BY ORDER OF THE SECRETARY OF THE AIR FORCE

AIR FORCE MANUAL 15-111

12 MARCH 2019

Weather

SURFACE WEATHER OBSERVATIONS

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

ACCESSIBILITY: This publication is available digitally on the e-Publishing website at **www.e-Publishing.af.mil** for downloading or ordering

RELEASABILITY: There are no releasability restrictions on this publication

---

OPR: HQ USAF/A3WP

Certified by: HQ USAF/A3W (Mr. Ralph O. Stoffler)

Supersedes: AFMAN15-111, 27 February 2013

Pages: 106

This manual implements Air Force (AF) Policy Directive (AFPD) 15-1, *Weather Operations.* It also implements World Meteorological Organization (WMO) *Manual on Codes, No. 306, Volume I.1 and Volume II.* It prescribes basic observing fundamentals and terms and establishes aviation code forms for recording and disseminating weather observations. This publication applies to all Regular Air Force, Air Force Reserve and Air National Guard organizations with assigned weather personnel, and to the uniformed members, civilian employees and contractors assigned thereto. This AF Manual (AFMAN) may be supplemented at any level, but all supplements that directly implement this publication must be routed to the office of primary responsibility (OPR) for coordination prior to certification and approval. Refer recommended changes and questions about this publication to the Office of Primary Responsibility (OPR) using the AF Form 847, *Recommendation for Change of Publication*; route AF Forms 847 from the field through the appropriate functional chain of command. The authorities to waive wing/organization level requirements in this publication are identified with a Tier ("**T-0, T-1, T-2, T-3**") number following the compliance statement. See AFI 33-360, *Publications and Forms Management*, for a description of the authorities associated with the Tier numbers. Submit requests for waivers through the chain of command to the appropriate Tier waiver approval authority, or alternately, to this publications' OPR for non-tiered compliance items. Ensure all records created as a result of processes prescribed in this publication are maintained in accordance with Air Force Manual 33-363, Management of Records, and disposed of in accordance with the Air Force Records Disposition Schedule located in the Air Force Records Information Management System. The use of the name or mark of any

specific manufacturer, commercial product, commodity or service in this publication does not imply endorsement by the AF.

SUMMARY OF CHANGES

This document has been substantially revised and needs to be completely reviewed. Major changes include the addition of roles and responsibilities and the reorganization of weather elements into respective chapters. The majority of operations have not changed but this manual must be read in entirety because of its restructure.

Chapter 1

OVERVIEW

1.1. General. This manual prescribes AF surface weather observing and reporting procedures based on guidance issued by WMO, the International Civil Aviation Organization (ICAO), National Weather Service (NWS), Federal Aviation Administration (FAA), and Allied Publications. Additionally, the FCM-H1 establishes an agreed upon minimum standard for surface weather observation requirements and procedures for Continental United States (CONUS) Federal meteorological agencies. Based on FCM-H1, this manual incorporates procedures applicable to AF weather operations in both US and overseas locations.

1.2. The procedures in this manual apply to all AF Weather organizations or associated contractors performing weather observing in support of AF, Army, or DoD wide operations. No set of procedures can cover all possibilities in weather observing. Weather personnel are expected to use their own judgment and experience, adhering as closely as possible to the procedures in this manual, to describe phenomena not covered adequately in the following chapters, while maintaining a focus on accuracy and safety of flight. **Note:** For the purposes of this manual, all organizations, regardless of size or makeup, tasked with preparing weather observations are referred to as weather flights (WFs) and detachments (Dets).

1.3. The AN/FMQ-19, AN/FMQ-22 and AN/FMQ-23 are certified AF fixed base weather observing systems (FBWOS). During controlled airfield hours, position-certified weather personnel will be physically present at an airfield weather services location to augment FBWOS observations. **(T-3)**. **Note:** For the purposes of this manual, with regards to airfield status, "controlled" refers to periods of time that the airfield is being controlled by an air traffic control (ATC) tower and is designated as Class B, C or D airspace.

Chapter 2

ROLES AND RESPONSIBILITIES

2.1. AF/A3W will process all T-0 waiver requests submitted by Air Force Weather organizations.

2.2. WF/Det Leadership will:

2.2.1. Submit all T-0 waiver requests to HQ USAF/A3W for coordination with external Federal agencies. **(T-1).**

2.2.2. Establish procedures to check all manually entered surface weather observations for erroneous data before dissemination and again after dissemination before the next observation to verify that no errors were generated during the dissemination process. **(T-3).**

2.2.3. Meteorological Equipment. Ensure performance of required user/operator maintenance on tactical meteorological equipment IAW Technical Orders (TOs)/operator manuals. **(T-2).**

2.2.3.1. Coordinate with host installation/supporting airfield and computer systems maintenance personnel to arrange maintenance support for assigned meteorological and communications systems, to include equipment calibration and standardization IAW established maintenance schedules and other contract or local instructions outlining acceptable maintenance support and response times. **(T-2).**

2.2.3.2. Ensure meteorological systems are calibrated and standardized upon installation IAW applicable periodic maintenance intervals, and after any major maintenance is performed on an instrument or sensor. **(T-1).**

2.2.4. Incorporate this AFMAN and major command (MAJCOM) guidance to document back-up equipment procedures for all equipment used to produce an observation to include lines of communication. **(T-1).**

2.2.5. Accompany airfield systems personnel on inspection of FBWOS and log any new equipment limitation(s) in appropriate Flight Information Handbook or report equipment issues to higher level(s) (e.g., MAJCOM).

2.2.6. Develop procedures to review new DoD FLIPs IAW AFI 11-201, *Flight Information Publication (FLIP),* to specify those AF and Army airfields operating with an FBWOS. Additionally, review radar instrument approach minimums, local notices to airmen (NOTAMs) and applicable directives for changes in airfield minima after publication. **(T-2).** See the Air Force Weather Techniques and Procedures – Flight Information Publication Procedures located on the AF Weather Knowledge Center (AFWKC).

2.2.7. Ensure the station information file (SIF) is current. Coordinate updates with the supporting Operational Weather Squadron (OWS) and the 14th Weather Squadron (WS) to preserve the observing location in their historical file.

2.2.8. Establish procedures to ensure quality control of the observations and Summary of the Day (SOD) data. **(T-3). Note:** When developing procedures, leadership should keep in mind that Joint Environmental Toolkit (JET) only archives the JET Form 3813s for 7 days.

2.2.9. Designate a single timepiece as a standard clock and establish procedures to perform a time check on a daily basis when open. **(T-1).**

2.2.10. Determine, document and update observation special (SPECI) criteria using local ceiling, prevailing visibility, and runway visual range (RVR) landing and circling minima. **(T-2).**

2.2.11. Document local RVR requirements/reporting deviations in the installation support plan. **(T-1).**

2.2.12. Establish an Alternate Operating Location (AOL) for use when the primary location must be evacuated. **(T-2).**

2.2.12.1. Ensure the AOL has adequate communications and a view of the airfield complex. **(T-3).**

2.2.12.2. Document AOL operations, limiting factors, and any reciprocal support from other agencies in the weather support plan. **(T-1).**

2.2.13. Establish a cooperative weather watch agreement with Air Traffic Control (ATC) and other appropriate agencies. **(T-1).** Document in local procedures as well as the base/host unit weather support plan. **(T-3).**

2.3. WF/Det technicians responsible for preparing weather observations will:

2.3.1. Disseminate all observations local and longline in the appropriate code format. **(T-0).**

2.3.2. Function as the "eyes forward" for the servicing OWS, and serve as the primary point of contact for the collaborative forecast effort to include resource protection for the installation. **(T-1).**

2.3.3. Maintain labeled photographs, lists or other means of identifying objects with known distances to be used as aids when manually determining visibility for the primary observation point, AOL, and ATC tower. **(T-1).** Annually review and certify as current, or update their visibility reference tool(s). **(T-1).**

2.3.4. Ensure supported ATC agencies are notified of all outages prior to contacting a maintenance agency as well as prior to an outage due to scheduled/routine maintenance. **(T-1).** Additionally, weather personnel will notify the supporting OWS when time permits. **(T-2).**

2.3.5. Transmit the JET Form 3813 or AF Form 3803, *Surface Weather Observations (METAR/SPECI),* to the 14 WS for archival on a scheduled basis IAW instructions on the 14WS website: **https://climate.af.mil/**. **(T-1).** **Attachment 2**

Chapter 3

REPORTING AND ENCODING WEATHER OBSERVATIONS

3.1. Aviation Weather Code Forms. This chapter contains information and directive guidance on reporting and encoding weather observations. In addition to prescribing basic observing fundamentals and terms, this chapter establishes aviation code forms for recording and disseminating METAR, SPECI, and LOCAL weather observations.

3.1.1. Aviation Routine Weather Report (METAR). A METAR is a routine scheduled observation as well as the primary observation code used by the United States to satisfy requirements for reporting surface meteorological data. METARs contain a complete report of wind, visibility, runway visual range (RVR), present weather, sky condition, temperature, dew point and altimeter setting collectively referred to as "the body of the observation." In addition, encoded and/or plain language information that elaborates on data in the body of the observation is appended in the METAR remarks (RMK) section. The contents of the remarks vary according to the mode of operation (e.g., automated or augmented), and are defined in each part of this manual.

3.1.1.1. WFs/Dets will operate with established METAR file times between 55 to 59 minutes past the hour. **(T-2).** When augmenting an FBWOS, the time ascribed to the observation is based on the last observed element to the nearest minute.

3.1.1.2. METAR observations taken at 0000, 0600, 1200, and 1800 Coordinated Universal Time (UTC) include additional data and are known as “6-hourly observations.” The METAR observations taken at 0300, 0900, 1500, and 2100 UTC also contain additional information and are known as “3-hourly observations.”

3.1.2. Aviation Selected Special Weather Report (SPECI). A SPECI is an unscheduled observation completed and transmitted when any of the special criteria listed in **Attachment 2** are observed or sensed. SPECIs contain all data elements found in a METAR plus additional remarks that elaborate on data in the body of the observation. All SPECI reports will be prepared and transmitted as soon as possible after the relevant criteria are observed. **(T-2).** The time ascribed to a SPECI reflects the time, to the nearest minute, that the SPECI criteria are first met or observed. For a METAR with SPECI criteria, the actual time ascribed to the observation is +55 to +59 minutes past the hour (standard time of a METAR observation) when the last element of an observation is recorded.

3.1.2.1. Base SPECI criteria on published take-off, landing, and circling airfield minima (e.g., Instrument Landing System [ILS], Tactical Air Navigation system [TACAN]) and other AF, higher headquarters, MAJCOM, Army and installation directives for all approaches. **(T-2).**

3.1.2.2. Range criteria may take the place of the criteria in **Attachment 2**.

3.1.2.3. Units may supplement the criteria values in **Attachment 2** with values from Combatant Commander Instructions, manuals, or supplement relating to minima for take-off, landing, visual flight rules (VFR), instrument flight rules (IFR) and alternates.

3.1.3. Aviation Selected Local Weather Report (LOCAL). A LOCAL is an unscheduled observation, reported to the nearest minute, not meeting SPECI criteria. LOCALs are only taken when unit leadership determines there is a requirement in support of local operations.

3.1.3.1. LOCALs taken in support of aircraft operations are encoded in METAR format. For LOCALs taken and disseminated to agencies other than ATC, the contents are established locally and documented in base/host unit support plans, local weather support agreements or standard operating procedures.

3.1.3.2. Altimeter setting (ALSTG) LOCALs are single element observations that contain the time and ALSTG. When ATC does not have access to real-time ALSTGs, WFs/Dets will disseminate an ALSTG LOCAL observation at an interval not to exceed 35 minutes when there has been a change of 0.01 inches of mercury (iHg) (0.3 hectopascals [hPa]) or more since the last disseminated ALSTG value. **(T-1). Note:** A METAR or SPECI taken within the established time interval fulfills this requirement.

3.2. METAR/SPECI Code Format. The METAR/SPECI report has two major sections: the Body and the Remarks. **Figure 3.1** contains the METAR/SPECI code, format and contents of the Body and Remarks sections of an observation. Together, the body and remarks make up the complete METAR/SPECI coded report and are encoded in the order shown in **Figure 3.1**. The underline character "_" indicates a required space between the groups. The actual content of the report depends on the observation program at the individual observing organization. **Note:** Proper encoding of individual elements can be found in their respective chapters.

Figure 3.1. Automated/Augmented METAR/SPECI Code.

METAR or SPECI	**_CCCC_YYGGggZ_COR** or **AUTO_dddff(f)G$f_m$$f_m$ (f_m)KT_$d_n$$d_n$$d_nVd_x$$d_x$$d_x$_ VVVVVSM** or **VVVV_RD$_RD_R$[D$_R$]/V$_RV_RV_RV_RFT, RD_RD_R$[D$_R$]/ V$_NV_NV_NV_NVV_XV_XV_XV_X$FT**, or **RD$_RD_R$[D$_R$]/V$_RV_RV_RV_R$, RD$_RD_R$[D$_R$]/V$_NV_NV_NV_NVV_XV_XV_XV_X$_w'w'_$N_sN_sN_sh_sh_sh_s$** or **VV$h_sh_sh_s$** or **CLR_T'T'/T'$_dT'_d$_AP$_HP_HP_HP_H$_RMK_(Automated, Manual, Plain Language)_(Additive Data and Automated Maintenance Indicators)**
Body of Report	
(1) Type of Report - **METAR or SPECI** (2) Station Identifier **- CCCC** (3) Date and Time of Report - **YYGGggZ** (4) Report Modifier - **COR or AUTO** (5) Wind - **dddff(f)G$f_m$$f_m$($f_m$)KT_$d_n$$d_n$$d_nVd_x$$d_x$$d_x$** (6) Visibility - **VVVVVSM (or VVVV)** (7) Runway Visual Range **- RD$_R$D$_R$[D$_R$]//V$_R$V$_R$V$_R$V$_R$FT or RD$_R$D$_R$[D$_R$]/V$_N$V$_N$V$_N$V$_N$VV$_X$V$_X$V$_X$V$_X$FT (or m)** (8) Present Weather - **w'w'** (9) Sky Condition - **$N_sN_sN_sh_sh_sh_s$ or VV$h_sh_sh_s$ or CLR** (10) Temperature and Dew Point - **T'T'/T'$_d$T'$_d$** (11) Altimeter - **AP$_H$P$_H$P$_H$P$_H$**	
Remarks Section of Report—RMK	
(1) Automated, Manual and Plain Language (2) Additive and Maintenance Data	

3.3. Coding METAR or SPECI Reports.

3.3.1. Type of Report (METAR or SPECI). The type of report, METAR or SPECI, is included in all reports. When SPECI criteria are met during the scheduled time of a routine report, the type of report will be a METAR. **(T-0).**

3.3.2. Station Identifier (CCCC). The observing location identifier, CCCC, is included in all reports. The observing location identifier consists of four alphanumeric characters typically representative of the airfield identifier according to the ICAO. A list of approved identifiers can be found in the FAA Order JO 7350 Series, *Location Identifiers*. Temporary and/or supplemental observation identifiers provided by the U.S. military beginning with "KQ" are coordinated IAW this publication.

3.3.3. Date and Time of Report (YYGGggZ). The date, YY, and time, GGgg, are included in all reports. The time is the actual time the report is transmitted longline or when the criteria for a SPECI is met or noted. If the report is a correction (COR) to a previously disseminated report, the time of the corrected report will use the same time as the report being corrected. The date and time group always ends with a "Z", indicating the use of UTC. For example, METAR KGRF 210855Z would be the 0900 scheduled report from KGRF taken at 0855 UTC on the 21st of the month. **(T-0).**

3.3.4. Report Modifier (AUTO or COR). The observation report modifier can be either COR or AUTO.

3.3.4.1. COR is entered into the report modifier group when a corrected METAR or SPECI is transmitted.

3.3.4.2. AUTO identifies the report as a fully automated report with no human intervention. AUTO is automatically included in reports when the weather technician signs off the automated dissemination system (ADS) indicating the observations are no longer being augmented.

3.3.4.3. AUTO and COR will not be seen in the same observation. If the term COR is used, the observation cannot be reported as AUTO, since a weather technician is manually correcting the observation. **(T-0).**

3.4. Coding Missing Data in METAR and SPECI Reports. When an element does not occur, or cannot be observed, the corresponding group and preceding space are omitted from that particular report. When a FBWOS cannot provide an element due to sensor failure, the software will automatically place a missing data flag (M) in the corresponding data field. The system will also include the maintenance indicator ($) at the end of the observation. Together, these two characters will cue the weather technicians to contact ATC agencies and maintenance personnel and begin back-up procedures.

3.5. Remarks (RMK). Remarks, found in **Attachment 3,** generally elaborate on parameters reported in the body of the report, and will be included in all METAR and SPECI observations if required. Remarks will be separated from the altimeter group by a space and the contraction RMK. If there are no remarks, the contraction RMK will not be entered. **(T-0).**

3.5.1. METAR/SPECI remarks fall into 2 major categories: (1) Automated and Augmented; and (2) Additive and Maintenance Data. **Attachment 3** gives an overview of remarks and their order of entry.

3.5.2. Remarks will be made IAW the following: **(T-0).**

3.5.2.1. Use of Contractions and Abbreviations. Where plain language is called for, authorized contractions, abbreviations and symbols will be used to conserve time and space. However, in no case should an essential remark be omitted for the lack of readily available contractions. In such cases, the only requirement is that the remark be clear. For a detailed list of authorized contractions, see the list of abbreviations and acronyms in **Attachment 1** and FAA Order JO 7340 Series, *Contractions.*

3.5.2.2. Time Entries in Remarks. Use UTC minutes past the hour if the time reported occurs during the same hour the observation is taken. UTC hours and minutes are used if the hour is different from the hour of the observation or this manual prescribes the use of hour and minutes.

3.5.2.3. Additive data will be reported at 0000, 0600, 1200, and 1800 UTC. When applicable, augment these reports with snow depth during controlled airfield hours. There is no requirement to augment/back-up additive data outside controlled airfield hours. **(T-0).**

3.5.2.4. Location Entries. Phenomena encoded in the body of the report as vicinity (VC) may be further described (e.g., direction from the observing location) in the remarks. Phenomena occurring beyond, or thought to be beyond, 10 statute miles (SM) of the point of observation may be reported as distant (DSNT) followed by the direction from the observing location. If known, the distance may be included in the remark. In the case of a tornado, the exact location should be included when possible.

3.5.2.5. Movement Entries. Movement of clouds or weather, if known, will be encoded with respect towards the direction the phenomenon is moving. **(T-0).** For example, a thunderstorm 9SM north moving toward the northeast would be encoded as "TS 9N MOV NE."

3.5.2.6. Direction. Directions will use the eight points of the compass encoded in a clockwise order beginning with north. **(T-0).** In the event that the reported phenomena is north but also extends northwest and northeast, record the phenomena in a clockwise direction (e.g., TS 10NW-NE).

3.6. Observation Methods.

3.6.1. Automated Observations. FBWOSs use time averaging of sensor data. Sky condition is an evaluation of sensor data gathered during the 30-minute period ending at the actual time of the observation. All other elements evaluated are based on sensor data that is within 10 minutes or less of the actual time of the observation. For objective elements such as pressure, temperature, dew point, and wind, automated and augmented observations use a fixed location and time-averaging technique. For subjective elements such as sky condition, visibility, and present weather, a FBWOS uses a fixed location, time-linear technique. Some FBWOSs are capable of generating an observation every minute; the One-Minute Observation (OMO) is encoded in METAR format and includes all of the basic weather parameters found in the body of the METAR plus specific automated remarks. The OMO also accepts augmented elements and remarks. The difference between the OMO and the METAR/SPECI is that the OMO is not normally disseminated. The weather technician can manually disseminate the OMO if required, for example, upon arrival at an AOL.

3.6.2. Augmented Observations. A fixed time, spatial averaging technique is used to evaluate subjective elements (i.e. sky condition, visibility, etc.) in augmented observations. Individual elements entered must reflect conditions existing at the actual time of observation. Observation of elements will be made as close to the scheduled time of the observation as possible to meet filing deadlines, but in no case will these observations be started more than 15 minutes before the scheduled time. **(T-1).** Supplement elements evaluated instrumentally with visual observations to ensure accuracy.

3.6.2.1. Order of Observing. Elements having the greatest rate of change are evaluated last. When conditions are relatively unchanging, evaluate outdoor elements first, followed by indoor elements with pressure being last.

3.6.2.2. Before taking observations at night, spend as much time as practicable outside to allow your eyes to adjust to lower light conditions.

3.7. Magnetic Declination. The local magnetic declination must be determined at each observing location to convert wind direction from magnetic to true. **(T-1).** Obtain local magnetic declination from the installation's DoD FLIPs or the Tactical Plotting Chart for your area, whichever is most current, or the National Oceanographic and Atmospheric Administration National Centers for Environmental Information website located at **http://www.ngdc.noaa.gov/geomag-web/#declination**. Local declination changes by several minutes of arc each year at most locations. Weather leadership must monitor FLIPs or revised charts for changes in local magnetic declination. **(T-1).** Shifts in declination may affect the orientation of the wind equipment; therefore, keep maintenance personnel informed of changes.

3.7.1. From magnetic to true: add easterly declination to magnetic direction and subtract westerly declination from magnetic direction.

3.7.2. From true to magnetic: add westerly declination to true direction and subtract easterly declination from true direction.

3.8. Unofficial Weather Reports. Unofficial weather reports are defined as a report of one or more weather elements from an individual who is not task certified to take official weather observations (e.g., a pilot or law enforcement official). Unofficial reports can provide additional and supplemental information that may be important to local aviation and public safety. They can also help increase the WF's/Det's situational awareness. Unofficial reports of severe weather from credible sources within 15 SM will be reported in the remarks section of the observation IAW **Attachment 3** and disseminated longline and locally during augmentation of an FBWOS. **(T-2).** As the "eyes-forward," WFs/Dets follow up credible reports of severe weather with the supporting OWS.

3.9. Modes of Observation. For meteorological observations the 'point of observation' is defined as the designated spot where the elements of an observation are viewed and/or sensed. The point of observation is within 5 SM (8000 m) of the airfield and affords as clear a view as possible of the runway complex. If necessary as an exception, the point of observation may be located further than 5 SM from the airfield but will be documented in the weather support plan and FLIP. **(T-2).**

3.9.1. Automated observations. The point of observation is the location(s) of the primary sensor group and the discontinuity sensor group. If the primary sensor group or the discontinuity sensor group is moved or a site survey shows the reported location information to be in error, the updated latitude, longitude, and elevation are provided in the station information file.

3.9.2. Augmented/Manual observations. The point(s) of observation will be the location of the primary and discontinuity (when available) sensor group(s) for objective elements and the designated point of observation used by WF/Det personnel to evaluate subjective elements and back-up sensed objective elements as needed. **(T-2).**

3.10. Rounding of Figures and Values. Except where otherwise directed in this AFMAN, round figures and values to the nearest reportable value (standard algebraic rounding). Example**:** 1.5 becomes 2, -1.5 becomes -2, 1.3 becomes 1, and -1.4 becomes -1.

3.10.1. When cloud height and visibility values are less than or equal to halfway between two reportable values, report the lower value; otherwise, report the next higher value. Example**:** cloud heights of 2,549 feet (ft) and 2,550 ft are reported as 2,500 ft and visibility values of 5 1/4 SM (8250 m) and 5 1/2 SM (8500 m) are reported as 5 SM (8000 m).

3.10.2. When computations of pressure values require that a number be rounded to comply with standards of reportable values, the number is always rounded down to the next reportable value. Example**:** A station pressure reading of 29.249 is rounded down to 29.245 and 29.244 is rounded down to 29.240. An ALSTG of 29.249 and 29.244 are both truncated to 29.24.

3.10.3. ALSTGs provided for international aviation purposes and reported in hPa are always rounded down and reported as whole numbers. Example**:** 1009.9 hPa and 1009.1 hPa are both truncated to 1009 hPa.

3.11. Dissemination. Most WFs/Dets use an ADS as the primary local and longline dissemination system. During periods when the ADS is unavailable use AF Weather-Web Service (AFW-WEBS), the OWS or another WF/Det to disseminate observations longline. **Figure 3.2** contains example METAR/SPECI augmented observations.

3.11.1. Pressure altitude (PA) and density altitude (DA) are disseminated locally. When required, disseminate PA (e.g., PA +130) or DA (e.g., DA +3680) following the last element or remark in the observation, with the exception of runway condition remarks which are reported last.

3.11.2. Corrections (COR) to Transmitted Data. Disseminate CORs in the same manner as the observation being corrected as soon as possible whenever an error is detected in a transmitted report. However, if the erroneous data has been corrected or superseded by a later report (with the same or more complete dissemination), do not transmit the corrected observation. Transmitted corrections will consist of the entire corrected observation. Use the original date and time of the observation as the date and time in the COR'd observation. See **Attachment 3**. **(T-0).**

Figure 3.2. Examples of Augmented Longline Dissemination of METARs/SPECIs.

