A107 WEATHER REPORTS

References: Aeronautical Information Manual Chapter 7, Section 1-31
FAA-H-8083-25A, Pilot's Handbook of Aeronautical Knowledge, Chapter 11 and
Chapter 12 (pgs 6-11)

INTRODUCTION
The objectives of this lesson are to gain an understanding of local area weather awareness and apply this awareness to mission planning and execution by reading and interpreting aviation routine weather reports (METARs) and Terminal Area Forecasts (TAFs).

The successful completion of every sortie is based upon the weather. Therefore, it is critical for the pilot to be able to obtain accurate weather reports and interpret them correctly in order to make a good go-no go decision before proceeding with the sortie.

There are basically two types of weather reports. There are historical reports that are prepared from actual weather observations and there are forecasts that utilize the observed phenomena and make projections for the future. Both of these reports are necessary for the pilot to understand. This lesson will cover one of each of these types of reports.

For information about meteorology and the science of weather, go to the references listed above.

AVIATION ROUTINE WEATHER REPORT (METAR)
An aviation routine weather report, or METAR (*Message D'Observation Mèteòrologique Pour L'Aviation Règulière*), is an observation of current surface weather reported in a standard international format. While the METAR code has been adopted worldwide, each country is allowed to make modifications to the code. Normally, these differences are minor but necessary to accommodate local procedures or particular units of measure. This discussion of METAR will cover elements used in the United States.

Information for METAR reports is observed hourly between 45 minutes after the hour until the top of the hour. The observation is made by either a person or automated equipment. While the exact time may vary from one reporting station to the next, a routine METAR will be reported between 50 minutes after the hour until the top of the hour.

If there is a significant change in the weather during the hour prior to a new METAR being reported, then a special report will be made. This is called a SPECI report.

SPECI - Special Weather Report - reported at any time when:
- There is a change in wind direction by 45 degrees or more in less than 15 minutes with a steady speed of 10 knots or more
- A thunderstorm forms or dissipates
- A layer of clouds or obscuring phenomenon aloft forms below 1,000 feet AGL

METARs provide information on current conditions for a specific airport out to a radius of 5 statute miles. Weather reported as being in the vicinity (VC) indicates conditions observed between 5 and 10 statute miles from the reporting station. Weather reported as being distant (DSNT) indicates conditions observed beyond 10 statute miles from the reporting station.

Example:
METAR KGGG 161753Z AUTO 14021G26 3/4SM +TSRA BR BKN008 OVC012CB 18/17 A2970 RMK PRESFR

A typical METAR report contains the following information in sequential order:

1. Type of Report— There are two types of METAR reports. The first is the routine METAR report that is transmitted every hour. The second is the aviation selected special weather report (SPECI).

This is a special report that can be given at any time to update the METAR for rapidly changing weather conditions, aircraft mishaps, or other critical information.

2. Station Identifier— Each station is identified by a four-letter code as established by the International Civil Aviation Organization (ICAO). In the 48 contiguous states, a unique three-letter identifier is preceded by the letter "K." For example, Gregg County Airport in Longview, Texas, is identified by the letters "KGGG," K being the country designation and GGG being the airport identifier. In other regions of the world, including Alaska and Hawaii, the first two letters of the four-letter ICAO identifier indicate the region, country, or state. Alaska identifiers always begin with the letters "PA" and Hawaii identifiers always begin with the letters "PH."

3. Date and Time of Report— The date and time (161753Z) are depicted in a six-digit group. The first two digits of the six-digit group are the date. The last four digits are the time of the METAR, which is always given in Coordinated Universal Time (UTC). A "Z" is appended to the end of the time to denote the time is given in Zulu time (UTC) as opposed to local time.

