CHAPTER 2

SURFACE WEATHER OBSERVATION PROGRAM

2.1 General

Surface weather observations are fundamental to all meteorological services. Observations are the basic information upon which forecasts and warnings are made in support of a wide range of weather sensitive activities within the public and private sectors.

2.2 Scope

This chapter briefly describes the Federal Government's surface weather observation program and outlines the observing program and procedures which apply to each of the agencies involved in surface weather observing. In addition, the chapter addresses the types of dissemination and the general requirements for verifying and making corrections to disseminated reports.

2.3 Surface Weather Observation Program

The Departments of Commerce (DOC), Defense (DOD), and Transportation (DOT) have established networks of stations that collectively provide the meteorological data used by the public and private sectors. As the Nation's primary civil meteorological agency, the DOC's National Weather Service (NWS) has the responsibility for observing, analyzing and forecasting weather conditions. DOD organizational elements within the U. S. Air Force (Major Commands), Marine Corps, and Navy (Naval Meteorology and Oceanography Command (NAVMETOCCOM)) take weather observations to support DOD operations worldwide. In addition to taking observations, the DOT's Federal Aviation Administration (FAA), as the agency responsible for safe operation of aircraft and efficient use of the Nation's airspace system, has the role of establishing requirements for, and disseminating aviation weather data to airspace users.

In addition to the observations taken by the above Federal agencies, observations are taken by commercial airline companies, private individuals, and local and state government agencies. These non-Federal locations are established and operated under the guidance of the NWS, in cooperation with the FAA.

2.4 Aviation Weather Observing Locations

There shall not be more than one official observation for a specific location at any one time. For meteorological observations, the observing location is defined as the point or points at which the various elements of the observation are evaluated. At a large airport, the locations may be defined as follows:

a. For clouds, surface visibility, and weather, the observing location may be at the touchdown area of the primary runway.

b. For tower visibility, the observing location shall be the Airport Traffic Control Tower (ATCT).

c. For temperature, dew point, and wind, the observing location may be the center of the runway complex.

d. For the location, type, and frequency of lightning (see paragraph 12.7.1.j(2)), the observing location may be the Airport Location Point (ALP) .

Specific details on the siting of observing equipment can be found in the Station Information File (see paragraph 4.3.1).

Manual and augmented weather observations may also contain information on phenomena occurring at other than the station. In these cases, the point(s) where the phenomenon occurs is not considered to be an additional observing location.

2.5 Types of Reports

2.5.1 Aviation Routine Weather Report (METAR)

METAR is the primary observation code used in the United States to satisfy requirements for reporting surface meteorological data. METAR contains a report of wind, visibility, runway visual range, present weather, sky condition, temperature, dew point, and altimeter setting collectively referred to as "the body of the report". In addition, coded and/or plain language information which elaborates on data in the body of the report may be appended to the METAR. This significant information can be found in the section referred to as "Remarks". The contents of the remarks will vary according to the type of weather station. At designated stations, the METAR may be abridged to include one or more of the above elements.

2.5.2 Aviation Selected Special Weather Report (SPECI)

SPECI is an unscheduled report taken when any of the criteria given in paragraph 2.5.2.a have been observed. SPECI shall contain all data elements found in a METAR plus additional plain language information which elaborates on data in the body of the report. All SPECIs shall be made as soon as possible after the relevant criteria are observed.

a. **Criteria for SPECI**

(1) WIND SHIFT. Wind direction changes by 45 degrees or more in less than 15 minutes and the wind speed is 10 knots or more throughout the wind shift.

(2) VISIBILITY. Surface visibility as reported in the body of the report decreases to less than, or if below, increases to equal or exceed:

(a) 3 miles.
(b) 2 miles.
(c) 1 mile.
(d) The lowest standard instrument approach procedure minimum as published in the National Ocean Service (NOS) *U.S. Terminal Procedures*. If none published, use 1/2 mile.