Augmented METAR Observations
METAR ETAR 010756Z VRB06KT 1400 R09/1220 -RA BR FEW000 SCT008 OVC012 01/M01 A2938 RMK AO2A TWR VIS 1600 VIS N 3200 CIG 010V015 BR FEW000 SLPNO ALSTG ESTMD;
METAR ETAR 011058Z COR 02010G17KT 1400 R36/4000 HZ SCT007 BKN020 OVC070 20/17 A3019 RMK AO2A SLP015 ALSTG/SLP ESTMD COR 1104;
METAR KHLN 011158Z 27004KT 3/4SM R32/P6000FT -RA BR FEW000 SCT005 OVC020 00/M01 A2992 RMK AO2A TWR VIS 2 BR FEW000 SLP982 ALSTG/SLP ESTMD 60010 70100 4/002 10010 21002 52010;
METAR EOIN 011157Z 30003KT 9999 CLR M04/M10 A3003 RMK AO2A SLP985 70010 4/002;
METAR RKTG 010358Z 00000KT 0800 FG VV011 24/24 A2998 RMK AO2A TWR VIS 1000 SLP982 RVRNO;
METAR ETAB 010655Z 24010G18KT 9999 TS SCT020CB BKN035 30/27 A2993 RMK AO2A TS 4SW MOV NE SLPNO;
METAR KGRF 011157Z 24012KT 10SM -TSRA FEW008 FEW025TCU SCT030CB 25/17 A2992 RMK AO2A PK WND 28045/10 TS 2NE MOV SE FU FEW008 SCT030 V BKN TCU SE-S SLPNO 60010 70010 52010;
Augmented SPECI Observations
SPECI ETAR 010731Z 25003KT 1600 BR BKN006 10/06 A3002 RMK AO2A CIG 004V008 RVRNO;
SPECI RJFA 011614Z 02005KT 0600 R36/2400 -DZ FG SCT000 SCT006 SCT016 02/M03 A2981 RMK AO2A TWR VIS 1000 VIS 0400V0800 FG SCT000;
SPECI KFAW 010812Z 24020G40KT 1 1/2SM +FC +TSRAGR SQ FEW030CB SCT040 BKN050 25/22 A2992 RMK TORNADO 3SW MOV NE FUNNEL CLOUD B02E09 3W MOV NE AO2A TWR VIS 2 1/2 VIS SW 2 TSB59 TS 5S-3W MOV NE GR 1/2 PRESFR;

3.11.3. Local Dissemination. During ADS outages or if ADS is not available, disseminate observations to ATC first. For further dissemination, establish procedures locally in an order of priority that is consistent with local requirements and scheduled file times for longline transmission. Coordinate local dissemination procedures to include code form, format and content with local customers and document in the local weather documentation. Locations without an ADS should disseminate observations locally as follows:

3.11.3.1. Disseminate wind direction in degrees magnetic (unless otherwise specified, see **Chapter 7**) using three digits.

3.11.3.2. Disseminate all other plain language remarks as required by local agencies after the last element of the observation.

3.11.3.3. Maintain a copy of all observations disseminated locally.

3.11.4. Voice Dissemination. Maintain instructions outlining priorities and procedures to follow for local dissemination of observations by voice relay (e.g., read back by the person receiving the data). Disseminate all observations immediately to local ATC agencies (e.g., tower, Radar Approach Control, Ground Control Approach), then to other users as established locally. Also maintain a record (written or recording) of all the following when voice is used to disseminate locally during outages of the primary system:

3.11.4.1. Actual time of observation (UTC).

3.11.4.2. Time (in minutes past the hour) the observation was transmitted to the tower and other local ATC agencies.

3.11.4.3. Single element LOCALs for Altimeter setting, PA or DA (where required).

3.11.4.4. Initials of the weather technician making the dissemination and the initials of the receiver at the supported agency.

3.11.5. Supplementary Identification of Observations. At limited-duty manual WFs/Dets and gunnery ranges, identify the last observation of the day (METAR or SPECI) by adding the term "LAST" following the last element in the observation text (e.g., TCU SE LAST), and include the remark on the AF Form 3803/JET Form 3813, as applicable.

3.11.6. Delayed Reports. Transmit the contraction NIL at the standard time when it is evident that a weather report will not be completed in time for scheduled transmission. **(T-0).** (Example: METAR KDYS NIL.)

3.11.7. Reports Filed But not Transmitted. When an augmented observation is not able to be transmitted longline before the next METAR or SPECI is required, transmit only the latest observation longline. Enter "FIBI" (contraction for *Filed But Impractical to Transmit*) in parenthesis in column 13 (FIBI). Include FIBI in a METAR only if a later observation containing all elements of a METAR is available for transmission.

3.11.8. When a SPECI is not transmitted longline, transmit subsequent SPECI only when the change between the last transmitted report and the current report meets the criteria for a SPECI. Otherwise, enter (FIBI) in remarks for the current report and only disseminate it locally.

3.12. Longline Dissemination by other WFs/Dets. Enter a record of longline dissemination by another WF/Det in parentheses in column 13 of AF Form 3803/JET Form 3813. Identify the WF/Det that transmitted the observation longline and the initials of the individual that received the data (e.g., [BY KGRF/DR], [BY 25 OWS/MS]).

3.13. Reports of a Volcanic Eruption. Reports of a Volcanic Eruption are disseminated regardless of the delay. Use any reasonable means to disseminate the report.

Chapter 4

GENERAL OBSERVING INFORMATION

4.1. General. This chapter contains general procedures pertaining to all AF weather organizations responsible for producing surface weather observations.

4.2. FBWOS. The following requirements apply to all primary meteorological equipment used in the generation of surface weather observations at both automated and manual weather observing locations.

4.2.1. FBWOSs operate in automated mode at AF and Army controlled airfields to provide the official METAR and SPECI observations with augmentation when required.

4.2.2. Siting and Exposure. As best as practical, FBWOS sensor groups are sited IAW the FCM-S4-1994, *Federal Standard for Siting Meteorological Sensors at Airports*. Previously installed sensors may be operated at their present locations; however, if they are relocated, siting will be IAW the federal standard. **(T-1).**

4.2.3. FBWOSs procured for operation on AF and Army locations must be certified as conforming with the station certification requirements contained in FCM-H1 as part of an operational evaluation and a fielding decision. Each site will conform to the site acceptance procedures and commission their FBWOS. **(T-1).**

4.2.3.1. At locations with assigned AF weather personnel, site acceptance and commissioning will be accomplished by the host-installation AF weather organization.

4.2.3.2. At locations with an AF-owned FBWOS, but no AF weather personnel assigned, site acceptance and commissioning will be accomplished by AF personnel, using host service or agency (e.g., Army, FAA) procedures, to substitute for unmet AF training and/or documentation requirements.

4.2.4. AN/TMQ-53s are used for tactical airfields, or as long-term backup (72-hours or greater) for fixed meteorological sensors (when sited appropriately) at AF and Army controlled airfields. AN/TMQ-53s will not be used as standalone weather sensors outside the local aerodrome, without prior approval from their parent MAJCOM. **(T-1).**

4.2.5. MAJCOMs must approve the use of FBWOS at locations other than controlled airfields (or local aerodromes).

4.2.6. In the automated mode, the FBWOS system continually senses, reports and measures the atmosphere for the following weather elements: wind speed and direction, visibility, thunderstorms, precipitation, obscurations to visibility, sky cover, cloud height, temperature, dew point and altimeter setting on all observations.

4.2.7. Locations with an FBWOS installed IAW section 4.4 below, are always designated as automated locations, even during periods of time when a weather technician augments an observation.

4.3. Automated Dissemination System (ADS). Any AF, Army, or National Weather Service accredited system capable of disseminating observations for use by operational customers is an ADS. At the majority of AF Weather operating locations the primary ADS is the Joint Environmental Toolkit (JET) platform.

4.4. FBWOS Certification Requirements.

4.4.1. FBWOS Commissioning Process. The process consists of four phases: installation, acceptance, activation, and operational capability. Certification of the weather flights concludes with the weather certification official declaring their weather flight is ready to operate using the FBWOS and the designated commander declaring initial operating capability (IOC). Commissioning occurs after all certification and commissioning requirements have been met to include ensuring open write-ups are addressed and closed on the AFTO 747, *Cyberspace Infrastructure System Acceptance*.

4.4.1.1. Installation. This phase includes all the activities at the site prior to the acceptance phase (e.g., site preparation, hardware installation, checkout, and calibration). WFs/Dets continue to use existing weather equipment to produce observations.

4.4.1.2. Acceptance. Acceptance testing, acceptance of the system from the contractor by the acquisition agency, and turnover of the system from the acquisition agency to base or post agencies.

4.4.1.3. Activation. Includes the act of placing the system into pre-operational use and includes training and a determination of operational readiness.

4.4.1.4. Operational Capability. Consists of two declarations:

4.4.1.5. Declaration of IOC. The weather certification official attests the system is ready for IOC and the WF/Det submits a memo recommending FBWOS be certified to operate as the official observation for that location. The memo will be sent to leadership of supported units, base operations, 14th Weather Squadron (WS) and the unit's parent MAJCOM. The designated commander for Air Force units' is the OSS/CC or equivalent. The designated commander for Army support units that fall under a WS is the WS/CC and MAJCOM weather functional for Army support units that fall directly under that command. The weather certification official must be sufficiently satisfied with system performance, level of proficiency of flight personnel, and the maintenance support capability to declare the assets operational and capable of performing the assigned mission. IOC is based solely on the judgment of the commander, and will not be schedule-driven. **(T-1).**

4.4.1.6. IOC signifies the weather flight has transformed from the existing system to the newly installed automated system. From this point forward, the newly installed system will generate the official surface weather observation. Units may declare portions of the system IOC [i.e. temperature, pressure, wind; but may have issues with ceilometer]. Units doing this identify which portions of data they are willing to use and which they will backup/augment. **(T-1).**

4.4.1.7. Declaration of Full Operating Capability (FOC). The weather certification official will declare FOC once all requirements for weather flight certification and system commissioning has occurred. This will include the closure of any open write-ups recorded on the AFTO 747. The declaration of FOC may occur simultaneously with IOC. The weather certification official will prepare the certification and commissioning documents for submission. **(T-1).**

4.4.1.8. The weather certification official will prepare a memo for the designated commander's signature recommending commissioning of the FBWOS. Attach the new station information file to the commissioning document. The weather flight will mail the signed commissioning document and attachments to 14 WS/DOD and 2 SYOS/SYSD and retain a copy of the document package in the flight's permanent historical file. **(T-1).**

4.5. Position Qualification Requirements. Weather personnel are trained, task certified, and position qualified IAW AFI 15-127, *Weather Training* and documented local training requirements/plans. Additionally, weather personnel task-certify ATC personnel to evaluate tower visibility values from the control tower. When required, weather personnel also ensure ATC personnel can operate applicable weather equipment located inside ATC facilities. Log ATC task certification on ATC provided AF Form 3622, *Air Traffic Control/Weather Certification and Rating Record*.

4.6. Station Information File. E-mail information to the 14 WS (**14WS_SIFUPDATE@us.af.mil**) and 2 SYOS (**2SYOS.SYSD@us.af.mil**) or mail it to: 14WS/WXD, 151 Patton Avenue, Asheville, NC 28801-5002. See **Attachment 4** for a list of information required.

4.7. Accuracy of Time. The accuracy of the time ascribed to weather observations is of the utmost importance, especially in aviation safety investigations. The standard clock is a standalone clock zeroed with the US Naval Observatory time (DSN: 312-762-1401). A computer network clock may be used as the standard clock if it is verified that the Base/Post network time is synchronized on a daily basis with a Global Positioning System (GPS) or Naval Observatory clock. Annotate time checks in Column 90 on either AF Form 3803/JET Form 3813, as applicable.

4.8. Alternate Operating Location (AOL). Allows a quick, safe, and seamless transition during an evacuation suitable for WFs/Dets to continue their full spectrum of normal operations. WFs/Dets work with the local command to establish an AOL and outline what is needed from various agencies on the installation to support operations at the location.

4.8.1. At a minimum, during evacuated procedures, WFs/Dets must be able to take/augment and disseminate an observation containing the minimum required elements (i.e., wind speed and direction, prevailing visibility, present weather and obscurations, sky condition, temperature, dew point and altimeter setting). **(T-1).**

4.8.2. When the capability exists, WFs/Dets will continue to augment observations following normal procedures. **(T-2).**

4.8.3. WFs/Dets will disseminate an observation within 15 minutes of arrival at the AOL and then resume normal operations to the fullest extent possible. **(T-2). Exception:** An observation is not required at automated locations when the FBWOS is working properly and no mandatory supplementary criteria are occurring.

4.8.4. Resume normal observing operations (i.e., automated, augmented) upon return to the primary observing location. If supplemental criteria are occurring or if the FBWOS is not working properly, disseminate an observation within 15 minutes of return to primary observing location. **(T-2).**

4.9. Cooperative Weather Watch. Encompasses the report of tower visibility, local pilot reports (PIREPs), and any occurrence of previously unreported conditions from ATC that are critical to the safety or efficiency of local operations and resources. At a minimum, the cooperative weather watch documents:

4.9.1. Procedures for task certified ATC personnel to report changes in tower visibility when it is less than 4 SM (6000 m) and differs from the prevailing visibility by at least one reportable value.

4.9.2. Procedures for ATC personnel to relay PIREPs as soon as practical, within ATC established duty priorities.

4.9.3. As part of the cooperative weather watch, if continuous RVR reporting is needed outside controlled airfield hours, WFs/Dets notify airfield leadership that the RVR system requires the runway lights to be left on to work properly. This practice supports the possibility that an aircraft may divert into the location in an emergency.

4.10. Control Tower Observations

4.10.1. ATC Personnel. ATC directives (e.g., AFI 13-204, Volume 3, *Airfield Operations Procedures and Programs*; FAAO JO 7110.65, *Air Traffic Control*; Army Training Circular 3-04.81, *Air Traffic Control Facility Operations, Training, Maintenance, and Standardization),* require task certified ATC personnel to take tower visibility observations when the prevailing visibility at the point of observation or at the tower level, is less than 4 SM (6000 m). Control tower personnel task certified to take visibility observations also notify the weather technician when the observed tower prevailing visibility decreases to less than 4 SM (6000 m) or increases to or exceeds 4 SM (6000 m).

4.10.2. Weather personnel:

4.10.2.1. Evaluate prevailing visibility as soon as practicable upon receipt of tower visibility report that differs from the latest reported surface visibility.

4.10.2.2. Use tower visibility values as a guide in determining the surface visibility when portions of the horizon are obstructed by buildings, aircraft, etc. **Note:** The presence of a surface-based obscuration, uniformly distributed to heights above the level of the tower, is sufficient reason to consider the prevailing visibility the same as at the control tower level.

4.10.2.3. Include a tower visibility remark in the next METAR or SPECI when either the surface prevailing visibility or the control tower visibility is less than 4 SM (6000 m) and the control tower visibility differs from the surface prevailing visibility by a reportable value.

4.11. Observing Aids for Visibility. Visibility reference tools that are photographs should be high quality color photos taken on a predominantly cloud and obscuration free day. It is also recommended observing locations develop map-type visibility charts to augment the photographic visibility markers.

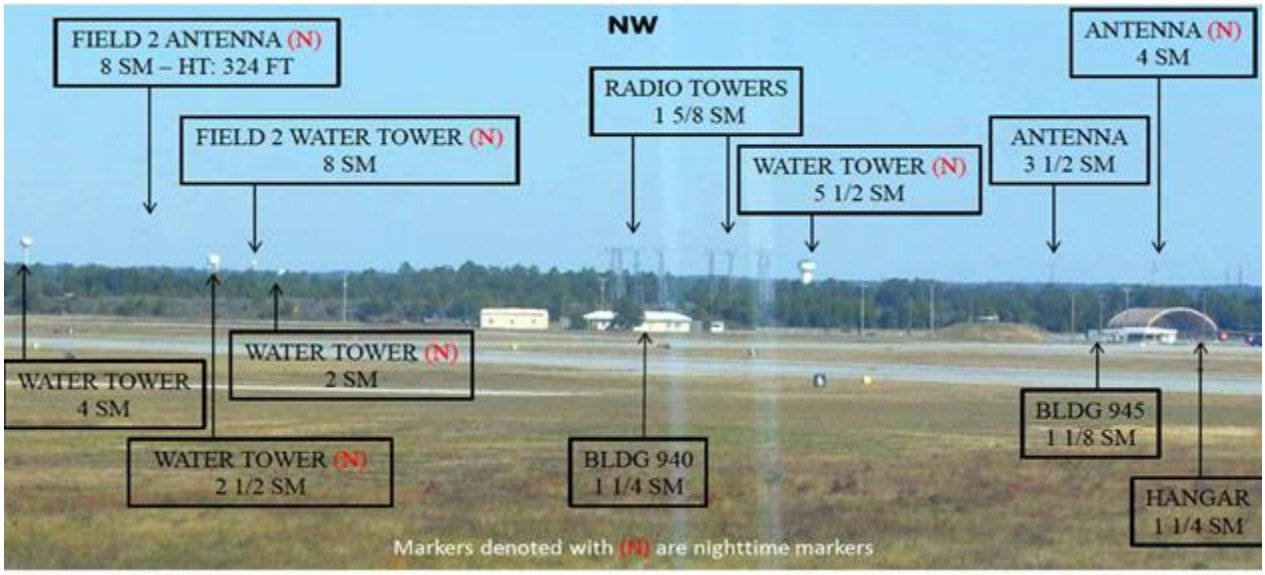
4.11.1. Objects in the visibility reference tool must be clearly identified with distance and direction from the observation point as well as whether the markers are day or nighttime aids (See **Figure 4.1**). **(T-2).** It is highly recommended that the visibility reference tool be in hard-copy format.

4.11.2. WFs/Dets should make use of existing detailed installation maps to determine marker distances while creating/updating visibility reference tools. Additional tools that may be available are military grid reference system maps, map display software/websites, laser range finder equipment, global positioning system, etc. If needed, WFs/Dets can submit a work order to survey the markers through the local Civil Engineering or Army equivalent agency.

4.11.3. The most suitable daytime markers are prominent dark or nearly dark colored objects (e.g., buildings, chimneys, wash-racks, hills, etc.) observed against a light-colored background; preferably the horizon sky. When using an object located in front of a terrestrial background, use caution when the object is located closer to the point of observation than it is to the terrestrial background.

4.11.4. The most suitable nighttime visibility markers are unfocused lights of moderate intensity. Runway course lights as well as TV/radio/water tower obstruction lights make good markers. **Note:** Do not use focused lights such as airway beacons due to their intensity.

Figure 4.1. Example Visibility Checkpoint Photograph.



4.11.5. Control Tower Visibility Aids. AFI 13-204, Volume 3, requires control towers to maintain a visibility checkpoint chart or list of visibility markers posted in the tower. Upon request, WFs/Dets will provide whatever assistance is necessary to help prepare a chart or markers of suitable objects for determining tower visibility. **(T-3).**

4.12. Aircraft Mishap. Upon notification of an aircraft mishap, WFs/Dets will:

4.12.1. Immediately encode and disseminate a full element SPECI in accordance with **Attachment 2**. **(T-1). Note:** A SPECI is not required for an in-flight emergency (IFE); however, this should alert weather personnel to be prepared to take a SPECI if the IFE becomes a mishap.

4.12.2. Follow locally developed guidance and procedures in AFMAN 15-129V2, *Air and Space Weather Operations – Exploitation*, to collect and save data related to the mishap. **(T-1).**

4.13. Inactive/Parallel Runway Equipment.

4.13.1. Supplemental Data. ATC may occasionally authorize an aircraft to land using an inactive runway. If weather sensors are installed on the inactive runway, the ATC agency may initiate a request for observation data to control aircraft using that runway. This is a temporary measure and the current observation is not affected since the active runway is not changed (i.e. supplemental data is included in the remarks section of the observation and does not replace the active/primary sensor data). Use of data from inactive runway sensors must be based on the following factors:

4.13.1.1. Supplemental RVR data for an inactive runway can be reported in the remarks section of an observation using the same basic code form as that specified for the active runway. Example**:** R03R/1600FT

4.13.1.2. Supplemental wind data for an inactive/parallel runway can be reported in the remarks section of an observation when there is at least a 6 knot (kt) difference in speed (sustained or gusts) between the active wind sensor and the inactive sensor(s). Example**:** WND RWY 32R 300/10G15KT

4.13.1.3. Cloud heights generally do not differ from one end of a runway to the other. However, FBWOS discontinuity sensors report cloud ceiling heights as a remark in the observation. Variations in the sky condition relative to the runways, such as reported in local PIREPs, can be taken into consideration in the evaluation of sky cover as reported in the official observation. WFs/Dets may report significant or unusual variations in the sky condition in the remarks section of the observation. Example**:** CLD LYR AT 400FT ON APCH RWY 23 RPRTD BY PIREPS

4.13.2. When the accuracy or validity of data from the active weather sensor is questionable, WFs/Dets may utilize inactive/parallel runway equipment as their back-up method to obtain objective elements. However, wind data will be reported as "estimated" if obtained as back-up from an inactive sensor. **Exception:** WFs/Dets ***will not*** use inactive/parallel runway equipment to back-up a faulty RVR reading; encode RVRNO as part of the official observation (may still encode a supplemental RVR reading). **(T-1).**

Chapter 5

OBSERVATION AUGMENTATION

5.1. General. This chapter describes the requirements and procedures to augment surface weather observations produced by an FBWOS. Augmentation is the process of having position-qualified weather personnel edit or add additional data to an observation generated by an FBWOS. The two augmentation processes of ***supplement*** and ***back-up*** are covered separately in the following sections.

5.1.1. Weather personnel must have a view of the airfield complex and maintain situational awareness of the current conditions as well as the FBWOS-sensed data and observations. **(T-1).**

5.1.2. When augmenting, weather personnel will:

5.1.2.1. Configure their ADS to disseminate in the augmented or manual mode. Selecting either of these dissemination modes removes the "AUTO" report modifier from the observation. When augmentation is no longer required, weather personnel must reconfigure their ADS to disseminate in the automated mode. **(T-1).**

5.1.2.2. Use manual observing methods to determine and report the elements of an observation. The description of these methods can be found in each subsequent chapter covering the elements of an observation. **(T-1).**

5.1.2.3. Documenting Augmented Observations. Use ADS (JET) Form 3813, electronic or paper AF Form 3803, or the approved electronic workbook version (Excel(R)) of AF Form 3803 (available at **https://climate.af.mil/ingest**). **(T-1).**

5.2. Supplementing FBWOSs. Supplementing is the process of manually adding observed weather conditions beyond the capabilities of the FBWOS to detect and/or report to an observation. Augment observations during controlled airfield hours and check the weather at intervals not to exceed 20 minutes whenever mandatory supplemental criteria in **Table 5.1** are observed or forecast to occur within 1 hour. **(T-1). Note**: This does not relieve weather personnel of their Severe Weather Action Plan (SWAP) responsibilities to respond to severe weather events during uncontrolled airfield hours IAW AFMAN 15-129V2, *Air and Space Weather Operations – Exploitation.* Weather personnel will continue to have a SWAP in place to respond to severe weather threats. **(T-1).**

Table 5.1. Mandatory Supplementation Conditions.

Tornado (**+FC**) (**Notes** 1 & 2)
Waterspout (**+FC**) (**Notes** 1 & 2)
Funnel Cloud (**FC**) (**Notes** 1 & 2)
Freezing Precipitation (**FZDZ**/**FZRA**)
Ice Pellets (**PL**)
Hail (**GR**)
Sandstorm (**SS**)/Dust Storm (**DS**) (Note 3)
Volcanic Ash (**VA**)
Tower Visibility remark (Note 4)
Notes: 1. The immediate reporting of tornadic activity takes precedence over all other phenomena. 2. Be prepared to supplement whenever a tornado watch is valid or warning has been issued; regardless of airfield clousure status. 3. Based on local weather warning criteria; if no warning criteria exists, this is not required. 4. Only required during controlled airfield hours.

5.2.1. When supplementing observations, weather personnel will ensure that all applicable element entries are made in the body of the observation along with accompanying remarks. **(T-1).** See **Attachment 3** for the full list of required elements and remarks.

5.2.2. Supplementing Sandstorms/Dust Storms. Sandstorms/Dust Storms will be reported whenever a local warning for the conditions is required. **(T-1).**

5.3. Back-up. Back-up is the process of manually editing/adding data or dissemination capability when the primary method is not operational, unavailable or suspected to be providing erroneous data (e.g. sensor/comm. failure, dew point higher than temperature).

5.3.1. Back-up is required during controlled airfield hours and may be required during uncontrolled airfield hours when elements triggering weather warnings are erroneously reported and/or when required for supplementation criteria above; otherwise, there is no requirement to back-up the system/sensor outside controlled airfield hours.

5.3.2. Weather personnel will not replace the entire automated observation with a manual observation when backing-up malfunctioning sensors, but will follow guidance in **Attachment 2** and **Attachment 3** and report the individual required elements. **(T-2).**

5.3.3. Unrepresentative values from any equipment, regardless of the method used, will not be included in the observation and will be considered missing if they cannot be determined through other methods. **(T-1).**

5.4. Back-up Equipment. Use an available Air Force-certified system to back-up the primary certified observing systems (e.g., AN/FMQ-19 discontinuity sensors, AN/TMQ-53) or approved manual methods. Manual observing equipment will be operated and maintained according to this manual and the applicable T.O. or user manual. **(T-1).**

5.4.1. Units may use the AN/TMQ-53 as a primary or back-up without estimating values with the exception of winds, if all the following conditions are met:

5.4.1.1. The equipment is in good working condition (e.g., operating properly) and properly maintained IAW the T.O. and established maintenance schedules.

5.4.1.2. The equipment is set up and operated IAW the T.O. and is sited IAW FCM-S4-1994, *Federal Standard for Siting Meteorological Sensors at Airports*, Chapters 3 and 4. **Note**: The AN/TMQ-53 has known sensor height exposure limitations.

5.4.1.3. The values are representative and consistent with the values from surrounding observing sites (if available).

5.4.2. For short-term sensor outages (less than 72-hrs) weather operators may use values obtained from other pieces of equipment (e.g., Laser Range Finders, tactical barometers, hand-held wind readers, or other tactical meteorological equipment).

