BY ORDER OF THE
SECRETARY OF THE AIR FORCE

AIR FORCE MANUAL 15-111
19 DECEMBER 2003

Weather

SURFACE WEATHER OBSERVATIONS

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

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This manual implements AFPD 15-1, *Atmospheric and Space Environmental Support*. It also implements Federal Meteorological Handbook No. 1 (FMH-1) and the World Meteorological Organization (WMO) aviation routine weather reports (FM-15 METAR) and aviation selected special weather reports (FM-16 SPECI) codes. It also prescribes basic observing fundamentals and terms and establishes aviation code forms for recording and disseminating METAR/SPECI/LOCAL weather observations. It applies to all Air Force personnel who take and disseminate METAR/SPECI/LOCAL surface observations for US Air Force and US Army operations. Send comments or suggested changes or improvements through channels to HQ AFWA/XOPS, 106 Peacekeeper Dr., Ste. 2N3, Offutt AFB, NE 68113-4039. Major commands (MAJCOM), field operating agencies, and direct reporting units send one copy of their supplement to HQ AFWA/XOPS and HQ USAF/XOWP; other commands send one copy of each supplement to the next higher headquarters. Maintain and dispose of all records created as a result of prescribed processes in this manual in accordance with AFMAN 37-139, *Records Disposition Schedule.*

SUMMARY OF REVISIONS

This document is substantially revised and must be completely reviewed.

This revision substantially reorganizes and streamlines weather observing practices within Air Force Weather. Included are procedures for operating the AN/FMQ-19 Automatic Meteorological Station (AMS), or like systems, in the automated and augmented mode. Also contained are traditional procedures for taking and reporting manual surface observations for use by units without AN/FMQ-19 or while performing augmentation/backup of AN/FMQ-19. This manual is divided into four parts covering general procedures, manual observations, automated observations, and augmented observations.

PART 1

GENERAL PROCEDURES

Chapter 1

INTRODUCTION

1.1. Background Information. This manual prescribes United States Air Force METAR weather observing and reporting procedures based on agreements with the World Meteorological Organization (WMO), the International Civil Aviation Organization (ICAO), National Weather Service (NWS), Federal Aviation Administration (FAA), international and domestic aviation interests, and other civil weather services.

1.2. General . Federal Meteorological Handbook No. 1 (FMH-1) establishes standard United States (US) surface weather observation requirements and procedures for US Federal meteorological agencies. Based on FMH-1, this manual incorporates procedures applicable to Air Force weather organizations in both US and overseas locations. When reference is made to the geographic area "United States," the implication is that US procedures will apply to the 48 contiguous states (CONUS), and Alaska, Hawaii, and Guam. US locations will use statute miles for visibility values, while locations outside the continental US (OCONUS) will use meters (metric system).

1.3. Applicability of Procedures. The procedures in this manual apply to all Air Force and Army permanent-type and non-fixed (tactical or temporary site) units performing manual, augmented, or automated observing operations.

1.3.1. Manual. A facility where a certified weather technician is responsible for observing, evaluating, and preparing METAR/SPECI observations during normal airfield operating hours. At these units, various degrees of automated sensors and/or other automated equipment may be available. However, the weather technician is completely responsible for the METAR/SPECI.

1.3.2. Automated. A facility equipped with an automated surface weather observing system (i.e., AN/FMQ-19 Automatic Meteorological Station [AMS], Automated Surface Observing System (ASOS), or other AFWA/MAJCOM-certified automated systems) that prepares the observations for transmission without a certified weather technician on duty (i.e., at closed airfields, unmanned observing sites, etc.).

1.3.3. Augmented. A facility with an automated surface weather observing system (i.e., AN/FMQ-19, ASOS, etc.) that prepares the METAR/SPECI for transmission. During normal airfield operating hours, augmented units will have a certified weather technician signed-on to the system to <u>add</u> operationally significant weather information to the observation not within the capability of the system to report (i.e., augment); or (1) <u>provide</u> information that the system failed to report due to equipment failure, or (2) <u>change</u> information that is deemed unrepresentative (i.e., backup/edit). **NOTE:** The weather technician is completely responsible for the observation even though the automated weather observing system generates the report. At facilities where augmentation is not available full time, the facility is classified as automated during the non-augmented periods.

1.4. Format of This Manual.

1.4.1. Part 1. Part 1 contains procedures and information applicable to all weather units responsible for preparing surface weather observations, without regard to the mode of operation.

1.4.2. Part 2. Part 2 contains the traditional procedures for taking, recording, and disseminating surface weather observations at manual units. AF weather units will follow the procedures in Part 2 when performing back up of the AN/FMQ-19 or other certified observing systems.

1.4.3. Part 3. Part 3 contains procedures for operating the AN/FMQ-19 or other certified observing systems in a fully automated mode.

1.4.4. Part 4. Part 4 contains the procedures for augmenting and backing up (editing) the AN/FMQ-19 (or other certified observing system) observations. The procedures in Part 4 are not stand-alone. There is information in the other parts of this manual that is fundamental to the process of augmentation and backup.

Chapter 2

GENERAL OBSERVING PROCEDURES

2.1. General. This chapter contains general procedures pertaining to all Air Force weather units.

2.1.1. Airfield Services Element. The Airfield Services Element within Combat Weather Teams (CWTs) will use the procedures in this manual to expand the traditional observing function at an airfield or a deployed observing location. This element will function as the "eyes forward" for the servicing Operational Weather Squadron (OWS), and in many cases, will serve as the primary point of contact for the collaborative forecast effort to include force protection for the installation. The responsibilities of the Airfield Services Element are outlined in Air Force Manual (AFMAN) 15-135, *Combat Weather Team Operations.*

2.1.2. Unforeseen Requirement. No set of procedures can cover all possibilities in weather observing. Weather personnel must use their own judgment, adhering as closely as possible to the procedures in this manual, to describe phenomena not covered adequately by this publication. Add remarks to an observation as necessary to describe unique or unusual weather conditions. In such circumstances, weather personnel must bring the situation to their supervisor's attention for possible referral through channels to Air Force Weather Agency/Operations Directorate (AFWA/XO) for clarification.

2.2. Wind and Runway Visual Range (RVR) Reporting.

2.2.1. Wind Reporting. CONUS and OCONUS weather units will report wind speed and directions using a 2-minute average following the Regional Codes and National Coding Practices of the USA (WMO-No. 306, Manual on Codes, Vol II). OCONUS units at locations where the host nation is responsible for the airfield observation will ensure DoD aircrews are aware of the type of winds reported by the local Air Traffic Control (ATC) agency (i.e., 2-minutes or 10-minutes averaged winds).

2.2.2. Visibility Reporting. Visibility will be reported in statute miles (SM) in the US, including Alaska, Hawaii, and Guam; and in meters at OCONUS units.

2.2.3. RVR Reporting. The unit of measurement will be the same as that published for the installation in DoD FLIPs; feet in the CONUS and generally in meters at OCONUS locations, unless otherwise determined locally. When no RVR minima are published in the DoD FLIPs, report locally in meters if prevailing visibility is locally disseminated in meters and in feet if prevailing visibility is reported locally in statute miles.

2.2.3.1. Manual observing units will continue to report RVR using the traditional procedures in **Part 2, Chapter 8** and the threshold values for legacy systems listed in **Table A4.1.** of **Attachment 4**.

2.2.3.2. AN/FMQ-19 units will provide RVR output according to the specifications listed in **Parts 3** and **4,** and the threshold values for AN/FMQ-19 listed in **Table A4.1.** of **Attachment 4**. **NOTE:** For OCONUS locations reporting RVR in meters, AN/FMQ-19 determines RVR in 50-meter increments up to 800 meters, and in 100-meter increments up to 1500 meters in accordance with (IAW) WMO. This has a minor effect on the RVR special requirement (i.e., 0750 vs. 0730 meters), and may have an effect on customer support and the reporting of RVR minima listed in the FLIP for some overseas locations. Weather units will coordinate RVR reporting in meters with supported customers and the ATC agency.

2.3. Definitions.

2.3.1. Weather Observing Unit (Station). The weather observing unit/station is the location from which weather observations are normally taken. The terms unit and station are used throughout this manual to indicate any weather site (permanent-type or non-fixed location) that performs a weather observing function.

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

2.3.3. Surface Weather Observation. A measurement or evaluation (manual, automated, or augmented) of one or more meteorological elements that describe the state of the atmosphere at the location where the observation is taken.

2.3.4. Manual Observation. Any observation for which a weather technician observes, evaluates, prepares, records, and transmits the observation without the use of an automated observing system. The guidelines for manual observations are presented in **Part 2.**

2.3.5. Automated Observation. Any observation that has been evaluated, prepared, and transmitted by an automated observing system without human intervention. The guidelines for automated observations are presented in **Part 3**.

2.3.6. Augmentation. Any automated observation to which additional weather information has been manually added that is beyond the capabilities of the automated weather observing system. The guidelines concerning augmentation are presented in **Part 4**.

2.3.7. Backup. A method of providing meteorological data, documentation, and/or communication of a weather observation when the primary automated method is unavailable or unrepresentative. The guidelines concerning manually provided backup information are presented in **Part 4**.

2.3.8. Actual Date and Time of Observation. For METAR reports, it is the actual date and time the last element of the report was observed or evaluated. For SPECI reports, it is the actual date and time the criterion for a SPECI was observed or sensed.

2.3.9. Coordinated Universal Time (UTC). The time in the zero degree meridian time zone will be the time used on all transmitted data. All times refer to the 24-hour clock and are commonly called "ZULU" times. The times 0000 and 2359 indicate the beginning and ending of the day, respectively.

2.3.10. Local Standard Time (LST). LST is a time based on the geographic location of the facility in one of the legally established time zones of the globe. Use LST when beginning a new AF Form 3803 or AF Form 3813, etc. DO NOT use Local Daylight-Saving Time.

2.3.11. Standard Time of Observation. The cardinal hour to which a record observation applies. For example, 1055Z is the 11th cardinal hour.

2.3.12. Aircraft Mishap. An unplanned event or series of events involving DoD aircraft that (1) results in damage to Aircraft; and/or (2) if a flight crewmember is onboard for any reason, results in damage to any property, and/or injury, illness or death. The term "onboard" includes all interior and exterior aircraft surfaces.

2.3.13. Magnetic Variation (Declination). Magnetic variation is the mathematical difference in degrees between true north (a constant) and magnetic north (station latitude). It is either "east" or "west" according to whether the compass needle points to the east or west of the geographic meridian.

2.4. Certification and Commissioning Requirements.

2.4.1. Airfield Services Element. Before performing augmentation/backup to the AN/FMQ-19 (ASOS, or other AFWA/MAJCOM-certified automated systems) or taking manual surface weather observations while performing the airfield services element function, weather personnel will be fully trained, task certified, and functionally qualified according to requirements outlined in Air Force Manual (AFMAN) 15-129, *Aerospace Weather Operations—Processes and Procedures,* and local training requirements.

2.4.1.1. Local weather personnel will task-certify Air Traffic Control (ATC) personnel to evaluate visibility values for both prevailing and sector visibility observations from the control tower. If required, weather personnel will also ensure ATC personnel can operate the applicable AN/FMQ-19 equipment in ATC facilities.

2.4.2. Automated Observing Systems. FMH-1 requires federal agencies to attest that their weather stations adhere to standards applicable to all stations involved in the making of surface weather observations used for aviation purposes.

