Ill.B. Weather Information

References: AC 00-6; AC 00-45; FAA-H-8083-25

Objectives

The student should develop knowledge of the elements related to weather information with the ability to interpret several weather sources and make a competent, well educated Go/No Go decision.

Key Elements

1. Information Sources
2. EFAS – 122.0
3. Go/No Go Decision

Elements

1. Thorough Weather Briefing
2. Weather Information Sources
3. In-Flight Weather Advisories
4. Recognizing Weather Hazards
5. Go/No Go Decision

Schedule

1. Discuss Objectives
2. Review material
3. Development
4. Conclusion

Equipment

1. White board and markers
2. References

IP’s Actions

1. Discuss lesson objectives
2. Present Lecture
3. Ask and Answer Questions
4. Assign homework

SP’s Actions

1. Participate in discussion
2. Take notes
3. Ask and respond to questions

Completion Standards

The student can effectively interpret the necessary weather information and has the ability to make a competent Go/No Go decision based on the information.
III.B. Weather Information

Instructors Notes:

Introduction:
Attention
Instead of getting ourselves stuck, in the air, in a thunderstorm or some sort of extreme weather we should
have a good understanding of weather information in order to know when to and not to fly.

Overview
Review Objectives and Elements/Key ideas

What
Through a complex system of weather services, government agencies, and independent weather observers,
pilots are given vast information regarding weather patterns, trends, and characteristics in the form of up-to-
date weather reports and forecasts

Why
These reports and forecasts enable pilots to make informed decisions regarding weather and flight safety.

How:
1. Importance of a Thorough Weather Briefing
   A. 1st step in determining if the flight can be conducted safely and where and when problems may occur
   B. 91.103 – You are required to become familiar with the weather reports and forecasts
   C. Weather can be dangerous, if you know what to expect, unforecast conditions will alert you to hazards

2. Weather Information Sources
   A. General Awareness of the Overall Weather
      i. TIBS – Transcribed Information Briefing Service
         a. Continuous telephone recordings of meteorological and aeronautical info (Phone #’s in the AFD)
            • Specifically, area and route briefings, airspace procedures, and special announcements
      ii. PATWAS – Pilots Automatic Weather Answering Service
      iii. TWEB – Transcribed Weather Broadcast (‘T’ in the upper right corner of the navaid ID box)
         a. Weather report transmitted continuously over a selected navaid
            • Route orientated info - Route forecast, forecast outlook, winds aloft, other selected weather
               a. For an area w/in 50 nm of FSS
            • Valid for 12 hours and updated 4 times a day
      iv. TV/Internet

   B. Detailed Briefing (Specific to the flight)
      i. FSS (1-800-WX BRIEF)
         a. Primary source for preflight weather
      ii. DUAT(S)
      iii. NWS – National Weather Service
      iv. SWSL – Supplemental Weather Service Location
         a. FSS/DUATS proved NOTAM info and filing of flight plans, while NWS/SWSL provide weather only

   C. Inflight Weather
      i. EFAS (Flight Watch) – 122.0
         a. Weather advisories tailored to the type of flight, route, cruising altitude
         b. 6 a.m. – 10 p.m. from 5,000’ AGL to 17,500’ AGL
      ii. HIWAS (‘H’ in the upper right corner of the navaid identification box)
III.B. Weather Information

a. Hazardous weather info broadcast continuously over selected navaids
   • AIRMETs, SIGEMTs, Convective SIGEMTs, urgent PIREPs

iii. TWEB

3. In-Flight Weather Advisories
   A. Forecasts that detail potentially hazardous weather
   B. AIRMET (WA)
      i. Issued every 6 hrs with intermediate updates issued as needed for a particular area forecast region
      ii. Info is of interest to all aircraft but the wx section concerns phenomena dangerous to light aircraft
      iii. 3 Types
         a. SIERRA denotes IFR and Mountain Obscurement
         b. TANGO denotes Turbulence, Strong Surface Winds, and Low-Level Wind Shear
         c. ZULU denotes Icing and Freezing Levels
   C. SIGMET (WS)
      i. In flight advisory concerning non-convective weather that is potentially hazardous to all aircraft
      ii. Severe icing/extreme turbulence/CAT not associated with T-storms; dust/sand storms lowering visibility to less than 3 miles and volcanic ash
      iii. Unscheduled forecasts valid for 4 hours (hurricane SIGMET is valid for 6)
   D. Convective SIGMENT (WST)
      i. Weather advisory issued for hazardous convective weather that affects the safety of every flight
      ii. Issued for
         a. Severe T-storms with
            • Surface winds greater than 50 knots
            • Hail at the surface >/= ¾ inch in diameter
            • Tornadoes
         b. Embedded T-storms
         c. A line of T-storms
         d. T-storms with heavy or greater precipitation affecting 40% or more of a 3,000 sq’ or greater area
   E. PIREPS
      i. A pilot generated report concerning meteorological phenomena encountered in flight
         a. Aircraft in flight are the only way to observe cloud tops, icing and turbulence
      ii. Fill the gaps between reporting stations