5.4.3. Weather personnel will make every attempt to promptly log out any malfunctioning equipment unless flight safety warrants otherwise. **(T-2). Exception:** Do not log out the FBWOS as the result of a system restart. Refer to AFI 21103, *Equipment Inventory, Status and Utilization Reporting*, for additional information.

5.5. False Freezing Precipitation Reports. Deficiency reports for false readings exist on the AN/FMQ19 and AN/FMQ-22 freezing precipitation sensors. Until these deficiencies are corrected, in order to mitigate the risk of false freezing precipitation reports during airfield closure hours, weather personnel will evaluate the risk of freezing precipitation occurring when the temperature is, or is forecast to be between 00 and 03 degrees Celsius. **(T-1).**

5.5.1. Collaborate with the supporting OWS to determine if the risk of freezing precipitation is acceptably low.

5.5.2. If freezing precipitation is expected, no additional action is needed regarding the equipment; continue normal operations.

5.5.3. If the risk of freezing precipitation is determined to be low, the local weather personnel will coordinate with sensor maintenance personnel to manually disable the freezing precipitation sensor. **(T-2).** If the sensor cannot be disabled, weather leadership will ensure personnel are physically present at an airfield weather services location to back-up the system's freezing precipitation sensor in order to prevent false freezing precipitation reports from being disseminated, even outside controlled airfield hours. **(T-2). Exception:** If the sensor cannot be disabled and is at a remote site without an airfield weather services element, back-up is not required.

5.5.4. Log out the freezing precipitation sensor during any period where the system is triggering false reports so the duration of each event can be tracked.

Chapter 6

OBSERVATION FORM ENTRIES AND DISPOSITION

6.1. General. This chapter provides general observation form information as well as detailed instructions for entries in the JET Form 3813 and the AF Form 3803. The JET Form 3813 is the primary method to document weather observations and is to be utilized to the maximum extent possible.

6.1.1. Only position qualified weather personnel are authorized to make entries on the JET Form 3813 or AF Form 3803. Trainees may make form entries when under the supervision of a position-qualified technician; qualified technician will initial final observation before transmission. **(T-1).**

6.1.2. Unless otherwise directed by this AFMAN, use a blank space when separating data, do not use a slash (/).

6.2. Automated Dissemination System (ADS) Procedures. The ADS (i.e., JET) can import sensor data directly into the JET Form 3813, transmit observations and send the daily form to the 14 WS for processing and archive.

6.2.1. The JET Form 3813 automatically populates some of the SOD data fields as the observations are recorded. As part of quality control, weather personnel will enter or correct data as needed. **(T-2).**

6.2.2. When using the JET Form 3813 to log ALSTG LOCALs, the temperature and dew point must be encoded to properly calculate density altitude values. ALSTG LOCALs passed by voice will be recorded in accordance with local procedures (e.g. AF Form 3803 or a local dissemination log). **(T-2).**

6.3. Non-ADS Procedures. Units not equipped with an ADS will use an electronic or paper AF Form 3803 and follow locally established procedures to disseminate the observations. **(T-1).**

6.3.1. When using a paper AF Form 3803, entries will be made with a black grade 2 medium lead or a mechanical pencil (.5 mm or .7 mm) in all capital, block letters/numerals. **(T-1).**

6.3.2. Record all observations on the AF Form 3803. **Exception:** ALSTG LOCALs do not need to be recorded on the AF Form 3803 if they are recorded on a local dissemination log or similar record.

6.4. Transfer and Disposition of the JET Form 3813/AF Form 3803. Transmit the JET Form 3813 (or AF Form 3803) to the 14 WS for archival on a scheduled basis IAW instructions on the 14WS website: **https://climate.af.mil/**. **(T-1). Note:** When developing procedures, leadership should keep in mind that JET only archives the JET Form 3813s for 7 days.

6.5. Form Header/Location information. Enter the applicable date and location information (i.e. ICAO, City/Installation, State) as listed in the FLIP.

6.6. Active Runway Columns and Column 90 - Remarks. See **Figure 6.1** for examples and entry format.

6.6.1. Active Runway and Equipment Changes. The Active Runway Columns provide a record of the runway in use as reported by ATC personnel and weather sensor equipment used for the reports at dual-instrumented airfields. Enter all times in UTC.

6.6.1.1. Each time the active runway is changed as reported by ATC personnel, enter the runway number and the time the weather sensor is changed for dual instrumentation or the time the runway is changed for single instrumentation.

6.6.1.2. The contraction "CONT" can be used instead of the time entry in the first line of the day for a 24-hour duty station to indicate no change from the last entry on the preceding day's record."

6.6.2. Remarks, Notes, and Miscellaneous Phenomena (Column 90). Use this column to record information considered significant to surface weather observation procedures and to elaborate on data recorded elsewhere on the form. Enter time to the nearest minute UTC.

6.6.2.1. Record conditions that affect the accuracy or representativeness of recorded data (e.g., possible impact of construction, sensor maintenance or aircraft operations on sensor readings, ice or snow accumulation on sensors).

6.6.2.2. Record outages and/or changes to meteorological sensors or systems identifying the back-up equipment in use. Include the times of the change or outage affecting the accuracy of the observations (e.g., 1953 FMQ-19 TEMP/DP SENSOR INOP, KESTREL IN USE). When the outage carries over to subsequent days, include the date and month.

6.6.2.3. Document reasons for omission of mandatory data entries.

6.6.2.4. Record standard clock time checks.

6.6.2.5. Record changes in hours of weather station operation (e.g., effective dates and times if temporary or date if permanent change).

6.6.2.6. Record miscellaneous items (e.g., time notified of an aircraft mishap).

6.6.2.7. Separate all entries with a semi-colon (;).

6.7. Synoptic Data. When no precipitation has occurred encode a "0," when a trace has occurred encode a "T," prefix all estimated values with an "E." Document the reason for an estimated amount (e.g. "E - 1:14 RATIO USED") in column 90. For accuracy, observe and take solid precipitation/snow fall measurements from the same location each time. The location should provide a horizontal and uniform distribution of solid precipitation accumulation. Avoid locations with drifting snow and those affected by buildings, trees and non-natural heat sources (e.g. paved surfaces). See **Figure 6.1** for examples and entry format.

6.7.1. Columns 41 and 42 - Time (UTC and Local Standard Time [LST]). **Note:** LST is not the same as local time during periods of Daylight Saving Time. LST is determined based on longitude and a specified offset from UTC. LST always has the same offset from UTC for a given location year-round.

6.7.1.1. Enter on the line captioned MID TO: (at units taking midnight LST observations) the beginning times in UTC and LST of the first 6-hourly observation scheduled after 0000 LST. On the following four lines (captioned 1, 2, 3 and 4 in column 43), enter the beginning time of each 6-hourly observation. Make all time entries in four figures to the nearest minute UTC.

6.7.1.2. No time entries are made on the rows captioned “MID (LST).” (i.e. The bottom row)

6.7.2. Column 43 - “NO.” There is no entry made in this column; the numbers are here for informational purposes to denote the 4 rows in the other synoptic data columns.

6.7.3. At the specified observation times, measure the amounts of each phenomenon and record this information in the corresponding columns and rows. **Note:** The first and last rows are only used by stations taking midnight LST observations.

6.7.3.1. At stations taking midnight LST observations, the first row is the measured amounts that occurred from midnight LST until the time of the first 6-hourly observation. The last row is the measured amounts that occurred from the time of the last 6-hourly of the day until midnight LST.

6.7.3.2. Limited-Duty Units. Use the following procedures for the first precipitation where one or more 6-hourly observations are missed while closed.

6.7.3.2.1. Using the rows corresponding with the first 6-hourly observation time that occurs after opening, measure the amounts of each phenomenon that occurred since the last recorded entries and record this information in the corresponding columns.

6.7.3.2.2. Prefix the entry with an asterisk (*) and enter a remark in column 90 to indicate the actual amount of time that has passed since the last record (e.g. “*0.36” is entered in Column 44 and “*42-HR PCPN FOR 0350 MEASURMENT” is entered in column 90).

6.7.4. Column 44 - Precipitation is a volumetric measurement of all precipitation that occurred during the period of observation (to include the water equivalent of solid precipitation) and is reported to the nearest hundredth inch (0.01); encode amounts less than 0.005in as a trace. Once this measurement is recorded, the collection device is emptied.

6.7.4.1. To determine the water equivalent of solid precipitation, use a known amount of water to melt any solid precipitation. Take a measurement and then subtract the known amount that was added; the resulting measurement is total amount including the water equivalent of solid precipitation.

6.7.4.2. If the water equivalent of solid precipitation cannot be measured, enter an estimated amount using a standard 1:10 ratio; or other ratio where there is evidence that it is more appropriate for the individual storm or location.

6.7.5. Column 45 - Snow Fall is a measurement of the depth of new freezing/solid precipitation that has occurred since the last synoptic observation and is reported to the nearest tenth inch (0.1); encode amounts less than 0.05in as a trace. This measurement is taken in a place cleared of solid precipitation at the beginning of the observation period (previous 6 hours) in order to provide a representative sample that does not include an accumulation outside the observation period.

6.7.5.1. If solid precipitation melted as it fell, consider the amount to be estimated and annotate Column 90 with “E-MELTED AS IT FELL.”

6.7.5.2. If the precipitation consists entirely of hail, prefix the entry with an “*” and annotate in Column 90 with “*HAIL IN COL 45 AT 0250.”

6.7.6. Colum 46 - Snow Depth is a measurement of the depth of the accumulated freezing and solid precipitation that is on the surface at the time of the observation and is reported to the nearest whole inch; encode amounts less than 0.5in as a trace.

6.7.6.1. Melted Precipitation Reporting Procedure. If solid precipitation melted during the period, annotate the measurement as estimated and enter the estimated maximum depth and the approximate time UTC of occurrence in column 90 (e.g. "E-MAX SNOW DEPTH 1 AT 1530").

6.7.6.2. If the measured depth consists entirely of hail, prefix the entry with an "*" and enter "*HAIL IN COL 46 AT 0350" in column 90.

6.8. Summary of the Day (SOD). The JET 3813 automatically populates some of the SOD data; however, as part of the quality control program, weather personnel are responsible for entering and/or correcting the data as needed. **Note:** JET has access to, and may record higher resolution data than what is normally available to the end user (e.g. slightly higher maximum temperature or wind speed that occurred between displayed measurements). With the exception of Column 70, the information entered in the SOD fields consists of data collected during the 24 hour period ending at midnight LST. See **Figure 6.1** for examples and entry format.

6.8.1. Columns 66 and 67 - 24 Hour Maximum and Minimum Temperatures. Encode the maximum and minimum temperatures in whole degrees Celsius.

6.8.2. Columns 68 and 69 - 24 Hour Precipitation and Snowfall. Enter the total amounts from Columns 44 and 45 respectively. **Exception:** Stations taking midnight LST observations do not include the value from their first 6-hourly observation when totaling amounts.

6.8.2.1. Prefix estimated amounts with an "E" and enter a remark in Column 90. Enter 0 if the phenomenon did not occur during the period.

6.8.2.2. If the entries are entirely trace amounts, encode the sum as a trace. Otherwise, when computing the total, trace entries are considered 0 (i.e. synoptic observation measurements of 0.0, 0.1, T, and 0.1 would total 0.2). **Exception:** Stations equipped with a recording/totaling gauge report the recorded/total amount regardless.

6.8.3. Column 70 - Snow Depth. Enter the depth of solid precipitation on the ground at 1200 UTC; this entry is the same as that in Column 46 for the 1200Z observation. If personnel are not on duty at 1200 UTC, enter depth as measured as near to 1200 UTC as practical along with a remark in column 90 to indicate the time of observation (e.g., COL 70 ENTRY OBSVD AT 1330); no remark is needed for a "0" entry. If the precipitation consists entirely of hail, prefix the entry with an "*" and annotate in Column 90 with "*HAIL IN COL 70 AT 1150."

6.8.4. Columns 71, 72, and 73 - Peak wind data. Enter the maximum instantaneous speed and associated direction observed during the period and time of occurrence to the nearest minute. **Note:** This speed may be reported from an inactive sensor.

Figure 6.1. Example AF Form 3803 (JET Form 3813) Synoptic and Summary of the Day Entries.

SURFACE WEATHER OBSERVATIONS *(METAR/SPECI)*

LATITUDE	LONGITUDE	STATION ELEVATION	TIME CONVERSION (LST to UTC)	MAG TO TRUE	DAY (LST)	MONTH	YEAR	STATION (or grid coord) & STATE OR COUNTRY
26° 38'N	69° 39'W	+126 Feet (MSL)	+ 4 Hrs. / - Hrs.	+ 20 Deg. / - Deg.	11	7	2017	KMAD, EUPSITE, ID

SYNOPTIC DATA

TIME (UTC) (41) MID (LST) TO:	TIME (LST) (42) MID TO:	NO (43)	PRECIP (weather square) (44)	SNOW FALL (45)	SNOW DEPTH (46)
550	150		0.02	0	
550	150	(1)	0.04	.6	1
1150	750	(2)	0.06	1.1	2
1750	1350	(3)	E1.18	0	3
2350	1950	(4)	T	*0.2	*T
MID (LST)	MID (LST)		0.59	0	0

SUMMARY OF THE DAY

24-HR MAX TEMP (°C) (66)	PRECIP (weather square) (68)	SNOW FALL (69)	SNOW DEPTH (70)
31	E1.85	1.3	2

24-HR MIN TEMP (°C) (67)	SPEED (knots) (71)	DRCTN (true) (72)	TIME (UTC) (73)
M03	32	270	1946

ACTIVE RNWY AND EQUIP CHANGE

TIME (UTC)	RNWY NO
400	11
1947	29
2121	11

(90) REMARKS, NOTES, AND MISCELLANEOUS PHENOMENA *(All times UTC)*

TIME CHECK: 0410; RADIO CHECK: 0415;
0610 - FMQ-19 TEMP SENSOR INOP, SLING PSYCHROMETER IN USE;
E - 1750 COL 44 DUE TO RAIN GAUGE LEAK;
1810 - FMQ-19 TEMP SENSOR RESTORED;
*HAIL IN COL 45 AND 46 @ 2350;

6.9. Body of the Observation. The body of the observation contains many of the mandatory and basic weather elements required to record an observation. This section describes the entries and format for each column in the body of the observation. This section does not describe methods of operating in automated mode, when supplementing, or taking manual observations. Detailed information regarding methods of observing elements and the applicable reportable values can be found in the following chapters covering each element. **Note:** Unless otherwise specified, each element below is required on every observation when occurring.

6.9.1. Column 1 - Type. The type of observation being recorded is annotated using the following format: “SA” for METARs, “SP” for SPECIs, and “L” for LOCALs. If SPECI criteria is observed during a METAR, the observation is still a METAR. When using the Jet Form 3813, if corrections are made to the observation, “-C” is appended to the original observation type (e.g. SA-C).

6.9.2. Column 2 - Time. The observation file time is entered as a four-digit UTC time. The standard file time for METARs is between 55 and 59 minutes past the hour and corresponds to the time the last element is observed. The time used for SPECIs and LOCALs is when the criteria requiring the observation is first observed.

6.9.3. Column 9A - Wind Direction. The sensed wind direction (corrected to true north) entered as a 3-digit compass heading, rounded to the nearest 10 degrees, indicating the direction the wind is coming from. (e.g. “180” indicates southerly wind, “040” indicates a northeasterly wind).

6.9.4. Column 10 and 11 - Wind Speed and Max Wind. The sensed sustained wind and wind gust speeds, in whole knots (kts) recorded as a 2-digit entry (e.g. 06, 26, 85). When speeds exceed 99 kts, 3 digits are used (e.g. 101, 123).

6.9.5. Column 9B - Wind Variability. The sensed wind variability for wind speeds greater than 6 knots, entered using 3-digit compass headings rounded to the nearest 10 degrees, indicating the 2 limits of variance in the wind direction and separated by a “V.” Directions are reported in a clockwise order (e.g. 090V160, 340V140).

6.9.6. Column 4A and 4B - Visibility in Meters and Statute Miles. The determined prevailing surface visibility, reported as four digits when in meters and whole numbers and/or fractions when reported in miles (e.g. 0800, 3200, 1/2, 2).

6.9.7. Column 4C - Runway Visual Range. Encoded as “R” and the applicable runway designation in two digits followed by a “/” and the determined RVR reported in whole feet. For dual/parallel runways, the runway designation may include additional letters indicating left, right, or center. (e.g. R06/1800, R35L/0600, R24L/4400).

6.9.8. Column 5 - Weather and Obscurations to Vision. The encoded present weather and obscurations determined to be on station or in the vicinity and effecting visibility or of enough significance to warrant reporting.

6.9.9. Column 3 - Sky Condition. Encoded as the amount of sky that is covered due to clouds and/or obscurations followed by a 3-digit height in hundreds of feet. Sky coverage is expressed using sky clear (SKC), clear (CLR), few (FEW), scattered (SCT), broken (BKN), overcast (OVC), and vertical visibility (VV) and corresponds to 0, 1-2, 3-4, 5-7, and 8 oktas of sky coverage (e.g. FEW004, SCT085, OVC170, VV000).

6.9.10. Columns 7 and 8 - Temperature and Dew Point. Encoded as whole degrees Celsius using 2 digits. Negative values are prefixed with "M" and missing values are omitted (e.g. 07, 11, M02).

6.9.11. Column 12 - Altimeter Setting (ALSTG). Prefixed with "A" and encoded as inches of mercury (iHg) using 4 digits truncated to the hundredths value; the decimal place is not encoded (e.g. A2992, A3013, etc.).

6.9.12. Column 17 - Station Pressure. Encoded as iHg using 5 digits rounded down to the nearest five thousandths value with the decimal place included (e.g. 29.925, 28.830, 27.105). **Note:** Station pressure is only recorded on 3-hourly and 6-hourly METAR observations.

6.9.13. Column 21 - Total Sky Cover. Encoded in oktas (1/8ths) of sky covered by obscurations and clouds and corresponds to the maximum coverage type reported in Column 3. **Note:** Total sky cover is not recorded on SPECI observations.

6.10. Observation Remarks. The remarks section of the observation contains additive data as well as descriptive remarks to expound on the basic weather elements in the body of the observation. Additive data is recorded in code format at specified times and intervals. Descriptive remarks are recorded in specified formats as well as plain language and can be time or situation dependent.

6.11. Recording Late Observations

6.11.1. If a METAR is taken late but within 15 minutes of the standard time (i.e. up to 14 minutes past the hour) and no appreciable changes have occurred since the standard time, record the observation as a METAR using the standard time with no additional remarks.

6.11.2. If a METAR is taken late and significant changes have occurred or the METAR is missed (i.e. more than 15 minutes late), follow the procedures below for the JET Form 3813 and AF Form 3803.

6.11.2.1. When using the 3813, if conditions have changed appreciably or the observation is more than 15 minutes late, record and transmit a SPECI. After transmitting the SPECI, record a METAR observation using the standard time of the missed observation and estimates of the conditions probable at the time of the missed observation. Enter "**(FIBI)**" (*Filed But Impractical to Transmit*) in Column 13. Save the observation to the form only; this observation is not transmitted.

6.11.2.2. When using the AF Form 3803, if conditions have changed appreciably or the observation is more than 15 minutes late, skip a line in the form and record and transmit a SPECI. After transmitting the SPECI, return to the skipped line and record a METAR observation using the standard time of the missed observation and estimates of the conditions probable at the time of the missed observation. Enter "**(FIBI)**" in Column 13. This observation is not transmitted.

6.12. Recording Corrections. Record a correction immediately after detecting an error in a ***transmitted*** report. Any error discovered before dissemination is corrected by deleting or erasing the erroneous data and entering the correct data; for quality control purposes, this does not constitute an error. When correcting errors discovered after dissemination, follow the procedures below for the JET Form 3813 and AF Form 3803.

6.12.1. JET Form 3813.

6.12.1.1. If an error is discovered after dissemination, but before another observation has been disseminated, select the observation type (SA-C, SP-C, or L-C) as applicable. Enter the original time of the observation to be corrected and re-enter the entire observation with the corrected data. JET will automatically enter "COR (time)" in remarks (Column 13) representing the time the correction is being disseminated (refer to **Attachment 3**). Select the "Submit Observation" button to disseminate the corrected observation locally and long-line. The letters "COR" will appear in the new observation after the unit's ICAO.

6.12.1.2. If an error is discovered after another observation has been disseminated, follow the same procedures above, but select the "Save to Form Only" button after entering the corrected observation. The observation will not be disseminated locally or long-line, but will be saved to the Form 3813. NOTE: JET will automatically enter COR (time) in remarks (Column 13) when preparing the correction, but will not record it on the form after selecting the "Save to Form Only" button.

6.12.2. AF Form 3803 Electronic or Paper. Make corrections according to the following procedures.

6.12.2.1. Electronic AF Form 3803. Enter the correct data in the appropriate field. In column 13, annotate "COR FROM," followed by the appropriate identification, the "original entry", and the time of the correction. For example, if the original (incorrect) temperature entry was 20, and it was corrected to 21 at 1430, the column 13 remark would read COR FROM TEMP 20 @ 1430 (in red font), and the temperature block would be 21 (in red font). For corrections not transmitted locally or long-line, no time reference is required.

6.12.2.2. Paper AF Form 3803. Make corrected entries in red pencil on the original. Enter corrections by drawing a line through the erroneous data and entering the correct data above it or on the next lower line. If space is insufficient, enter the correction in column 13 with an appropriate identification (e.g., TEMP 25). If the correction is disseminated locally, or locally and long-line, enter COR in column 13 followed by the time (to the nearest minute UTC) the correction was locally disseminated. In the case of long-line-only dissemination (e.g., a correction for additive data), enter COR and the approximate UTC time the correction was transmitted.

6.12.3. For other form errors, not in the body or remarks section of an observation, delete/erase the erroneous data and enter the correct data. Include a remark in Column 90 briefly explaining the correction. If the error was in the Synoptic Data/SOD sections and already transmitted to the 14 WS, resend the corrected form.

Chapter 7

WIND

7.1. Introduction. This chapter describes the observing and reporting standards for wind data. Wind is measured in terms of velocity, a vector that includes direction and speed. To the maximum extent possible, wind is measured in an unobstructed area to minimize inconsistencies caused by local obstructions that may result in an unrepresentative report of the general wind patterns.

7.2. Wind Group (dddff(f)G$f_m f_m(f_m)$KT_$d_n d_n d_n V d_x d_x d_x$).

7.2.1. Direction. The true direction (ddd) the wind is blowing from is encoded in tens of degrees using three figures. Directions less than 100 degrees are preceded with a "0." For example, a wind direction of 90° is encoded "090."

7.2.2. Speed. The wind speed, ff(f), is entered as a two- or three-digit group immediately following the wind direction. The speed is encoded in whole knots using the tens and units digits. The hundreds digit is only used when the wind speed exceeds 100 knots and is never reported as a leading zero. Speeds of less than 10 knots are encoded using a leading zero in the tens position. The group always ends with KT to indicate the wind speeds are reported in knots. For example, a wind speed of 8 knots is encoded 08KT. A wind speed of 112 knots is encoded 112KT.

7.2.3. Gust. Wind gusts are encoded in the format, G$f_m f_m(f_m)$. The wind gust is encoded in two or three digits immediately following the wind speed. The wind gust is encoded in whole knots using the units and tens digits and, if required, the hundreds digit. For example, a wind from due west at 20 knots with gusts to 35 knots is encoded 27020G35KT.

7.2.4. Variable Wind Direction (speeds 6 knots or less). Variable wind direction with wind speed 6 knots or less may be encoded as VRB in place of the ddd. For example, if the wind is variable at three knots, it could be encoded VRB03KT.

7.2.5. Variable Wind Direction (speeds greater than 6 knots). Wind direction varying 60 degrees or more with wind speed greater than 6 knots is encoded in the format, $d_n d_n d_n V d_x d_x d_x$. The variable wind direction group immediately follows the wind group. The directional variability is encoded in a clockwise direction. For example, if the wind is variable from 180° to 240° at 10 knots, is encoded 21010KT 180V240.

7.2.6. Calm Wind. Calm wind is encoded as 00000KT.

7.3. Wind Algorithms. The wind algorithm uses 5-second average wind directions and speeds to compute and report the 2-minute average in the observation. The 5-second speed is also used as the instantaneous wind to determine gusts, squalls and peak wind data. The 2-minute direction is used to determine wind shifts and the range of variability.

7.4. Standards and Reporting. FBWOS sensors determine the wind direction, speed, gusts, wind shifts and peak wind at all automated observing locations. See **Table 7.1** for a quick reference of wind element reporting characteristics.

7.4.1. Wind direction is determined by averaging the direction the wind is coming from with regards to true north, over a 2-minute period. Wind direction is reported using a 3-digit compass heading rounded to the nearest 10 degrees, or when meeting criteria below, may be reported as variable (VRB). **Note:** At OCONUS locations where the host nation is responsible for the airfield observation, winds may be reported using a different standard (i.e. 10-minute average instead of 2-minute).

7.4.2. Wind Speed is determined by averaging the speed over a 2-minute period and is reported in whole knots.

7.4.3. Wind gusts are determined by evaluating the most recent 10-minutes of wind speed data for rapid fluctuation in speed with a variation of 10 knots or more between peaks and lulls. The speed of a gust shall be the maximum instantaneous wind speed.

7.4.4. Peak Wind Speed is the highest instantaneous wind speed measured within the aerodrome during the specified reporting period. The hourly peak wind data is only reported in the remarks of a METAR when the speed is greater than 25 knots; see **Attachment 3** for remark format. The daily peak wind data is reported in the summary of the day regardless of speed. For incomplete wind records, data may still be used if it is determined by the weather technician that the peak wind speed occurred outside the period of missing data; otherwise, treat the element as missing.