2.4.2.1. AN/FMQ-19 Automatic Meteorological Station (AMS). AF weather units receiving the AN/FMQ-19 will be certified in accordance with (IAW) the AFWA-provided *Air Force Weather Station Certification & Observing System 21st Century (OS-21) Fixed Based System (FBS) Commissioning Plan*. This document identifies the process weather units at USAF and Army locations will use to certify the unit (station). In addition, the plan identifies the process for formally commissioning the AN/FMQ-19.

2.4.2.1.1. As best as practical, the AN/FMQ-19 automated sensor groups will be sited in accordance with the *Federal Standard for Siting Meteorological Sensors at Airports*. Presently installed sensors may be operated at their present locations. However, if they are relocated, the federal standards will be followed.

2.4.2.1.2. The algorithms used in AN/FMQ-19 automated sensors must conform to the latest algorithms prescribed in the *Federal Standard Algorithms for Automated Weather Observing Systems used for Aviation Purposes.* These algorithms do not apply to previously authorized systems, which may continue to operate until replaced or modified.

2.4.2.1.3. Units with a ground to air radio equipped AN/FMQ-19 will ensure the system's broadcast radio frequency and telephone number (DSN and/or commercial) are published in DoD Flight Information Publications (FLIP).

2.4.2.2. Automated Surface Observing System (ASOS). Weather agencies purchasing ASOS equipment will certify the operating location and commission the system IAW the Certification Requirements outlined in Chapter 3 of Federal Meteorological Handbook No. 1, *Surface Weather Observations and Reports* (FCM-H1-1995). In addition, agencies will follow the AFWA-provided *Air Force Weather Station Certification & Observing System 21st Century (OS-21) Fixed Based System (FBS) Commissioning Plan*, tailoring the plan for ASOS. The plan is available from HQ AFWA/XPF. Once installed and operational, all ASOS locations will update the Station Information File to reflect the new equipment and any changes to operations (see **paragraph 2.4.3.** below).

2.4.3. Station Information. AF weather units responsible for preparing surface weather observations, regardless of the mode of operation, will ensure their station information is current and maintained on permanent file at the Air Force Combat Climatology Center (AFCCC) and in the unit's historical file. See **Attachment 6** for a list of information required. Information can be sent to AFCCC via electronic mail or mail it to:

AFCCC/DOD
151 Patton Avenue
Asheville, NC 28801-5002

2.4.3.1. AF weather units receiving the AN/FMQ-19 will send this information to AFCCC as part of the *Air Force Weather Station Certification & Observing System 21st Century (OS-21) Fixed Based System (FBS) Commissioning Plan*.

2.4.4. Meteorological Equipment.

2.4.4.1. Fixed Equipment. The following requirements apply to all primary meteorological equipment used in the generation of surface weather observations at both manual observing units and units with an automated weather observing system.

2.4.4.1.1. Equipment Maintenance, Calibration, and Standardization. AF weather units will perform required user/operator maintenance in accordance with (IAW) equipment Technical Orders (TOs)/operator manuals. Units will also ensure host/supporting METNAV and computer maintenance personnel provide maintenance to meteorological and communications systems, to include equipment calibration and standardization, IAW established maintenance schedules and other contract or local instruction provisions outlining acceptable maintenance support and response times. Calibration and standardization should be performed upon installation and at least annually thereafter, and after any major maintenance is performed on an instrument or sensor.

2.4.4.1.1.1. Weather personnel performing the Airfield Services Element will be responsible for determining the operational acceptability of meteorological equipment. When the accuracy or validity of information from fixed meteorological equipment is questionable, weather personnel will initiate corrective maintenance actions and discontinue the use of such equipment until maintenance has been accomplished and the equipment is restored and operational. Weather units will develop backup procedures for use until the equipment is restored.

2.4.4.1.2. Siting and Exposure. Weather units will coordinate with the host/supporting METNAV to perform an annual inspection of all meteorological equipment on the airfield to ensure it is in good condition and to see that there are no obstructions affecting the siting and exposure of the equipment. Weather leadership should accompany METNAV on this inspection.

2.4.4.2. Tactical Equipment. Weather units with tactical equipment will ensure it is in good working condition and properly maintained, and calibrated and standardized (if applicable) IAW applicable TOs and established maintenance schedules.

2.4.4.3. Technical Orders (TOs)/Operator Manuals. Permanent-type and non-fixed sites will have applicable operator manuals and/or TOs on hand for each piece of assigned meteorological equipment (manual, automated, tactical), with copies available for deployment. All units will operate meteorological equipment IAW its TO and/or operator manual.

2.5. Backup and Tactical Operations .

2.5.1. Backup Operations. During outages of the primary fixed meteorological instruments and sensors, weather units should use available tactical and other certified meteorological equipment as backup.

2.5.1.1. Units may use the AN/TMQ-53, Tactical Meteorological Observing System (TMOS), other tactical meteorological (TACMET) equipment, non-tactical aneroid barometer, the sensors from the AN/FMQ-19 discontinuity group (and midfield if available), or other MAJCOM-approved equipment as backup. Wind and pressure values from any form of backup equipment will be estimated.

2.5.1.2. Weather technicians will visually validate the cloud height and visibility values from backup equipment (including the AN/FMQ-19 discontinuity group or the visibility values from the midfield group) before using them in the observation.

2.5.2. Tactical Operations. Deployed units may use the AN/TMQ-53, Tactical Meteorological Observing System (TMOS) without estimating wind and pressure values if all the following conditions are met:

2.5.2.1. The AN/TMQ-53 equipment is in good working condition (i.e., operating properly) and properly maintained IAW the TO and established maintenance schedules.

2.5.2.2. The equipment is set up and operated IAW the TO and/or operator manual, and is sited to be representative of the approach (active) end of the runway.

2.5.2.3. According to the weather technician, the values from the AN/TMQ-53 equipment are representative and consistent with the values from surrounding observing sites (if available). Any time the weather technician considers the wind or pressure values from the AN/TMQ-53 to be suspect; the values will be estimated.

2.5.2.4. Wind and pressure values from any other piece of equipment in a tactical environment (e.g., Kestrel 4000 or similar hand-held devices, tactical aneroid barometers, or other tactical meteorological (TACMET) equipment) will be estimated.

2.5.3. Estimating Winds and Pressure. Estimate wind and pressure values by including the proper remark in the observation (i.e., WND DATA ESTMD, ALSTG/SLP ESTMD) in column 13 of AF Form 3803, Surface Weather Observations (METAR/SPECI/LOCAL), or 3813, Federal Meteorological Surface Weather Observations (METAR/SPECI).

2.5.3.1. Document the use of backup observing equipment in Column 90 of the AF Form 3803/3813 (e.g., FMQ-13 INOP, WND DATA OBTAINED USING AN/TMQ-53; FMQ-19 RWY32 WINDS INOP, WND DATA OBTAINED USING RWY16). See **Part 2** for additional guidance on estimating winds and pressure using legacy equipment.

2.5.4. Unrepresentative Values. Unrepresentative meteorological values from any backup/tactical equipment will not be included in the observation. These values will be considered missing (**M**).

2.6. Accuracy of Time. The accuracy of the time ascribed to weather observations is of the utmost importance, especially in aviation safety investigations. AF weather units will designate a single timepiece as the standard clock and establish procedures to check it on a daily basis. The standard clock will be within ± 1 minute of the US Naval Observatory time. Annotate a time check in Column 90 on either AF Form 3803/3813, as applicable. **NOTE:** Do not designate any piece of equipment connected to a network (such as N-TFS or AN/FMQ-19) as the standard clock as this time can be changed by network control without an operator's input.

2.6.1. Adjust the internal clocks of all applicable equipment (e.g., AN/FMQ-13, N-TFS, AN/FMQ-19) to the correct time whenever the time error is more than 1 minute off the standard clock. Record any time corrections to equipment in Column 90, e.g., 0605 N-TFS CLOCK ADJUSTED +2 MINUTES.

2.7. Quality Control of Observations. AF weather units will 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.

2.8. Aviation Weather Code Forms. In addition to prescribing basic observing fundamentals and terms, this manual establishes aviation code forms for recording and disseminating METAR, SPECI, and LOCAL weather observations.

2.8.1. Aviation Routine Weather Report (METAR). 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. METAR contains a complete report of wind, visibility, runway visual range, present weather and obscurations, sky condition, temperature, dew point, and altimeter setting collectively referred to as "the body of the report." In addition, encoded and/or plain language information that elaborates on data in the body of the report may be appended to the METAR. The contents of the remarks will vary according to the mode of operation (i.e., manual, automated, or augmented), and are defined in each part of this manual. Scheduled METAR observations taken hourly are called *record observations*.

2.8.1.1. Manual, automated, and augmented weather units will establish METAR file times between H+55 to H+59 minutes past the hour.

2.8.1.2. Record observations taken at 0000, 0600, 1200, and 1800 UTC include additional data and are known as 6-hourly observations. The record observations taken at 0300, 0900, 1500, and 2100 UTC are known as 3-hourly observations and also contain additional information. The contents of routine METAR observations from manual observing units are specified in **Part 2** of this manual. The contents of METAR observations from automated and augmented observing units are included in **Parts 3** and **4** respectively.

2.8.2. Aviation Selected Special Weather Report (SPECI). SPECI is an unscheduled observation completed and transmitted when any of the special criteria listed in **Attachment 2** for manual, automated, and augmented weather units have been observed or sensed. SPECI will contain all data elements found in a METAR plus additional remarks that elaborates on data in the body of the report. All SPECI reports will be prepared and transmitted as soon as possible after the relevant criteria are observed.

2.8.3. Aviation Selected Local Weather Report (LOCAL). LOCAL is an unscheduled observation (not meeting SPECI criteria) taken at a manual unit when any of the criteria listed in **Part 2, Chapter 5** has been observed. For LOCALs taken in support of aircraft operations, the code form will be METAR. For LOCALs taken and disseminated to other than ATC agencies, the contents may be established locally and specified in the installation's weather support document (WSD). The criteria for LOCAL observations are established through agreement with supported agencies on the installation. All LOCAL reports will be prepared and disseminated as soon as possible after the relevant criteria are observed.

2.9. Unofficial Weather Reports. A report of one or more weather elements from an individual who is not 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 the safety of local aviation and the public. It can also help increase the weather technician's situational awareness. Unofficial reports of severe or mission-restricting weather can be appended in the remarks of the observation and sent out at the technician's discretion (e.g., Unconfirmed tornado 9 miles west KXXX per law enforcement). When in doubt, send it out. Follow up credible reports by calling the supporting OWS.

2.10. Recency of Observed Elements.

2.10.1. Manual Observations. Individual elements entered in an observation must, as closely as possible, reflect conditions existing at the actual time of observation. Elements entered will have been observed within 15 minutes of the actual time of the observation. Gusts and squalls will be reported if observed within 10 minutes of the actual time of the 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. Supplement elements evaluated instrumentally with visual observations to ensure accuracy.

2.10.2. Automated Observations. Individual elements entered in an observation must, as closely as possible, reflect conditions existing at the actual time of observation. For those elements that the weather technician evaluates using spatial averaging techniques (e.g,. sky cover and visibility), automated systems substitutes time averaging of sensor data. Therefore, in an automated observation, sky condition will be an evaluation of sensor data gathered during the 30-minute period ending at the actual time of the observation. All other elements evaluated will be based on sensor data that is within 10 minutes or less of the actual time of the observation.