4. Recognizing Weather Hazards
   A. Hazards can be recognized through proper interpretation of aviation weather charts, reports, etc
      i. Area Forecasts, WST, WS, WA, Significant Weather Prog charts
   B. Also, utilizing weather information resources will allow hazards to be recognized
      i. LLWAS, PIREPS, Convective Outlook, METARs, etc

5. Go/No Go Decision
   A. Weather factors must be considered in relation to the equipment to be flown
      i. Can the plane handle the flight?
      ii. The following conditions may lead to a No Go Decision
         a. T-Storms of any kind, especially embedded
         b. Fast-moving fronts or squall lines
         c. Moderate or greater turbulence
         d. Icing
         e. Fog, or other visual obscurations
   B. Physical/Mental condition
III.B. Weather Information

i. Sick, tired, upset, depressed – These factors can greatly affect the ability to handle any problem

C. Recent Flight Experience
   i. Don’t go beyond your abilities or the airplane’s abilities
   ii. EX: Are you comfortable in MVFR if you haven’t flown in a while

D. Flying is a continual process of decision making through the entire flight

Conclusion:
Brief review of the main points
It is very important to be able to interpret and make a Go/No Go decision based on the information attained. A safe flight begins with a thorough weather briefing to ensure the pilot understands the meteorological factors that may affect the flight.

PTS Requirements:
To determine that the applicant exhibits instructional knowledge of the elements related to weather information by describing:
   1. Importance of a thorough preflight weather briefing.
   3. Use of real-time weather reports, forecasts, and charts for developing scenario-based training.
   4. In-flight weather advisories.
   5. Recognition of aviation weather hazards to include wind shear.
   6. Factors to be considered in making a “go/no-go” decision.
III.B. Weather Reports and Charts

References: 14 CFR part 91; AC 00-6, AC 00-45, FAA-H-8083-25, AC 61-84; AIM

Objectives
To develop knowledge of the elements related to weather information by analyzing weather reports, charts, and forecasts from various sources.

Elements
1. METAR, TAF, and FA
2. Surface Analysis Chart
3. Radar Summary Chart
4. Winds and Temperature Aloft Chart
5. Significant Weather Prognostic Charts
6. Convective Outlook Chart
7. AWOS, ASOS, and ATIS reports

Schedule
1. Discuss Objectives
2. Review material
3. Development
4. Conclusion

Equipment
1. White board and markers
2. References
3. Current weather reports

IP’s Actions
1. Discuss lesson objectives
2. Present Lecture
3. Ask and Answer Questions
4. Assign homework

SP’s Actions
1. Participate in discussion
2. Take notes
3. Ask and respond to questions