(3) RUNWAY VISUAL RANGE (RVR). The highest value from the designated RVR runway decreases to less than, or if below, increases to equal or exceed 2,400 feet during the preceding 10 minutes. U.S. military stations may not report a SPECI based on RVR.

(4) TORNADO, FUNNEL CLOUD, OR WATERSPOUT.

(a) is observed.
(b) disappears from sight, or ends.

(5) THUNDERSTORM.

(a) begins (a SPECI is not required to report the beginning of a new thunderstorm if one is currently reported).
(b) ends.

(6) PRECIPITATION.

(a) hail begins or ends.
(b) freezing precipitation begins, ends, or changes intensity.
(c) ice pellets begin, end, or change intensity.

(7) SQUALLS. When squalls occur.

(8) CEILING. The ceiling (rounded off to reportable values) forms or dissipates below, decreases to less than, or if below, increases to equal or exceed:

(a) 3,000 feet.
(b) 1,500 feet.
(c) 1,000 feet.
(d) 500 feet.
(e) The lowest standard instrument approach procedure minimum as published in the National Ocean Service (NOS) *U.S. Terminal Procedures*. If none published, use 200 feet.

(9) SKY CONDITION. A layer of clouds or obscurations aloft is present below 1,000 feet and no layer aloft was reported below 1,000 feet in the preceding METAR or SPECI.

(10) VOLCANIC ERUPTION. When an eruption is first noted.

(11) AIRCRAFT MISHAP. Upon notification of an Aircraft Mishap unless there has been an intervening observation.

(12) MISCELLANEOUS. Any other meteorological situation designated by the responsible agency, or which, in the opinion of the observer, is critical.

b. The SPECI criteria are only applicable to stations that have the capability of evaluating the event. For example, visually evaluated elements, such as a tornado, are not applicable to non-staffed automated stations.

2.6 Observing Standards Applicable to All Stations

2.6.1 Use of Certified Observers. All personnel performing an observation function shall be certified in accordance with paragraph 3.3.1. Certification may be limited in accordance with observer responsibilities.

2.6.2 Backup. Backup refers to a method, in accordance with agency procedures, for providing meteorological reports, parts of reports, documentation, or communication of reports when the primary method is unavailable.

2.6.3 Rounding Figures. Except where otherwise designated in this Handbook, the rounding of numbers shall be accomplished as follows: If the fractional part of a positive number to be dropped is equal to or greater than one-half, the preceding digit shall be increased by one. If the fractional part of a negative number to be dropped is greater than one-half, the preceding digit shall be decreased by one. In all other cases, the preceding digit shall remain unchanged. For example, 1.5 becomes 2, -1.5 becomes -1, 1.3 becomes 1, and -2.6 becomes -3.

2.6.4 Time Used in Reports. With the exception of designated stations which shall transmit reports in accordance with agency instructions, METAR shall be transmitted at fixed intervals with SPECI transmitted when any of the criteria in paragraph 2.5.2.a occurs or is noted. Each station's schedule for transmitting reports shall be included in the Station Information File (see paragraph 4.3.1).

a. **Accuracy of Time in Reports.** A procedure shall be established to assure that the accuracy of the timing device used to establish times in the observation program are within ±1 minute of the U.S. Naval Observatory time.

b. **Scheduled Time of Report.** The scheduled time of the METAR shall be the Coordinated Universal Time (UTC) a METAR is required to be available for transmission.

c. **Actual Date and Time of Observation.** The actual date and time of METAR shall be the time the last element of the observation was observed. The actual time of a SPECI shall be the time the criteria for the SPECI was met or noted.

d. **Time Disseminated in Observations.** All times disseminated in observations shall reference the 24-hour UTC clock, e.g., 1:47 A.M. shall be referred to as 0147 and 1:47 P.M. as 1347. The times 0000 and 2359 shall indicate the beginning and ending of the day, respectively.

e. **Date and Time Entered in Observations.** All dates and times entered in observations shall be with reference to the 24-hour clock. The times that are disseminated as part of the observation shall be entered in UTC. However, at the discretion of the responsible agency, those times used to otherwise document the observation or other related observational data may be either Local Standard Time (LST) or UTC. The time standard selected shall be clearly indicated on all records; if LST is used, the number of hours used to convert to UTC shall also be indicated.