2.10.2.1. One-Minute Observations (OMO). AN/FMQ-19 generates an observation every minute. Once each minute, AN/FMQ-19 performs internal diagnostic and QC checks on sensor data and then updates the OMO. The OMO is encoded in METAR format and includes all basic weather parameters found in the body of the METAR plus specific automated remarks. The OMO also accepts augmented elements and remarks. The basic difference between the OMO and the METAR/SPECI is that the OMO is not disseminated longline. The weather technician can manually disseminate the OMO if required, for example, upon arrival at the Alternate Operating Location (AOL).

2.11. Observation Requirements Specific to the Installation.

2.11.1. Manual Observing Units. At manual units, the SPECI criteria will reflect all the local Ceiling and Prevailing Visibility landing and circling minima. The LOCAL criteria will reflect the installation's Runway Visual Range thresholds and other applicable take-off minima. SPECI/LOCAL criteria will be based on published airfield minima for all approaches (i.e., ILS, TACAN), and other Air Force, higher headquarters, MAJCOM, and Army directives.

2.11.2. Automated and Augmented/Backup Observing Units. At automated and augmented/backup units, the local Ceiling, Prevailing Visibility, and Runway Visual Range minima will be SPECI observations generated by the AN/FMQ-19 (or like system). Units with automated observing systems will update SPECI criteria in the software to ensure the system generates the required SPECI observations for the published airfield minima (take-off, landing, circling) for all approaches (i.e., ILS, TACAN). Automated and augmented/backup units will not generate LOCAL observations.

2.11.3. FLIP Review. As soon as possible after publishing, units will have procedures to review each new edition of DoD Flight Information Publications (FLIPs), including the RADAR Instrument Approach Minimums, local NOTAMs, and applicable directives for changes in the airfield minima. See **Figure 2.1.**, **Figure 2.2.**, and **Figure 2.3.**

Figure 2.1. Extract from DoD Flight Information Publication (Terminal Instrument Procedures Legend).

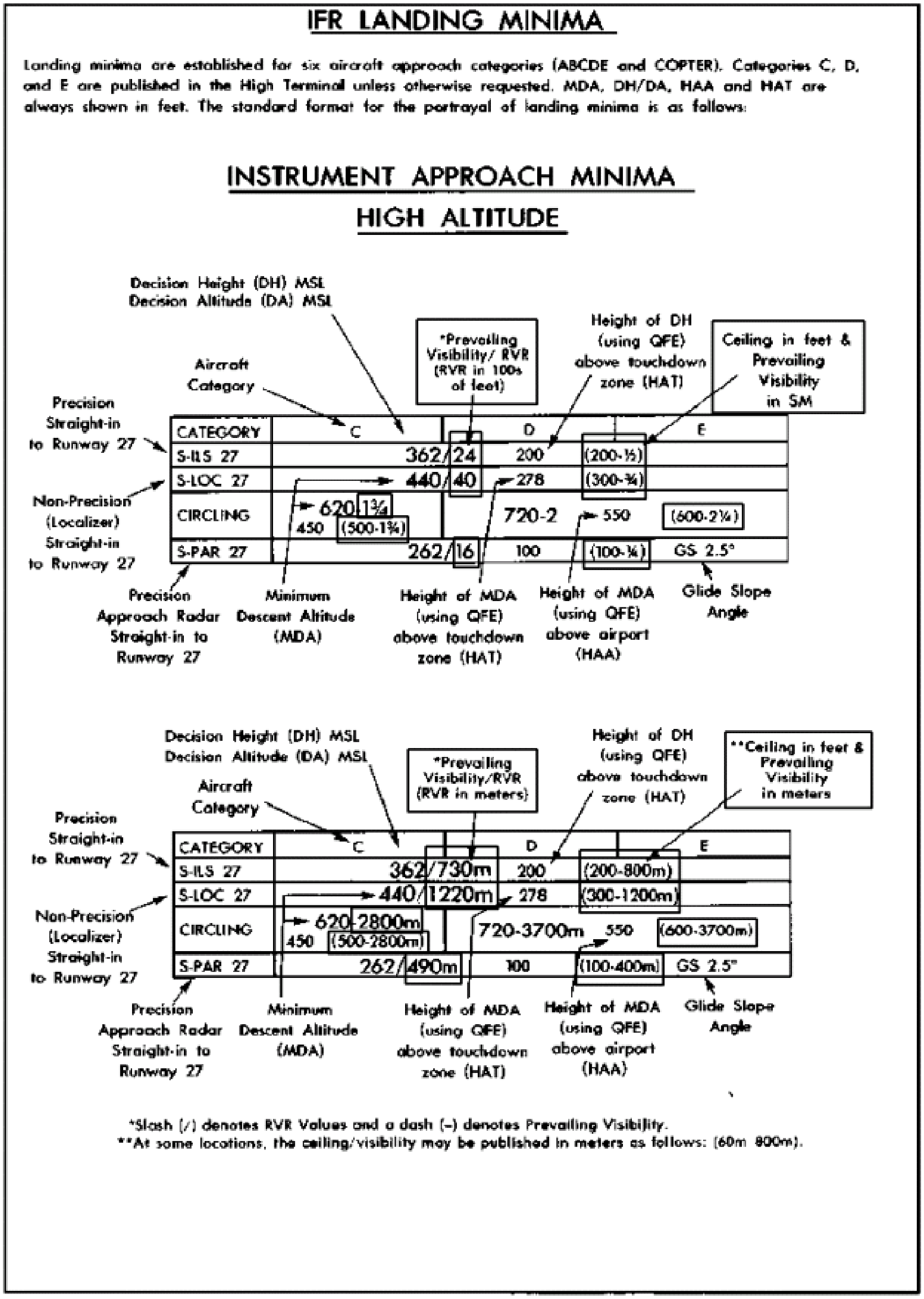


Figure 2.2. Extract from DoD Flight Information Publication (CONUS Terminal Instrument Procedures).

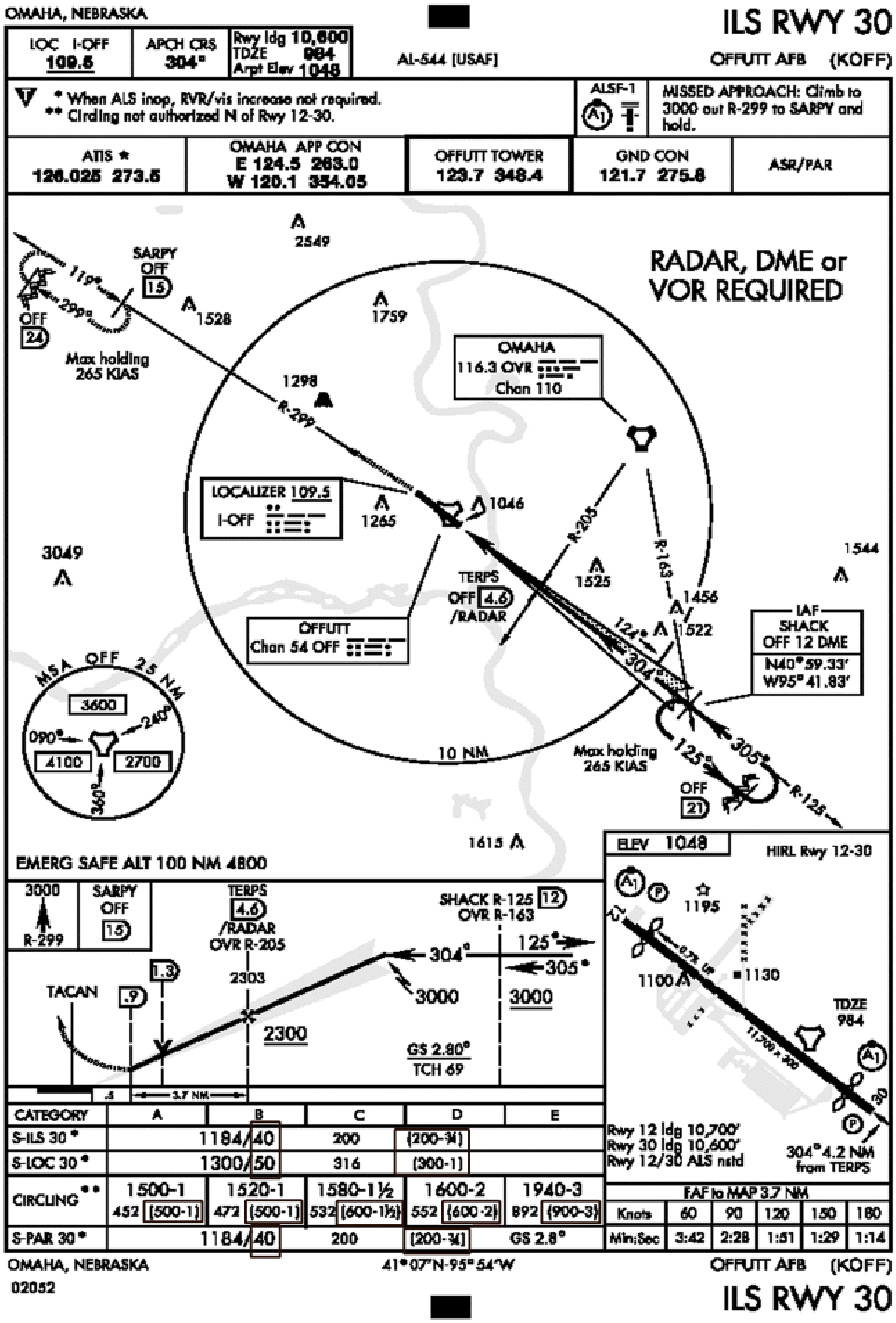
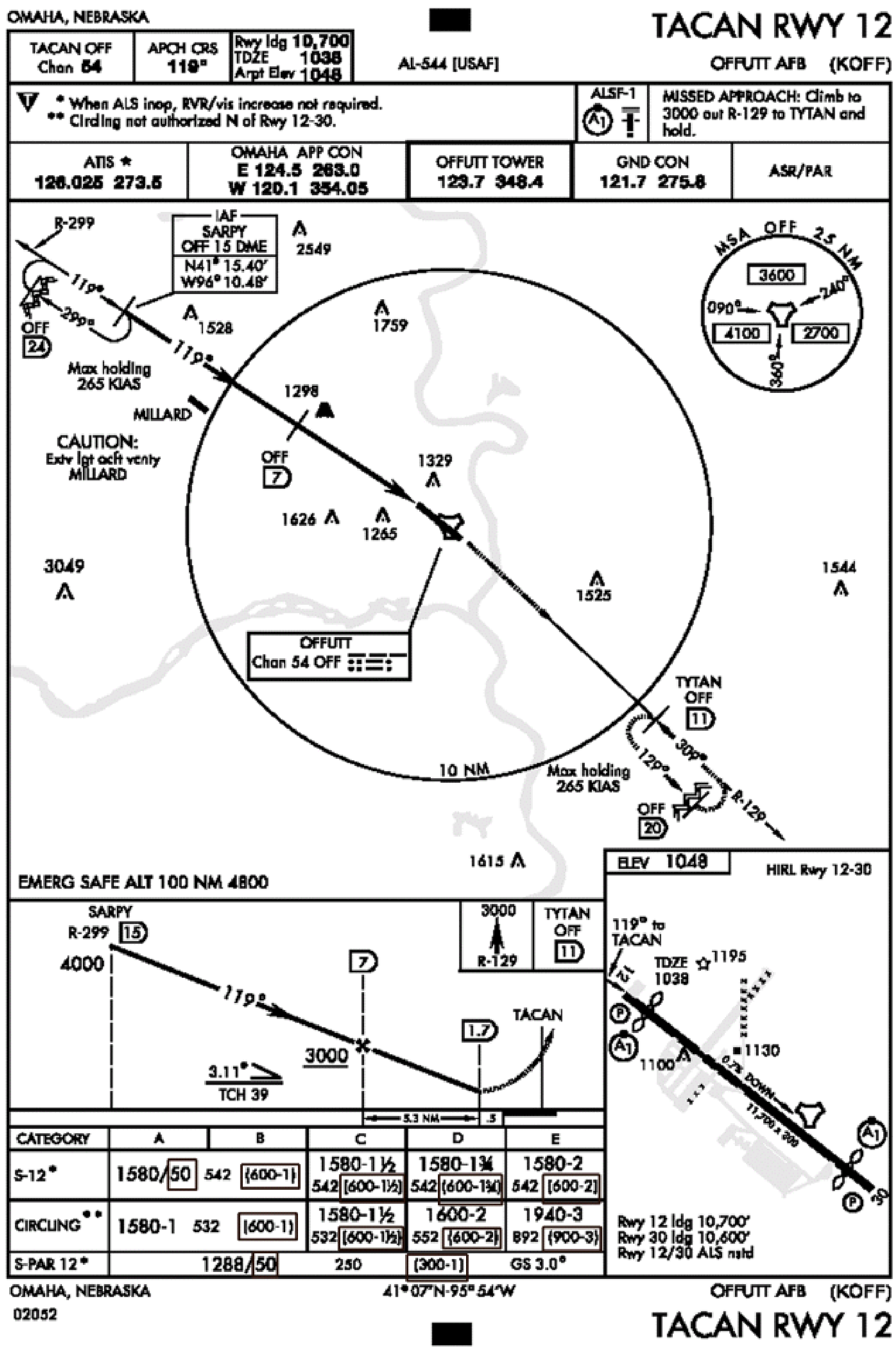