Completion Standards
The lesson is complete when the student can decipher and use the weather reports, charts, and sources to make a competent “go/no-go” decision.
1. METAR, TAF, and FA
   A. METAR (Aviation Routine Weather Report)
      i. An observation of current surface weather reported in a standard international format
      ii. Contains the following information:
         a. Type of Report – There are 2 types. The first is the routine METAR report, transmitted hourly.
            i. The 2nd is the aviation selected special weather report (SPECI).
            a. Is given any time to update a METAR for rapidly changing weather, aircraft mishaps, etc.
         b. Station Identifier – Four letter code (ex. KAHN). K is the country identifier and AHN is the airport identifier. (Alaska always begins with “PA” and Hawaii identifiers always begin with “PH”)
         c. Date and Time of Report – (161753Z) Reported in a six digit group. The first 2 digits are the date; the last 4 are the time, in UTC.
         d. Modifier – Denote that the METAR came from an automated source or was corrected
            i. “AUTO” indicates the report came from an automated source
            ii. “AO1” and “AO2” indicate the type of precipitation sensors at the station
            iii. “COR” identifies a corrected report.
         e. Wind – (14021G26)
            i. Reported with 5 digits unless speed is > 99 knots, then it is 6
               a. The first 3 digits indicate wind direction in tens of degrees
               b. The last 2 digits indicate the speed of the wind in knots
                  1. Gusting winds (G) show with the peak gust after the “G”
               c. If wind varies more than 60 degrees and the speed > 6 knots, a separate group of numbers, separated by a “V” will indicate the extremes of the directions
         f. Visibility – (3/4SM)
            i. Reported in statute miles
            ii. RVR is sometimes reported following the visibility,
               a. RVR is the distance a pilot can see down the runway in a moving aircraft.
                  1. Shown with an “R” then the runway number, a slant, and the visual range in feet.
         g. Weather – (-RA BR) Two different categories: Qualifiers and Weather Phenomenon
            i. Qualifiers show intensity or proximity as well as descriptor codes
               a. -, +, VC, SH, TS, FZ, etc
            ii. Phenomena describe the different precipitation, obscuration, and other phenomena
               a. DZ, RA, HZ, SS, DS, SN, etc
         h. Sky Condition – (BKN008 OVC012)
            i. Always reported in the sequence of amount, height, and type
               a. Heights are depicted with three digits in hundreds of feet above ground
                  1. Clouds above 12,000 ft are not detected
               b. TCU and CB clouds are reported with their height
               c. The amount of sky coverage is reported in eightths of the sky from horizon to horizon.
         i. Temperature and Dewpoint – (18/17)
            i. In degrees Celsius (Temp below 0 degrees Celsius are preceded by the letter “M”)
         j. Altimeter Setting – (A2970)
            i. Preceded by the letter “A” and reported as inches of mercury in a four digit number
III.B. Weather Reports and Charts

- “PRESRR” or “PRESFR” represent rising or falling pressure

  k. Remarks – RMK
  - May include wind data, variable visibility, begin/end times of phenomenon, pressure info, and various other necessary info

EXAMPLE:
METAR BTR 161753Z 14021G26 ¾SM –RA BR BKN008 OVC012 18/17 A2970 RMK PRESFR

EXPLANATION:
Type of Report: Routine METAR
Location: Baton Rouge, Louisiana
Date: 16th day of the month
Time: 1753 Zulu
Modifier: None shown
Wind Information: Winds 140 at 21 knots gusting to 26 knots
Visibility: ¾ SM
Weather: Light rain and mist
Sky Conditions: Skies broken 800 ft, Overcast 1,200 ft
Temperature: Temp 18 degrees C, Dewpoint 17 degrees C
Altimeter: 29.70 in. Hg.
Remarks: Barometric pressure is falling

B. Terminal Aerodrome Forecast (TAF)
   i. A terminal aerodrome forecast is a report established for the 5 s.m. radius around an airport
   ii. Valid for a 24-hour period, and is updated four times a day at 0000Z, 0600Z, 1200Z, and 1800Z.
   iii. The TAF utilizes the same descriptors and abbreviations as the METAR.
   iv. Includes the following information in sequential order:
      a. Type of Report – Can either be a routine forecast (TAF) or an amended forecast (TAF AMD)
      b. ICAO Station Identifiers – (KAHN) Same as METAR
      c. Date and Time of Origin – Six number code. First 2 are the date; last four are the time, in UTC
      d. Valid Period Date and Time – Given by a 6 digit number group. The first 2 are the date, the next 2 are the beginning time for the valid period and the last 2 are the end time
      e. Forecast Wind – The wind direction and speed forecasts are given in a five-digit number group
      f. Forecast Visibility – Given in statute miles (Greater than 6 SM is shows as “P6SM”)
      g. Forecast Significant Weather – Coded the same as a META (No sig wx forecast “NSW” shown)
      h. Forecast Sky Condition – Given same as the METAR. Only “CB” clouds are forecast
      i. Forecast Change Group – For any significant weather change forecast to occur, the expected conditions and time period are included, this information can be shown as:
         • FM - From is used when a rapid and significant change, usually within an hour, is expected
         • BECMG - Becoming is used when a gradual change is expected over no more than 2 hours
         • TEMPO - Temporary is used for temporary fluctuations, expected to last for less than an hr
      j. Probability Forecast – The given percentage that describes the probability of thunderstorms and precipitation occurring in the coming hours

