashed lines surround areas of moderate or greater turbulence.

Shading indicates that precipitation covers at least half of the area.



Although FAA written exams may show dashed rectangles, in real life, Severe Weather Watch Areas are outlined with sold rectangles as shown here. Areas of precipitation are shown in concentric, irregular outlines in increasing levels of severity. “NE” means “no echo”.

Closeup of Radar Summary Chart – Eastern United States



VIP LEVEL	PRECIPITATION INTENSITY
1	LIGHT
2	MODERATE
3	HEAVY
4	VERY HEAVY
5	INTENSE
6	EXTREME

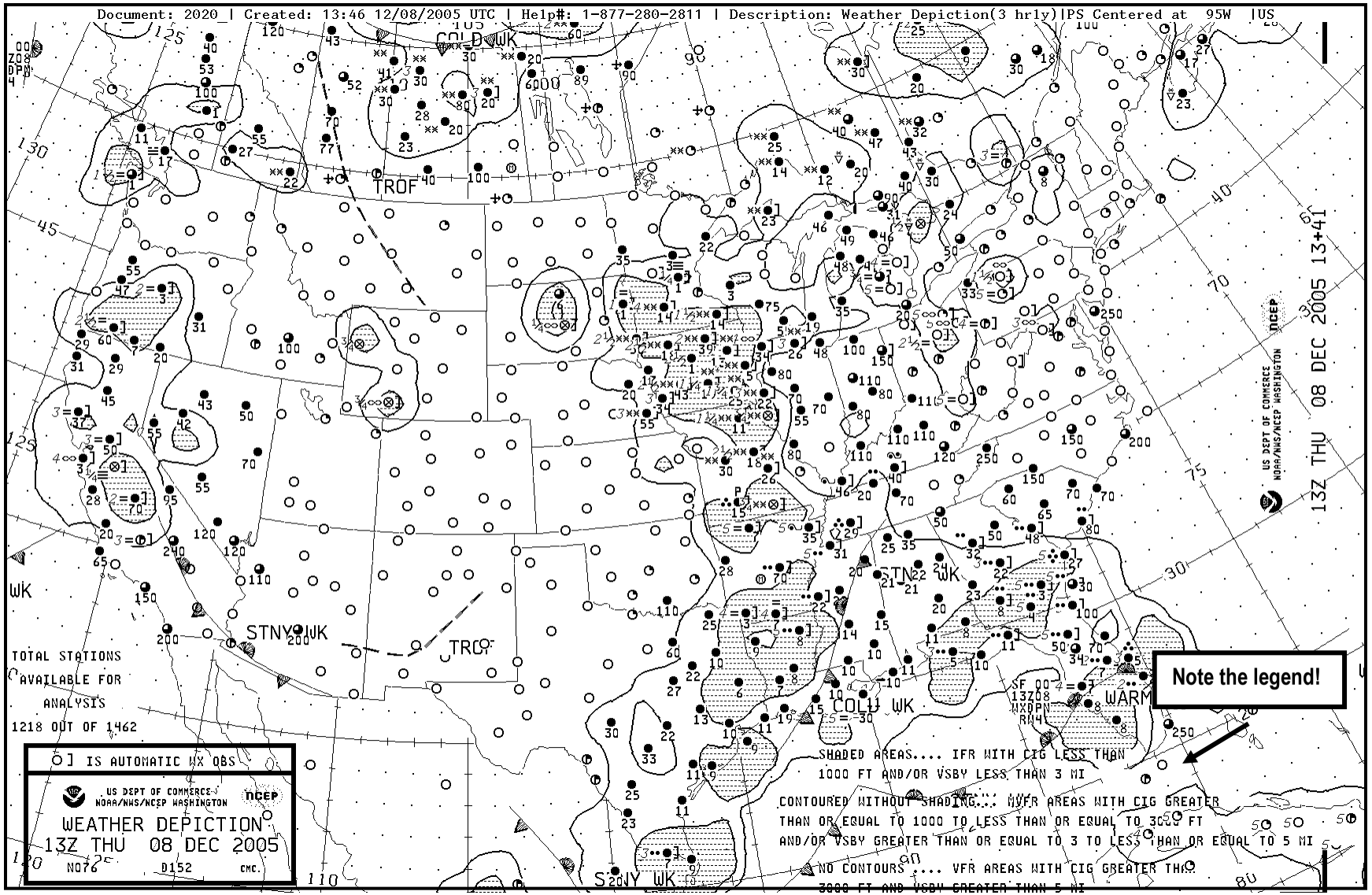
VIP = Video Integrator Processor

R	RAIN
RW	RAIN SHOWER
TRW	THUNDERSTORM
S	SNOW
IP	ICE PELLETS
SW	SNOW SHOWER
NE	NO ECHO
NA	NO OBSERVATION
SLD	8/10 or greater coverage
WS999	Severe Thunderstorm Watch
WT999	Tornado Watch