Figure 2.3. Extract from DoD Flight Information Publication (CONUS Terminal Instrument Procedures).



2.11.4. Magnetic Variation. The local magnetic variation must be determined at each observing location to convert wind direction from magnetic to true. Obtain local magnetic variation from the installation's DoD FLIPs or the Tactical Plotting Chart for your area; whichever is most current. The earth's magnetic field is continually shifting. Local variation will change by several minutes of arc each year at most locations. Supervisors must monitor FLIPS or revised charts for changes in local magnetic direction. Shifts in variation may affect the orientation of the wind equipment; therefore, keep maintenance personnel informed of changes. **Figure 2.4.** shows the legend breakdown for FLIP entries; item 35 shows the magnetic variation. Also provided is an explanation of block 35 and an example for Offutt AFB, which shows the magnetic variation to be 5.0× east from true north. Convert magnetic and true wind direction as follows:

Figure 2.4. Extract from DoD Flight Information Publication (Terminal Instrument Procedures Legend).

A-2 AIRPORT/FACILITY DIRECTORY LEGEND

SAMPLE

LESPERANCE INTL, (TAVISH FLD) FL Keystone I KLES CIV (N)
N24°01.90′ W81°35.26′ (32UMA2028522509) 301 UTC+2(+3DT)
SKETCH, H-4H, L-12F

(B) RWY-09 L5,9,24,50 (8596x148 ASP L5,9,50 RWY-27
S80 T220 ST175 TT315 TDT800
PCN 74 R/B/W/T)
8404→ ←7596
←NET BEFAB (35′) HOOK BAK-12(B) (853′) HOOK BAK-12(B) (796′) NET BEFAB (34′)→

SERVICE - AOE LGT - REIL Rwy 27 rqr 30 min PN.
A-GEAR - Rwy 09 BAK-12 barrier hsg lctd 200′ fr rwy cntrline. JASU - (C-26) 3(MA-1) 4(MD-3) FUEL - A+ (DG AIR C636-555-1212) A J8 FLUID - PRESAIR LHOX LOX OIL - O-128 TRAN ALERT - No reciprocating eng maint avbl. Exp delays on wkend.

REMARKS - Opr 0500-2300Z++. RSTD - OFFL BUS ONLY. Rwy 09 ldg 7925′ ngt.
CAUTION - Ints hvy jet tfc. TFC PAT - Rgt tfc. NS ABTMT - Mand quiet hr 2330-0400Z++. CSTMS/AG/IMG - CSTMS avbl PN rqr. MISC - Rwy 09-27 grooved. Class D Airspace eff 0400-2330Z++ OT Class G. N - PPR only.

COMMUNICATIONS - PTD - 372.2 ATIS - 128.3 279.3 AWOS-3 - C305-389-1056. 135.375 RDO - 122.0 APP - Opr H24. (R) (E) 123.975 309.95 362.3 (123.975 Blw 5000′.) (309.95 Abv 5000′.) TWR - Opr 0400-2330Z++. 126.3 138.7 217.4 238.5 GND - 121.9 348.6 DEP - (R) 121.3 263.0 CLNC DEL - 121.4 281.4 KAYE COMD POST - 128.1 293.7 349.4 (349.4 AMC acft) PMSV METRO - 344.6 REMARKS: (Full svc dur wx fcst hr.) A/G - See Global HF Systems listing in FIH. FSS-GAINESVILLE GNV-DL-NOTAM KLES

NAVAIDS - CLERMONT VOR-DME - HA 117.500 CMF CH 122 (100/50) N24°01.15′ W81°35.33′ At Fld. 1060/(A)2°00.0′E CLERMONT NDB - MHW 390.000 AVI N24°55.59′ W81°25.71′ 047° 9.5 NM to Fld. Unk/1°2.3′E MP 0700-1000Z++ Wed. VHF/UHF/DF

CMF VOR-DME unuse 015°-070° byd 25 NM blw 4500′
150°-180° byd 20 NM blw 6500′

ILS/RADAR - ➡ ILS - BRG 272° LCZR AV 110.7 GS 3° ■ RADAR - ASR - Call RADAR - 140.675 362.1 344.0 279.6 385.4 PAR - Call GCA (123.3 279.6 362.1 Mil) (123.3 Civ)

35 ELEVATION/VARIATION - is the elevation (MSL) and magnetic variation of the antenna. The airport elevation will be substituted when navaid elevation is unknown (applies to navaids at the field except NDB). The assigned antenna magnetic variation will be shown when available, and indicated by an (A) preceding the variation.

NAVAIDS - OFFUTT TACAN - L OFF CH 54 N41°07.03′ W95°54.00′ At Fld. 1017/(A)5°00.0′E No-NOTAM MP: 1300-1500Z++ Thu.
OFF TACAN unuse 300°-330° byd 15 NM blw 4000′
330°-300° byd 30 NM blw 5000′

2.11.4.1. From magnetic to true: (1) add easterly variation to magnetic direction, and (2) subtract westerly variation from magnetic direction.

2.11.4.2. From true to magnetic: (1) add westerly variation to true direction, and (2) subtract easterly variation from true direction.

2.12. Points of Observation. For meteorological observations, the observing location is defined as the point or points at which the various elements of the observation are evaluated. Normally, points of observation are confined to an area within 2 statute miles (3200 meters) of the observing unit to include phenomena affecting the runway complex, drop zone or landing zone. In cases where all measurements are taken at approximately the same point, a unit will be regarded as having a single observation location. For non-fixed locations (tactical and mobile weather teams), the point of observation is determined by the local situation. In cases where various sensors are in different locations to obtain acceptable exposure, the weather observations may also contain information on phenomena occurring at other than the location of the observing unit (e.g., clouds over mountains W, lightning SE, thunderstorms NW). However, in such cases, the point of observation is not extended to include points where the distant phenomena are occurring. For example, at a large, modern airfield, the points of observation are generally considered as follows:

2.12.1. Manual Observations:

2.12.1.1. For elements such as prevailing visibility, present weather, and obscurations, the observing location may be coincident with the weather observing unit; or it may be the touchdown area of the primary runway. The selected location must provide consistent visually determined values.

2.12.1.2. The center of the runway complex for temperature, dew point, pressure, lightning; and winds if the sensor is not installed at touchdown areas.

2.12.1.3. A point near the approach end of a runway for touchdown runway visual range (RVR), winds, and all cloud height and ceiling elements.

2.12.2. Automated Observations. The location of the primary sensor group and the discontinuity group for automated observing systems. The automated sensor groups are sited in accordance (or as close to as practicable) with the *Federal Standard for Siting Meteorological Sensors at Airports*.

2.12.3. Tower Observations. The aircraft control tower for tower prevailing visibility.

2.13. Rounding of Figures and Values. Except where otherwise designated, round figures and values as follows:

2.13.1. If the fractional part of a positive number to be dropped is equal to or greater than one-half, the preceding digit will be increased by one. If the fractional part of a negative number to be dropped is greater than one-half, the preceding digit will be decreased by one. In all other cases, the preceding digit will remain unchanged. For example, 1.5 becomes 2, -1.5 becomes -1, 1.3 becomes 1, and -2.6 becomes -3.

2.13.2. When cloud height and visibility values are halfway or less between two reportable values, report the lower value. For example, cloud heights of 2,549 feet and 2,550 feet are reported as 2,500 feet, visibility values of 5 1/4 miles (8250 meters) and 5 1/2 miles (8500 meters) are reported as 5 miles (8000 meters).

2.13.3. When cloud height and visibility values are greater than halfway between two reportable values, report the higher value. For example, a cloud height of 2,451 feet is reported as 2,500 feet, and a visibility value of 4 3/4 miles (7750 meters) is reported as 5 miles (8000 meters).

2.13.4. When computations of pressure values require that a number be rounded to comply with standards on reportable values, the number will be rounded down to the next reportable value. For example, a station pressure reading of 29.249 is rounded down to 29.245 while a station pressure reading of 29.244 is rounded down to 29.240. Altimeter setting readings of 29.249 and 29.244 are both truncated to 29.24.

2.13.5. Altimeter settings provided for international aviation purposes and reported in whole hectopascals (hPa) are rounded down when disposing of tenths of hPa (e.g., 1009.9 hPa and 1009.1 hPa are both rounded down to 1009 hPa).

2.14. Observation Forms.

2.14.1. AF Form 3803, *Surface Weather Observations (METAR/SPECI).* The AF Form 3803 will be used at non-N-TFS weather observing units and at units without N-TFS 3.1 or higher software. This form is an electronically generated official record and compilation of daily surface weather observations and summary data. The form may be printed out as a paper version at non-N-TFS weather observing units without the capability to use and transmit the electronic version. Start a new form with the first observation of each new calendar day local standard time (LST).

2.14.1.1. Locations (classified or unclassified) taking surface observations for tactical weather operations will prepare the electronic or paper, as applicable**,** AF Form 3803 in one copy. Units using a paper copy of the AF Form 3803 may record data for more than 1 day on the same sheet by entering the day and month of the next day's observations on a separate line following the last observation of the preceding day. Units using the electronic version of the AF Form 3803 will use a separate worksheet for each calendar day.

2.14.2. AF Form 3813-*Federal Meteorological Form 3813, Surface Weather Observation (METAR/SPECI FORM FOR MILITARY USE)*. This form will be used at N-TFS weather observing units with N-TFS version 3.1 or higher and at units with N-TFS as the primary interface for AN/FMQ-19. This form is an electronically generated official record and compilation of daily surface weather observations and summary data.