EXAMPLE:
TAF
KPIR 111130Z 111212 15012KT P6SM BKN090
TEMPO 1214 5SM BR
EXPLANATION
Routine TAF for Pierre, South Dakota. On the 11th day of the month, at 11:30Z. Valid for 24 hrs from 1200Z on the 11th to 1200Z on the 12th. Wind from 150 at 12 knots. Greater than 6 SM visibility. Broken clouds at 9,000 ft. Temporarily, between 1200Z and 1400Z, visibility 5 SM in mist. From 1500Z winds from 160 at 15 knots, gusting to 25 knots. Visibility greater than 6SM, and clouds broken at 8,000ft, overcast at 15,000 ft. Between 0000Z and 0400Z, there is a 40 percent probability of visibility 3 statute miles, thunderstorm with moderate rain showers, clouds broken at 3,000 ft with cumulonimbus clouds. From 0400Z winds are from 140 at 18 kts, visibility greater than 6 SM. Clouds at 4,000ft scattered and overcast at 8,000. Temporarily between 0400Z and 0800Z, visibility 3 SM, thunderstorms with moderate rain. Clouds overcast at 3,000 ft with cumulonimbus clouds. Becoming between 0800Z and 1000Z, wind from 320 at 7 knots. End of report =

C. Area Forecasts (FA)
   i. The FA gives a picture of clouds, general weather conditions, and VMC expected over a large area encompassing several states. This forecast gives information vital to en route operations as well as forecast information for smaller airports that do not have terminal forecasts.
   ii. There are six areas for which area forecasts are published in the contiguous 48 states
   iii. Area forecasts are issued 3 times a day and are valid for 18 hours
   iv. Four Sections
      a. **Header** – Gives the location identifier of the source of the FA, the date and time of issuance, the valid forecast time, and the area of coverage

EXAMPLE
DFWC FA 120945
SYNOPSIS AND VFR CLDS/WX
SYNOPSIS VALID UNTIL 130400
CLDS/WX VALID UNTIL 122200...OTLK VALID 122200-130400
OK TX AR LA MS AL AND CSTL WTRS

EXPLANATION
The area forecast shows information given by Dallas Fort Worth, for the region of Oklahoma, Texas, Arkansas, Louisiana, Mississippi, and Alabama, as well as a portion of the gulf coast waters. It was issued on the 12th day of the month at 0945. The synopsis is valid from the time of issuance until 0400 hours on the 13th. VFR clouds and weather information on this area forecast is valid until 2200 hours on the 12th and the outlook is valid until 0400 hours on the 13th.

b. **Precautionary Statements** – IFR conditions, mountain obscurations, and thunderstorm hazards are described. Statements of height are in MSL - if given otherwise, AGL or CIG will be noted

EXAMPLE
SEE AIRMET SIERRA FOR IFR CONDITIONS AND MTN OBSCN.
TS IMPLY SEV OR GTR TURB SEV ICE LLWS AND IFR CONDS.
NON MSL HGTS DENOTED BY AGL OR CIG
EXPLANATION:
The FA covers VFR clouds and weather, so the precautionary statement warns that AIRMET Sierra should be referenced for IFR conditions and mountain obscuration. The code TS indicates the possibility of thunderstorms and implies there may be occurrences of severe or greater turbulence, severe icing, low-level wind shear, and IFR conditions. The final line of precautionary statement alerts the user that heights for the most part are mean sea level (MSL). Those that are not MSL will be above ground level (AGL) or ceiling (CIG).

c. **Synopsis** – A brief summary identifying the location/movement of pressure systems, fronts, and circulation patterns

EXAMPLE:
SYNOPSIS...LOW PRES TROF 10Z OK/TX PNHDL AREA FCST MOV EWD INTO CNTRL-SWRN OK BY 04Z. WRMFRNT 10Z CNTRL OK-SRN AR-NRN MS FCST LIFT NWD INTO NERN OK-NRN AR EXTRM NRN MS BY 04Z.

EXPLANATION:
As of 1000Z, there is a low pressure trough over the Oklahoma and Texas panhandle area, which is forecast to move eastward into central southwestern Oklahoma by 0400Z. A warm front is located over Central Oklahoma, southern Arkansas, and northern Mississippi at 1000Z is forecast to lift northwestward into northeastern Oklahoma, northern Arkansas, and extreme northern Mississippi by 0400Z.

d. **VFR Clouds and Weather** – Lists expected sky conditions, visibility, and weather for the next 12 hrs and an outlook for the following 6 hrs

EXAMPLE:
S CNTRL AND SERN TX
AGL SCT-BKN010. TOPS 030. VIS 3-5SM BR.
14-16Z BECMG AGL SCT 030. 19Z AGL SCT050.
OTLK... VFR