7.4.5. Wind Shifts are a change in direction by at least 45 degrees that occurs in less than 15 minutes and has sustained winds of at least 10kts throughout the shift. See **Attachment 3** for remark format.

Table 7.1. Wind Observing Standards.

Parameter	Observing and Reporting Standard
Wind direction	2-minute average in 10 degree increments with respect to true north is reported.
Wind speed	2-minute average speed in knots is reported.
Wind gust	The maximum instantaneous speed in knots in the past 10 minutes is reported.
Wind squall	The maximum instantaneous speed in knots is reported
Peak wind	The maximum instantaneous speed in knots (since the last scheduled report) shall be reported whenever the speed is greater than 25 knots.
Wind shifts	Wind shift and the time the shift occurred are reported.

7.5. Manual Observing Methods.

7.5.1. Predominant wind direction, speed, gusts, and shifts are determined by the primary active wind sensor; peak wind data is determined by all available runway sensors. Data obtained from alternate equipment may be used as a guide for determining winds when the primary sensor is considered unrepresentative or inoperative. **Note:** Winds will be reported as estimated when obtained from any source other than the properly sited wind sensor for the active runway **(T-2)**. See **Attachment 3** for remark format.

7.5.2. To determine wind direction manually using a compass (or digital measuring device), face into the wind in an unobstructed area and take a 2-minute average reading of the wind direction; convert this magnetic direction to true direction where applicable. While determining the predominant direction, take note of the limits of variability for reporting when applicable. **Note:** Do not use the movement of clouds, regardless of how low they are, in determining the surface wind direction.

7.5.3. To determine wind speed manually, using an approved anemometer face into the wind in an unobstructed area with the device held at eye-level and take a 2-minute average reading of the wind speed. Use the same method over a 10-minute period to determine gusts when applicable. If an instrument is not available, use the Beaufort scale (**Table 7.2**) to determine the wind speed.

Table 7.2. Beaufort Scale of Winds.

Wind Equivalent -- Beaufort Scale				
Beaufort #	**MPH**	**KTS**	**Terminology**	**Description**
0	<1	<1	Calm	Calm. Smoke rises vertically.
1	1-3	1-3	Light Air	Wind motion visible in smoke.
2	4-7	4-6	Light Breeze	Wind felt on exposed skin. Leaves rustle.
3	8-12	7-10	Gentle Breeze	Leaves and smaller twigs in constant motion.
4	13-18	11-16	Moderate Breeze	Dust and loose paper are raised. Small branches begin to move.
5	19-24	17-21	Fresh Breeze	Smaller trees sway.
6	25-31	22-27	Strong Breeze	Large branches in motion. Whistling heard in overhead wires. Umbrella use becomes difficult.
7	32-38	28-33	Near Gale	Whole trees in motion. Some difficulty when walking into the wind.
8	39-46	34-40	Gale	Twigs broken from trees. Cars veer on road.
9	47-54	41-47	Severe Gale	Light structure damage.
10	55-63	48-55	Storm	Trees uprooted. Considerable structural damage.
11	64-72	56-63	Violent Storm	Widespread structural damage.
12	73-82	64-71	Hurricane	Considerable and widespread damage to structures.

Chapter 8

VISIBILITY

8.1. Introduction. This chapter describes the observing and reporting standards for visibility. Visibility is a measure of the opacity of the atmosphere and is expressed in terms of the horizontal distance at which a person is able to see and identify specified objects. Visibility values are reported in SM at U.S. locations (including Hawaii, Alaska and Guam); at overseas locations, the unit of measure will be the same as that published for the installation in DoD FLIP airfield approach plate minimums (i.e. usually meters). **(T-2).**

8.2. Visibility Group (VVVVVSM). The surface visibility, VVVVVSM (VVVV in meters for overseas locations), is encoded using the values listed in **Table 8.1** A space is encoded between whole numbers and fractions of reportable visibility values. For example, a visibility of 1 1/ 2 SM is encoded 1 1/2SM. The visibility group at US locations always ends in SM to indicate that visibilities are in statute miles. Only FBWOS locations may use an M to indicate "less than" when reporting visibility (e.g., M1/4SM (M0400) means a visibility less than 1/4 SM as reported by AN/FMQ-19).

8.3. Visibility Algorithms. The visibility algorithm calculates the average visibility by evaluating the sensor data gathered from a single point during a 10-minute period ending at the actual time of the observation. Additionally, the data gathered during the averaging period is used to determine if variable visibility should be reported. Where the FBWOS has meteorological discontinuity sensors, the data from the additional sensors is examined to determine if their values meet criteria for generating a visibility remark.

8.4. Standards and Reporting. The FBWOS sensors determine the average visibility over time and record the corresponding reportable value as the prevailing visibility. If the visibility falls halfway between two reportable values, the lower value is reported.

8.4.1. Prevailing visibility is determined by weather personnel as the greatest distance that can be seen in at least half of the horizon circle and may not necessarily be continuous (i.e. may be composed of sectors). Prevailing visibility represents a value determined from a height of approximately 6 feet above the ground level and is reported using **Table 8.1**

8.4.2. Tower visibility is reported in column 13 when either the tower or prevailing visibility is less than 4SM and they differ by at least one reportable value; see **Attachment 3** for format. **Note:** Tower visibility does not replace the prevailing visibility reported in the body of the observation.

8.4.3. Variable prevailing visibility is reported in column 13 when the prevailing (or sensor derived average) visibility is less than 3SM and rapidly fluctuating by at least 1/2SM during the period of observation; see **Attachment 3** for format.

8.4.4. Sector visibility is reported in column 13 when the visibility in at least 1/8th of the horizon differs from the prevailing visibility by at least one reportable value and either the prevailing or sector visibility is less than 3SM; see **Attachment 3** for format.

8.4.5. Visibility at second location is reported in column 13 at locations equipped with two or more visibility sensors when the visibility at the designated discontinuity sensor is lower than the visibility in the body of the observation by a reportable value; see **Attachment 3** for format.

8.4.6. Software limitations in some automated sensors only support visibility reporting increments of 1/4SM (from 0 to 1 3/4 SM) and 1/2 SM (from 2 to 3 SM). Leadership will locally document procedures to ensure supplementation during controlled airfield hours for observed values that are beyond the capability of the software to report when required to meet published landing and/or circling minimum visibility values. **(T-3).**

Table 8.1. Visibility - Reportable Values.

Visibility - Reportable Values in SM | Meters							
0	0000	1/2	0800	1 1/2	2400	3	4800
1/16	0100	5/8	1000	1 5/8	2600	4	6000
M1/8	M0200	3/4	1200	1 3/4	2800	5	8000
1/8	0200	7/8	1400	1 7/8	3000	6	9000
3/16	0300	1	1600	2	3200	7	9999
1/4	0400	1 1/8	1800	2 1/4	3600	8	9999
5/16	0500	1 1/4	2000	2 1/2	4000	9	9999
3/8	0600	1 3/8	2200	2 3/4	4400	10	9999

Notes:
1. Values are reported in 1SM increments from 10 to 15SM and 5SM increments above 15SM.
2. All values greater than 6SM are reported as "9999" when reporting in meters.
3. Some values may not be supported by FMQ-19, FMQ-23 or Automated Surface Obeserving System (ASOS) software.
4. M1/8 (M0200) is an automated report for visibility less than 1/8SM (0200m).
5. MAJCOMs may direct the use of 3000m and 5000m in place of 3200m and 4800m (OCONUS).

8.5. Manual Observing Methods.

8.5.1. Prevailing visibility is observed with un-aided vision (i.e. no binoculars or night vision goggles) from a designated point of observation that permits the weather technician to evaluate the horizon circle at the surface.

8.5.1.1. The point of observation should be as free from obstructions as possible to permit the maximum view of the horizon circle. Where obstructions exist, move to as many locations as necessary and practical within the period of observation to view as much of the horizon as possible.

8.5.1.2. At locations that necessitate deviation, visibility may be determined from a designated point of observation that is elevated but is always be reported as the surface visibility and will be documented in the FLIP (e.g. "SFC VIS determined at ATC tower" or "Visibility obs at 50ft AGL"). **(T-2).**

8.5.2. Evaluate visibility as frequently as practical using all available visibility markers to determine the greatest distance that can be seen in all directions around the horizon circle.

8.5.2.1. If a marker has sharp outlines and little blurring of color, the visibility is much greater than the distance to that marker.

8.5.2.2. If a marker can be seen, the visibility is about the same as the distance to the marker.

8.5.2.3. If a marker cannot be seen due to weather and/or reportable obscurations, the visibility is less than the marker.

8.5.3. Under uniform conditions, consider the prevailing visibility to be the same as that determined in any direction around the horizon circle.

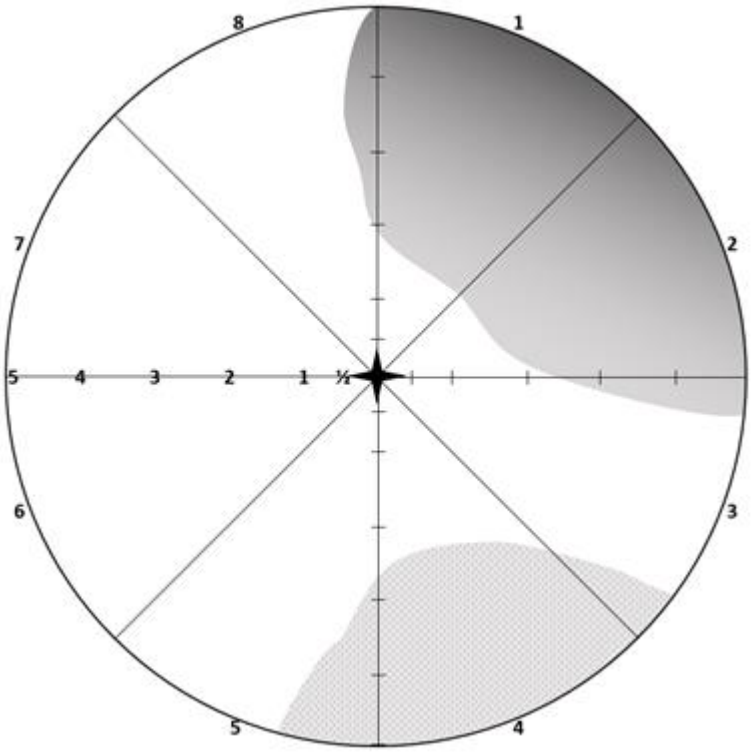
8.5.4. Under non-uniform conditions, divide the horizon into sectors that have uniform visibility and represent at least 1/8th of the horizon circle.

8.5.4.1. The greatest distance seen in least half of sectors that make up the horizon circle (may be non-contiguous) is reported as the prevailing visibility.

8.5.4.2. The visibility in sectors is reported in remarks when they differ from the prevailing visibility by one or more reportable value and either the prevailing or the sector visibility is less than 3SM (4800 m) or if it is considered operationally significant; see examples in **Figure 8.1** and **Attachment 3** for format.

8.5.5. If the visibility is rapidly fluctuating by at least 1/2SM (0800m) during the period of the observation and the prevailing visibility is less than 3SM (4800 m), the visibility is considered variable and the minimum and maximum visibility values observed are reported in remarks; see **Attachment 3** for format.

Figure 8.1. Determining Prevailing and Sector Visibility.



8.5.6. In **Figure 8.1**, visibility of 5SM is the furthest that can be seen in sectors 3, 5, 6, 7, and 8. In sectors 1 and 2, visibility is reduced to 2SM due to an approaching fog bank. In sector 4, a diminishing snow shower is still reducing visibility to 2 1/2SM. Based on this information, prevailing visibility should be reported as 5SM and a sector visibility remark should be reported with visibility of 2SM in the north through east (N-E) and 2 1/2SM to the south-southeast (SSE).

Chapter 9

RUNWAY VISUAL RANGE (RVR)

9.1. Introduction. This chapter describes the observing and reporting standards for RVR data. RVR is an instrumentally derived value that represents the horizontal distance that a pilot can see down the runway. The maximum distance in the direction of takeoff or landing at which the runway, or specified lights or markers delineating it, can be seen from a position above a specified point on its center. For all locations reporting RVR, the unit of measure will correspond to the units of measure used to report visibility (i.e. feet for SM and m for meters). **(T-2).**

9.2. Runway Visual Range Group ($RD_RD_R[D_R]/V_RV_RV_RV_RFT$). "FT" at the end of the group indicates the units of measurement are in feet. Overseas locations will use measurement values as published in the DoD Flight Information Publication (FLIP) (typically meters). Locations reporting in meters will not include FT or any other indicator of units. **(T-0).**

9.2.1. RVR is encoded in the format RD_RD_R**$[D_R]$**/$V_RV_RV_RV_R$FT, where R indicates the runway number follows, D_RD_R**$[D_R]$** is the runway number (the additional D_R may be used for runway approach directions, such as R for right, L for left, and C for center), $V_RV_RV_RV_R$ is the constant reportable value.

9.2.2. RVR that is varying is encoded in the format, RD_RD_R[DR] /$V_NV_NV_NV_NVV_XV_XV_XV_X$FT, where $V_NV_NV_NV_N$ is the lowest reportable value in feet, V separates lowest and highest visual range values, $V_XV_XV_XV_X$ is the highest reportable value. The 10-minute RVR for runway 01L varying between 1,000 and 5,000 (0300 and 1500 m) feet would be encoded "R01L/1000V5000FT" (R01L/0300V1500).

9.2.3. If the RVR is less than its lowest reportable value, the $V_RV_RV_RV_R$ or $V_NV_NV_NV_N$ groups will be preceded by M. If the RVR is greater than its highest reportable value, the $V_RV_RV_RV_R$ or $V_XV_XV_XV_X$ groups are preceded by a P. For example, an RVR of less than 100 feet (0050 m) will be encoded "M0100FT" (M0050); an RVR of greater than 6,000 feet (1500 m) will be encoded "P6000FT" (P1500). **(T-0).**

9.3. RVR Algorithms. Most FBWOSs automatically sense and report RVR using a determined 10-minute average. **Note:** For OCONUS locations reporting RVR in meters, FBWOSs determine RVR in 50-meter increments up to 800m and in 100-meter increments up to 1500m. This has a minor effect on the RVR special requirements as derived from the reporting minima listed in the FLIP (e.g. 0730 m is the published minima, the SPECI requirement will be set to 0750 m).

9.4. Standards and Reporting. RVR is reported using values in **Table 9.1** whenever the prevailing visibility is less than or equal to 1 SM (1600 m) and/or when RVR for the designated instrument runway is less than or equal to 6000 ft (1500 m).

9.4.1. When an RVR reporting requirement is occurring but the 10-minute average cannot be determined, no value will be reported and RVRNO will be included in column 13 remarks. **(T-1).**

9.4.2. At automated stations where it is applicable, RVR values for as many as four designated runways can be reported for long-line dissemination. At manual stations, only RVR for the designated runway is reported. See **Table 9.2** for RVR observing and reporting standards.

9.4.3. RVR Information Not Available (RVRNO remark). Indicates the 10-minute average touchdown RVR for the in-use runway is not available (e.g., equipment failure) during periods when prevailing visibility is 1 mile (1600 m) or less or RVR is 6,000 feet (1830 m) or less. RVRNO is not reported in the body of the METAR/SPECI and will be reported in the remarks IAW **Attachment 3**. **(T-0).**

Table 9.1. RVR Reportable Values.

RVR - Reportable Values in Feet | Meters							
Feet	Meters	Feet	Meters	Feet	Meters	Feet	Meters
M0100		0900			0650	3500	
0100	M0050	1000	0300	2200		4000	1200
0200	0050	1200	0350		0700		1300
0300	0100		0400	2400	0750	4500	
0400		1400		2600	0800		1400
0500	0150		0450	2800		5000	1500
0600		1600	0500	3000	0900	5500	P1500
0700	0200	1800	0550		1000	6000	
0800	0250	2000	0600		1100	P6000	
Note: 1. Values preceeded with an "M" indicate less than; a "P" indicates greater than.							

Table 9.2. Summary of RVR Observing and Reporting Standards.

RVR	Observing and Reporting Standard
Number of RVRs	Up to 4[1]
RVR Light Setting	5 for transmissometer systems
When Reported	When visibility ≤ 1 statute mile AND/OR RVR ≤ 6,000 feet

1. Manual observations shall contain only one RVR.

9.5. Manual Observing Methods. RVR is an instrument derived measurement, there is not a manual observing method to determine RVR values.

Chapter 10

PRESENT WEATHER

10.1. Introduction. This chapter describes present weather and reporting standards including qualifiers and weather phenomena. Reports may be instrument derived, physically observed or determined using a combination of the two. Unless otherwise noted, the term “on station” refers to phenomena detected/determined to be occurring within 5NM of the point of observation.

10.2. Present Weather Group (w'w'). The following general rules apply when reporting present weather in a METAR or SPECI report:

10.2.1. Weather occurring within 5 SM (unless directed elsewhere in nautical miles for thunderstorms and lightning) of the point of observation is encoded in the body of the report. Weather occurring in the vicinity of the station (between 5 and 10 SM unless directed elsewhere in nautical miles for thunderstorms and lightning) is also encoded in the body of the report. FBWOSs only use the vicinity (VC) qualifier with thunderstorms (TS). Augmented stations may report weather not occurring at or in the vicinity of the station in the remarks.

Table 10.1. Notations for Manually Reporting Present Weather.

QUALIFIER		WEATHER PHENOMENA		
INTENSITY OR PROXIMITY 1	**DESCRIPTOR 2**	**PRECIPITATION 3**	**OBSCURATION 4**	**OTHER 5**
- Light Moderate + Heavy **VC** - In the Vicinity	**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** Snow Pellets	**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(s) (including a Tornado, or Waterspout) **SS** Sandstorm **DS** Dust Storm

Note: For airfields operating an ASOS, the shaded elements in this table indicate qualifier/phenomena or combinations that are not possible and will not be reported due to restrictions in the current software configuration. **(T-0).** Manual or augmented observations created on an ASOS will contain these elements if permitted by a future software upgrade. **(T-0).**

10.2.2. Separate groups are used for each type of present weather. Each group is separated from the other by a space. A METAR/SPECI will contain no more than three present weather groups. The groups will be ordered by priority based on **Table 10.2** **(T-0).**

Table 10.2. Present Weather Reporting Order.

First	- Tornadic Activity—Tornado, Funnel Cloud or Waterspout.
Second	- Thunderstorm(s) (with/without associated precipitation).
Third	- Precipitation in order of decreasing predominance—Most dominant reported first.
Fourth	- Obscurations and/or other Phenomena in order of decreasing predominance (except Tornado, Funnel Cloud or Waterspout)—Most dominant reported first.

10.3. Present Weather Qualifiers. Present weather groups are constructed by considering columns 1 through 5 in **Table 10.1** in sequence (e.g., heavy freezing rain is encoded +FZRA).

10.3.1. Intensity Qualifier (- , +). The intensity qualifier will be used to encode light (-), moderate (no symbol), and heavy (+) intensities with all reportable precipitation types, to include precipitation appended to showers, thunderstorms, and freezing precipitation. **(T-1).** Ice crystals (IC), unknown precipitation (UP) and hail (GR), including those associated with a TS and showers (SH), will not use intensity qualifiers. No intensity will be ascribed to the obscurations of blowing dust (BLDU), blowing sand (BLSA), blowing snow (BLSN), blowing spray (BLPY), well-developed dust/sand whirls (PO) and squalls (SQ). Tornados and waterspouts are encoded as +FC, while a funnel cloud is always encoded as FC. Only moderate or heavy intensity are ascribed to sandstorm (SS) and dust storm (DS). **(T-0).**

10.3.2. Proximity Qualifier. VC (weather phenomena observed in the vicinity of, but not at the point of observation), will only be encoded in combination with FG, SH, PO, BLDU, BLSA, BLSN, SS, DS and TS. Intensity qualifiers will not be encoded with VC. VCFG will be encoded to report any type of fog in the vicinity of the point(s) of observation. Precipitation not occurring at the point of observation but within 10SM will be encoded as showers in the vicinity (VCSH). **(T-0).**

10.3.3. Descriptor Qualifier. Only one descriptor will be encoded for each weather phenomena group (e.g., -FZDZ). Mist (BR), Haze (HZ), Smoke (FU), and Volcanic Ash (VA) will not be encoded with any descriptor. **(T-0).**

10.3.3.1. The descriptors shallow (MI), partial (PR), and patches (BC) are only encoded with FG (e.g., MIFG). For MIFG (shallow fog) to be encoded, FG must cover part of the station, extend no higher than 6 feet above the ground, with visibility more than 6 feet above the ground 5/8SM (1000 m) or more, while the apparent visibility in the FG layer is less than 5/8SM (1000 m). For PRFG (partial fog) to be encoded, FG must cover a substantial part of the station and extend to at least 6 feet above the ground with visibility in the FG less than 5/8SM (1000 m). For BCFG (fog patches) to be encoded, FG must randomly cover part of the station and extend to at least 6 feet above the ground with the apparent visibility in the FG patch or bank less than 5/8SM (1000 m), while visibility over other parts of the station is greater than or equal to 5/8SM (1000 m).

10.3.3.2. The descriptors low drifting (DR) and blowing (BL) are only encoded with dust (DU), sand (SA), and snow (SN) (e.g., BLSN or DRSN). DR will be encoded for DU, SA, or SN raised by the wind to less than 6 feet above the ground. **(T-0).** When BLSN is observed with SN falling from clouds, both phenomena are reported (e.g., SN BLSN). When, because of BLSN, the weather technician cannot determine whether or not SN is also falling, then only "BLSN" will be reported. **(T-0).** BL may also be encoded with spray (PY).

10.3.3.3. SH is encoded only with one or more of the precipitation types of rain (RA), SN, PL, GS or GR. The SH descriptor indicates showery-type precipitation. When showery-type precipitation is encoded with VC (VCSH), the intensity and type of precipitation is not encoded.

10.3.3.4. The descriptor TS may be encoded by itself, i.e., a TS without associated precipitation, or it may be encoded with precipitation. If encoding a TS with precipitation, the following are the authorized types: RA, SN, PL, GS, GR, UP. For example, a TS with SN and GS would be encoded as "TSSNGS."

10.3.3.5. The descriptor freezing (FZ) is only encoded in combination with FG, drizzle (DZ) or RA (e.g., FZRA, FZFG, FZDZ). FZ is only reported with FG when the temperature is less than 0 degrees Celsius.

10.3.4. Precipitation. FBWOSs may have one type of precipitation per observation and augmented stations may have up to three types of precipitation encoded in a single present weather group. They are encoded in decreasing predominance based on intensity. Only one intensity indicator (+ or -) may be encoded and it refers to the intensity of the total precipitation.

10.3.4.1. Precipitation types are DZ, RA, SN, IC, PL, GS, GR and SG. Report the start and end of all precipitation types.

10.3.4.2. GR is reported regardless of the size of the hail stone. Measure the largest stone and report the size in ¼ inch increments in the Remarks. If no hail size is reported, it will be assumed to be small hail. **(T-0)**.

10.3.5. Obscurations. With the exception of VA, DRDU, DRSA, DRSN, MIFG, PRFG, and BCFG, obscurations are encoded in the body of the report if the surface visibility is less than 7SM (9999 m). Reportable obscurations are FG, BR, FU, VA, DU, SA, HZ, and PY.

10.3.5.1. BR is reported when the obscuration consists of water droplets or ice crystals and the visibility is at least 5/8 SM (1000 m), but less than 7SM (9999 m).

10.3.5.2. FG is reported when the obscuration consists of water droplets or ice crystals (FG or FZFG) and the visibility is less than 5/8SM (1000 m). FZ is only reported with FG when visibility is less than 5/8 SM (1000 m) and temperature is less than 0 degrees Celsius.

10.3.5.3. VA is always reported when present.

10.3.5.4. PY is encoded only when used with the descriptor BL.

10.3.6. Other Weather Phenomena.

10.3.6.1. SQ is reported when a sudden increase in wind speed of at least 16 knots is observed, and is sustained at 22 knots or more for at least 1 minute.

10.3.6.2. Sandstorms are encoded as SS, dust storms as DS. Report a moderate SS/DS when visibility is reduced to less than 5/8 statute mile (1000 m) and greater than or equal to 5/16 statute mile (0500 m) due to BLSA/BLDU. Report a +SS/+DS if visibility is less than 5/16 statute mile (0500 m) due to BLSA/BLDU.

10.3.6.3. Well-developed sand or dust whirls are encoded as PO.

10.4. Present Weather Capabilities of an FBWOS. Using multiple sensors in conjunction, FBWOSs can determine and report the proximity, type and intensity of precipitation as well as obscurations and report up to three precipitation/obscuration groups.

10.4.1. For liquid precipitation, the FBWOS determines intensity from particle size and fall velocity through the sensor field. For snowfall, the minimum intensity is based on the reported surface visibilities and may be reported higher than what is occurring due to other phenomena that are reducing visibility.

10.4.2. When equipped with a working lightning detection capability, an FBWOS reports thunderstorms as on station when cloud-to-ground lightning is detected within 5NM, in the vicinity when detected between 5 and 10NM, and as a lighting distant remark in column 13 when detected between 10 and 30NM. See **Table 10.3** for a list of the qualifiers, weather, and obscurations reported by an FBWOS. **Note:** In addition to **Table 10.3**, the FMQ-23 can also detect Hail (GR) and Ice Pellets (PL).

Table 10.3. Automated Present Weather Reporting.