2.14.2.1. The N-TFS 3.1 upgrade will have the ability to store data on the AF Form 3813 and electronically transmit it to AFCCC for processing and archive. Full-time units will start a new form at the beginning of each calendar day LST and will execute the send function on N-TFS daily after 0300 LST (but not more than 7 days later). Limited-duty units will develop procedures to begin a new form and send the data to AFCCC at an appropriate time, usually at the beginning the next duty day (not to exceed 7 days).

2.14.2.2. Automated and Augmented AN/FMQ-19 units using AF Form 3813 must perform a thorough review of the form before sending to AFCCC. At this time, there are some blocks (e.g., summary data) that do not automatically fill with the information from the AN/FMQ-19 observations. Weather units must go back through the daily METAR/SPECI observations, extract this information, and manually enter the data on the form before sending to AFCCC.

2.14.3. All METAR and SPECI observations will be recorded on the applicable AF Form 3803 or 3813. This includes LOCAL observations at manual units taken for aircraft mishaps. Other LOCAL observations need not be recorded on the form if a record of the observations is made by a local dissemination device (e.g., N-TFS). Normally, when such a recording device is inoperative or not available, all LOCAL observations are recorded on the form. However, single element LOCALs for altimeter setting are not entered on the form if a record of the values is maintained on a local dissemination log or a tape-recording. When in doubt, record the LOCAL.

2.15. Retention and Disposition of Records. All surface observing records/forms (hard or electronic copy) will be retained and disposed of in accordance with the **15 Series Tables** of AFMAN 37-139, *Records Disposition Schedule*. Units with N-TFS 3.1 or higher will execute the send option daily to transmit the AF Form 3813 data to AFCCC. Units without N-TFS 3.1 or higher will complete the approved version of the electronic AF Form 3803 and, at the beginning of each month, will email the previous month's zipped workbook as an attachment to AFCCC. Units without the capability to email the electronic 3803 forms (workbooks) will send either a CD containing the workbook or the original hard-copy forms and two copies of Standard Form 135, *Records Transmittal and Receipt*, to:

AFCCC/DOD
151 Patton Avenue, Room 120
Asheville, NC 28801-5002

Locations operating in tactical environments will coordinate with AFCCC/DOD for timely transmission and receipt of their forms.

2.16. Alternate Operating Location (AOL). AF weather units responsible for preparing surface weather observations, without regard to the mode of operation, as part of the Airfield Services Element will establish an AOL when the primary location is evacuated. Units will 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. Operations at the AOL and any reciprocal support from other agencies will be coordinated and documented in the local weather support document. See AFMAN 15-129 for additional guidance on operating at a backup location.

2.16.1. The AOL will be a location with adequate communications and a view of the airfield complex. Some units may be equipped to augment/backup the AN/FMQ-19 at the AOL, assuming the automated sensors are still working. If the sensors are not operating, units should plan to use available backup equipment (e.g., tactical equipment) and methods to prepare the observations.

2.16.2. The "eyes forward" function will begin immediately upon arrival at the AOL. Automated observations will be available for transmission from the AOL as soon as the necessary augmentation/backup is complete. Manual observations will be available for transmission as soon as possible after arriving at the AOL and evaluating the individual elements. The recency requirement defined in **Part 1, paragraph 2.10.1.** for elements observed at manual units will apply for manual observations prepared at the AOL.

2.16.3. At a minimum, weather personnel must be able to prepare an initial observation containing the minimum required elements (i.e., wind speed and direction, prevailing visibility, present weather and obscurations, sky condition, and temperature and dew point). Additionally, an altimeter setting will be included if necessary equipment is available.

2.16.4. Resume the augmentation/backup function to the AN/FMQ-19, or begin taking manual observations as soon as returning to the primary location of the Airfield Services Element.

2.17. Cooperative Weather Watch. Weather units responsible for preparing surface weather observations, without regard to the mode of operation, as part of the Airfield Services Element will establish a cooperative weather watch with Air Traffic Control (ATC), and other appropriate base/post agencies, as required. Of primary concern is the report of tower visibility different from the prevailing surface visibility, reporting of sector visibility, local PIREPs**,** and any occurrence of previously unreported weather conditions that could affect flight safety or be critical to the safety or efficiency of other local operations and resources. All weather personnel must thoroughly understand and be able to execute every element in the local cooperative weather watch agreement. The cooperative weather watch will define, at a minimum, the following:

2.17.1. The process for ATC personnel certified to evaluate tower visibility to report changes in tower prevailing visibility and sector visibility to the local weather unit when tower visibility is less than 4 statute miles (6000 meters) and is different from the surface prevailing visibility, and reporting sector visibility. See **Parts 2** and **4** for instructions on encoding tower visibility and sector visibility.

2.17.2. The requirement for weather technicians to reevaluate the weather conditions whenever a reliable source (i.e., ATC, pilots, local law enforcement, etc.) reports weather conditions different from the last disseminated observation (e.g., different ceiling height, visibility, present weather). Based on reevaluation of the different weather conditions reported and local policy, weather personnel will:

2.17.2.1. Generate a SPECI or LOCAL (manual units) observation if the different conditions warrant immediate dissemination.

2.17.2.2. Include the differing conditions in the next required METAR, SPECI, or LOCAL observation if the conditions alone do not warrant immediate dissemination.

2.17.3. As part of the Cooperative Weather Watch, weather units with AN/FMQ-19 will coordinate the need to leave the runway lights on when the airfield is closed to allow the system to continue reporting RVR. This is encouraged in case of an emergency aircraft divert into the location.

2.17.4. Units will coordinate cooperative weather watch requirements with the appropriate base/post agencies and specify the requirements in the local weather support document.

2.18. Control Tower Observations and Weather Unit Actions.

2.18.1. ATC Personnel. ATC directives (i.e., AFI 13-203, *Air Traffic Control*; FAA Order 7110.65, *Air Traffic Control*) require certified control tower personnel to make tower prevailing and sector visibility observations when the prevailing visibility at the usual point of observation, or at the tower level, is less than 4 miles. Control tower personnel certified to take visibility observations are instructed by their agency to:

2.18.1.1. Notify the weather unit when they observe tower prevailing visibility to decrease to less than, or increase to equal or exceed **4 miles (6000 meters).**

2.18.1.2. When the prevailing visibility at the tower or the surface is less than 4 miles (6000 meters), report all changes of one or more reportable values to the weather unit.

2.18.1.3. As required by FAA Order 7110.65, use the lower of either the tower or surface visibility as the prevailing visibility for aircraft operations.

2.18.2. Weather Unit Personnel. Weather personnel will:

2.18.2.1. Notify the tower as soon as possible, whenever the prevailing visibility at the weather unit's observation point decreases to less than, or increases to equal or exceed 4 miles (6000 meters).

2.18.2.2. Re-evaluate surface prevailing or sector visibility, as soon as practicable, upon initial receipt of a differing control tower value, and upon receipt of subsequent reportable changes at the control tower level.

2.18.2.3. Use control tower values of prevailing or sector visibility as a guide in determining the surface visibility when the view of portions of the horizon is obstructed by buildings, aircraft, etc. The presence of a surface-based obscuration, uniformly distributed to heights above the level of the tower, is sufficient reason to consider the weather unit's prevailing visibility to be the same as the control tower level.

2.18.2.4. When the tower visibility is less than **4 miles (6000 meters)** and differs from the visibility at the surface point of observation, report the lower visibility value in the body (column 4) and report the higher visibility in the remarks section (column 13) in all observations. The format for the remark is given in **Attachment 3.**

2.19. Observing Aids for Visibility.

2.19.1. Visibility Charts and Aids. AF weather units will post charts, lists, or other positive means of identifying lights or objects used as observing aids near the weather technician's position so they can be accessed quickly and easily. Separate lists or charts should be used for daytime and nighttime markers. In any case, the aids must be clearly identified as to whether they are daytime or nighttime aids.

2.19.1.1. Fixed-base units should submit a work order through the Terminal Instrument Procedures (TERPS) unit on the installation to have the local Civil Engineering (CE) agency survey the markers. Deployed units should use available tools, such as Military Grid Reference System (MGRS) maps, laser range finder equipment, and Global Positioning System (GPS) devices to create tactical visibility markers.

2.19.1.2. The most suitable daytime markers are prominent dark or nearly dark colored objects (such as buildings, chimneys, hills, or trees) observed in silhouette 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.

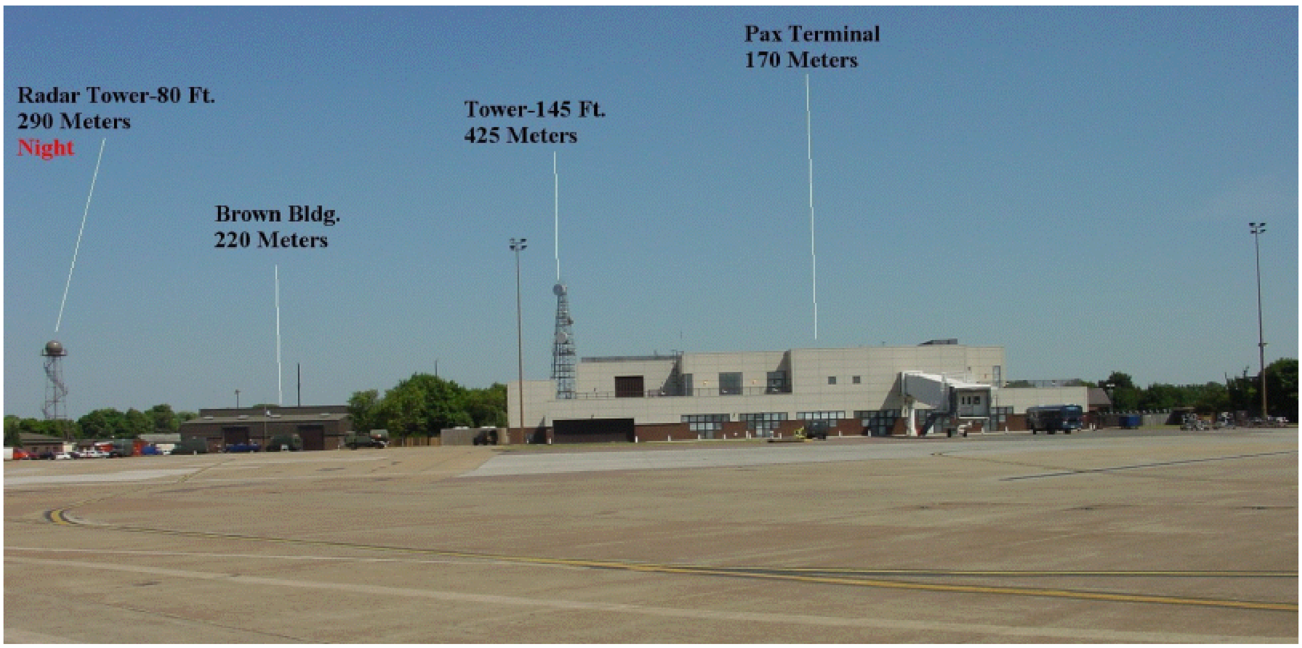
2.19.1.3. The most desirable night-visibility markers are unfocused lights of moderate intensity (about 25-candle power). The red or green runway course lights of airway beacons and TV or radio tower obstruction lights may be used. Do not use focused lights such as airway beacons due to their intensity; however, their brilliance may serve as an aid in estimating whether the visibility is greater or less than the distance to the light source.

2.19.1.4. Representative visibility markers should be high quality (color/digital) photos taken on a predominantly cloud and obscuration free (clear) day, and be representative of the current state of the airfield/site (see **Figure 2.5.).** It is also recommended units develop map-type visibility charts to augment the photographic visibility markers.