OK
PNDL AND NW... AGL SCT030 SCT-BKN100. TOPS FL200
15Z AGL SCT040 SCT100. AFT20Z SCT TSRA
DVLPG..FEW POSS SEV. CB TOPS FL450.
OTLK... VFR

EXPLANATION:
In south central and southeastern Texas, there is a scattered to broken layer of clouds from 1000ft AGL with tops at 3,000 ft, visibility is 3 to 5 statute miles in mist. Between 1400 Zulu and 1600 Zulu, the cloud bases are expected to increase to 3,000 ft AGL. After 1900Z, the cloud bases are expected to continue to increase to 5,000 ft AGL and the outlook is VFR.

In northwestern Oklahoma and panhandle, the clouds are scattered at 3,000 ft with another scattered to broken layer at 10,000 ft AGL, with tops at 20,000 ft. At 1500Z, the lowest cloud base is expected to increase to 4,000 ft AGL with a scattered layer at 10,000 ft AGL. After 2000Z, the forecast calls for scattered thunderstorms with rain developing and a few becoming severe; the cumulonimbus clouds will have tops at flight level 450 or 45,000 ft MSL.

2. **Surface Analysis Chart**
   A. Depicts an analysis of the current surface weather
   B. Computer prepared report transmitted every 3 hours covering contiguous 48 states and adjacent areas
III.B. Weather Reports and Charts

C. Shows areas of high/low pressure, fronts, tems, dewpoints, wind direction/speed, local weather, visual obstructions

D. Surface weather observations for reporting points across the US are also depicted on this chart. Each of these reporting points is illustrated by a station model. A station model will include:
   i. Type of Observation – Round indicates official weather observer, square is automated station
   ii. Sky Cover – Shown as clear, scattered, broken, overcast, or obscured/partially obscured
   iii. Clouds – Cloud types are represented by specific symbols. Low cloud symbols are placed beneath the station model, while middle and high cloud symbols are placed directly above the station model. Typically, only one type of cloud will be depicted with the station model.
   iv. Sea Level Pressure – Given in 3 digits to the nearest tenth of a millibar. For 1000 mbs or greater, prefix a 10 to the 3 digits; for less than 1000 mbs, prefix a 9 to the 3 digits
   v. Pressure Change/Tendency – In tenths of mbs over the past 3 hours, depicted directly below the slp
   vi. Precipitation – Precipitation that has fallen over the last 6 hours to the nearest hundredth of an inch
   vii. Dewpoint – In degrees Fahrenheit
   viii. Present Weather – Many different weather symbols are used to describe the current weather
   ix. Temperature – Given in degrees Fahrenheit
   x. Wind – True direction of wind is given by the wind pointer line, indicating the direction from which the wind is coming (A short barb is 5 knots, a long barb is 10 knots, and a pennant is 50 knots)

3. Radar Summary Chart
   A. A graphically depicted collection of radar weather reports (SDs) displaying areas of precipitation as well as information regarding the characteristics of precipitation
   B. The chart is published hourly at 35 min past the hour
   C. A radar summary chart includes:
      i. No information – If info isn’t reported it will say “NA.” if no echoes are detected, it will say “NE
      ii. Precipitation Intensity Contours – Described as one of 6 levels and shown by 3 contour intervals
      iii. Height of Tops – The heights of the echo tops are given in hundreds of feet MSL
      iv. Movement of Cells – Indicated by an arrow pointing in the direction of movement, speed in knots is at the top of the arrow heard (“LM” indicates little movement)
      v. Type of Precipitation - Marked using specific symbols (not those used on the METAR)
      vi. Echo Configuration – Echoes are shown as being areas, cells, or lines
      vii. Weather Watches – Depicted by boxes outlined with heavy dashed lines
   D. Limitations
      i. Only depicts areas of precipitation
      ii. Will not show areas of clouds and fog with no appreciable precipitation,
      iii. Will not show the heights of the tops and bases of the clouds
   E. Depiction of current precipitation and should be with current METAR and weather forecasts

4. Winds and Temperatures Aloft Chart (FD)
   A. Provide wind and temperature forecasts for specific locations
   B. The forecasts are made twice a day based at 0000Z and 1200Z
   C. Through 12,000 ft are true altitudes and above 18,000 ft are pressure altitudes
   D. Wind
      i. Direction is always in reference to true north and wind speed is always given in knots
      ii. No winds are forecast when a given level is within 1,500 ft of station elevation
      iii. Wind direction and speed are listed together in a four digit code
         a. The first two numbers indicate the direction the wind is blowing from in tens of degrees
         b. The second two numbers indicate the speed of the wind