Type	Reporting Notation
Vicinity	VC (used with TS only)
Thunderstorm	TS
Freezing	FZ
Unknown Precipitation	UP (not reported by TMQ-53)
Drizzle	-DZ, DZ, +DZ
Freezing Drizzle	-FZDZ, FZDZ, +FZDZ
Rain	-RA, RA, +RA
Freezing Rain	-FZRA, FZRA, +FZRA
Snow	-SN, SN, +SN
Mist	BR
Fog	FG
Freezing Fog	FZFG
Haze	HZ
Squall	SQ

10.5. Standards and Reporting. Unless specifically noted below, present weather will only be reported in the body of the observation when it is determined to be occurring on station or in the vicinity at the time of observation. **(T-1).** Other significant weather phenomena not on station *should* be reported in the remarks section when it is determined to be operationally significant.

10.5.1. Up to three groups will be reported when augmenting or encoding manual observations. Each group will have up to one intensity/proximity qualifier and/or descriptor and up to three types of weather phenomena. **(T-1).**

10.5.2. When multiple phenomena are appended to an intensity qualifier, the qualifier is denoting the intensity of the total precipitation.

10.5.3. Present weather groups will be encoded in the following order and precedence: **(T-1).**

10.5.3.1. Tornadic Activity - Tornado, Funnel Cloud, then Waterspout.

10.5.3.2. Thunderstorms - on station or in the vicinity, with or without associated precipitation.

10.5.3.3. Precipitation in order of decreasing predominance.

10.5.3.4. Obscurations and/or other phenomena in order of decreasing predominance.

10.6. Descriptors. Descriptors serve to further describe certain weather phenomena to provide additional specificity on the observed conditions. Additional information for each descriptor (with encoded form in parenthesis) is provided below and in **Table 10.1**

10.6.1. Shallow (MI): Only used to describe fog that has very little vertical extent (<6ft) where visibility is reduced in the horizontal but can be easily seen through when looking in the vertical.

10.6.2. Partial (PR): Only used to describe fog where visibility is reduced in the horizontal and covers part of the celestial dome but does not constitute a vertical visibility sky condition (i.e. a surface-based obscuration covering less than 8 oktas of the sky).

10.6.3. Patches (BC): Only used to describe small areas of fog with little vertical extent (~6-20ft).

10.6.4. Low Drifting (DR): Only used to describe dust, sand, or snow that is being raised by the wind to a height of less than 6ft and is not obstructing visibility.

10.6.5. Blowing (BL): Only used to describe dust, sand, snow, or spray that is being raised by the wind to a height above 6ft and is obstructing visibility.

10.6.6. Shower(s) (SH): Only used to describe showery-type (cumuliform) precipitation; characterized by a rapid start, stop, and/or change in intensity. When encoded as in the vicinity, the type of precipitation is not included (i.e., VCSH not VCSHRA).

10.6.7. Thunderstorm (TS): May be encoded by itself or with an associated precipitation type(s); RA, SN, PL, GS, GR, and UP are the authorized types of precipitation that may be appended to TS. When it is determined that a thunderstorm is within 5-10NM, it may be encoded as VCTS. If thunder is heard and the distance cannot be reliably determined, TS will be encoded as on station. **(T-2).** See manual observing procedures for additional guidance on determining the use of TS in the body of the observation.

10.6.8. Freezing (FZ): Only encoded with fog when the temperature is below freezing or with rain or drizzle when super-cooled liquid droplets are freezing on contact with surface objects and coating them with a glaze of ice.

10.7. Weather Phenomena. Weather phenomena are divided into the three categories of precipitation, obscurations, and other.

10.7.1. Precipitation is any form of water particle, whether in a liquid, freezing or frozen state, that falls from the atmosphere and reaches the ground. Precipitation may be encoded in the body of the observation with or without a reduction in prevailing visibility.

10.7.1.1. Drizzle (DZ): A form of liquid precipitation characterized by fairly uniform drops with diameters of less than 0.02-inch (0.5 mm) that are very close together. Drizzle appears to float while following air currents but unlike fog droplets, it does fall to the ground. May be encoded with the qualifiers light, moderate, heavy and/or freezing.

10.7.1.2. Rain (RA): A form of liquid precipitation that can be showery or uniform and is characterized by droplets that are generally larger than 0.02-inch (0.5 mm). Smaller droplets may occur from stratiform clouds but unlike drizzle, the droplets are widely separated. May be encoded with the qualifiers light, moderate, heavy, showers, thunderstorms and/or freezing. Precipitation not occurring at the point of observation but within 10 statute miles is coded as showers in the vicinity (VCSH).

10.7.1.3. Snow (SN): A form of solid precipitation composed of white or translucent ice crystals, most of which are complex branch hexagonal forms and often combined into flakes. May be encoded with the qualifiers light, moderate, heavy, showers, and/or thunderstorms. Additionally, snow can be qualified as drifting, blowing and in the vicinity if blowing (VCBLSN).

10.7.1.4. Snow Grains (SG): A form of solid precipitation made up of very small, white, opaque particles of ice; the frozen equivalent of drizzle. When the grains hit hard ground they do not bounce or shatter and usually fall in small quantities, mostly from stratus type clouds and never as showers. May be encoded with the qualifiers light, moderate, and/or heavy.

10.7.1.5. Ice Crystals (IC): A form of solid precipitation that falls as unbranched ice crystals in the form of needles, columns or plates. Under certain conditions, can appear without precipitable overhead cloud cover and is commonly referred to as Diamond Dust. Is not encoded with any qualifiers when it is the sole form of precipitation in the weather group.

10.7.1.6. Ice Pellets (PL): Hard grains of ice consisting of frozen raindrops, or largely melted and refrozen snowflakes. Ice pellets are transparent or translucent pellets of ice, which are round or irregular, rarely conical, and which have a diameter of 0.2 inch (5 mm), or less.

10.7.1.7. Hail (GR): Precipitation in the form of small balls or other pieces of ice falling separately or frozen together in irregular lumps. Hail includes small hail, which is pellets of snow encased in a thin layer of ice which have formed from the freezing, either of droplets intercepted by the pellets, or of water resulting from the partial melting of the pellets.

10.7.1.8. Snow Pellets (GS): A form of solid precipitation composed of white, opaque grains of ice. GS is normally round or conical, brittle, easily crushed, and rebound when falling on hard surfaces. Diameters range from 0.08 to 0.2 inch (2 to 5 mm).

10.7.1.9. Unknown Precipitation (UP): A form of precipitation reported by an FBWOS when it detects precipitation is occurring but cannot determine the type. UP is not reported in manual or augmented observations.

10.7.2. Obscurations are a collection of particles (hydrometeors and lithometeors) in contact with the surface or aloft and reported in the body of the observation when they are in a dense enough concentration to be reducing visibility below 7SM.

10.7.2.1. Mist (BR): A form of obscuration composed of minute water particles or ice crystals suspended in the atmosphere. BR is reported when visibility is greater than or equal to 5/8SM (1000m) but less than 7SM (9999m). Mist can be distinguished from haze by color and moisture content; when viewed against the background, mist produces a grayish tinge.

10.7.2.2. Fog (FG): A form of obscuration composed of minute water particles suspended in the atmosphere. FG is a denser concentration than BR and is reported when visibility is reduced to less than 5/8SM (1000m). When the temperature is less than 0^{o}C and FG is present, report as FZFG, even if ice is not accumulating on exposed surfaces. FG may also be encoded with the descriptors VC, MI, PR, and BC.

10.7.2.3. Smoke (FU): Small particles produced by combustion that are suspended in the air. When present may cause the sun to appear very red at sunrise and sunset and during the daytime, can cause a reddish tinge to the background. Smoke that has traveled a great distance from its source usually has a light grayish or bluish color and is evenly distributed in the air.

10.7.2.4. Volcanic Ash (VA): Fine particles of rock powder that have erupted from a volcano and remain suspended in the atmosphere for long periods of time. Volcanic Ash will always be reported in the body of the observation when observed, regardless of the visibility and vicinity to the station. **(T-1).**

10.7.2.5. Widespread Dust (DU): Solid materials suspended in the atmosphere in the form of small irregular particles, many of which are microscopic in size. When lifted to high enough levels in the atmosphere, dust may travel and be observed as it settles at locations significantly far from the original source region.

10.7.2.6. Sand (SA): Sand particles picked up from the surface of the earth by the wind, reducing the horizontal visibility.

10.7.2.7. Haze (HZ): Extremely small, dry particles suspended in the air in sufficient enough numbers to reduce visibility. May be distinguished from mist by color and moisture content; when viewed against a dark background, produces a bluish tinge and when viewed against a light background, appears as a yellowish veil.

10.7.2.8. Spray (PY): Water droplets displaced by the wind from a body of water, generally from the crests of waves, and carried up into the air in such quantities that they reduce the horizontal visibility. When observed to be reducing visibility, spray is always reported as blowing (BLPY).

10.7.3. Other Phenomena are meteorological events that do not necessarily directly reduce visibility but are of enough significance that they warrant reporting in an observation when they are in the area (i.e. on-station, in the vicinity, or distant). When applicable, additional information describing the nature of the phenomena is included in column 13 remarks following the guidance in **Attachment 3.**

10.7.3.1. Well-Developed Dust/Sand Whirl (PO): Dust or sand that is raised from the ground and takes the form of a whirling column with varying height, small diameter and an approximate vertical axis. Commonly referred to as "Dust Devils," they typically form in dry regions on hot, calm days when intense surface heating causes a very steep temperature lapse rate in the lower levels of the atmosphere; may be strong enough to cause wind damage.

10.7.3.2. Squall (SQ): A strong wind event characterized by a sudden increase in speed of at least 16 kts with sustained speeds of at least 22 kts for at least 1 minute.

10.7.3.3. Funnel Cloud (FC): A funnel shaped mass of moisture and/or debris associated with a violent, rotating column of air. Funnel clouds usually form as pendants from cumulonimbus clouds and may be observed over land or water but *do not* touch the surface. Can be confused with scud/inflow bands which appear similar in appearance but do not rotate.

10.7.3.4. Tornado/Water Spout (+FC): A funnel shaped mass of moisture and/or debris associated with a violent, rotating column of air *that does* touch the surface. Regardless of where they form or move, this phenomenon is reported as a Tornado while over land and a Water Spout while over water; both are encoded as +FC.

10.7.3.5. Dust storm (DS): An unusual, frequently severe weather condition characterized by strong winds and dust-filled air that can reduce visibility over an extensive area, often preceded by a wind driven dust wall that can exceed 3,000ft in vertical extent.

10.7.3.6. Sandstorm (SS): A wind driven event, typically occurring during the heat of the day and dying out at night, where particles of sand are lifted enough to cause a reduction in visibility. Unlike a DS, the sand is mostly confined to the lowest 10ft and rarely rises more than 50ft above the ground.

10.8. Manual Observing

10.8.1. Present weather is determined through physical observation and by using a combination of the Qualifiers, Precipitation Types, Obscurations, and Other Phenomena described above. These elements, combined with prevailing and sector visibility, dictate what present weather is encoded.

10.8.2. When observed to be occurring on station, all forms of precipitation will be reported. **(T-1).** Use **Table 10.4** to determine precipitation intensity (applicable intensity qualifier) based on rate-of-fall, accumulation characteristics, and/or visibility. If in the vicinity, should be reported using the VC qualifier; in this case, no intensity is assigned. If precipitation is observed to be occurring beyond 10SM of the observation point, may be reported in column 13 remarks as distant.

Table 10.4. Determining Precipitation Intensity.

Rain / Ice Pellets - Based on Rate-of-Fall (See Notes 1)	
Intensity	**Criteria**
Light	Rate of up to 0.10” per hr; maximum 0.01 inch in 6 minutes
Moderate	Rate of 0.11” - 0.30” per hr; more than 0.01 inch to 0.03 inch in 6 minutes
Heavy	Rate of more than 0.30” per hr; more than 0.03 inch in 6 minutes
Rain - Based on accumulation	
Intensity	**Criteria**
Light	Scattered drops that, regardless of duration, do not completely wet an exposed surface up to a condition where individual drops are easily seen.
Moderate	Individual drops are not clearly identifiable; spray is observable just above pavements and other hard surfaces
Heavy	Rain seemingly falls in sheets; individual drops are not identifiable; heavy spray to height of several inches is observed over hard surfaces
Ice Pellets - Based on Accumulation and Visibility	
Intensity	**Criteria**
Light	Scattered pellets that do not completely cover an exposed surface regardless of duration; visibility is not affected
Moderate	Slow accumulation on ground; visibility reduced by ice pellets to less than 7SM (9999m)
Heavy	Rapid accumulation on ground; visibility reduced by ice pellets to less than 3SM (4800m)
Snow / Snow Pellets / Drizzle - Based on visibility	
Intensity	**Criteria**
Light	Visibility > 1/2SM (800m)
Moderate	Visibility > 1/4SM (0400m) but ≤ 1/2SM (800m)
Heavy	Visibility ≤ 1/4SM (0400m)
Notes: 1. Intensity is determined based on the *rate*	

10.8.3. Hail (GR). When observed on station, regardless of size, hail will be encoded GR as present weather in column 5. All reports of hail must include the size of the largest hailstone observed in the Remarks (RMK) section of METAR/SPECI in increments of 1/4 inch. If no hail size is reported, it will be assumed to be small hail. If the initial observation to report the beginning or ending of hail is missed (e.g. personnel sheltering for safety), at the first opportunity, disseminate a full observation including the begin/end times of the hail activity following the format in **Attachment 3. (T-1).**

10.8.4. When observed to be occurring, thunderstorms and any associated precipitation will be reported as on station, in the vicinity, or as distant using the following guidelines and **Figure 10.1** **(T-1).** If known, the distance, direction and direction of movement for storms within 30NM of the location will be included in column 13 remarks following guidance in **Attachment 3**.

10.8.4.1. A thunderstorm is considered to be observed through detected/observed lighting, audible thunder, or the presence of hail (GR) if the local noise level is such that thunder cannot be heard. **(T-0).**

10.8.4.2. If a thunderstorm is positively identified as being within 5NM of the point of observation or a thunderstorm is observed and the location cannot be positively identified, thunderstorms will be reported as occurring on station. **(T-0).** Positive identification is achieved through lighting detection equipment and/or display and interpretation of available radar imagery (i.e. 40dBz elevated to -10^{o}C height within storm core). Visual positive identification will only be used when lighting is seen to strike an object at a known distance. **Note:** Estimating the distance of a lightning strike based on bolt/flash intensity or the "flash-bang" method is not a suitable means of determining distance.

10.8.4.3. When lightning is observed at a manual station, the frequency, type of lightning, and location shall be reported. The remark shall be coded in the format listed in **Attachment 3**. The contractions for the type and frequency of lightning shall be based on **Table 10.5** **(T-0).**

Table 10.5. Type and Frequency of Lightning.

Type of Lightning		
Type	**Contraction**	**Definition**
Cloud-ground	CG	Lightning occurring between cloud and ground.
In-cloud	IC	Lightning which takes place within the cloud.
Cloud-cloud	CC	Streaks of lightning reaching from one cloud to another.
Cloud-air	CA	Streaks of lightning which pass from a cloud to the air, but do not strike the ground.
Frequency of Lightning		
Frequency	Contraction	Definition
Occasional	OCNL	Less than 1 flash/minute.
Frequent	FRQ	About 1 to 6 flashes/minute.
Continuous	CONS	More than 6 flashes/minute.

10.8.4.4. If a thunderstorm can be positively identified as being located within 5-10NM of the point of observation, thunderstorms will be encoded as in the vicinity. **(T-0).**

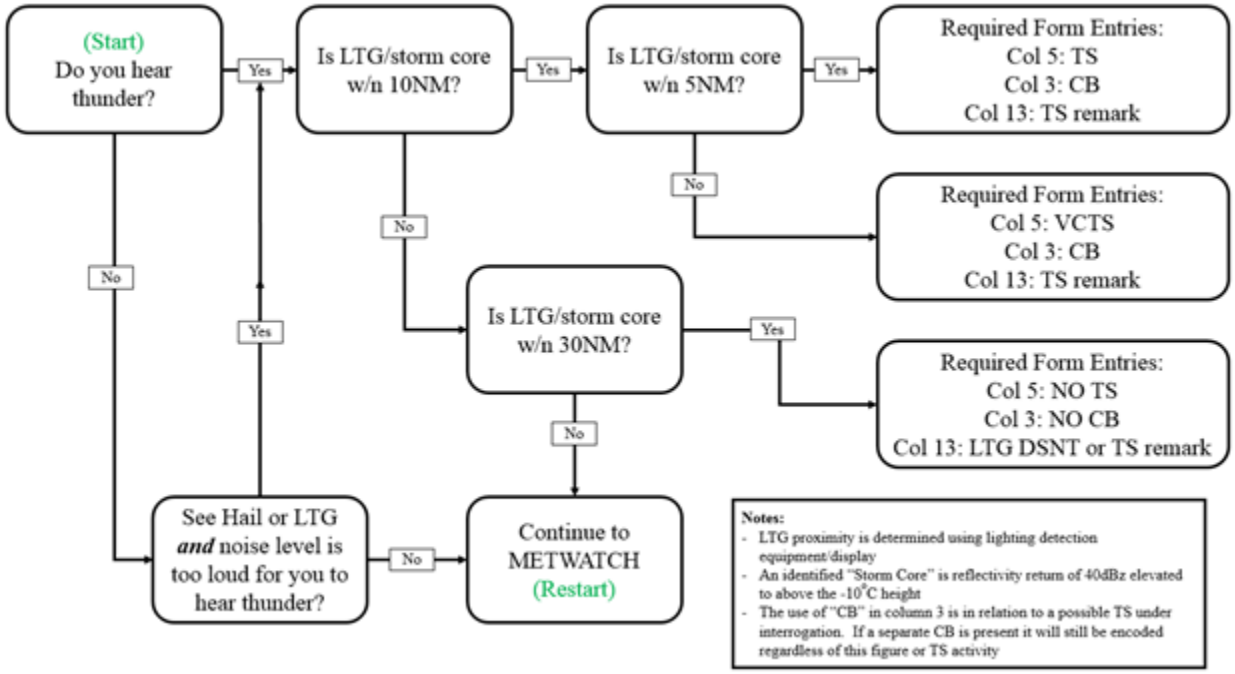
10.8.4.5. If a thunderstorm is positively identified as beyond 10NM of the point of observation, thunderstorms are not encoded in the body of the observation as present weather; in this case, only a column 13 remark is appropriate.

10.8.4.6. Through the lifecycle of a thunderstorm, it may move through any combination of on-station, in the vicinity, and/or distant and be reported as such.

10.8.4.7. A thunderstorm is considered to have ended when 15 minutes has elapsed since the occurrence of the criteria in **paragraph 10.8.4.2**. **(T-0).**

10.8.4.8. If the initial observation to report the beginning or ending of tornadic activity, hail, or thunderstorm activity is missed (e.g. personnel sheltering for safety), at the first opportunity, follow the procedures for delayed reporting. Then disseminate a full observation including the begin/end times of the thunderstorm following the format in **Attachment 3. (T-1).**

Figure 10.1. Thunderstorm Determination.



10.8.5. When observed, determine the requirement to report obscurations in conjunction with the following criteria:

10.8.5.1. When obscurations are reducing the prevailing visibility below 7SM (9999) they will be encoded in column 5 as a present weather obscuration. **(T-1).**

10.8.5.2. When obscurations are observed but are not reducing visibility they *should* be reported in the remarks section when it is determined to be operationally significant but are not encoded in column 5. **Exception:** volcanic ash will always be reported in the body of the observation when observed, regardless of the visibility and vicinity to the station. **(T-1).**

10.8.6. When observed, determine the requirement to report other weather phenomena in conjunction with the following criteria:

10.8.6.1. Tornadic activity will always be reported in the body of the observation when observed. **(T-1).**

10.8.6.2. Funnel clouds, water spouts, and tornadoes will be reported in observations when first observed, if they transition from one type to another (i.e. FC becomes +FC), and when they end. **(T-1).**

10.8.6.2.1. When first observed, follow the format in **Attachment 3** to immediately encode and disseminate an observation including all elements from the body of the observation and the single remark for tornadic activity.

10.8.6.2.2. If the initial observation to report the beginning, change in type, or ending of tornadic activity is missed (e.g. personnel sheltering for safety), at the first opportunity follow the format in **Attachment 3** to disseminate a full observation including the begin/end times of the tornadic activity. **(T-1).**

Chapter 11

SKY CONDITION

11.1. Introduction. This chapter describes the observing and reporting standards for sky condition. Sky condition is a description of the celestial dome as seen from a single point on the surface of the earth and is reported with relation to what could be seen if there was an unobstructed view from horizon to horizon.

11.2. Sky Condition Group ($N_sN_sN_sh_sh_sh_s$ or $VVh_sh_sh_s$ or SKC or CLR). Sky condition is encoded in the format, $N_sN_sN_sh_sh_sh_s$, where $N_sN_sN_s$ is the amount of sky cover and $h_sh_sh_s$ is the height of the base of the layer in hundreds of feet above the surface. There is no space between the amount of sky cover and the height of the layer. Report layer height using reportable values in **Table 11.1**

11.2.1. Sky condition is encoded in ascending order up to the first overcast layer. At mountain locations, if the cloud layer is below the observation location elevation, the height of the layer will be reported in the body of the METAR or SPECI as "///." **(T-0).**

11.2.2. No more than six layers will be reported. If more than six layers are observed during back-up, weather technicians will use **Table 11.2** to help determine which layers are to be reported. **(T-0).**

Table 11.1. Increments of Reportable Values of Sky Cover Height.

Range of Height Values (feet)	Reportable Increment (feet)
≤ 5,000	To nearest 100
> 5,000 but ≤10,000	To nearest 500
> 10,000	To nearest 1,000

Table 11.2. Priority for Reporting Layers.

Priority	Layer Description
1	Lowest few layer
2	Lowest broken layer
3	Overcast layer
4	Lowest scattered layer
5	Second lowest scattered layer
6	Second lowest broken layer
7	Highest broken layer
8	Highest scattered layer

11.2.3. Vertical visibility is encoded in the format, $VVh_sh_sh_s$, where VV identifies an indefinite ceiling and $h_sh_sh_s$ is the vertical visibility into the indefinite ceiling in hundreds of feet. There is no space between the group identifier and the vertical visibility.

11.2.4. Clear skies are encoded in the format, CLR or SKC, where CLR is the abbreviation used by all FBWOS locations and SKC is used by manual stations to indicate no clouds are present.

11.2.5. Each layer is separated from other layers by a space. The sky cover for each layer reported is encoded by using the appropriate reportable contraction**.** The report of clear skies (CLR or SKC) is reported by itself. The abbreviations FEW, SCT, BKN and OVC will be followed, without a space, by the height of the cloud layer. **(T-0).**

11.2.6. A partial obscuration will be encoded with the reportable layer construction corresponding to the amount of the sky that is obscured followed by the layer height. A surface-based obscuration will have a layer height of 000. A remark will also be appended for any surface-based obscurations. For example: fog obscuring 2/8ths of the sky would be encoded in the body of the report as FEW000 and clarified in the remarks as FG FEW000. (T-0).

11.3. Sky Condition Algorithms. An FBWOS derives sky condition by detecting the frequency and height of clouds that move over the sensor over a continuously averaged period of 30 minutes. The data collected from the sensor is processed into coverage amount, height and variability of clouds.

11.3.1. FBWOS sensors are capable of reproducing a sky condition report comparative to that of a human weather technician but may perform poorly in situations where clouds develop in the vertical but have little horizontal movement (i.e. convective clouds either remain directly over sensor and are over-reported or do not pass over the sensor and are under-reported). When equipped with multiple ceilometers, the data from the discontinuity sensors are examined and compared with the primary sensor to determine the requirement to report non-uniform ceiling conditions IAW **Attachment 3.**

11.3.2. FBWOSs report sky condition from 100ft up to a maximum of 25,000ft. **Note:** Some systems may report heights exceeding 25,000ft.

11.4. Standards and Reporting. Sky condition is an evaluation of all obscurations/clouds making up layers at different heights and is reported in oktas (eighths) using a code form with appended height above the surface. Sky condition is reported in all METAR and SPECI observations.

11.4.1. Clouds and/or obscuring phenomena (not necessarily all of the same type) with bases at approximately the same level constitute a layer. They may be either continuous or composed of detached elements. A trace aloft is evaluated as 1/8th; however, a surface-based obscuring phenomenon is only classified as a layer when it covers at least 1/8th of the sky. All layers are treated as opaque.

11.4.2. Heights of layers are reported using a three-digit value representing hundreds of feet above the surface and are rounded to a reportable increment. Layer heights up to 5,000ft are reported to the nearest 100 feet, layer heights between 5,000ft and 10,000ft are reported to the nearest 500ft and layers above 10,000ft are reported to the nearest 1,000ft. When a value falls halfway between two reportable increments, the lower value is reported.

11.4.3. Sky cover is determined using the summation principle. This principle states that the sky cover at any level is equal to the sky cover in all lower levels up to and including the layer in question. In other words, no layer can be classified as less than the layers below it and no total sky cover can be greater than 8/8ths. See **Figure 11.1** for an example of the summation principle.

11.4.4. Sky cover code forms reflect the degree of sky coverage based on a summation of the amount of clouds/obscuring phenomena at and below layer being evaluated. The approved code forms are listed below (with encoded form in parenthesis):

11.4.4.1. Sky Clear (SKC or CLR) - The absence of any clouds/obscuring phenomena; 0/8ths coverage. **Note:** Sometimes encoded as NCD or NSC by automated stations and organizations outside of AF weather to indicate No (Significant) Clouds Detected below 12,000ft (or 25,000ft with the 25K algorithm); CLR, NCD and NSC do not necessarily indicate clear skies.