2.19.2. Currency of Representative Visibility Markers. AF weather unit leaders will establish a process to review and update (as needed) the representative visibility markers annually and when significant changes, such as new construction, take place at the airfield/site.

2.19.3. Alternate Operating Location (AOL) Aids. If an AOL is required, units will prepare the representative visibility markers and aids to assist in taking surface observations at the location. Follow the same guidance as that for fixed-base locations for preparing AOL visibility markers.

Figure 2.5. Example Visibility Checkpoint Photograph.



2.19.4. Control Tower Visibility Aids. ATC regulations require control towers to maintain a visibility checkpoint chart or list of visibility markers posted in the tower. Upon request, units will provide whatever assistance is necessary to help prepare a chart or markers of suitable objects for determining tower visibility.

2.20. Aircraft Mishap. Upon notification on an aircraft mishap:

2.20.1. Manual units will take a LOCAL observation IAW instructions in **Part 2.**

2.20.2. Augmented units will check the latest AN/FMQ-19 observation (i.e., METAR/SPECI/OMO) and perform augmentation/backup as required IAW **Part 4** instructions. Because AN/FMQ-19 automatically prepares and archives an observation every minute, weather units are not required to include an aircraft mishap remark in the observation. There are no special archive requirements at units with AN/FMQ-19. Dissemination is not required unless AN/FMQ-19 has generated a pending METAR or SPECI observation.

2.20.3. Manual and Augmented units will collect and save data related to an aircraft mishap according to instructions in AFMAN 15-129 and AFMAN 15-135, *Combat Weather Team Operations*. Managers of automated units will retrieve the archived surface observation data from AN/FMQ-19 as required by the requesting agency.

2.21. Miscellaneous Observations.

2.21.1. Runway Condition. Manual and augmented weather units will report runway surface condition (RSC) and runway condition reading (RCR) information in a SPECI observation when its determined and provided by the airfield manager or operations officer. **Table 2.1.** provides example RSC/RCR information. See **Attachment 2** for SPECI reporting.

Table 2.1. Example RSC/RCR Information.

RSC & RCR INFORMATION	
Wet Runway	WR
Slush on Runway	SLR
Loose Snow on Runway	LSR
Packed Snow on Runway	PSR
Ice on Runway	IR
RSC "patchy"	P
Runway Sanded	SANDED
RSC is "patchy" but rest of runway wet or dry	P WET or P DRY
Packed snow on runway, decelerometer reading 15	PSR15
Loose snow on runway, decelerometer reading 20	LSR20
Ice on runway, decelerometer reading 05, condition patchy, runway sanded	IR05P/SANDED
Ice on runway, no decelerometer reading available	IR //
Loose snow on runway, decelerometer reading 08, patchy, rest of runway dry	LSR08P DRY
Ice on runway, decelerometer reading of 05, condition patchy, remainder of runway wet	IR05P/WET
RCR is not reported	RCRNR

2.21.2. Midnight Observations. The midnight observation is taken to complete the climatological record of the LST day at units where 0000 LST does not coincide with the standard time of a 6-hourly observation. The observation consists of maximum and minimum temperature, precipitation amounts, and peak wind. Obtain this data at the time of the observation and record for the LST day ending at the time observed (except as otherwise directed in **Part 2**).

2.21.3. Nuclear Accident. When notified of a real world nuclear accident, take and disseminate (locally and longline) a SPECI. Append the remark AEROB as the last remark to the SPECI.

2.21.4. Earthquake Reports. AF weather units located in the CONUS (including Alaska, Hawaii, and Guam) will establish procedures to report earthquake occurrences. This includes units staffed by contract weather observers. Earthquake reports are required for only those detected during the unit's hours of operation. OCONUS units may report earthquakes as duties permit.

2.21.4.1. As soon as possible following an earthquake and establishing Internet connection, access the United States Geological Survey (USGS) earthquake website (current URL: **http://earthquake.usgs.gov**), select the "REPORT AN EARTHQUAKE" follow additional links appropriate to the geographic region in which you are located and to the time of the earthquake you have felt, and fill out the earthquake questionnaire. In the event of a major earthquake swarm or aftershock sequence, in which it is impractical to report every felt shock, report the stronger shocks. These would typically be no more than several a day.

2.21.4.2. As a follow up, send a report longline via the Automated Weather Network (AWN) using the format in **Attachment 5** as a guide. Retain a printout of the "Report an Earthquake" form and the AWN message for unit records.

2.21.5. Other. Any other meteorological situation, which in the opinion of the weather personnel, is significant to the safety of aircraft operations or force protection.

Chapter 3

ENTRIES ON OBSERVATION FORMS

3.1. Introduction. This chapter contains instructions for making entries on AF Form 3803, *Surface Weather Observations (METAR/SPECI*), and AF Form 3813-*Federal Meteorological Form 3813, Surface Weather Observation (METAR/SPECI FORM FOR MILITARY USE)* provided as part N-TFS.

3.2. Basic Entries on Forms. Units equipped with N-TFS 3.1 or higher will use the electronically generated AF Form 3813. The AFCCC-developed electronic AF Form 3803 will be used by non-N-TFS units that have the capability to convey the workbook to AFCCC via email or by mailing a CD containing the workbook. Non-N-TFS units without either of these capabilities may use the electronic or paper AF Form 3803. MAJCOMs or higher headquarters may supplement this manual with additional requirements. **Attachment 7** contains a sample AF Form 3803 for a part-time unit and a sample of a partial AF Form 3803 for a full-time unit.

3.2.1. Authorization to Make Entries on Forms. Only task-certified weather technicians are authorized to make entries on the forms. Trainees may make entries on the forms only when under the immediate supervision of a certified weather technician who attests to the validity of the entries by initialing in column 18 (trainee's initials go in Column 90 Remarks).

3.2.2. Writing Instruments. Units not using the electronic forms described in **paragraph 3.2.** will use the same type of writing instrument when filling out the paper AF Form 3803. Ensure legible copies and ample contrast (for photographic requirements) by using only a pencil with black grade 2 medium lead or a mechanical pencil (.5 mm or .7 mm) using only black HB or MH lead. AF Form 3803 hand-written entries will be all capital, block letters, or block numerals.

3.2.2.1. Weather units will ensure all paper forms sent to AFCCC have no cuts, tears, stains, or staples. Once AFCCC receives the forms, they are digitized for permanent record.

3.2.3. Separation of Data. Use a blank space in column 13 to separate data. Do not use a solidus (/).

3.2.4. Missing Data. When an element does not occur or cannot be observed, the corresponding group and preceding space are omitted from that particular report. Briefly explain in column 90 (Remarks, Notes, and Miscellaneous Phenomena) the reasons for missing data. This does not apply to elements that can be obtained by estimation or alternate methods of determination (e.g., sky condition, visibility, present weather, wind, pressure).

3.2.4.1. When AN/FMQ-19 cannot provide an element due to sensor failure, the software will automatically place a missing data flag (**M**) in the corresponding data field on AF Form 3813.

3.2.5. Late Observations. When a METAR is taken late, but within 15 minutes of the standard time of observation, and no appreciable changes (SPECI or LOCAL criteria) have occurred since the standard time, enter the observation in black and transmit as a METAR using the standard time of observation. If conditions have changed appreciably or the observation is more than 15 minutes late, skip a line and record and transmit a SPECI. After transmitting the SPECI, return to the skipped line and, using the standard time of the missed observation, record an observation in RED using estimates of the conditions probable at the time of the missed observation, using data from recording instruments whenever possible. This observation will not be transmitted.

3.2.6. Corrections. Disseminate a correction immediately after detecting an error in a transmitted report. Do not send a correction longline if superseded by a later report, except in response to an AXXX Bulletin (Not Received By KAWN**).** All hand written entries must be legible.

3.2.6.1. Correct errors discovered before dissemination (all columns, electronic or paper forms) by deleting or erasing, as applicable, the erroneous data from the form and entering the correct data in black (font or pencil). Erasing entries on the paper form is authorized only if the data has not been disseminated (either locally or longline).

3.2.6.2. Correct errors discovered after either local or longline dissemination as follows:

3.2.6.2.1. AF Form 3813. If an error is discovered after dissemination but before another observation has been disseminated, select that observation and click COR on the N-TFS A/N forms window. Enter the correction and transmit the corrected observation. The letters "COR" will appear in the new observation after the unit's ICAO. If an error is discovered after dissemination and after another observation has been disseminated, then select "Edit 3813" on the A/N observation form and enter the file time of the observation to be corrected. Make the necessary corrections and add "COR XXX (time)" in the remarks section and select transmit. This corrected observation will not be sent locally or longline, but will be added to the automated 3813 directly below the original incorrect observation.

3.2.6.2.2. AF Form 3803 Electronic or Paper. Make corrections according to the following procedures. All corrected data and Column 13 & 90 remarks will be in **RED FONT**, except as noted in paragraph **3.2.6.2.2.2.2.**

3.2.6.2.2.1. Columns 1 through 13.

3.2.6.2.2.1.1. Electronic 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), and the temperature block would be 21 (in red). For corrections not transmitted locally or longline, no time reference is required.

3.2.6.2.2.1.2. Paper 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 longline, enter COR in column 13 followed by the time (to the nearest minute UTC) the correction was locally disseminated. In the case of longline-only dissemination (e.g., a correction for additive data), enter COR and the approximate UTC time the correction was transmitted.

3.2.6.2.2.2. Columns 15 through 90.

3.2.6.2.2.2.1. Electronic 3803. Enter the correct data in the appropriate field, and then annotate the corrections. For errors in columns 15 through 21, annotate "COR FROM" in **column 13** followed by the appropriate identification, the **ORIGINAL ENTRY**, and the time of the correction. For example, if the original (incorrect) station pressure entry was 29.370, and it was corrected to 29.375 at 1430, the column 13 remark would read COR FROM STA PRES 29.370 @ 1430, and the station pressure block would be 29.375. For errors in columns 22 through 90, annotate "COR FROM" in **column 90**, followed by the appropriate identification, the **ORIGINAL ENTRY**, and the time of the correction. For example, if the original (incorrect) snow depth entry was 40, and it was corrected to 42 at 1430, the column **90** remark would read COR FROM SNOW DEPTH 40 @ 1430, and the snow depth block would be 42. For corrections not transmitted locally or longline, no time reference is required.

3.2.6.2.2.2.2. Paper 3803. For an error resulting in erroneous data being disseminated locally or longline, draw a **BLACK** line through the erroneous entry, and enter the correct data **IN BLACK** on the next line beneath it. If space is insufficient, enter the correction in column 90 with an appropriate identification (e.g., 1758 STA PRES 29.375).

3.2.6.2.2.3. For other corrections delete or erase the erroneous entry and enter the correct data.

3.3. Column Entries on AF Form 3803/3813.

3.3.1. Heading Entries. Prepare and use a new AF Form 3803 or AF Form 3813 at 0000 LST each day (not Daylight Saving Time). Enter heading information and other required data in the blocks provided. On subsequent pages for the same day, only the date and unit identification data need be entered. **NOTE:** The 3813 and the electronic 3803 have all the heading information for most units, which can be edited upon opening the month's forms and is automatically input to each day's worksheet.

3.3.1.1. Latitude and Longitude. Enter latitude and longitude in degrees and minutes. This data normally corresponds to that officially established for an airfield (e.g., as published in DoD FLIPs). At locations where the data has not been established, obtain the approximate latitude and longitude of the observing site by means of an aeronautical chart or other convenient reference source, such as the Global Positioning Satellite (GPS).