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iii. If the wind speed is forecast to be greater than 100 knots but less than 199 knots, 50 is added to the direction and 100 is subtracted from the speed
   a. To decode, the reverse must be accomplished
      • EX: For 7319 - Subtract 50 from the direction, add 100 to the speed to get 230° at 119 knots

v. If the wind speed is forecast to be 200 knots or greater, the wind group is coded as 99 knots
   a. EX: For 7799 - Subtract 50 from the direction, add 100 to 99 to get 270 at 199 knots or greater

vi. Light and Variable wind is coded “9900”

E. Temperature
   i. Temperature is always given in Celsius
   ii. No temperatures are forecast for any station with 2,500 ft of station elevation
   iii. Temperatures above 24,000 feet MSL are negative.

EXAMPLE:

<table>
<thead>
<tr>
<th>FD</th>
<th>3000</th>
<th>6000</th>
<th>9000</th>
<th>12000</th>
<th>18000</th>
<th>24000</th>
<th>30000</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMA</td>
<td>2714</td>
<td>2725+09</td>
<td>2625-04</td>
<td>2631-15</td>
<td>2542-27</td>
<td>256942</td>
<td></td>
</tr>
<tr>
<td>DEN</td>
<td>2321-04</td>
<td>2532-08</td>
<td>2434-19</td>
<td>2441-31</td>
<td>235347</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

EXPLANATION:
The heading indicates that this FD was transmitted on the 15th of the month at 1640Z and is based on the 1200 Zulu radiosonde. The valid time is 1800 Zulu on the same day and should be used for the period between 1700Z and 2100Z. The heading also indicates that the temperatures above 24,000 feet MSL are negative. Since the temperatures above 24,000 feet are negative, the minus sign is omitted. A 4-digit data group shows the wind direction in reference to true north, and the wind speed in knots. The elevation at Amarillo, TX (AMA) is 3,605 feet, so the lowest reportable altitude is 6,000 feet for the forecast winds. In this case, “2714” means the wind is forecast to be from 270° at a speed of 14 knots. A 6-digit group includes the forecast temperature aloft. The elevation at Denver (DEN) is 5,431 feet, so the lowest reportable altitude is 9,000 feet for the winds and temperature forecast. In this case, “2321-04” indicates the wind is forecast to be from 230° at a speed of 21 knots with a temperature of –4°C.

5. Significant Weather Prognostic Charts
   A. Portray forecasts of selected weather conditions at specified valid times
      i. Forecasts are made from a comprehensive set of observed weather conditions. The observed conditions are extended forward in time and become forecasts by considering atmospheric and environmental processes.
   B. Forecasts are made for various periods of time
      i. Each valid time is the time at which the forecast conditions are expected to occur
         a. The valid time is printed on the lower left hand corner of each panel
         b. A 12-hour prog is a forecast of conditions with a valid time 12 hours after the observed time
            • EX: A 12 hr forecast based on 00Z observations is valid at 12Z
      ii. Forecasts are issued four times a day at 0000Z, 0600Z, 1200Z, 1800Z
   C. Altitude information is referenced to MSL. (Below 18,000’ are true, above 18,00’ are pressure)
   D. The prog charts are generated for two general time periods
      i. Day 1 progs are forecast for the first 24-hour period and are prepared for 2 altitude references
      ii. Day 2 progs are forecast for the second 24-hour period
   E. Charts are available for low-level significant weather and high-level significant weather
i. Low Level Chart
   a. A day 1 forecast of significant weather for the conterminous US
   b. Weather information pertains to the layer from surface to FL240 (400 mbs)
      • The information is provided for two forecast periods: 12 hours and 24 hours
   c. The chart is composed into 4 panels:
      • The upper two panels depict the 12 and 24-hour significant weather progs
         a. The Significant weather panels display forecast weather flying categories
            (VFR/IFR/MVFR), freezing levels, and turbulence
         1. A legend on the chart illustrates symbols and criteria used for these conditions
      • The lower two panels depict the 12 and 24-hour Surface Progs
         a. Display forecast positions and characteristics of pressure systems, fronts, precipitation
            1. Standard symbols are used to show fronts and pressure centers
            2. Direction of movement of the pressure center is depicted by an arrow
            3. The speed is in knots and is shown next to the arrow
            4. Areas of forecast precipitation and thunderstorms are outlined
               a. Shaded areas of precip. indicate at least ½ the area is affected by the precip.
               b. Unique symbols indicate the type of precipitation and the manner it occurs
   d. Using the chart
      • Provides an overview of selected flying weather conditions up to 24,000 ft for day 1
      • Surface winds can be inferred from surface pressure patterns
      • Structural icing can be inferred in areas with clouds and precipitation, above freezing levels, and in areas of freezing precipitation
      • Use to obtain an overview of the progression of weather during day 1