11.4.4.2. Few (FEW) - A trace through 2/8ths coverage.

11.4.4.3. Scattered (SCT) - 3/8ths through 4/8ths coverage.

11.4.4.4. Broken (BKN) - 5/8ths through less than 8/8ths. **Note:** The lowest BKN or greater layer represents the ceiling.

11.4.4.5. Overcast (OVC) - The sky is completely covered by clouds/obscuring phenomena; 8/8ths coverage. **Note:** All layers are treated as opaque (i.e. an overcast layer of thin cirrus can be seen through however the sky is still overcast).

11.4.4.6. Vertical Visibility (VV) - The sky is completely covered by a surface-based phenomena (e.g. snow, fog); 8/8ths coverage. The terms totally obscured and indefinite ceiling may also be used in relation to this sky condition. **Note:** Vertical Visibility constitutes a ceiling.

11.4.5. For aviation purposes, the reported ceiling is defined as the lowest height at which the summation of layers equals broken or greater coverage ($\geq$ 5/8ths) or the maximum height that can be observed into a vertical visibly obscuration.

11.4.6. A variable ceiling represents a situation in which the height of the ceiling rapidly increases and decreases by specified amounts during the period of observation and the ceiling is below 3,000ft. See **Table 11.3** for additional reporting criteria.

Table 11.3. Criteria for Variable Ceiling.

Ceiling (feet)	Variation Amount (feet)
$\leq$ 1,000	200
> 1,000 and $\leq$ 2,000	400
> 2,000 and < 3,000	500

11.4.7. A variable sky condition represents a situation in which a layer varies rapidly in coverage amount by at least one reportable value during the period of the observation and the layer is below 3,000ft.

11.4.8. Sky cover and ceiling heights from PIREPS should be used to maintain situational awareness and to compare against the determined or sensor derived sky condition. Convert cloud bases reported in PIREPs from mean sea level (MSL) to above ground level (AGL) before comparing to the local data. Reevaluate sky cover and ceiling heights when PIREPS indicate an operationally significant difference from the current observation.

11.5. Manual Observing Methods. The legacy Qualification Training Package Observing – *Trainer's Guide,* found on the AFWKC and the WMO-No. 407 *International Cloud Atlas*, *Volume II* both contain references and photographs for identifying the various cloud forms and can be used as a resource when determining significant cloud types and amounts. Sky condition will be evaluated in all METAR and SPECI observations. **(T-1).**

11.5.1. All layers visible from the point of observation are considered in sky cover reports. A maximum of six layers may be reported. When more than six layers are present, use **Table 11.2** to determine reporting priority.

11.5.2. When observed, significant cloud types will be reported in the observation using the following guidance. **(T-1).**

11.5.2.1. When observed and within 10nm, cloud layers with cumulonimbus (CB) or towering cumulus (TCU) are identified by appending the contractions CB and/or TCU to the layer height and are further described in column 13 remarks. **Note:** Only one contraction is appended to each layer in the body of the observation; CB has priority if both are observed at the same layer height.

11.5.2.2. When observed and beyond 10nm, CB and TCU are not appended to the cloud layer report. In this case, only a column 13 remark is used (e.g., CB 14NW-20NNE MOV SE AND TCU DSNT S).

11.5.2.3. All other significant cloud features are reported in column 13 as remarks following guidance in **Attachment 3.**

11.5.3. To determine total layer coverage and total sky cover, from a location that affords the maximum view of the celestial dome, mentally divide the sky into halves, quarters and/or eighths and estimate the layer coverage amount starting with the lowest layer. Using the summation principle, add each successive layer amount in eighths estimated. See **Figure 11.1** for sky cover example.

11.5.3.1. When evaluating interconnected layers formed by the horizontal extension of cumulus, a layer will only be treated as separate if the base appears horizontal and at a different height than the parent cloud. Otherwise, the entire cloud is regarded as a single layer and is annotated with the height of the base of the parent cloud (i.e. a well-developed anvil from a CB may be treated as its own separate layer).

11.5.3.2. Determine total layer and sky cover amount based on what is actually seen, to include the bases and sides of clouds or obscuring phenomenon. Do not reduce coverage estimation to compensate for the packing effect that is commonly seen with cumuliform clouds. The packing effect is observed as an increased sky coverage amount due to the viewing angle of the sides of clouds when looking to the horizon. See **Figure 11.2** for an example of the packing effect.

Figure 11.1. Sky Cover Evaluation Example.

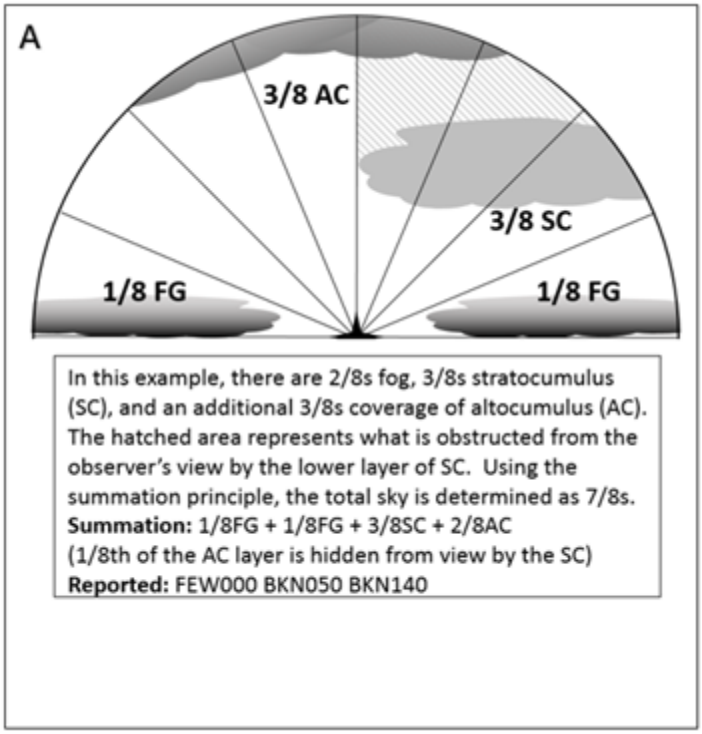
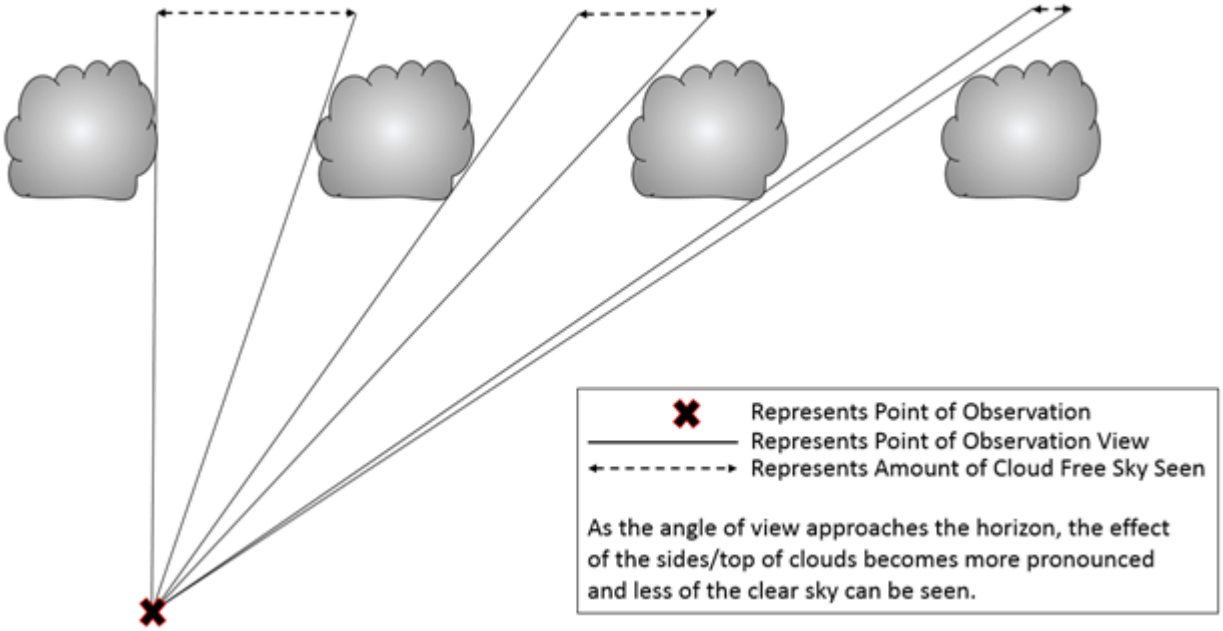


Figure 11.2. Illustration of the Packing Effect.



11.5.4. The primary method for determining layer height is using the equipment derived height from an installed ceilometer. When determining layer height, treat layers as uniform; the height overhead is the same as the height of the entire layer. In the absence of the primary ceilometer or when it is determined to be malfunctioning, determine the layer height for each observed

element using one of the following methods. **Note:** Determining layer height based on the speed of movement of individual cloud elements is not a reliable method.

11.5.4.1. Deployable meteorological equipment such as an AN/TMQ-53 ceilometer.

11.5.4.2. A handheld ceilometer. When used, this device must be held as perpendicular to the ground as possible and used only to measure cloud bases directly overhead. If held at an angle, it erroneously displays heights as too great.

11.5.4.3. PIREPs from aircraft in the local area.

11.5.4.4. Known heights of unobscured portions of natural landmarks or objects.

11.5.4.5. Observation of a weather balloon; dew point depression from upper air profiles.

11.5.4.6. Convective Cloud Height Table. Use **Table 11.4** to estimate the height of cumulus clouds formed in the vicinity of the observing location. **Note:** This method is most accurate in determining cloud bases below 5,000ft. This method cannot be used to determine heights of non-cumuliform clouds or for locations in mountainous/hilly terrain.

Table 11.4. Convective Cloud Height Estimates.

CONVECTIVE CLOUD-BASE HEIGHT TABLE			
Surface Dewpoint Depression (°C)	**Estimated Cloud Base Height (ft)**	**Surface Dewpoint Depression (°C)**	**Estimated Cloud Base Height (ft)**
0.5	200	10.5	4,200
1.0	400	11.0	4,400
1.5	600	11.5	4,600
2.0	800	12.0	4,800
2.5	1,000	12.5	5,000
3.0	1,200	13.0	5,200
3.5	1,400	13.5	5,400
4.0	1,600	14.0	5,600
4.5	1,800	14.5	5,800
5.0	2,000	15.0	6,000
5.5	2,200	15.5	6,200
6.0	2,400	16.0	6,400
6.5	2,600	16.5	6,600
7.0	2,800	17.0	6,800
7.5	3,000	17.5	7,000
8.0	3,200	18.0	7,200
8.5	3,400	18.5	7,400
9.0	3,600	19.0	7,600
9.5	3,800	19.5	7,800
10.0	4,000	20.0	8,000

Chapter 12

TEMPERATURE AND DEW POINT

12.1. Introduction. This chapter describes the observing and reporting standards for temperature and dew point. Temperature is a measure of the average kinetic energy of air molecules. Dew point is the temperature that a parcel of air at a constant pressure and water vapor content must be cooled, in order for saturation to occur.

12.2. Temperature/Dew Point Group (T'T'/T'$_d$T'$_d$). The temperature and dew point are encoded as two digits rounded to the nearest whole degree Celsius. Subzero temperatures and dew points will be prefixed with an M. **(T-0).**

12.2.1. Temperature is separated from the dew point by a slash (/). For example, a temperature of 4°C with a dew point of -2°C is encoded as "04/M02." A temperature of -0.5°C is encoded as "M00." **Exception:** On the electronic (Excel®) AF Form 3803, use a minus sign (-) rather than an M to indicate below zero temperature/dew points. The form macros will automatically convert the minus sign to an M on the form while retaining the numerical value of the temperature/dew point for calculations.

12.2.2. If the temperature is not available, the entire temperature/dew point group will not be encoded. If the dew point is not available, the temperature is encoded followed by a slash (/) and no entry will be made for dew point. For example, a temperature of 1.5°C and a missing dew point would be reported as "02/". **(T-0).**

12.3. Temperature/Dew Point Algorithms. The FBWOS continuously senses and measures temperature and dew point and provides a report in degrees Celsius every minute. The 24-hr maximum and minimum temperatures are based on the highest and lowest average temperatures during the period of evaluation. **Note:** The AN/FMQ-19 stops reporting dew point when the temperature is $\leq -34^{o}$ Celsius.

12.4. Standards and Reporting. Temperature and dew point are primarily determined using an FBWOS or other approved digital instrumentation. If no digital method is available, use any backup means available.

12.4.1. All measurements are reported in degrees Celsius (C). Reports are to the nearest whole degree in the body of all observations. Reports are to the nearest 1/10th of a degree in the summary of the day section of the AF Form 3803 and the remarks section of an observation. Reports are to the nearest whole degree on the JET Form 3813 due to system.

12.5. Manual Observing Methods.

12.5.1. The primary method to obtain temperature and dew point are by directly reading the sensor output from an FBWOS. If using back-up equipment, follow the procedures in the applicable T.O. or user's manual.

12.5.2. The maximum and minimum temperatures are the highest and the lowest temperature values respectively for the time period (hourly, 6-hr, 24-hr). Determine maximum and minimum temperatures from a digital readout or temperature recording equipment. If no other record is available, use the temperature entries recorded in the observations (24-hour observing locations only).

Chapter 13

PRESSURE

13.1. Introduction. This chapter describes the observing and reporting standards for pressure measurements. All pressure values are initially derived from the atmospheric pressure as measured by a barometer and may be reported in either inches of mercury (iHg) or hectopascals (hPa).

13.2. Altimeter ($AP_HP_HP_HP_H$). The altimeter group always starts with an A (the international indicator for altimeter in inches of mercury). The altimeter is encoded as a four-digit group immediately following the A using the tens, units, tenths, and hundredths of inches of mercury. The decimal point is not encoded.

13.3. Pressure Measurement Algorithms. The FBWOS sensors measure the barometric pressure and then based on that value, compute the pressure parameters (e.g., station pressure, altimeter setting, and sea-level pressure). Computations are made each minute. In addition to the pressure parameters, the FBWOS also generates pressure change and pressure tendency remarks for possible inclusion in the observations. FBWOS pressure sensors are capable of measuring pressure from 17.5 to 32.5 iHg (600 to 1,100 hPa).

13.4. Standards and Reporting. At a minimum, all observations will include an altimeter setting (ALSTG) in the body of the observation; additional pressure computations are recorded and reported in accordance with this manual and local directives. **(T-1).** All pressure values will be rounded down to the nearest reportable value. **(T-1).** In the United States and at US military organizations overseas, pressure data is expressed as iHg for station pressure and ALSTGs and as hPa for sea-level pressure (SLP); however, MAJCOMs may direct the use of hPa for reporting purposes. **Note:** The common international unit of measure is hPa for all pressure data.

13.4.1. All pressure-related values are considered estimated any time the readings are suspect in the opinion of weather personnel or when pressure is obtained through any method other than the primary sensor. **Exception:** The AN/TMQ-53 may be used as a back-up without estimating pressure values if it has been set-up and properly maintained IAW FCMS4-1994 and the T.O., and the values are representative and consistent with other reports in the area.

13.4.2. The primary measurements of atmospheric pressure used in observations are the station pressure and the altimeter setting.

13.4.2.1. Station pressure is defined as the atmospheric pressure computed for the level of the station elevation. This initial pressure calculation is used to derive all other pressure reports. Station pressure is not disseminated but is recorded at 3-hourly intervals on the observation form. **Note:** Station pressure may be referred to by the acronym "QFE" by the international community.

13.4.2.2. The altimeter setting is a computed pressure value that an aircraft altimeter scale is set to so it indicates the altitude above MSL of an aircraft on the ground at the location for which the value was determined. **Note**: The letter "A" is used to identify an ALSTG in observations at CONUS locations and OCONUS US military locations. The letter "Q" is used by the international community; additionally, an ALSTG may be referred to by the acronym "QNH."

13.4.3. Additional derived pressure-related reports are added to observations when occurring and/or at regular intervals in accordance with this manual, higher headquarters guidance, and local procedures. These reports include but are not limited the following:

13.4.3.1. Sea-level Pressure (SLP) is a report of the theoretical reduction of station pressure to sea level. Where the earth's surface is above sea level, it is assumed the atmosphere extends to sea level below the observing location and the properties of the hypothetical atmosphere are related to conditions observed at the unit. **Note:** SLP may be referred to by the acronym "QFF" by the international community.

13.4.3.2. Pressure tendency is a coded report (5-group) included on the 3-hourly observations that indicates the characteristic and amount of pressure change during the 3-hour period preceding the observation.

13.4.3.3. Pressure falling rapidly (PRESFR) and pressure rising rapidly (PRESRR) are remarks used to indicate a rapid fluctuation in pressure has occurred. These remarks are reported in column 13 whenever the station pressure changes at a *rate* of at least 0.06 iHg per hour (0.01 iHg per 10 minutes) with a change of at least 0.02 iHg having occurred at the time of observation.

13.4.3.4. Pressure Altitude (PA) is an altitude in the standard atmosphere at which a given pressure is observed. It is the indicated altitude above or below the 29.92 iHg constant-pressure surface. **Note:** PA may be referred to by the acronym "QNE" by the international community.

13.4.3.5. Density Altitude (DA) is the PA corrected for virtual temperature deviations from the standard atmosphere.

13.4.3.6. Field Elevation (Ha) is the officially designated elevation of an airfield/site above mean sea level. It is the elevation of the highest point on any of the runways of the airfield/site.

13.4.3.7. Station Elevation (Hp) is the officially designated height above sea level to which station pressure pertains; generally, the same as field elevation.

Table 13.1. Units of Measure and Resolution of Pressure Parameters.

Parameter	Unit of Measure	Resolution
Station Pressure	Inches of Mercury	0.005 iHg
Altimeter Setting	Inches of Mercury	0.01 iHg
Sea Level Pressure	Hectopascals	0.1 hPa
Pressure Altitude	Feet	10 ft
Density Altitude	Feet	10 ft

13.5. Manual Observing Methods. All organizations with a permanent weather observing mission in direct support of flying operations will have a primary pressure measurement instrument and will designate a back-up pressure measuring instrument. **(T-1).** The primary method to obtain pressure measurements are by directly reading the sensor output from an FBWOS or its associated software (i.e. JET).

13.5.1. Pressure Measurement Instrumentation. Obtain pressure data using an instrument from the following priority list. When using back-up equipment, follow the procedures in the applicable T.O. or user's manual and treat all values as estimated (see **paragraph 13.4.1** for exception).

13.5.1.1. AN/FMQ-19, Automatic Meteorological Station (AMS).

13.5.1.2. AN/FMQ-22/23 AMS.

13.5.1.3. Automated Surface Observing System (ASOS).

13.5.1.4. AN/TMQ-53, Tactical Meteorological Observing System.

13.5.1.5. Altimeter Setting Indicator (ASI).

13.5.1.6. Aircraft altimeter.

13.5.1.7. Other MAJCOM-approved device.

13.5.2. Station Pressure. Determine the station pressure by taking a direct reading, and if necessary, applying the posted pressure correction obtained during a scheduled barometer comparison.

13.5.3. Altimeter Setting. Read directly from the pressure measuring device.

13.5.3.1. If a direct readout of the primary method is unavailable, ASLTG is computed using the current station pressure value and the locally designated method (e.g. online forecaster tools found on AFW-WEBS and OWS websites, pressure reduction calculator, ALSTG quick reference chart).

13.5.3.2. If required for international aviation purposes, use **Table 13.2** to convert values from iHg to hPa.

Table 13.2. ALSTG - iHg to hPa.

IHg	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
	Hectopascals									
28.0	948	948	948	949	949	949	950	950	950	951
28.1	951	951	952	952	952	953	953	953	954	954
28.2	955	955	955	956	956	956	957	957	957	958
28.3	958	958	959	959	959	960	960	960	961	961
28.4	961	962	962	962	963	963	963	964	964	964
28.5	965	965	965	966	966	966	967	967	967	968
28.6	968	968	969	969	969	970	970	970	971	971
28.7	971	972	972	972	973	973	973	974	974	974
28.8	975	975	976	976	976	977	977	977	978	978
28.9	978	979	979	979	980	980	980	981	981	981
29.0	982	982	982	983	983	983	984	984	984	985
29.1	985	985	986	986	986	987	987	987	988	988
29.2	988	989	989	989	990	990	990	991	991	991
29.3	992	992	992	993	993	993	994	994	994	995
29.4	995	995	996	996	997	997	997	998	998	998
29.5	999	999	999	1000	1000	1000	1001	1001	1001	1002
29.6	1002	1002	1003	1003	1003	1004	1004	1004	1005	1005
29.7	1005	1006	1006	1006	1007	1007	1007	1008	1008	1008
29.8	1009	1009	1009	1010	1010	1010	1011	1011	1011	1012
29.9	1012	1012	1013	1013	1013	1014	1014	1014	1015	1015
30.0	1015	1016	1016	1016	1017	1017	1018	1018	1018	1019
30.1	1019	1019	1020	1020	1020	1021	1021	1021	1022	1022
30.2	1022	1023	1023	1023	1024	1024	1024	1025	1025	1025
30.3	1026	1026	1026	1027	1027	1027	1028	1028	1028	1029
30.4	1029	1029	1030	1030	1030	1031	1031	1031	1032	1032
30.5	1032	1033	1033	1033	1034	1034	1034	1035	1035	1035
30.6	1036	1036	1036	1037	1037	1037	1038	1038	1038	1039
30.7	1039	1040	1040	1040	1041	1041	1041	1042	1042	1042
30.8	1043	1043	1043	1044	1044	1044	1045	1045	1045	1046
30.9	1046	1046	1047	1047	1047	1048	1048	1048	1049	1049
NOTE: The hPa values in this table are truncated to their reportable value (i.e. rounded down to the nearest whole hPa)										

13.5.4. Sea-Level Pressure. Determine the SLP by taking a direct reading from the FBWOS. If a direct readout of the primary method is unavailable, SLP is computed using the current station pressure and the locally designated method (e.g. online forecaster tools found on AFW-WEBS and OWS websites, pressure reduction calculator, or SLP quick reference chart). **Note:** In addition to when using back-up equipment, SLP is also considered estimated when the 12-hour mean temperature is estimated.

13.5.5. Pressure Tendency. Determine the pressure tendency by taking a direct reading from the FBWOS during the 3-hourly observations.

13.5.5.1. If a direct readout of the pressure tendency is unavailable, compute the tendency using the following procedures:

13.5.5.1.1. Determine the pressure tendency from the 3-hour trend of the ALSTGs. Using the code figures in **Table 13.3,** choose the figure which best describes the character of the change from the trend.

13.5.5.1.2. Determine the difference (without regard to positive or negative) in station pressure from the 3-hour period to the nearest 0.005-inch by subtracting the current station pressure from the station pressure from 3 hours ago. Use **Table 13.4** to select the code figure that corresponds to the net change. **Note:** Limited-duty units can access the FBWOS software to obtain past pressure information when if available.

13.5.5.2. Consider the 3-hour pressure tendency group (5appp) as indeterminable when any portion of the group is impossible to determine. Annotate the reason for not reporting the group in column 90 (e.g. sensor outage).

Table 13.3. Pressure Tendency Character.

General Description	Pressure Characterization	Code Figure
Atmospheric pressure now higher than 3 hours ago	Increasing, then decreasing	0
	Increasing, then steady, or increasing then increasing more slowly	1
	Increasing steadily or unsteadily	2
	Decreasing or steady, then increasing; or increasing then increasing more rapidly	3
Atmospheric pressure now same as 3 hours ago	Increasing, then decreasing	0
	Steady	4
	Decreasing, then increasing	5
Atmospheric pressure now lower than 3 hours ago	Decreasing, then increasing	5
	Decreasing, then steady; or decreasing then decreasing more slowly	6
	Decreasing steadily or unsteadily	7
	Steady or increasing, then decreasing; or decreasing then decreasing more rapidly	8

Table 13.4. Amount of Pressure Change in Last 3 Hours.

Code figure, Difference in Pressure (iHg and hPa)											
Code Figure	**Inches of Hg**	**hPa**	**Code Figure**	**Inches of Hg**	**hPa**	**Code Figure**	**Inches of Hg**	**hPa**	**Code Figure**	**Inches of Hg**	**hPa**
000	.000	0.0	051	.150	5.1	102	.300	10.2	152	.450	15.2
002	.005	0.2	052	.155	5.2	103	.305	10.3	154	.455	15.4
003	.010	0.3	054	.160	5.4	105	.310	10.5	156	.460	15.6
005	.015	0.5	056	.165	5.6	107	.315	10.7	157	.465	15.7
007	.020	0.7	058	.170	5.8	108	.320	10.8	159	.470	15.9
008	.025	0.8	059	.175	5.9	110	.325	11.0	161	.475	16.1
010	.030	1.0	061	.180	6.1	112	.330	11.2	163	.480	16.3
012	.035	1.2	063	.185	6.3	113	.335	11.3	164	.485	16.4
014	.040	1.4	064	.190	6.4	115	.340	11.5	166	.490	16.6
015	.045	1.5	066	.195	6.5	117	.345	11.7	168	.495	16.8
017	.050	1.7	068	.200	6.8	119	.350	11.9	169	.500	16.9
019	.055	1.9	069	.205	6.9	120	.355	12.0	171	.505	17.1
020	.060	2.0	071	.210	7.1	122	.360	12.2	173	.510	17.3
022	.065	2.2	073	.215	7.3	124	.365	12.4	174	.515	17.4
024	.070	2.4	075	.220	7.5	125	.370	12.5	176	.520	17.6
025	.075	2.5	076	.225	7.6	127	.375	12.7	178	.525	17.8
027	.080	2.7	078	.230	7.8	129	.380	12.9	179	.530	17.9
029	.085	2.9	080	.235	8.0	130	.385	13.0	181	.535	18.1
030	.090	3.0	081	.240	8.1	132	.390	13.2	183	.540	18.3
032	.095	3.2	083	.245	8.3	134	.395	13.4	185	.545	18.5
034	.100	3.4	085	.250	8.5	135	.400	13.5	186	.550	18.6
036	.105	3.6	086	.255	8.6	137	.405	13.7	188	.555	18.8
037	.110	3.7	088	.260	8.8	139	.410	13.9	190	.560	19.0
039	.115	3.9	090	.265	9.0	141	.415	14.1	191	.565	19.1
041	.120	4.1	091	.270	9.1	142	.420	14.2	193	.570	19.3
042	.125	4.2	093	.275	9.3	144	.425	14.4	195	.575	19.5
044	.130	4.4	095	.280	9.5	146	.430	14.6	196	.580	19.6
046	.135	4.6	097	.285	9.7	147	.435	14.7	198	.585	19.8
047	.140	4.7	098	.290	9.8	149	.440	14.9	200	.590	20.0
049	.145	4.9	100	.295	10.0	151	.445	15.1	201	.595	20.1
									203	.600	20.3

NOTE: Code figures in this table are based on the conversion from inches of mercury to hectopascals since station pressure is taken in inches of mercury. However, other code figures not listed (e.g., 016 for 1.6 hPa) are also used at locations where station pressure is determined in hectopascals.