3.3.1.1.1. Classified locations using KQXX location identifiers (or EQXX for NATO classified locations) will leave the latitude and longitude blank so that the completed forms may be transmitted and data based via unclassified means.

3.3.1.2. Station Elevation. Enter the unit's station elevation to the nearest foot. At units located at an airfield, station elevation is considered the same as field elevation (e.g., as published in the DoD FLIPs). At locations where field elevation has not been established (e.g., a gunnery range), station elevation is considered the same as barometer elevation unless a more representative level is established in coordination with the local facility. **NOTE:** GPS equipment may be used as a reliable source of station elevation information.

3.3.1.3. Time Conversion. Circle or enter the applicable sign (+ or -) and enter the number of hours appropriate to convert LST to UTC (or vice versa as indicated on the edition of the form in use). **NOTE:** This entry does not change when local clocks are changed to local Daylight Saving Time.

3.3.1.4. Conversion From Magnetic to True Direction. Circle or enter the applicable sign (+ or -) and enter the number of degrees (to the nearest 10 degrees) appropriate for conversion of direction from magnetic to true (see **Part 2, Chapter 6**).

3.3.1.5. Day. Enter the LST day of the month (one or two digits).

3.3.1.6. Month. Enter a three-letter abbreviation for the LST month.

3.3.1.7. Year. Enter the LST year (four digits).

3.3.1.8. Station and State or Country. Enter the unit (station) name followed by the two-letter state abbreviation, or if not in the United States, the country name in full.

3.3.2. Type of Observation (Column 1). Enter the designator for the type of observation using **Figure 3.1.**

Figure 3.1. Observation Designators.

AF Form 3803 Designator	AF Form 3813 Designator	Type of Observation
SA	METAR	Record (METAR)
SP	SPECI	Special (SPECI)
L	LOCAL	LOCAL (See Note)

NOTE: Use of the N-TFS prompt LOCAL-MSHAP will automatically include the remark (ACFT MSHP) in column 13 of AF Form 3813. (Manual units only.)

3.3.3. Time of Observation (Column 2). Enter the actual time of observation in the format GGgg, where GGgg is the hour and minute (UTC).

3.3.4. Wind Entries (Columns 9 Through 11).

3.3.4.1. Wind Direction (Column 9A). Encode and report the mean wind direction (ddd) observed during the 2-minute period before the actual time of observation. When the observation period includes a discontinuity (e.g., an abrupt variation or change) in the wind direction, use only data occurring since the discontinuity in obtaining average values (i.e., the time interval in these cases will be correspondingly reduced).

3.3.4.1.1. Enter wind direction with reference to true north to the nearest 10 degrees using three digits. When the wind is calm, enter 000.

3.3.4.1.2. Variable Wind Direction (speeds 6 knots or less). Variable wind direction may be encoded as VRB column 9A in place of the ddd when the wind speed is 6 knots or less in the preceding 2 minutes.

3.3.4.1.3. Variable Wind Direction (speeds greater than 6 knots). In Column 9B, encode and report a variable wind direction when the wind direction varies by 60 degrees or more with an average wind speed greater than 6 knots in the preceding 2 minutes. Encode in a clockwise direction the extremes of variability $d_nd_nd_nVd_xd_xd_x$ where dndndn and $d_xd_xd_x$ are the extremes of variability and V is the indicator. For example, a variable wind direction of 180 degrees to 240 degrees would be encoded 180V240. The mean wind direction observed during the 2-minute period before the actual time of observation will be encoded and reported in column 9A.

3.3.4.2. Wind Speed (Column 10). Enter the average wind speed (ff) observed during the 2-minute period before the actual time of observation. When the observation period includes a discontinuity in the wind speed, use only data occurring since the discontinuity in obtaining average values. Enter wind speed to the nearest knot using two digits. Use three digits (fff) when winds are 100 knots or more. Enter "00" when the wind is calm. (See Note in **paragraph 3.3.4.3.** below.)

3.3.4.3. Maximum Wind Speed (Gusts) (Column 11). Enter the maximum wind speed ($f_m f_m$) in knots (KT) observed during the 10-minute observation period when fluctuations between peaks and lulls are 10 knots or more. Enter this data to the nearest knot using two digits. Use three digits ($f_m f_m f_m$) when winds are 100 knots or more. **NOTE:** Units equipped with the AN/FMQ-13 cannot accurately measure wind speeds exceeding 99 knots. Follow procedures outlined in **Part 2, Chapter 5** when AN/FMQ-13 wind speeds exceed 99 knots.

3.3.4.3.1. At locations where recorders are inoperative or not installed, weather personnel may report gusts or squalls observed on a hand-held anemometer or on direct-reading dials during a 2-minute period of observation. When winds are obtained in this manner, the remark WND DATA ESTMD will be entered in column 13.

3.3.4.4. Wind Data Entries. **Table 3.1.** illustrates various entries for wind data.

Table 3.1. Examples of Wind Entries.

Column 9	Column 10	Column 11	Column 9B	Description of the Winds
010	07			010 degrees true at 7 knots.
000	00			Calm wind.
160	23	31		160 degrees true at 23 knots, maximum speed at 31 knots.
360	103	114		360 degrees true at 103 knots, maximum speed at 114 knots.
290	08	15		290 degrees true at 8 knots, maximum speed at 15 knots.
VRB	06			Variable wind direction wind speeds 6 knots or less.
070	07		050V110	Varying between 50 degrees and 110 degrees (with a mean of 070 degrees) at 7 knots.

3.3.5. Visibility Entries (Column 4).

3.3.5.1. Meters (Column 4A). Encode and report the prevailing visibility (VVVV) in meters at overseas locations (excluding Guam, Alaska, and Hawaii). When the prevailing visibility is less than 9999 meters, an appropriate entry must be made in column 5 for present weather. If field minima are published in statute miles, record visibility in statute miles in column 4B.

3.3.5.2. Miles (Column 4B). Encode and report the prevailing visibility (VVVVVSM) in statute miles (SM) at US locations (including Guam, Alaska, and Hawaii). Disseminate the visibility group with SM to indicate that the visibility is in statute miles. When the prevailing visibility is 6SM or less, an appropriate entry must be made in column 5 for present weather. Leave a blank space between whole numbers and fractions. For example, a value of 1 1/2 miles would be recorded as 1 1/2 and disseminated as 1 1/2SM.

3.3.6. Runway Visual Range (Column 4C/4D). Report both local and longline RVR data on AF Form 3803 or AF Form 3813 in column 4C. Units without 10-minute average capability will record only the local RVR data.

3.3.6.1. Local and Longline Entries. Enter RVR data in feet or meters (as applicable) from an instantaneous 1-minute or 10-minute average readout in column 4C. Only RVR data obtained from a system providing a 10-minute RVR average readout will be disseminated longline. Units with a 10-minute average capability, but are unable to transmit the data due to RVR equipment problems/outage will enter RVRNO in column 4C and report RVRNO longline. Units without equipment that provides a 10-minute RVR capability are not required to enter RVRNO in column 4C.

3.3.6.2. Some versions of N-TFS software do not correctly format the longline RVRNO entry in column 4D of the AF Form 3813. Until the N-TFS software is upgraded to version 3.1 or higher, units must enter the runway number indicator ("R") and the runway number (e.g., 19) in the first RVR field followed by "RVRNO" in the second field. N-TFS automatically adds the solidus (e.g., R09/RVRNO).

3.3.7. Present Weather, Obscurations, and Other Weather Phenomena (w'w') (Column 5).

3.3.7.1. Present Weather, Obscurations, and Other Weather Phenomena Reporting Standards. Present weather, obscurations, and other weather phenomena occurring at the station (within 5 statute miles/8000 meters of the point(s) of observation) or in the vicinity of the station (5 statute miles/8000 meters to 10 statute miles/16 kilometers from the point(s) of observation) will be encoded in the body of the report (column 5). Present weather, obscurations, and other weather phenomena observed but not occurring at the station or in the vicinity of the station (occurring more than 10 statute miles/16 kilometers from the point(s) of observation) will be encoded in the remarks section (column 13).

3.3.7.1.1. When phenomena (such as FC, TS, CB, CBMAM, and TCU) are more than 10 statute miles (16 kilometers) from the point(s) of observation and the distance is known, use that distance in remarks (TS 15NE). In this case, the contraction DSNT is not required. The contraction DSNT should be used only when the phenomena is believed to be more than 10 miles (16 kilometers) from the point(s) of observation, but the exact statute mile distance is unknown. The DSNT remark will only be reported in column 13; do not report DSNT in column 5.

3.3.7.2. Encode and report, both locally and longline, up to a maximum of three separate present weather, obscuration, and other weather phenomena groups (w'w') using the appropriate code figures. When no reportable present weather, obscuration, and other weather phenomena w'w' are observed, leave column 5 blank.

3.3.8. Sky Condition (Column 3). Encode and report surface-based partial obscuration ($N_sN_sN_sh_sh_sh_s$), cloud layer(s) and obscuration layer(s) aloft ($N_sN_sN_sh_sh_sh_s$), indefinite ceilings ($VVh_sh_sh_s$), or a clear sky (SKC) in ascending order of height up to the first overcast layer. Manual units will report a maximum of six layers of clouds or surface based obscuring phenomena. Automated units will report a maximum of three layers.

3.3.8.1. Amount ($N_sN_sN_s$). Note the amount of sky cover for each layer in eighths (or oktas) attributable to clouds or obscuration layers aloft. Encode the amount as few (trace to 2 eighths), scattered (3 to 4 eighths), broken (5 to less than 8 eighths), and overcast (8 eighths) using the three-letter abbreviations FEW, SCT, BKN, and OVC followed without a space by the height. When there is an indefinite ceiling, encode VV followed without a space by the height. Each layer reported will include the amount of sky covered (or hidden by surface-based partial obscuration) by that layer and all layers below that level (summation principle). No layer, or combination of layers can have a summation amount greater than 8/8ths.

3.3.8.1.1. Amount of Surface-Based Obscuration. If at least 1/8th to less than 8/8ths of the sky is not visible due to a surface-based partial obscuration, encode the amount of sky hidden as FEW, SCT, or BKN followed by a height of 000 in column 3 and place a clarifying remark in column 13. For example, fog obscuring 2/8ths of the sky would be entered in column 3 as FEW000 and clarified in column 13 as FG FEW000.

3.3.8.2. Height (hshshs). Encode and report the height of the layer using the appropriate reportable values. For vertical visibility into an indefinite ceiling, base the height on either the distance seen into the layer, the height corresponding to the top of a laser (or rotating) beam ceilometer, or the height at which a ceiling balloon completely disappears. For surface-based partial obscurations, the height will always be 000.

3.3.8.3. Type (CC). Encode and report significant convective clouds by appending the letter abbreviations CB (cumulonimbus/cumulonimbus mammatus) or TCU (cumulus congestus of great vertical extent), as appropriate, to the cloud group without a space. Encode and append cumulonimbus (CB) and towering cumulus (TCU) to the end of the applicable cloud layer ($N_sN_sN_sh_sh_sh_sCC$). If both CB and TCU are at the same level, report CB only. For example, less than one eighth of cumulonimbus at 3,000 feet and an eighth of towering cumulus at 3,000 feet would be encoded FEW030CB.