EXAMPLE:

ii. 36 and 48-hour Surface Prog
    a. A day 2 forecast of general weather for the conterminous US
    • An extension of the day 1 low-level prog chart issued from the same observed data base
    b. The chart is issued two times daily at 0000Z and 1200Z and valid 36/48 hrs after observed
III.B. Weather Reports and Charts

- EX: A chart issued based on 00Z Tuesday observations has a 36-hour valid time of 12Z Wednesday and a 48-hour valid time of 00Z Thursday.

- The chart is composed of two panels and a forecast discussion.
  - The two panels contain the 36 and 48-hour surface progs.

- The panels display forecast positions/characteristics of pressure patterns, fronts, precipitation.
  - Provides info regarding only surface weather forecasts, includes a discussion of the forecast.
  - Standard symbols are used to show fronts and pressure centers.
  - Precipitation areas are outlined on each panel.
  - The forecast discussion is a discussion of the day 1 and day 2 forecast package, including identification/characterization of weather systems and associated weather conditions portrayed on the prog charts.

- Using the chart.
  - The 36 and 48-hour surface prog provides a general weather conditions outlook for day 2.
  - The chart can be used to assess the progression of weather through day 2.

iii. High-Level Significant Weather Prog.

a. The high-level significant weather prog chart is a day 1 forecast of significant weather covering a large portion of the Northern Hemisphere and a limited portion of the Southern Hemisphere.

b. Weather information pertains to the layer from above 24,000 to 60,000 ft.
  - Conditions routinely appearing are jet streams, CB clouds, turbulence, and tropopause heights, surface front are also included to add perspective.

c. Tropical cyclones, squall lines, eruptions, sandstorms, dust storms will appear.

d. Each prog chart is issued 4 times a day and is valid times at 00Z, 06Z, 12Z, 18Z.

e. Using the chart.
  - This chart is used to get an overview of selected flying weather conditions above 24,000 ft.

EXAMPLE:
6. Convective Outlook Chart
   A. Delineates areas forecast to have thunderstorms
   B. Presented in two panels
      i. The left-hand panel is the Day 1 Convective Outlook
         a. Outlined areas are where thunderstorms are forecasted during the day 1 period
            • The outlook issued qualifies the risk (SLGT, MDT, HIGH) and areas of general thunderstorms
         b. Issued 5 times daily
            • 1st issuance is 06Z and is the initial Day 1 Outlook, valid 12Z until 12Z the following day
            • The other issuances are 1300Z, 1630Z, 2000Z, and 0100Z
            • All issuances are valid until 12Z the next day
      ii. The right-hand panel is the Day 2 Convective Outlook
          a. Contains the same information as the Day 1 Outlook
          b. It is issued 2 times a day
             • The first issuance is at 0830Z during standard time and 0730Z during daylight time
             • It is updated at 1730Z
          c. The timeframe covered is from 12Z the following day to 12Z the next day
             • EX: If today is Mon, the Day 2 Outlook will cover the period 12Z Tuesday to 12Z Wednesday
      iii. Levels of Risk
           a. Risk areas come in 3 varieties based on the number of severe thunderstorm reports per geographical unit and forecaster confidence
              • SEE TEXT is used for situations where slight risk was considered, but at the time of the forecast, was not warranted
              • SLGT risk - Well-organized severe T-storms expected but in small numbers/low coverage
              • MDT risks - Greater concentration of severe T-storms, and greater magnitude of severe wx
              • HIGH risk - Almost always means a major weather outbreak is expected, with great coverage
              • In addition to the risk areas, general T-storms are outline, but not labeled