13.5.6. Pressure Altitude (PA) and Density Altitude (DA). PA and DA are automatically computed by FBWOSs, displayed on the ADS (e.g., JET) and TMQ-53 sensor displays, and disseminated locally to ATC agencies. If a direct readout of the primary method is unavailable, PA and DA can also be computed using the OWS or AFW-WEBS Forecaster Tools..

13.5.6.1. FBWOS and JET software compute DA using different formulas; the formula used by JET takes into account water vapor and the FBWOS does not. AF weather organizations should provide their supported units with DA values obtained directly from the ADS and TMQ-53 sensor displays when available. **(T-3).**

13.5.6.2. When the primary pressure sensor is inoperative, notify ATC agencies that the reported PA and DA values are estimated.

13.5.7. Rapid Pressure Changes. The FBWOS/JET automatically enter this remark if the condition is detected. If unavailable, manually determine whether the pressure change at the time of an observation and report the condition in the remarks of the observation using the format in **Attachment 3**.

13.6. Comparison and Calibration Procedures. Each unit with an AN/TMQ-53, a hand-held barometer, and/or equivalent will establish a barometer comparison/calibration program. **(T-3). Note:** Comparisons should be delayed during periods of high wind speeds (25 knots or higher, sustained or gusting), rapid temperature changes or steep horizontal and/or vertical temperature gradients (i.e. frontal system in area or frontal passage).

13.6.1. Record and document barometer comparisons on a locally developed worksheet/spreadsheet, or MAJCOM or higher headquarters approved form/worksheet/spreadsheet. Retain the last two barometer comparisons on file and dispose of all others.

13.6.2. Deployable barometers (e.g., AN/TMQ-53, handheld barometer).

13.6.2.1. At a minimum, compare barometers against a standard barometer annually, before deployment, when first deployed, if relocated during a deployment, and as soon as practical after redeployment.

13.6.2.2. Determine a mean correction by making at least four comparisons, not less than 15 minutes apart, against the standard barometer.

13.6.2.2.1. For handheld barometers, the standard barometer is the local observing system (i.e., AN/FMQ-19, AN/FMQ-23, or AN/TMQ-53).

13.6.2.2.2. For the AN/TMQ-53, the standard barometer can be either the local observing system or, when available, a maintenance standard barometer (used by airfield systems/depot maintenance personnel).

13.6.2.3. Apply the mean correction (or adjust the software to reflect the correction) to a fifth pressure reading. If the corrected reading differs from the standard barometer by more than 0.01iHg (0.34hPa), re-accomplish the steps above. If the corrected reading exceeds 0.03iHg (1.01hPa), discontinue use and replace the device (for the AN/TMQ-53, turn in to depot maintenance).

13.6.2.4. At locations that do not have a standard barometer, and while deployed, compare each barometer against any available calibrated pressure instrument (e.g., aircraft altimeter) following the same procedures above.

MARK D. KELLY, Lt Gen, USAF
Deputy Chief of Staff, Operations

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

AFPD 15-1, *Weather Operations*, 12 November 2015

AFI 11-201, *Flight Information Publication,* 31 March 2009

AFI 11-202, Volume 3, *General Flight Rules,* 10 August 2016

AFI 13-204, Volume 3, *Airfield Operations Procedures and Programs*, 1 September 2010

AFI 15-127, *Weather Training*, 14 March 2012

AFI 15-128, *Weather Force Structure,* 7 February 2011

AFI 21-103, *Equipment Inventory, Status and Utilization Reporting*, 26 January 2012

AFI 33-360, *Publications and Forms Management*, 1 December 2015

AFMAN 15-129, Volume 2, *Air and Space Weather Operations – Exploitation*, 7 December 2011

AFMAN 33-363, *Management of Records*, 1 March 2008

AR 95-1, *Flight Regulations*, 22 March 2018

AR 95-2, *Airspace, Airfields/Heliports, Flight Activities, Air Traffic Control, and Navigational Aids*, 31 March 2016

FAAO JO 6560.20C, *Siting Criteria for Automated Weather Observing Systems*, 6 September, 2017

FAAO JO 7340.2H, *Contractions,* 6 March 2018

FAAO JO 7350.9M, *Location Identifiers*, 18 July 2018

FAAO JO 7110.65X, *Air Traffic Control*, 12 September 2017

Federal Meteorological Handbook No. 1 (FCM-H1), *Surface Weather Observations and Reports,* November 2017

FCM-S4-1994, *Federal Standard for Siting Meteorological Sensors at Airports*, August 1994

Qualification Training Package Observing, *Trainer's Guide,* 15 February 2010

TC 3-04.81, *Air Traffic Control Facility Operations, Training, Maintenance, and Standardization,* 29 October 2010

WMO-No. 306, Manual on Codes, Vol I, *International Codes*, 2011 Edition

WMO-No. 306, Manual on Codes, Vol II, *Regional Codes and National Coding Practices*, 2011 Edition

WMO-No. 407, *International Cloud Atlas*, Volume II, 1987

Prescribed Forms

AF Form 3803 – *Surface Weather Observations (METAR/SPECI)*, 01 August 2000

JET Form 3818 – *Surface Weather Observations (METAR/SPECI)*, 01 August 2000

Adopted Forms

AF 679 – *Air Force Publication Compliance Item Waiver Request/Approval*, 09 May 2018

AFTO 747 – *Cyberspace Infrastructure System Acceptance*, 18 February 2016

AF 847 – *Recommendation for Change of Publication*, 22 September 2009

AF 3622 – *Air Traffic Control/Weather Certification and Rating Record*, 15 May 2018

AF Form 4058 – *Airfield Operations Policy Waiver*, 01 May 2001

Abbreviations and Acronyms

Minus "-"—Light intensity

no symbol—Moderate intensity

Plus "+"—Heavy intensity

Forward slash "/"—Indicates visual range data follows; separator between temperature and dew point data

ACC—Altocumulus Castellanus

ACFT MSHP—Aircraft Mishap

ACSL—Altocumulus Standing Lenticular Cloud

ADS—Automated Dissemination System

AFW-WEBS—Air Force Weather Web Services

ALSTG—Altimeter Setting

AO1—ASOS/AWOS stations without a precipitation discriminator

AO2—Remark included in METAR/SPECI observations from FBWOS WFs/Dets without augmentation (or ASOS/AWOS stations with a precipitation discriminator)

AO2A—Remark included in METAR/SPECI observations from FBWOS WFs/Dets with manual augmentation

AOL—Alternate Operating Location

APRNT—Apparent

APRX—Approximately

ASOS—Automated Surface Observing System

ATC—Air Traffic Control

AURBO—Aurora

AUTO—Automated Report

B—Began

BC—Patches

BKN—Broken

BL—Blowing

BR—Mist

C—Center (With Reference To Runway Designation)

CB—Cumulonimbus Cloud

CBMAM—Cumulonimbus Mammatus Cloud

CCSL—Cirrocumulus Standing Lenticular Cloud

CHI—Cloud-Height Indicator

CHINO—Cloud-height-indicator, Sky Condition At Secondary Location Not Available

CIG—Ceiling

CLR—Clear

CONTRAILS—Condensation Trails

CONUS—Continental United States

COR—Correction to A Previously Disseminated Report

DoD—Department Of Defense

DR—Low Drifting

DS—Dust storm

DSNT—Distant

DU—Widespread Dust

DZ—Drizzle

E—East, Ended

ESTMD—Estimated

FAA—Federal Aviation Administration

FBWOS—Fixed Base Weather Observing System

FC—Funnel Cloud

FEW—Few Clouds

FG—Fog

FIBI—Filed But Impracticable To Transmit

FIRST—First Observation After A Break In Coverage At An Augmented Observing

FLIP—Flight Information Publication

FROPA—Frontal Passage

FT—Feet

FU—Smoke

FZ—Freezing

FZRANO—Freezing Rain Information Not Available

G—Gust

GR—Hail (any size)

GS—Snow Pellets

hPa—Hectopascals (millibars)

HZ—Haze

IAW—In Accordance With

IC—Ice Crystals

ICAO—International Civil Aviation Organization

IFR—Instrument Flight Rules

ILS—Instrument Landing System

JET—Joint Environmental Toolkit

KT—Knots

L—Left (With Reference To Runway Designation)

LAST—Last Observation Before A Break In Coverage At An Augmented Observing

LOC—Location

LST—Local Standard Time

LTG—Lightning

LWR—Lower

M—Minus, Less Than

MAJCOM—Major Air Force Command

METAR—Aviation Routine Weather Report

MI—Shallow

MMLS—Mobile Microwave Landing System

MOV—Move, Moving, Moved

MT—Mountains

N—North

N/A—Not Applicable

NE—Northeast

NW—Northwest

OCONUS—Outside Continental United States

OFCM—Office of the Federal Coordinator for Meteorology

OHD—Overhead

OVC—Overcast

OWS—Operational Weather Squadron

P—Greater Than (used with RVR)

PAR—Precision Approach Radar

PCPN—Precipitation

PK WND—Peak Wind

PL—Ice Pellets

PNO—Precipitation Amount Not Available

PO—Dust/Sand Whirls (Dust Devils)

PR—Partial

PRESFR—Pressure Falling Rapidly

PRESRR—Pressure Rising Rapidly

PWINO—Precipitation Identifier Sensor Not Available

PY—Spray

R—Right (With Reference To Runway Designation)

RA—Rain

RMK—Remark

RVR—Runway Visual Range

RVRNO—Runway Visual Range Information Not Available

RWY—Runway

S—South

SA—Sand

SCSL—Stratocumulus Standing Lenticular Cloud

SCT—Scattered

SE—Southeast

SFC—Surface

SG—Snow Grains

SH—Shower(s)

SLP—Sea Level Pressure

SLPNO—Sea Level Pressure Not Available

SM—Statute Miles

SN—Snow

SNINCR—Snow Increasing Rapidly

SPECI—Aviation Selected Special Weather Report

SQ—Squall

SS—Sandstorm

SW—Southwest

SWAP—Severe Weather Action Plan

TCU—Towering Cumulus

TO—Technical Order

TS—Thunderstorm

TSNO—Thunderstorm Information Not Available

TWR—Tower

UNKN—Unknown

UP—Unknown Precipitation

UTC—Coordinated Universal Time

V—Variable

VA—Volcanic Ash

VC—In the Vicinity

VFR—Visual Flight Rules

VIS—Visibility

VISNO—Visibility at Secondary Location Not Available

VRB—Variable

VV—Vertical Visibility

W—West

WF/Det—Weather Flight/Detachment

WMO—World Meteorological Organization

WND—Wind

WSHFT—Wind Shift

Z—Zulu (e.g., Coordinated Universal Time)

Terms

Additive Data—A group of coded remarks that includes pressure tendency, amount of precipitation, and maximum/minimum temperature during specified periods of time.

Aviation Routine Weather Report—The WMO METAR code format used worldwide to encode weather observations.

Eyes Forward—WF/Det technicians are the eyes forward for the OWS forecasters and integrate weather radar data, meteorological satellite imagery, lightning detection readouts, and non-standard weather data systems (vertical profilers, mesonet data, etc.) to create an integrated weather picture and near-term trend forecasts for the OWS. Eyes forward yields meaningful meteorological information not contained in coded observations to the servicing OWS and is an integral part of the meteorological watch for an installation or contingency operating location.

File Time—The specific time or specific time block a weather message or bulletin is scheduled to be transmitted.

Freezing Rain—Rain that falls in liquid form but freezes upon impact to form a coating of glaze upon the ground and on exposed objects.

Glaze—A coating of ice formed by freezing precipitation covering the ground or exposed objects.

ICAO Identifier—A specifically authorized 4-letter identifier assigned to a location and documented in ICAO Document 7910.ICAO.

International Civil Aviation Organization—A United Nations organization specializing in matters dealing with international aviation and navigation.

Joint Environmental Toolkit (JET)—JET consolidates and integrates key capabilities from several familiar systems (N-TFS, OPS-II, JWIS, AOS, IWWC, IWEDA, IMETS…) used in OWSs, WFs/Dets, AOCs, and even deployed into one seamless application.

Limited-Duty Unit—A WF/Det that provides less than 24-hour a day forecast service.

Longline—dissemination of a surface weather observation outside of local installation.

Notice to Airmen (NOTAM)—A timely notice containing information concerning the establishment, condition, or change in any aeronautical facility, service, procedures, or hazards, essential to personnel concerned with flight operations.

Observed—Indicates reported weather information was determined visually by weather personnel, or weather sensing equipment, or by using radar.

Pilot Report (PIREP)—A report of in-flight weather provided by an aircraft crewmember.

Severe Weather—Any weather condition that poses a hazard to property or life.

Attachment 2

SPECIAL (SPECI) CRITERIA

Table A2.1. SPECI Criteria.

Reference Number	Criteria	Pertinent data	Manual	Automated	Supplement	Back-up
1	**Visibility** decreases to less than or, if below, increases to equal or exceed: (1) 3SM/4800 m (See Notes 1 and 8). (2) 2SM/3200 m (See Note 4). (3) 1½SM/2400 m (See Note 5). (4) 1 statute mile/1600 m (See Note 1). (5) ¾ statue mile/1200 m (See Note 10). (6) ½ statute mile/800 m (See Note 6). (7) ¼ statute mile/400 m (See Note 6). (8) All published airfield landing minima (including circling), as listed in the DoD FLIPs, aircraft-specific AFI 11-2 Series Volume 3, MAJCOM supplements, and Service publications applicable to aircraft	Surface visibility as reported in the body of the report decreases to less than or, if below, increases to equal or exceed.	**X**	**X**	**X**	**X**

Reference Number	Criteria	Pertinent data	Manual	Automated	Supplement	Back-up
	assigned to the installation (See Note 9). If none is published, use ½ mile/800 m (See Notes 1 and 6). (9) Visibility minima as applicable to range support, covered in governing directives and support agreements. (10) All airfield takeoff minima published in DoD FLIPs.					
2	**Ceiling** decreases to less than or, if below, increases to equal or exceed: (1) 3000 feet (See Note 1). (2) 2000 feet (See Note 10). (3) 1500 feet (See Note 1). (4) 1000 feet (See Note 2). (5) 800 feet (See Note 2). (6) 700 feet (See Note 4). (7) 500 feet (See Note 1).	The ceiling (rounded off to reportable values) forms or dissipates below, decreases to less than, or if below, increases to equal or exceed stated criteria.	**X**	**X**	**X**	**X**

Reference Number	Criteria	Pertinent data	Manual	Automated	Supplement	Back-up
	(8) 300 feet (See Note 5). (9) 200 feet (See Note 6). (10) 100 feet (See Note 6). (11) All published airfield landing minima (including circling), as listed in DoD FLIPs and appropriate USAF, Army, or MAJCOM flying instructions and publications. If none published, use 200 feet (See Note 7). (12) Ceiling minima, as applicable to range support, covered in governing directives and support agreements. (13) All airfield takeoff minima as published in the DoD FLIPs. (14) All other landing, takeoff, and pilot-restrictions for ceiling published in aircraft-specific AFI 11-2 Series Volume 3, MAJCOM supplements, and Service publications applicable to aircraft assigned to the installation.					
3	**Sky Condition**	A layer of clouds or obscuring phenomena aloft is observed below	**X**	**X**	**O**	**X**

Reference Number	Criteria	Pertinent data	Manual	Automated	Supplement	Back-up
		the highest published instrument landing minimum (including circling) applicable to the airfield, and no layer aloft was reported below this height in the previous METAR or SPECI.				
4	**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.	**X**	**X**	**O**	**X**
5	**Squall**	When squalls occur.	**X**	**X**	**O**	**X**
6	**Volcanic Eruption** (See Remark 1, **Table A3.1**)	Eruption or volcanic ash cloud first noted.	**X**	**M**	**X**	**X**
7	**Thunderstorm** (occurring on station) (1) Begins. (2) Ends.	A SPECI is not required to report the beginning of a new thunderstorm if one is currently reported.	**X**	**X**	**X**	**X**
8	**Precipitation** (1) Hail begins or ends. (2) Freezing precipitation begins, ends, or changes intensity.	**Note:** Except for freezing rain, freezing drizzle, hail, and ice pellets, a SPECI is not required for changes in type (e.g., drizzle changing to snow grains) or the beginning or ending of one type while another is in progress (e.g., snow changing to rain and snow).	**X** **X** **X**	**M** **M** **M**	**X** **X** **X**	**X** **X** **X**

Reference Number	Criteria	Pertinent data	Manual	Automated	Supplement	Back-up
	(3) Ice pellets begin, end, or change intensity. (4) Any other type of precipitation begins or ends (N/A for ASOS).		**X**	**X**	**O**	**X**
9	**Tornado, Funnel Cloud, or Waterspout** (1) Is observed. (2) Disappears from sight or ends.		**X**	**M**	**X**	**X**
10	**Runway Visual Range (RVR)** (1) RVR for the active runway decreases to less than or, if below, increases to equal or exceed: (a) 6000 feet (P1500 m for FBWOS sensors, 1830 m for ASOS sensors) (b) 5000 feet (1500 m for FBWOS sensors, 1520 m for ASOS sensors) (c) 4000 feet (1300 m), touch and go landing mins in 11 Series AFIs for mutiple platforms.	The highest value during the preceding 10 minutes from the designated RVR runway decreases to less than, or if below, increases to equal or exceed. **Note:** The RVR SPECI observations is taken, but only transmitted longline at locations with a 10-minute RVR average readout capability.		**X**		

Reference Number	Criteria	Pertinent data	Manual	Automated	Supplement	Back-up
	(d) 2400 feet (750 m for FBWOS sensors, 0730 m for ASOS sensors), PAR approaches for mutiple platforms (e) 2000 feet (600 m for FBWOS sensors, 0610 m for ASOS sensors) Required for CAT I and II ILS Localizer Critical Areas, Precision Approach Radar (PAR) Touchdown Areas, and MMLS Azimuth Critical Area. (f) 1600 feet (400 m), required for multiple platforms in 11 Series AFIs. (g) 1200 feet (400 m), CAT II ILS approach mins. (h) 1000 feet (320 m), required in multiple 11 Series AFIs (i) 600 feet (200 m), operational takeoff mins in 11 Series AFI (j) All published RVR minima applicable to the runway in use.					

Reference Number	Criteria	Pertinent data	Manual	Automated	Supplement	Back-up
	(2) RVR is first determined as unavailable (RVRNO) for the runway in use, and when it is first determined that the RVRNO report is no longer applicable, provided conditions for reporting RVR exist.					
11	**Tower Visibility**	Transmit a SPECI with the tower visibility as a remark: (1) When notified by the control tower that tower visibility has decreased to less than or, if below, increased to equal or exceed 1, 2, or 3SM, 1600, 3200 or 4800 m (IAW FAA JO 7110.65X, *Air Traffic Control*) and the control tower visibility differs from the prevailing visibility. (2) When notified by the control tower that tower visibility has decreased to less than or, if below, increased to equal or exceed locally developed tower special criteria (if applicable) and the control tower visibility differs from the prevailing visibility.	**X**	**M**	**X**	**X**

Reference Number	Criteria	Pertinent data	Manual	Automated	Supplement	Back-up
12	**Upon Resumption of Observing Function**	A SPECI is taken within 15-minutes after weather personnel return to duty following a break in observing coverage or augmentation at the observing location unless a METAR observation is filed during that 15-minute period	**X**		**X**	**X**
13	**Criteria Established Locally.** Take a SPECI for any criteria significant to local installation operations (e.g., alert observations). These criteria will be coordinated with base agencies and specified in the base/host unit's plans or weather support document.		**X**	**X**	**X**	**X**
14	**Aircraft Mishap** (at manual observing locations and at automated observing locations when an FBWOS is in supplement or back-up mode). Take an aircraft mishap SPECI immediately following notification or sighting of an aircraft mishap at or near the observing location unless there has been an intervening observation.	Identify the observation by including the remark in column 13 remarks on the AF Form 3803/JET Form 3813 only; e.g., (ACFT_MSHP). This remark is not disseminated locally or longline. (See Note 7)	**X**		**X**	**X**
15	**Miscellaneous**	Any other meteorological situation that the airfield weather personnel deem critical	**O**	**O**	**O**	**O**

Reference Number	Criteria	Pertinent data	Manual	Automated	Supplement	Back-up
NOTES: **X** – Indicates required data **O** – Indicates optional data based on local operational requirements **M** – Indicates Mandatory Supplementary Weather Conditions. When weather personnel are on duty, switch FBWOS to augment mode and begin supplementation operations. 1. OFCM policy, FAA policy, and mutiple MAJCOM 11 Series AFI supplements 2. FAA Aeronautical Information Manual requires 1000-ft ceilings for VFR ops in controlled airspace 3. Ceilings required by AFI 13-204, Volume 3; required for ground ops decisions; visibility required for OFCM and FAA policy 4. Ceiling and visibility required in mutiple MAJCOM 11 Series AFI supplements, visibility required in FAA and OFCM policy. 5. Required in mutiple MAJCOM 11 Series AFI supplements. 6. Required in AR 95-1, *Aviation Flight Regulations,* fixed wing and helicopter minimums, departure requirement if RVR is not available for multiple 11 series AFIs. 400-meter visibility is required if a blizzard warning is required criteria for a location. 7. A SPECI observation is not required for in-flight emergencies, i.e., those declared to reflect an unsafe condition that could adversely affect the safety of the aircraft. However, such in-flight emergencies should alert weather personnel to intensify the weather watch to ensure maximum support to the aircraft in distress. If the in-flight emergency results in an accident or incident, the aircraft mishap SPECI is then required. 8. Substitute 5000 m for 4800 m at OCONUS locations based on allied or host-nation practice 9. At airfields where takeoff/landing/circling minima are equal to non-reportable visibility values, units will substitute the next lower reportable visibility value for their special criteria 10. Touch and go landing minimum for multiple platforms in 11 Series AFIs. 11. If in doubt, take the observation; also see **Table 5.1**.						

Attachment 3

REMARKS

Table A3.1. Automated, Manual, and Plain Language Remarks/Additive and Maintenance Data.