35 Cell movement to the northeast at 35 knots

450 Highest precipitation tops in area 45,000 feet MSL

Severe Weather Watch Area

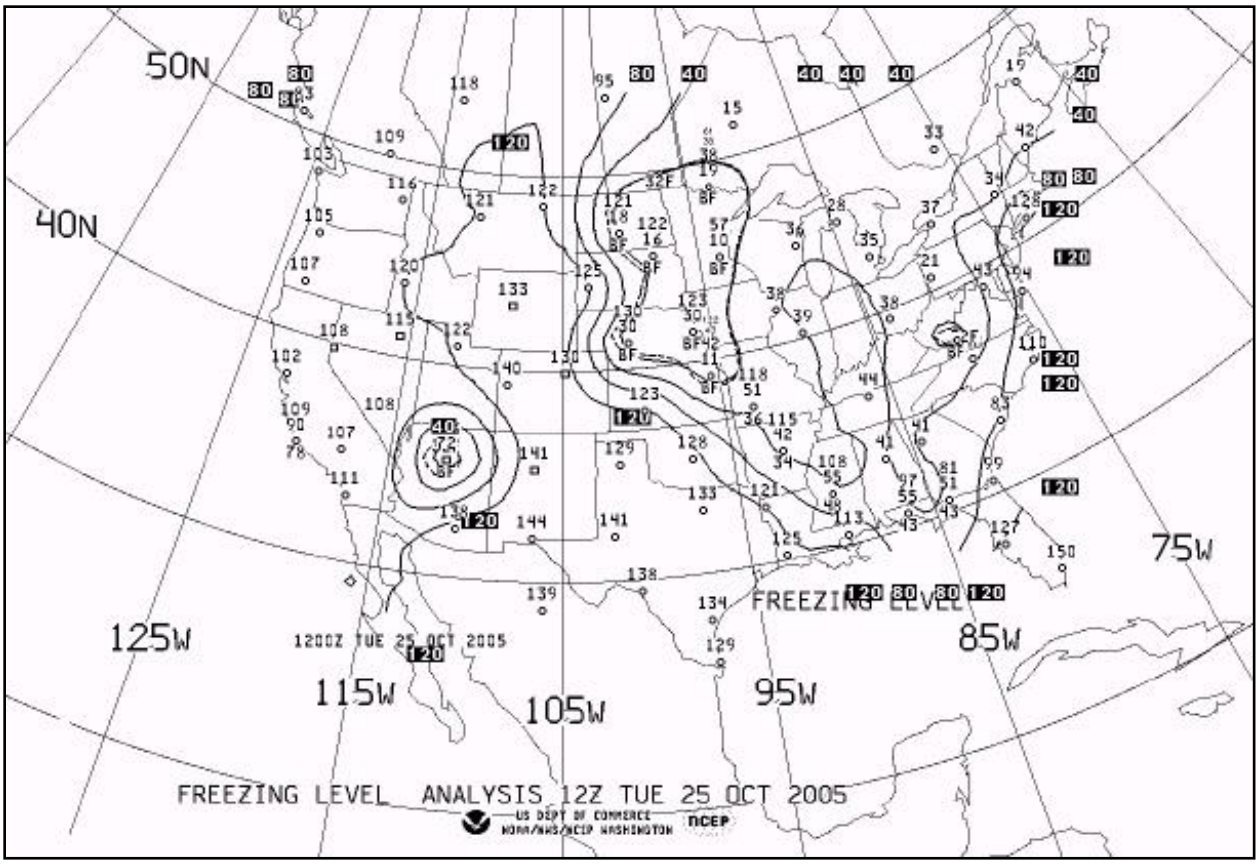


STNY Stationary
OCLD Occluded
TROF Low Pressure
WK Weak
CIG Ceiling

Clear Few Scattered Broken Overcast Obscure

Each circle represents a reporting station. Bases of clouds are indicated in hundreds of feet AGL and appear below the circles.

Freezing Level Chart



Lifted Index (Stability Chart)