<table>
<thead>
<tr>
<th>NOTATION</th>
<th>EXPLANATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEE TEXT</td>
<td>Used for those situations where a slight risk was considered, but at the time of the forecast, was not warranted</td>
</tr>
<tr>
<td>SLGT</td>
<td>A high probability of 5-29 reports of 1 inch or larger hail, and/or 3-5 tornadoes, and/or 5-29 wind events,...or...a low/moderate probability of moderate to high risk being issued later if some conditions come together</td>
</tr>
<tr>
<td>MDT</td>
<td>A high probability of at least 30 reports of hail 1 inch or larger; 6-19 tornadoes; or numerous wind events (30)</td>
</tr>
<tr>
<td>HIGH</td>
<td>A high probability of at least 20 tornadoes with at least two of them rated F3 (or higher), or an extreme derecho causing widespread (50 or more) wind events with numerous higher-end wind (80 mph or higher) and structure damage reports</td>
</tr>
</tbody>
</table>

b. Using the chart
   • A flight planning tool used to determine forecast areas of thunderstorms

7. ASOS, AWOS, and ATIS
   A. ASOS (Automated Surface Observing System)
      i. Continuous min-by-min observations to generate a METAR and can provide other information
      ii. ASOS software transmits a SPECI report whenever it determines a significant change in conditions
      iii. Types of Observations
          a. Every ASOS contains:
             • Cloud height indicator
             • Visibility Sensor
             • Precipitation identification sensor
III.B. Weather Reports and Charts

- Freezing rain sensor (at select sites)
- Pressure sensors
- Ambient temperature and dew point temp sensors
- Anemometer (wind direction & speed)
- Rainfall accumulation sensor

b. Some include precipitation discriminator which differentiates liquid/frozen precipitation
   - If it has this capability, it’s designated as A02 in the remarks section (otherwise A01)

c. At selected ASOS installations lightning detection equipment is installed

d. Some include precipitation discriminator which differentiates liquid/frozen precipitation
   - If it has this capability, it’s designated as A02 in the remarks section (otherwise A01)

B. AWOS (Automated Weather Observing System)

i. First widely installed automated weather data gathering system at US airports

ii. AWOS is available in lesser configurations without all the types of observations listed above

iii. Levels of service:
   - AWOS-A: Only reports the altimeter setting
   - AWOS-1: Also measures and reports wind speed, direction, gusts, temperature, and dew point
   - AWOS-2: Adds visibility information
   - AWOS-3: Most capable system – also includes cloud/ceiling data (essentially equivalent to ASOS)
     - Like ASOS, AWOS-3 can include precipitation discrimination sensors indicated by A02
     - Lightning detection is also a possible enhancement for selected AWOS-3 sites

iv. Difference between ASOS/AWOS is ability to identify/report significant changes in surface weather

b. AWOS-3: Most capable system – also includes cloud/ceiling data (essentially equivalent to ASOS)
   - Like ASOS, AWOS-3 can include precipitation discrimination sensors indicated by A02
   - Lightning detection is also a possible enhancement for selected AWOS-3 sites

v. Levels of service:
   - LEVEL A: The highest – which is typically available at major airports like those in or near Class B
     - Other levels offer less human augmentation, with fewer types of weather reported
   - LEVEL B – Has human observers available 24 hours a day
     - LEVEL C – At airports with part-time towers (Human augmentation ends when tower closes)
   - LEVEL D – Found at smaller, nontowered airports meeting the FAA or NWS criteria for the ASOS
     - Unattended, and always contain the AUTO designation when in a METAR

C. ATIS (Automatic Terminal Information Service)

i. A continuous broadcast of recorded non-control information in busier terminal areas

ii. Contain essential info - weather, active runways, approaches, and other required info (NOTAMs)

iii. Updated when there is a significant change in the information; it is given a letter designation

iv. In its simplest form, the ATIS is a continuously playing recording of a person reading the message

v. Re-recorded at every update (which is several times per hour at least), which is quite cumbersome

vi. Data may be entered by hand, coming from a METAR, or be taken directly from sensors
   - Modern systems are fully automated and do not require a controller except in case of sensor failures/ unusual activities

vii. Some airports have separate ATISs for arriving/departing aircraft, each on its own frequency

Conclusion
Brief review of the main points
PTS Requirements:
To determine that the applicant exhibits instructional knowledge of the elements related to weather information by describing:
1. Importance of a thorough preflight weather briefing.
3. Use of real-time weather reports, forecasts, and charts for developing scenario-based training.
4. In-flight weather advisories.
5. Recognition of aviation weather hazards to include wind shear.
6. Factors to be considered in making a “go/no-go” decision.