4. Modifier—Modifiers denote that the METAR came from an automated source or that the report was corrected. If the notation "AUTO" is listed in the METAR, the report came from an automated source. It also lists "AO1" or "AO2" in the remarks section to indicate the type of precipitation sensors employed at the automated station. When the modifier "COR" is used, it identifies a corrected report sent out to replace an earlier report that contained an error. Example:
METAR KGGG 161753Z COR

5. Wind—Winds are reported with five digits (14021) unless the speed is greater than 99 knots, in which case the wind is reported with six digits. The first three digits indicate the direction the wind is blowing in tens of degrees. If the wind is variable, it is reported as "VRB." The last two digits indicate the speed of the wind in knots (KT) unless the wind is greater than 99 knots, in which case it is indicated by three digits. If the winds are gusting, the letter "G" follows the wind speed (G26). After the letter "G," the peak gust recorded is provided. If the wind varies more than 60° and the wind speed is greater than 6 knots, a separate group of numbers, separated by a "V," will indicate the extremes of the wind directions.

6. Visibility— The prevailing visibility (3/4 SM) is reported in statute miles as denoted by the letters "SM." It is reported in both miles and fractions of miles. At times, RVR, or runway visual range is reported following the prevailing visibility. RVR is the distance a pilot can see down the runway in a moving aircraft. When RVR is reported, it is shown with an R, then the runway number followed by a slant, then the visual range in feet. For example, when the RVR is reported as R17L/1400FT, it translates to a visual range of 1,400 feet on runway 17 left.

Closely related to cloud cover and reported ceilings is visibility information. Visibility refers to the greatest horizontal distance at which prominent objects can be viewed with the naked eye. Current visibility is also reported in METAR and other aviation weather reports, as well as automated weather stations. Visibility information, as predicted by meteorologists, is available during a preflight weather briefing.

The maximum visibility reported in a METAR is 10 SM. If the visibility is less than 10 SM, the reason for the reduced visibility is given.

7. Weather— Weather can be broken down into two different categories: qualifiers and weather phenomenon (+TSRA BR). First, the qualifiers of intensity, proximity and the descriptor of the weather will be given. The intensity may be light (-), moderate ( ) or heavy (+). Proximity only depicts weather phenomena that are in the airport vicinity. Descriptors are used to describe certain types of precipitation and obscurations. Weather phenomena may be reported as being precipitation, obscurations and other phenomena such as squalls or funnel clouds. Descriptions of weather phenomena as they begin or end and hailstone size are also listed in the remarks section of the report.

QUALIFIER		WEATHER PHENOMENA		
INTENSITY OR PROXIMITY 1	DESCRIPTOR 2	PRECIPITATION 3	OBSCURATION 4	OTHER 5
Light Moderate (see note 2) + Heavy VC In the Vicinity (see note 3)	MI Shallow PR Partial BC Patches DR Low Drifting BL Blowing SH Shower(s) TS Thunderstorm FZ Freezing	DZ Drizzle RA Rain SN Snow SG Snow Grains IC Ice Crystals PL Ice Pellets GR Hail GS Small Hail and/or Snow Pellets UP Unknown Precipitation	BR Mist FG Fog FU Smoke VA Volcanic Ash DU Widespread Dust SA Sand HZ Haze PY Spray	PO Well- Developed Dust/Sand Whirls SQ Squalls FC Funnel Cloud Tornado Waterspout (see note 3) SS Sandstorm SS Dust storm

1. **The weather groups shall be constructed by considering columns 1 to 5 in the table above in sequence, i.e. intensity, followed by description, followed by weather phenomena, e.g. heavy rain shower(s) is coded as +SHRA**
2. **To denote moderate intensity no entry or symbol is used.**
3. **Tornados and waterspouts shall be coded as +FC.**

8. Sky Condition— Sky condition (BKN008OVC012CB) is always reported in the sequence of amount, height and type or indefinite ceiling/height (vertical visibility). The heights of the cloud bases are reported with a three-digit number in hundreds of feet above the ground. Clouds above 12,000 feet are not detected or reported by an automated station. The types of clouds, specifically towering cumulus (TCU) or cumulonimbus (CB) clouds are reported with their height. Contractions are used to describe the amount of cloud coverage and obscuring phenomena. The amount of sky coverage is reported in eighths of the sky from horizon to horizon.