Remark Number	Observed Condition	Enter in Remarks Section	Manual	Automated	Supplement	Back-up
1	**Volcanic Eruption**	Report the following information, if known: (1) Name of volcano, (2) Latitude and longitude or direction and distance from the installation, (3) Date/time UTC of eruption, (4) Size description, approximate height and direction of movement of the ash cloud, (5) And any other pertinent data, e.g., MT AUGUSTINE VOLCANO 70SM SW ERUPTED 231505 LARGE ASH CLOUD EXTENDING TO APRX 30000 FT MOV NE.	**X**	**M**	**X**	**X**
2	**Tornadic Activity** (See Note 1)	Encode tornadoes, funnel clouds, or waterspouts in format, **Tornadic activity_B/E(hh)mm_ LOC/DIR_(MOV)**, where TORNADO, FUNNEL CLOUD, or WATERSPOUT identifies the specific tornadic activity, B/E denotes the beginning and/or ending time, (hh)mm is the time of occurrence (only the minutes are required if the hour can be inferred from the report time), LOC/DIR is the location (distance if known) and/or direction of the phenomena from the installation, and MOV is the movement, if known. Tornadic activity will be encoded as the first remark after the "RMK" entry. For example, "TORNADO B13 6 NE" would indicate that a tornado, which began at 13 minutes past the hour, was 6SM northeast of the observing location.	**X**	**M**	**X**	**X**

Remark Number	Observed Condition	Enter in Remarks Section	Manual	Automated	Supplement	Back-up
3	**Augmented or Automated Systems**	**(AO2 or AO2A).** Encode **AO2** in all METAR/SPECI from FBWOSs without augmentation. Encode **AO2A** in all METAR/SPECI from FBWOSs with manual augmentation. **Note:** ASOS/AWOS stations without a precipitation discriminator will report AO1; ASOS/AWOS stations with a precipitation discriminator will report AO2.		**X**	**X**	**X**
4	**Peak Wind**	Encode peak wind (> 25 knots) in format, **PK_WND_dddff(f)/(hh)mm** of the next METAR, where PK_WND is the remark identifier, ddd is the direction of the peak wind, ff(f) is the peak wind speed since the last METAR, and (hh)mm is the time of occurrence (only the minutes are required if the hour can be inferred from the report time). There will be a space between the two elements of the remark identifier and the wind direction/speed group; a slash "/" (without spaces) will separate the wind direction/speed group and the time. This remark is still required even if the peak wind speed was transmitted in an intervening SPECI, but is not required if the peak wind occurred and/or reoccurred during the 2-minute observation period prior to the METAR. For example, a peak wind of 45 knots from 280 degrees that occurred at 15 minutes past the hour would be encoded "PK WND 28045/15." Multiple occurrence example: PK WND 24042/43 25042/19 (augmented mode). **Note:** FBWOS report the most recent occurrence of the peak wind.	**X**	**X**		**X**
5	**Wind Shift**	Encode wind shift (45 in less than 15 minutes with sustained winds 10 kts) in format, **WSHFT_(hh)mm**, where WSHFT	**X**	**X**		**X**

Remark Number	Observed Condition	Enter in Remarks Section	Manual	Automated	Supplement	Back-up
		is the remark identifier and (hh)mm is the time the wind shift began. When augmenting, the contraction **FROPA** may be manually entered by the weather personnel following the time if it is reasonably certain that the wind shift was the result of a frontal passage. There is a space between the remark identifier and the time and, if applicable, between the time and the frontal passage contraction. For example, a remark reporting a wind shift accompanied by a frontal passage that began at 30 minutes after the hour would be encoded as "WSHFT 30 FROPA."				
6	**Tower Visibility**	Encode tower visibility as, **TWR_VIS_vvvvv** where vvvvv is the observed tower visibility value when surface and/or tower visibility are less than 4SM (6000 m) and the control tower reported visibility differs from the surface prevailing visibility by a reportable value. There is a space between each of the remark elements. For example, if the surface visibility is 2 statute mile (3200 m) and tower visibility is 1½SM (2400 m), you would encode TWR VIS 1½ (TWR VIS 2400). Continue to carry the last reported tower visibility in subsequent METAR or SPECI observations unless otherwise notified by the control tower.	**X**	**M**	**X**	**X**
7	**Variable Prevailing Visibility**	Encode variable prevailing visibility (visibility < 3SM (4800 m) increases/decreases by ½SM (800 m) during observation) in format **VIS_$v_nv_nv_nv_nv_nVv_xv_xv_xv_xv_x$**, where VIS is the remark identifier, **$v_nv_nv_nv_nv_n$** is the lowest visibility evaluated, V denotes variability between two values, and **$v_xv_xv_xv_xv_x$** is the highest visibility evaluated. There is one space following the remark identifier; no spaces between the	**X**	**X**		**X**

Remark Number	Observed Condition	Enter in Remarks Section	Manual	Automated	Supplement	Back-up
		letter V and the lowest/highest values. For example, a visibility that was varying between ½ and 2SM would be encoded "VIS 1/2V2."				
8	**Sector Visibility**	Encode sector visibility (visibility in ≥ 45° sector differs from prevailing visibility by one or more reportable values and either prevailing or sector visibility is < 3SM (4800 m) in format, **VIS_[DIR]_vvvvv_[Plain Language],** where VIS is the remark identifier, [DIR] defines the sector to 8 points of the compass, and vvvvv is the sector visibility inSM or m, using the appropriate set of values. For example, a visibility of 2½SM (4000 m) in the northeastern octant would be encoded "VIS NE 2 1/2" (VIS NE 4000).	**O**			
9	**Visibility at Second Location**	Encode visibility at a second location in format **VIS_vvvvv_[LOC]**, where VIS is the remark identifier, vvvvv is the measured visibility value, and [LOC] is the specific location of the visibility sensor(s). Include the remark only when the condition is lower than that contained in the body of the report. For example, a visibility of 2½SM (4000 m) measured by a second sensor located at runway 11 would be encoded "VIS 2 1/2 RWY11" (VIS 4000 RWY11).		**X**		

Remark Number	Observed Condition	Enter in Remarks Section	Manual	Automated	Supplement	Back-up
10	**Lightning**	**Automated (including Augmented) Observing Locations.** When lightning is detected: Within 5 nautical miles of the detector, it will report **TS** in the body of the report with no remark; Between 5 and 10 nautical miles of the detector, it will report **VCTS** in the body of the report with no remark; Beyond 10 but less than 30 nautical miles of the detector, report it as LTG DSNT followed by the direction from the sensor (e.g., **LTG DSNT W)**. **Manual Observing Locations.** Report lightning type and frequency based on **Table 10.3** (e.g. OCNL LTGICCCCG)	**X**	**X**		**X**
11	**Beginning and Ending of Precipitation**	Encode beginning and ending of precipitation in format, **w'w'B(hh)mmE(hh)mm** (FBWOS will encode on all observations up to and including the next METAR with time encoded in an HHMM format), where w'w' is the type of precipitation, B denotes the beginning, E denotes the ending, and (hh)mm is the time of occurrence (only the minutes are required if the hour can be inferred from the report time). There are no spaces between the elements. The encoded remarks are not required in SPECI and should be reported in the next METAR. Do not encode intensity qualifiers. For example, if rain began at 0005, ended at 0030, and snow began at 0020, and ended at 0055, the remarks would be encoded "RAB05E30SNB20E55." If the precipitation were showery, the remark would be encoded "SHRAB05E30SHSNB20E55."	**X**	**X**		**X**

Remark Number	Observed Condition	Enter in Remarks Section	Manual	Automated	Supplement	Back-up
12	**Beginning and Ending of Thunderstorms** (See Note 1)	Encode beginning and ending of thunderstorm(s) in format, **TSB(hh)mmE(hh)mm**, where TS indicates thunderstorm, B denotes the beginning, E denotes the ending, and (hh)mm is the time of occurrence (only the minutes are required if the hour can be inferred from the report time). There are no spaces between the elements. For example, if a thunderstorm began at 0159 and ended at 0230, the remark would be encoded "TSB0159E30." FBWOSs automatically provide a remark both when the thunderstorm begins and ends (e.g., TSB1635 indicates a thunderstorm began at 1635Z).	**X**	**X**		**X**
13	**Thunderstorm Location**	Encode thunderstorm(s) in format, **TS_LOC_(MOV_DIR)**, where TS identifies the thunderstorm activity, LOC is the location (distance if known) of the thunderstorm(s) from the installation, and MOV_DIR is the movement with direction, if known. For example, a thunderstorm 8SM southeast of the installation and moving toward the northeast would be encoded "TS 8SE MOV NE."	**O**			
14	**Hailstone Size**	Encode hailstone size, **GR_[size]_[Plain Language]**, where GR is the remark identifier and [size] is the diameter of the largest hailstone. The hailstone size is encoded in ¼-inch increments. For example, "GR 1 3/4" would indicate that the largest hailstones were 1¾ inches in diameter. If hail smaller than ¼ inch is observed shall be coded as less than ¼ inch (i.e., “GR LESS THAN 1/4”).	**X(*)**		**X(*)**	**X(*)**
15	**Snow Pellet**	Encode snow pellet intensity in the format **GS_[intensity]**, where GS is the remark identifier and [intensity] is the observed intensity. The snow pellet intensity shall be coded as LGT, MOD, or HVY incidating light, moderate, or heavy intensity, respectively.	**X**		**X**	**X**

Remark Number	Observed Condition	Enter in Remarks Section	Manual	Automated	Supplement	Back-up
16	**Variable Ceiling Height**	Encode variable ceiling height (height variable and ceiling layer below 3000 feet) in format, **CIG_$h_nh_nh_nVh_xh_xh_x$**, where CIG is the remark identifier, hnhnhn is the lowest ceiling height evaluated, V denotes variability between two values, and hxhxhx is the highest ceiling height evaluated. There is one space following the remark identifier; no spaces between the letter V and the lowest/highest ceiling values. For example, "CIG 005V010" would indicate a ceiling that was varying between 500 and 1000 feet.	**X**	**X**		**X**
17	**Partial Obscurations**	Encode partial obscurations (surface-based or aloft) in format, **w'w'_[$N_sN_sN_s$]$h_sh_sh_s$_[Plain Language]**, where w'w' is the present weather causing the obscuration at the surface or aloft, and $N_sN_sN_s$ is the applicable sky cover amount of the obscuration aloft (FEW, SCT, BKN, OVC) or at the surface (FEW, SCT, BKN), and $h_sh_sh_s$ is the applicable height. Surface-based obscurations will have a height of "000." There is a space separating the weather causing the obscuration and the sky cover amount, and no space between the sky cover amount and the height. For example, fog hiding 3-4 oktas of the sky would be encoded "FG SCT000." A broken layer of smoke at 2000 feet would be encoded "FU BKN020."	**O**		**O**	
18	**Variable Sky Condition**	Encode variable sky condition (sky condition below 3000 feet that varies between one or more reportable values (FEW, SCT, BKN, OVC) during the period of observation) in format, **$N_sN_sN_s(h_sh_sh_s)$ _V_$N_sN_sN_s$_[Plain Language]**, where $N_sN_sN_s(h_sh_sh_s)$ is the predominant sky condition $N_sN_sN_s$ is the varying sky condition, and V denotes the variability between the two ranges. For example, SCT V	**X**	**X**		**X**

Remark Number	Observed Condition	Enter in Remarks Section	Manual	Automated	Supplement	Back-up
		BKN" would identify a scattered layer that is variably broken. If there are several layers with the same sky condition amount in the report, the layer height will be coded with the variable layer. For example, an observation with cloud layers of SCT010 BKN014 BKN020 with a cloud layer at 1400 feet that is varying between broken and overcast would be coded "BKN014 V OVC."				
19	**Significant Cloud Types**	Encode significant cloud types as follows. Identify cumulonimbus (CB) of any kind and towering cumulus (TCU) in the body of the report in the sky condition group. Include distance if known. (1) **Cumulonimbus or Cumulonimbus Mammatus** as appropriate, (when no thunderstorm is being reported) in format **(CB or CBMAM_LOC_(MOV_DIR)_[Plain Language]** where CB or CBMAM is the cloud type, LOC is the direction from the observing location, and MOV_DIR is the movement with direction (if known). Separate the cloud type entries from each other with a space. For example, a CB 21 nautical miles west of the observing location moving toward the east would be encoded "CB 21W MOV E." If a CB is more than 10 nautical miles to the west and distance cannot be determined, encode as "CB DSNT W." (2) **Towering cumulus** in format **TCU_[DIR]_[Plain Language]**, where TCU is cloud type and DIR is direction from the observing location. Separate the cloud type entries by a space. For example, a towering cumulus cloud up to 10 nautical	**O**		**O**	

Remark Number	Observed Condition	Enter in Remarks Section	Manual	Automated	Supplement	Back-up
		miles west of the observing location would be encoded "TCU W." (3) **Altocumulus Castellanus** in format, **ACC_[DIR]_[Plain Language]**, where ACC is cloud type and DIR is direction from the observing location. Separate the cloud type entries by a space. For example, an ACC cloud 5 to 10 nautical miles northwest of the observing location would be encoded "ACC NW."				
19	**Significant Cloud Types (cont)**	(4) **Standing lenticular or Rotor clouds.** Stratocumulus (SCSL), altocumulus (ACSL), or cirrocumulus (CCSL), or rotor clouds in format, **CLD_[DIR]_[Plain Language]**, where CLD is cloud type and DIR is direction from the observing location. Separate the cloud type entries by a space. For example, ACSL clouds observed southwest through west of the observing location would be encoded "ACSL SW-W"; an apparent rotor cloud northeast of the observing location would be encoded "APRNT ROTOR CLD NE"; and CCSL clouds south of the observing location would be encoded "CCSL S."	**O**			
20	**Ceiling Height at Second Location**	Encode ceiling height at a second location in format, **CIG_hhh_[LOC]**, where CIG is the remark identifier, hhh is the measured height of the ceiling, and [LOC] is the specific location of the ceilometer(s) at the observing location. This remark is only generated when the ceiling is lower than that contained in the body of the report. For example, if the ceiling measured by a second sensor located at runway 11 is broken at 200 feet; the remark would be "CIG 002 RWY11."		**X**		

Remark Number	Observed Condition	Enter in Remarks Section	Manual	Automated	Supplement	Back-up
21	**Pressure Rising or Falling Rapidly**	Include **PRESRR** (pressure rising rapidly) or **PRESFR** (pressure falling rapidly) when the pressure is rising or falling at a rate of 0.06 iHg per hour or more, totaling a change 0.02 iHg or more at the time of observation,	**X**	**X**		**X**
22	**Sea Level Pressure**	Encode sea-level pressure in format **SLPppp**, where SLP is the remark identifier and ppp is the sea level pressure in hectopascals. For example, a sea level pressure of 998.2 hectopascals would be encoded as "SLP982." If SLP is not available, it is encoded as "**SLPNO.**"	**X**	**X**		**X**
23	**Aircraft Mishap**	Include the remark **ACFT_MSHP [Plain Language]** to document weather conditions when notified of an aircraft mishap. The remark is not transmitted. Indicate non-transmission by enclosing the remark (ACFT_MSHP) in parentheses in the observation.	**X**		**X**	**X**
24	**Snow Increasing Rapidly**	Include the snow increasing rapidly remark in the next METAR, whenever the snow depth increases by 1 inch or more in the past hour. Encode the remark in format, **SNINCR_[inches-hour/inches on ground]**, where SNINCR is the remark indicator, inches-hour is the depth increase in the past hour, and inches on ground is the total depth of snow on the ground at the time of the report. Separate the depth increase in the past hour from the total depth on the ground by a slash "/". For example, a snow depth increase of 2 inches in the past hour with a total depth on the ground of 10 inches would be encoded "SNINCR 2/10."	**O**		**O**	

Remark Number	Observed Condition	Enter in Remarks Section	Manual	Automated	Supplement	Back-up
25	**Other Significant Information** **[Plain Language Remarks]**	Added to report information significant to aircraft safety or resource protection. Amplifies entries in main observation. Some remarks will use the same order of entry as data the remark most closely relates (e.g., a VIS LWR E remark would have the entry as a sector visibility remark). (1) **Unofficial Weather Reports**. Information important to local aviation and public safety reported by an individual not task certified to take official weather observations. For example, UNOFFL RPT TORNADO 9 W OF KKAC PER LAW ENFORECMENT or CLD LYR AT 400 FT ON APCH RWY 23 RPRTD BY PIREPS, CIG VIS LWR ON APCH RWY14L. (2) **Estimated Wind and Pressure. WND DATA ESTMD or ALSTG/SLP ESTMD** indicates the winds and/or pressure values from the primary airfield sensors are suspect or inoperative, and back-up equipment is being used. Report winds as estimated if using the AN/TMQ-53 as a back-up at permanent (non-tactical) locations or when the fixed-base wind equipment on the active end of the runway is inoperative and the wind data for the runway in use is obtained using the most reliable system available (e.g., inactive runway instrumentation at locations with wind equipment installed on two or more runways, hand-held anemometer, Beaufort scale, etc.).	**O** **X**		**O** **X**	

Remark Number	Observed Condition	Enter in Remarks Section	Manual	Automated	Supplement	Back-up
		(3) **Significant Atmospheric Phenomena not Reported Elsewhere.** Present weather observed but not occurring at the point of observation or in the vicinity (e.g., SHRA OVR MTNS N). (4) **Aurora** observed in the past hour. Include **AURBO** in the next METAR and subsequent METARs throughout period of occurrence. (5) **Condensation Trails**. Include **CONTRAILS** to indicate condensation trails are observed. (6) **Location Unique Information** (as required), e.g., fog dispersal, rawinsonde data, state of ground, wind difference between parallel runways.	**O** **O** **O** **O**		**O** **O**	**O** **O**
26	**Hourly Precipitation Amount** (METAR only)	Encode hourly precipitation amount in format, **Prrrr**, where P is the group indicator and rrrr is the water equivalent of all precipitation that has occurred since the last METAR. The amount is encoded in hundredths of an inch. For example, "P0009" would indicate 9/100 of an inch of precipitation fell in the past hour; "P0000" would indicate that less than 1/100 of an inch of precipitation fell in the past hour. When an indeterminable amount of precipitation has occurred during the period, encode Prrrr as P////. Omit the group if no precipitation occurred since the last METAR.		**X**		**O**
27	**3- and 6-Hour Precipitation Amount**	Encode the 3- and 6-hourly precipitation group in format, **6RRRR**, where 6 is the group indicator and RRRR is the amount of precipitation. Report the amount of precipitation	**X**	**X**		**X**

Remark Number	Observed Condition	Enter in Remarks Section	Manual	Automated	Supplement	Back-up
	(See Note 2) (METAR only)	(water equivalent) accumulated in the past 3 hours in the 3-hourly report; and the amount accumulated in the past 6 hours in the 6-hourly report. The amount of precipitation is encoded in inches, using the tens, units, tenths and hundredths digits of the amount. When an indeterminable amount of precipitation has occurred during the period, encode RRRR as 6////. For example, 2.17 inches of precipitation would be encoded "60217." A trace will be encoded "60000."				
28	**24-Hour Precipitation Amount** (See Note 2) (METAR only)	Encode the 24-hour precipitation amount in format, **7$R_{24}R_{24}R_{24}R_{24}$**, where 7 is the group indicator and $R_{24}R_{24}R_{24}R_{24}$ is the 24-hour precipitation amount. Include the 24-hour precipitation amount in the 1200 UTC (or MAJCOM/Higher Headquarters designated time) whenever more than a trace of precipitation (water equivalent) has fallen in the preceding 24 hours. The amount of precipitation is encoded by using the tens, units, tenths, and hundredths of inches (water equivalent) for the 24-hour period. If more than a trace (water equivalent) has occurred and the amount cannot be determined, encode the group as 7////. For example, 1.25 inches of precipitation (water equivalent) in the past 24 hours will be encoded "70125."	**X**	**X**		**O**
29	**Snow Depth on Ground** (See Note 2) (METAR only)	Encode snow depth during controlled airfield hours in the 0000, 0600, 1200, and 1800 UTC observation, or MAJCOM specified reporting time for your installation, when supplementing for snow depth. The remark is encoded in the format, **4/sss**, where 4/ is the group indicator and sss is the	**X(*)**		**X**	**O**

Remark Number	Observed Condition	Enter in Remarks Section	Manual	Automated	Supplement	Back-up
		snow depth in whole inches using three digits. For example, a snow depth of 21 inches will be encoded as "4/021."				
30	**Hourly Temperature and Dew Point** (METAR only)	Encode the hourly temperature and dew point group to the tenth of a degree Celsius in format, **$Ts_nT'T'T's_nT'_dT'_dT'_d$**, where T is the group indicator, s_n is the sign of the temperature, T'T'T' is the temperature, and $T'_dT'_dT'_d$ is the dew point. Encode the sign of temperature and dew point as 1 if the value is below 0°C and 0 if the value is 0°C or higher. The temperature and dew point is reported in tens, units, and tenths of degrees Celsius. There will be no spaces between the entries. For example, a temperature of 2.6°C and dew point of -1.5°C would be reported in the body of the report as "03/M01" and the $Ts_nT'T'T's_nT'_dT'_dT'_d$ group as T00261015". If dew point is missing report the temperature; if the temperature is missing do not report the temperature/ dew point group.		**X**		**O**
31	**6-Hourly Maximum Temperature** (See Note 2) (METAR only)	Encode the 6-hourly maximum temperature group in format, **$1s_nT_xT_xT_x$**, where 1 is the group indicator, s_n is the sign of the temperature, $T_xT_xT_x$ is the maximum temperature in tenths of degrees Celsius using three digits. Encode the sign of maximum temperature as 1 if the maximum temperature is below 0°C and 0 if the maximum temperature is 0°C or higher. For example, a maximum temperature of -2.1°C would be encoded "11021"; 14.2°C would be encoded "10142."	**O**	**X**		**O**
32	**6-Hourly Minimum Temperature**	Encode the 6-hourly minimum temperature group in format, **$2s_nT_nT_nT_n$**, where 2 is the group indicator, s_n is the sign of the temperature, and $T_nT_nT_n$ is the minimum temperature in	**O**	**X**		**O**

Remark Number	Observed Condition	Enter in Remarks Section	Manual	Automated	Supplement	Back-up
	(See Note 2) (METAR only)	tenths of degrees Celsius using three digits. Encode the sign of minimum temperature as 1 if the minimum temperature is below 0°C and 0 if the minimum temperature is 0°C or higher. For example, a minimum temperature of -0.1°C would be encoded "21001"; 1.2°C would be encoded "20012."				
33	**24-Hour Maximum and Minimum Temperature** (METAR only)	Encode the 24-hour maximum temperature and the 24-hour minimum temperature in format, **4$s_n$$T_xT_xT_xs_nT_nT_nT_n$,** where 4 is the group indicator, s_n is the sign of the temperature, $T_xT_xT_x$ is the maximum 24-hour temperature, and TnTnTn is the 24-hour minimum temperature encoded in tenths of degrees Celsius using three digits. Encode the sign of maximum or minimum temperature as 1 if it is below 0°C and 0 if it is 0°C or higher. For example, a 24-hour maximum temperature of 10.0°C and a 24-hour minimum temperature of -1.5°C would be encoded "401001015"; a 24-hour maximum temperature of 11.2°C and a 24-hour minimum temperature of 8.4°C would be encoded as "401120084."		**X**		**O**
34	**3-Hourly Pressure Tendency** (See Note 2) (METAR only)	Encode the 3-hourly pressure tendency group in format, **5appp**, where 5 is the group indicator, "a" is the character of pressure change over the past 3 hours, and ppp is the amount of barometric change in tenths of hectopascals. The amount of barometric change is encoded using the tens, units, and tenths digits. For example, a steady increase of 3.2 hectopascals in the past three hours would be encoded "52032." **Note:** FBWOSs report pressure net change code figures that **Table 13.4** may not reflect, e.g., 001, 004, 006, 011.	**O**	**X**		**O**

Remark Number	Observed Condition	Enter in Remarks Section	Manual	Automated	Supplement	Back-up
35	**Sensor Status Indicators**	Report sensor outages using the following remarks:				
		(1) **RVRNO** - Runway Visual Range information should be reported but is missing or not available.	**X**	**X**		**X**
		(2) **PWINO** - precipitation identifier information not available.		**X**		
		(3) **PNO** - precipitation amount not available.		**X**		
		(4) **FZRANO** - freezing rain information not available.		**X**		
		(5) **TSNO** - thunderstorm information not available.		**X**		
		(6) **VISNO (LOC)** - visibility at secondary location not available, e.g., VISNO RWY06.		**X**		
		(7) **CHINO (LOC)** - (cloud-height-indicator) sky condition at secondary location not available, e.g., CHINO RWY06.		**X**		
36	**Maintenance Indicator**	A maintenance indicator sign **$** is appended at the end of the report when (e.g., FBWOS) maintenance is needed on the system.		**X**		**X**
37	**(1) LAST** (manual observing locations only)	(1) At limited-duty manual observing locations and gunnery ranges, identify the last observation of the day (METAR or SPECI) by adding the term "LAST" following the last element in the observation text (e.g., TCU SE LAST).	**X**			
	(2) FIRST		**X**			

Remark Number	Observed Condition	Enter in Remarks Section	Manual	Automated	Supplement	Back-up
	(See Note 2) **(3) COR**	(2) The FIRST remark will be used to facilitate collection of observations from limited-duty units, and deployed units in manual observing mode. (3) Enter COR in column 13 followed by the time (to the nearest minute UTC) the correction was locally disseminated (e.g., COR 1426).	**X**		**X**	**X**

NOTES:
X – Indicates required data
(*) – See **Table 5.1**
O – Indicates optional based on local operational requirements
M – Indicates Mandatory Supplementary Weather Conditions. When weather personnel are on duty, switch FBWOS to augment mode and begin supplementation operations.

1. Encode when in augmented mode only if the initial SPECI taken for the beginning and/or ending of tornadic activity, thunderstorm, or hail was not transmitted longline, include the time of beginning (B) and/or ending (E) with the current (most recent) remark in the next SPECI or METAR observation transmitted longline. Enter the indicator B and/or E and the appropriate time(s) immediately following the phenomena reported (e.g., TSB35 12 SW MOV E, GRB37E39 GR 3/4). These B and/or E times are entered for longline transmission only.
2. Or as directed by MAJCOM or Higher Headquarters supplement when augmenting observations
3. Substitute 5000 m for 4800 m at OCONUS locations based on the host-nation practice
4. Weather personnel will augment the FBWOS during controlled airfield hours to ensure accurate information when there is an AF deficiency report (DR) issued by system lead command or the FBWOS program management office covering systems or sensor operations.

Attachment 4

STATION INFORMATION

Figure A4.1. Required Information in the Station Information File.

STATION INFORMATION FILE	
Physical Characteristics	- Name of Installation. - Station ICAO Identifier. - WMO Index Number. - Time Zone (+/- relative to UTC). - Latitude/Longitude to the nearest minute - Field Elevation. - Station Elevation (or elevation of FBWOS, primary group). - Elevation of Primary Barometer (or elevation of FBWOS, primary group).
Observing Operation (consistent with FLIP entires)	- Full automated operations (provide operating hours). - Augmented observations (provide hours observations are available).
Sensor Data	- FBWOS. Date installed and commissioned. - Location of FBWOS sensors in relation to the airfield runways. - Legacy Fixed-Base Sensors (list all). - Location of legacy sensors in relation to the airfield runways. - Explain any non-standard siting of sensors. - Provide listing of FBWOS back-up equipment.
Physical Description of Observation Site.	Include additional features that affect the weather or climatology. For example, surrounding surface grass, dirt, concrete, asphalt, nearby bodies of water, trees/forest, etc. Include available maps, layouts, photos, etc.