2.6.5 Sensor Siting Standards. All installations of sensors shall be in accordance with the latest *Federal Standard for Siting Meteorological Sensors at Airports* published by the OFCM. Presently installed sensors may be operated at their present location. However, if they must be relocated, the Federal standards shall be followed.

2.6.6 Algorithms Used by Automated Stations. Automated stations shall use algorithms that conform with the latest *Federal Standard Algorithms for Automated Weather Observing Systems* published by the OFCM. These algorithms do not apply to previously authorized systems, which may continue to operate until replaced or modified.

2.7 Recency of Observed Elements

2.7.1 Recency of Observed Elements at Automated Stations. Individual elements entered in an observation shall, as closely as possible, reflect conditions existing at the actual time of observation. For those elements that the human observer evaluates using spatial averaging techniques (e.g., sky cover and visibility), the automated station substitutes time averaging of sensor data. Therefore, in an automated observation, sky condition shall be an evaluation of sensor data gathered during the 30-minute period ending at the actual time of the observation. All other elements evaluated shall be based on sensor data that is within 10 minutes or less of the actual time of the observation.

2.7.2 Recency of Observed Elements at Manual Stations. Individual elements entered in an observation shall, as closely as possible, reflect conditions existing at the actual time of observation. Elements entered shall have been observed within 15 minutes of the actual time of the observation. Gusts and squalls shall be reported if observed within 10 minutes of the actual time of the observation. Observation of elements shall be made as close to the scheduled time of the observation as possible to meet filing deadlines, but in no case shall these observations be started more than 15 minutes before the scheduled time.

2.8 Dissemination

For purposes of this Handbook, dissemination is the act of delivering a completed report to users.

2.8.1 Types of Dissemination. There are two general types of dissemination:

a. **Local** -- The transmission or delivery of a weather report to individual or groups of users in the service area of the weather station.

b. **Long-line** -- The transmission of a weather report beyond the service area of the weather station.

2.8.2 Dissemination Requirements. All reports shall be given local dissemination. At designated stations, reports shall be given long-line dissemination. When reports are corrected, the corrected reports shall be given the same dissemination as the reports being corrected.

2.8.3 Dissemination Priority. If reports cannot be disseminated simultaneously, local and long-line, they should be disseminated first to the local airport traffic control users. Further dissemination priorities shall be defined by the responsible agencies.

2.8.4 Corrections to Transmitted Data. Corrections shall be disseminated, as soon as possible, whenever an error is detected in a transmitted report. However, if the erroneous data has been superseded by a later report (with the same or more complete dissemination), it shall not be necessary to transmit the corrected report. Corrections transmitted shall consist of the entire corrected report. The original date and time of the report shall be used as the date and time in the corrected report.

2.9 Report Filing Time

SPECIs shall be completed and transmitted, as soon as possible. Agencies shall establish filing deadlines for all METARs; the filing deadlines shall be no sooner than necessary to assure the availability of the report at its scheduled time. METARs shall not be transmitted sooner than 10 minutes before their scheduled time.

2.10 Delayed Reports

When transmission of an observation is delayed until time for the next regularly scheduled report, only the latest report shall be transmitted. In the record of observations, the remark **FIBI** (Filed But Impractical to Transmit) shall be appended in parentheses to the report that was not transmitted to indicate the report was not transmitted. The remark FIBI shall not be included in any local dissemination of the report.

When a SPECI is not transmitted long-line, the later SPECI shall be transmitted long-line only when the overall change between the last transmitted report and the current report satisfies the criteria for a SPECI. If the SPECI is not transmitted long-line, the remark FIBI shall be appended to the report in the record of observations. The SPECI shall be disseminated locally.

Reports of Volcanic Eruption shall be disseminated, by any means possible, regardless of the delay.