A ceiling, for aviation purposes, is the lowest layer of clouds reported as being broken or overcast, or the vertical visibility into an obscuration like fog or haze. Clouds are reported as broken when five-eighths to seven-eighths of the sky is covered with clouds. Overcast means the entire sky is covered with clouds. Current ceiling information is reported by the aviation routine weather report (METAR) and automated weather stations of various types.

9. Temperature and Dew point— The air temperature and dew point are always given in degrees Celsius (18/17). Temperatures below 0°C are preceded by the letter “M” to indicate minus.

The relationship between dew point and temperature defines the concept of relative humidity. The dew point, given in degrees, is the temperature at which the air can hold no more moisture. When the temperature of the air is reduced to the dewpoint, the air is completely saturated and moisture begins to condense out of the air in the form of fog, dew, frost, clouds, rain, hail, or snow.

As moist, unstable air rises, clouds often form at the altitude where temperature and dew point reach the same value. When lifted, unsaturated air cools at a rate of 5.4 degrees F per 1,000 feet and the dew point temperature decreases at a rate of 1 degree F per 1,000 feet. This results in a convergence of temperature and dew point at a rate of 4.4 degrees F. Apply the convergence rate to the reported temperature and dew point to determine the height of the cloud base.

10. Altimeter Setting— The altimeter setting is reported as inches of mercury in a four-digit number group (A2970). It is always preceded by the letter “A.” Rising or falling pressure may also be denoted in the remarks sections as “PRESRR” or “PRESFR” respectively.

11. Remarks—Comments may or may not appear in this section of the METAR. The information contained in this section may include wind data, variable visibility, beginning and ending times of

particular phenomenon, pressure information and various other information deemed necessary. An example of a remark regarding weather phenomenon that does not fit in any other category would be: OCNLLTGICCG. This translates as occasional lightning in the clouds and from cloud to ground. Automated stations also use the remarks section to indicate the equipment needs maintenance. The remarks section always begins with the letters “RMK.”

Example:
METAR BTR 161753Z 14021G26 3/4SM -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 degrees at 21 knots gusting to 26 knots
Visibility: .....3/4 statute mile
Weather: .....light rain and mist
Sky Conditions: .....Skies broken 800 feet, overcast 1,200
Temperature: .....Temperature 18° C, dewpoint 17° C
Altimeter: .....29.70 in. Hg
Remarks: .....Barometric pressure is falling.

AVIATION FORECASTS
Observed weather condition reports are often used in the creation of forecasts for the same area. A variety of different forecast products are produced and designed to be used in the preflight planning stage. Only the Terminal Aerodrome Forecast (TAF) will be discussed in this lesson.

TERMINAL AERODROME FORECASTS (TAF)
TAFs are always produced by a human forecaster. For this reason there are far fewer TAF locations than there are METARs. TAFs take into account local, small-scale, geographic effects. While this information may be included at military installations and on international TAFs, the National Weather Service (NWS) does not include temperature, icing or turbulence information.

A TAF is a report established for the 5 statute mile radius around an airport. Weather within 10 SM will sometimes be included, and will be coded as VC for vicinity. For example, thunderstorms in the vicinity will be coded as VCTS. TAFs are issued every six hours (0000Z, 0600Z, 1200Z, 1800Z). TAFs will often be issued a short time prior to the scheduled forecast time. While TAFs are valid for up to 24 hours, they are replaced by the next one issued. When current or forecast weather conditions differ drastically from the issued TAF, a forecaster will issue an amendment and AMD will be coded in the beginning of the TAF. At some airports, TAFs are not issued 24 hours a day. NIL is used when the forecasting station is closed, when two consecutive METARs have not been issued for the airport, or the information from the observation station is not being transmitted to the forecasting station. The TAF utilizes the same descriptors and abbreviations as used in the METAR report.

The TAF includes the following information in sequential order:

1. Type of Report— A TAF can be either a routine forecast (TAF) or an amended forecast (TAF AMD).

2. ICAO Station Identifier— The station identifier is the same as that used in a METAR.

3. Date and Time of Origin— Time and date of TAF origination is given in the six-number code with the first two being the date, the last four being the time. Time is always given in UTC as denoted by the Z following the number group.