Lifted Index

> +4 - stable air

0 to +4 - marginally stable

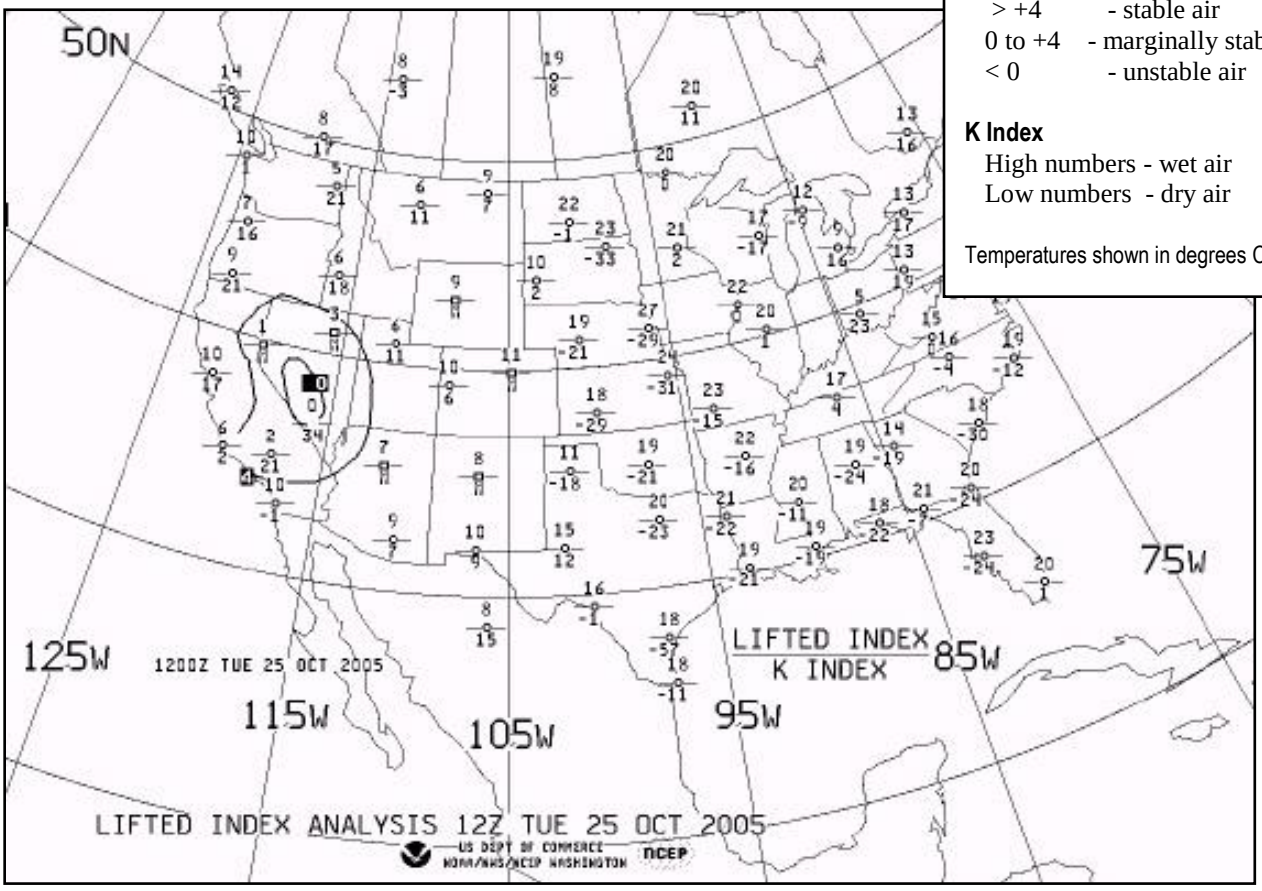
< 0 - unstable air

K Index

High numbers - wet air

Low numbers - dry air

Temperatures shown in degrees Celsius.



Winds and Temperatures Aloft Forecast

FD1US1
DATA BASED ON 191200Z VALID 191800Z FOR USE 1800-0000Z.
TEMPS NEG ABV 24000 FT

	3000	6000	9000	12000	18000	24000	30000	34000
EYW	1113	1114+16	0915+11	0716+06	0620-06	0417-17	051932	051842
JAX	1107	9900+16	2205+11	2106+07	9900-06	0412-16	071230	071940
MIA	1107	0908+16	0911+11	0917+06	0818-07	0517-17	061732	051842
MLB	1209	9900+16	1106+11	1009+06	0409-06	0611-16	062731	074240
PFN	1306	0709+17	0605+11	9900+08	9900-06	1005-15	080830	130941
PIE	1406	1010+16	1113+10	1008+07	0208-06	0416-16	073430	074340
TLH	9900	0610+17	9900+11	2906+08	9900-06	0706-16	121230	111240
ATL	3206	3005+17	2705+12	9900+07	2511-05	2709-15	190630	181141
CSG	9900	9900+16	9900+12	9900+07	2609-05	2907-15	181030	161541
SAV	9900	9900+16	9900+11	2307+08	2805-06	0510-16	070530	091240
ILM	2808	2410+17	2711+13	2805+08	3111-06	0105-15	990030	990040
RDU	2408	2610+17	2817+12	2913+07	3018-05	3011-15	280529	260840
CAE	2907	2805+17	2606+12	3105+07	2908-05	9900-15	990030	990040
CHS	9900	9900+17	2406+11	2608+08	3008-06	0408-15	990030	111240

Altitudes MSL through 12,000 feet.

18,000 feet and above are pressure altitude.

Airport Reporting Stations

Wind from 240 degrees at 6 knots Temperature is 11 C.

Winds light and variable. Temperature is -30 C.

Wind directions are in true degrees. No winds are forecast within 1,500 feet of station elevation. No temperatures are forecast for the 3,000 foot level, or for any level within 2,500 feet of station elevation. Temperatures are in degrees Celsius and are assumed to be negative above 24,000 feet. Thus, plus and minus symbols will not be shown above 24,000 feet.

If a coded direction is more than “36”, this indicates that the wind speed is 100 knots or more. There will never be any directions listed between 37 and 50 inclusive. Subtract 50 from the number to get the wind direction. Then, add 100 to the wind number to get the actual wind speed in knots.