4. Valid Period Date and Time—The valid forecast time period is given by a six digit number group. The first two numbers indicate the date, followed by the two digit beginning time for the valid period, and the last two digits are the ending time. The TAF will show, for example, 2418/2524. This means that the TAF is valid from day 24 of the month at 1800Z to day 25 of the month at 2400Z.

5. Forecast Wind— The wind direction and speed forecast are given in a five digit number group. The first three indicate the direction of the wind in reference to true north. The last two digits state the wind-speed in knots as denoted by the letters “KT.” Like the METAR, winds greater than 99 knots are given in three digits.

6. Forecast Visibility— The forecast visibility is given in statute miles and may be in whole numbers or fractions. If the forecast is greater than 6 miles, it will be coded as “P6SM.”

7. Forecast Significant Weather— Weather phenomenon is coded in the TAF reports in the same format as the METAR. If no significant weather is expected during the forecast time period, the denotation “NSW” will be included in the “becoming” or “temporary” weather groups.

8. Forecast Sky Condition— Forecast sky conditions are given in the same manner as the METAR. Only cumulonimbus (CB) clouds are forecast in this portion of the TAF report as opposed to CBs and towering cumulus in the METAR.

9. Forecast Change— For any weather change forecast to occur during the TAF time period, the expected conditions and time period are included in this group. This information may be shown as From (FM), Becoming (BECMG), and Temporary (TEMPO). “From” is used when a rapid and significant change, usually within an hour, is expected. “Becoming” is used when a gradual change in the weather is expected over a period of no more than 2 hours. “Temporary” is used for temporary fluctuations of weather, expected to last for less than an hour.

FM designator- There will be a date and time identifier preceding the forecast information. FM180900, meaning from day 18 of the month at 0900Z. The FM change group is for significant and rapid change to a new set of prevailing weather conditions.

BECMG group - The “becoming” designator is used for gradual changes in weather taking place over a longer time frame—usually two hours. The changes, like the elements we have already discussed, are bracketed by date and time identifiers. So BECMG 1914/1918 VRB35G50 1SM TSRA BKN010CB means that strong, gusty winds to 50 knots, visibilities of one mile, and thunderstorms with 1,000-foot broken skies and cumulonimbus clouds are expected to appear between 1400Z and 1800Z on day 19 of the month.

TEMPO group - There is a date and time breakdown for temporary weather conditions. TEMPO 1908/1912 means that the forecast conditions are valid on day 19 of the month, between 0800Z and 1200Z. TEMPO refers to any change in wind, visibility, weather, or sky condition that is expected to last for “generally less than an hour at a time, and is expected to occur during less than half the time period.” For the above time period—0800Z to 1200Z—the temporary weather is expected to last for less than an hour, and take place during less than two hours.

PROB Forecast— The probability forecast is a given percentage that describes the probability of thunderstorms and precipitation occurring in the coming hours. This forecast is not used for the first 6 hours of the 24-hour forecast. You see a date after this probability forecast, e.g. PROB40 1812/1820, meaning a 40-49 percent probability of the forecast weather from day 18 between 1200Z and 2000Z.

TAF AMD (Amended Terminal Forecast) is issued when the previous version is no longer representative of the current or expected weather during the time period (usually 24-30 hours). The amended TAF supersedes the previous TAF.

TAF COR (Corrected Terminal Forecast) is a TAF that has been corrected. When a corrected TAF is issued, disregard previous TAFs.

Always refer to the amendment date/time group at the end of the TAF to distinguish the most current forecast.

NOTICE TO AIRMEN (NOTAM)
Time-critical information which is of either a temporary nature or not sufficiently known in advance to permit publication on aeronautical charts or in other operational publications receives immediate dissemination via the National NOTAM System. There are two types of NOTAMS.

FDC NOTAM – Regulatory - Flight Data Center. These NOTAMs are regulatory in nature which means that it is imperative for the pilot to know and follow them. For example, the airport is closed.

NOTAM (D) – Non-regulatory. These NOTAMs are good to know but not necessarily critical. For example, the taxiway is closed.