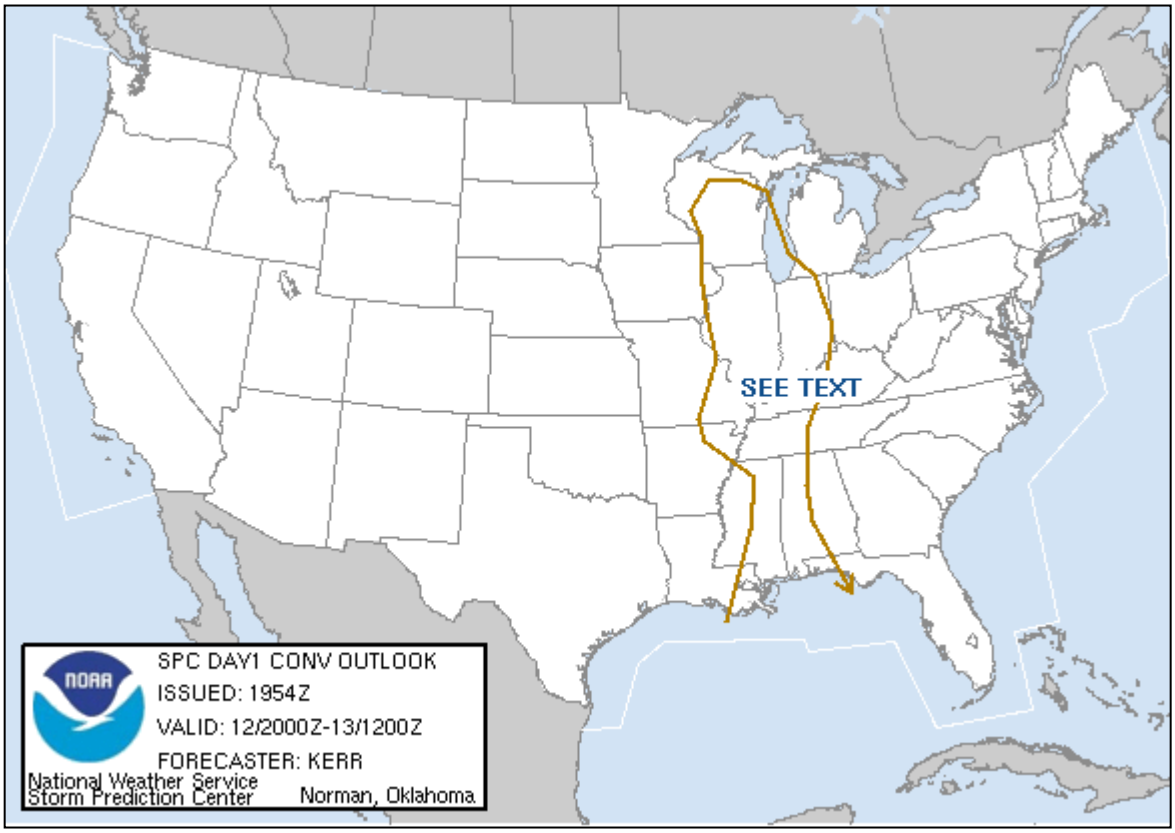
For example, a forecast of “731960” indicates a wind direction from 230 degrees (73-50=23) and a wind speed of 119 knots (100+19=119).

If the wind speed is 200 knots or greater, the wind speed is coded as 99. For example, “7799” is decoded to yield a wind direction of 270 degrees and wind speed greater than 199 knots.

When the forecast speed is less than 5 knots, the code group is “9900” and read “light and variable”.

Convective Outlook Chart

The Convective Outlook chart delineates areas forecast to contain thunderstorms. It qualifies levels of risk as SLDT, MDT, or HIGH.



The "Day 1" chart is issued five times a day. The first issuance is at 0600Z and is valid from 1200Z that day until 1200Z the following day. Subsequent issuances are made at 1300Z, 1630Z, 2000Z, and 0100Z and are valid until 1200Z on the following day.

The "Day 2" chart contains the same types of information and is issued twice daily.

C. TASK: **WEATHER INFORMATION** (ASEL and ASES)

REFERENCES: 14 CFR part 91; AC 00-6, AC 00-45, AC 61-23/FAA-H-8083-25, AC 61-84; AIM.

Objective. To determine that the applicant:

1. Exhibits knowledge of the elements related to weather information by analyzing weather reports, charts, and forecasts from various sources with emphasis on—

    a. METAR, TAF, and FA.
    b. surface analysis chart.
    c. radar summary chart.
    d. winds and temperature aloft chart.
    e. significant weather prognostic charts.
    f. convective outlook chart.
    g. AWOS, ASOS, and ATIS reports.

The reference above is taken directly from the Private Pilot Practical Test Standards. It indicates the charts and reports that you should expect to see during the ground portion (i.e. the oral exam) of your Practical Test.