3.3.9. Temperature (Column 7). Enter the air temperature (T'T') to the nearest whole degree Celsius using two digit values. When the air temperature is missing or not available, leave blank. When the temperature is below zero degrees Celsius, prefix the value with an M to signify minus. When the temperature is reported but the dew point is missing, include the solidus (/) in the longline transmission following the temperature. For example, a temperature of minus 3 degrees Celsius with a missing dew point would be encoded M03/. Exception: On the electronic AF Form 3803, use a minus sign (-) rather than an M to indicate below zero temperatures. The form macros will automatically convert the minus sign to an M on the form while retaining the numerical value of the temperature for calculations.

3.3.10. Dew Point Temperature (Column 8). Enter the dew point temperature (Td'Td') to the nearest whole degree Celsius using two digit values. When the dew point temperature is missing or not available, leave blank. When using statistical data (i.e., entering the water equivalent of the dry-bulb temperature when the air temperature is M37 Celsius/M35 degrees Fahrenheit or below), enter the statistical data in parentheses but do not transmit the parentheses longline. When the dew point is below zero degrees Celsius, prefix the value with an M to signify minus. For example, a dew point of minus 0.2 Celsius would be encoded M00. Exception**:** On the electronic AF Form 3803, use a minus sign (-) rather than an M to indicate below zero dew points. The form macros will automatically convert the minus sign to an M on the form while retaining the numerical value of the dew point for calculations.

3.3.11. Altimeter Setting (Column 12). Encode and report the altimeter setting ($AP_HP_HP_HP_H$) rounded down to the nearest hundredth of an inch Hg in four digits (do not encode a decimal point in the altimeter setting). When missing or not available, leave blank. When coding an estimated altimeter setting, indicate by a remark in column 13 (e.g., ALSTG ESTMD). Additionally, encode a remark such as SLP982 ALSTG/SLP ESTMD when the SLP is estimated as well. The altimeter indicator **A** is not required on the forms.

3.3.12. Remarks (Column 13). Use remarks to report operationally significant information not reported elsewhere, to elaborate on entries made in the body of the report, to report plain language remarks, and record additive data groups. Use **Attachment 3,** Table of Remarks to determine remarks order of entry.

3.3.12.1. Column 13 General Requirements.

3.3.12.1.1. Contractions. Use the meteorological contractions in this manual, and the Federal Aviation Administration (FAA) Order 7340 Series *Contractions Manual*. When using contractions from FAA Order 7340, priority will be given to contractions for NWS, GEN, and ATC, in that order. In case of conflict, contractions from this manual take precedence over those in 7340. Contractions that conflict with definitions in this manual *will not* be used (i.e., BINOVC, HALF, FEW CU, ACCAS, etc).

3.3.12.1.2. Time Entries. Unless otherwise directed, make time entries in minutes past the hour if the time reported is within 1 hour of filing time, or in hours and minutes UTC (without the time zone indicator) if the time is more than 1 hour before filing time.

3.3.12.1.3. Location of Phenomena. Enter direction and location of phenomena in a clockwise order using eight points of the compass and using no more than 90-degree increments between directions. For example, when there is a line of towering cumulus distant north through southeast (135 degree of coverage), the remark TCU DSNT N-E-SE could be used to meet the no more than 90-degree increment between directions limitation. Also, if a CB was detected on radar in the example above, report distance and direction using annotation like CB 22N-11E-16SE in column 13.

3.3.12.1.4. Movement of Clouds and Phenomena. Report movement of clouds or other phenomena with respect to the direction toward which the clouds or phenomena are moving.

3.3.12.1.5. Distance. Enter local visibility distance values in statute miles in the CONUS and in meters at overseas locations. Disseminate local visibility remarks using the same values as the prevailing visibility is disseminated in. Base distances of phenomena on a reliable method of determination, e.g., by means of a radar or pilot report. **NOTE:** When deriving distances from RADAR, remember to convert RADAR miles, usually nautical, to statute (NM to SM) using **Table 7.1.** in **Part 2, Chapter 7.**

3.3.12.1.5.1. Distances to tornadoes, waterspouts, funnel clouds (FC), thunderstorms (TS), cumulonimbus or cumulonimbus mammatus (CB/CBMAM), and tower cumulus (TCU) will be encoded and transmitted using statute miles. Base distances of phenomena on the most reliable method of determination available, e.g., by means of a radar, lightning detection equipment, or pilot report. Automated lightning detection equipment generally depicts distance in nautical miles.

3.3.12.1.5.2. Weather personnel may use the "flash-to-bang" method (see the lightning, count the number of seconds to the bang, divide the total seconds by five = distance in statute miles) of determining thunderstorm distances when a more reliable method is not available.

3.3.12.1.6. Remark Combinations. Remarks pertaining to tornadic or thunderstorm activity may be combined with those for CB/CBMAM when the direction of movement is the same, e.g., TS 6E AND CB 15S-9W MOV E.

3.3.12.1.7. Height. Enter height above field elevation for remarks elaborating on encoded data in the body of the observation, e.g., ceiling.

3.3.12.1.8. Plain Language Column 13 Remarks. Enter additional information needed to amplify entries in the body of the observation. Also, add any remark considered significant to the safety of aircraft operations or force protection. Include remarks significant to the safety of aircraft operations or force protection using the same order of entry as the encoded data to which it most closely relates (e.g,. a VIS LWR E remark would have the same order of entry as a sector visibility remark).

3.3.12.2. Encoded Additive Data Column 13 Groups. Encode and report in column 13 after the last remark. Do not use a solidus (/) to separate data. The reporting requirement for specific additive data remarks will be determined by MAJCOM or higher headquarters.

3.3.12.2.1. Column 13 Order of Entry and Coding Instructions. When an additive data group is not required, omit the group and proceed on to the next additive group that applies to the current situation. Refer to **Attachment 3**, Table of Remarks, for additive data encoding and order of entry requirements.

3.3.13. Station Pressure (Column 17). Enter station pressure on each 3- and 6-hourly observation (e.g., 29.995). When computations of pressure values require that a number be rounded to comply with standards on reportable values, the number will be rounded down to the next reportable value. For example, a station pressure reading of 29.249 is rounded down to 29.245, while a station pressure reading of 29.244 is rounded down to 29.240. Units have the option of entering station pressure on each METAR to meet mission and operational requirements. When estimating station pressure data, prefix station pressure with an E. Enter M if station pressure is missing.

3.3.14. Weather Technician's Initials (Column 18). Enter the initials of the weather technician responsible for the observation.

3.3.15. Total Sky Cover (Column 21). Enter the total sky cover amount in each hourly observation. This amount is entered as a whole number and cannot exceed 8 (for 8/8). Also, an 8 is entered when vertical visibility into an indefinite ceiling is reported in column 3. For example, enter 6 for six-eighths, 0 for clear, 1 for one-eighth (1 will also be entered when no more than a trace of total cloud cover or obscuring phenomena is observed), and 3 for one eighth of cloud with two eighths of sky hidden by surface-based obscuring phenomena, 7 for seven-eighths or more but less than eight-eighths, 8 for eight-eighths (e.g,. an overcast or indefinite ceiling).

3.3.16. Time UTC (Column 41). On the line captioned MID TO (at units taking midnight LST observations), enter the beginning time of the first 6-hourly 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. A time entry is not applicable to the MID line. Make all time entries in four figures to the nearest minute UTC. See **Figure 3.2.**

3.3.16.1. The electronic AF Form 3803 has internal macros to calculate and populate the Summary of the Day (SOD) data fields on the form. Each of the SOD fields can be edited by the weather technician except columns 68 and 69.

3.3.16.2. The AF Form 3813 automatically populates the SOD data fields as the observations are entered on N-TFS. The weather technician does not need to enter any of the SOD data unless there are changes or corrections to observation data previously entered.

Figure 3.2. Example AF Form 3803 Synoptic and Summary of the Day Entries.

SURFACE WEATHER OBSERVATIONS (METAR/SPECI)						LATITUDE 30° 10'N	LONGITUDE 79° 01'W	STATION ELEVATION +218 Feet (MSL)	
SYNOPTIC DATA						SUMMARY OF DAY			
TIME (UTC) (41)	TIME (LST) (42)	NO (43)	PRECIP (water equiv.) (44)	SNOW FALL (45)	SNOW DEPTH (46)	24-HR MAX TEMP (°C) (66)	PRECIP (water equiv.) (68)	SNOW FALL (69)	SNOW DEPTH (70)
MID (LST) TO: 0550	MID TO: 0050		0.02	0.0		28	0.91	*T	0
0550	0050	(1)	0.05	0.0	0				
1150	0650	(2)	0.00	0.0	0	24-HR MIN TEMP (°C) (67)	SPEED (knots) (71)	DRCTN (true) (72)	TIME (UTC) (73)
1750	1250	(3)	0.00	0.0	0				
2350	1850	(4)	0.89	*T	0	06	53	260	1854
MID (LST)	MID (LST)		T	0.0	0				

3.3.17. Time LST (Column 42). Enter the local standard time (LST) equivalent to the time UTC entered in column 41.

3.3.18. Observation Number (Column 43). No entry required. This column provides a reference to the lines used for the midnight and 6-hourly observations. Entries in columns 41 through 45 are made on the first line of this column to record precipitation amounts for the period from midnight LST to the first 6-hourly observation of the day. Entries in columns 41 through 46 are made on the lines captioned 1, 2, 3, and 4 to record 6-hourly precipitation amounts and snow depth data at the respective synoptic observation times of the day. Entries in columns 44 through 46 are made on the last line to record precipitation amounts for the period from the last 6-hourly observation to midnight LST. No entries are made on the lines captioned MID TO and MID in time zones where midnight LST corresponds to the time of a 6-hourly observation.

3.3.19. Precipitation (Column 44). On the MID TO line (at units taking midnight LST observations), enter the amount of precipitation (water equivalent) that has occurred between the midnight LST observation and the first 6-hourly observation time. At 6-hourly observation times, on the applicable lines 1, 2, 3, and 4, enter the amount of precipitation occurring in the 6 hours before the respective 6-hourly observations. On the MID line (at units taking midnight LST observations), enter the amount of precipitation that has occurred between the last 6-hourly observation and the midnight LST observation.

3.3.19.1. Reporting Requirements. Enter 0 if no precipitation occurred in the period; enter a T for a trace (amounts of less than 0.005-inch). If no precipitation has occurred before actual precipitation observation time, but is observed to occur before coding of the observation, enter T even though a measurable amount may have occurred. Enter measurable amounts to the nearest 0.01 inch.

3.3.19.1.1. Water Equivalent. Whenever the water equivalent of frozen precipitation cannot be measured (e.g., by melting a core sampling), enter the estimated water equivalent on the basis of a 1:10 ratio, or other ratio where there is evidence that a different ratio is more appropriate for the individual storm or location (see **Part 2**, **Table 13.2.**). Prefix estimated values (except 0 or T) with the symbol E, and enter a remark in column 90 to indicate the ratio used (e.g., E - 1:15 RATIO USED).

3.3.19.1.2. Limited-Duty Units. Use the following procedures for the first precipitation observations at limited-duty units (those operating less than 24 hours per day) where one or more 6-hourly observations are not made.

3.3.19.1.2.1. Determine and enter the total accumulation of precipitation since the last recorded 6-hourly observation. Except as specified below, make this entry at the time of the current 6-hourly observation.

3.3.19.1.2.2. At units opening between 1200 and 1400 UTC, determine this precipitation data at the time of the first METAR of the day and enter it on the line corresponding to the 1200Z 6-hourly observation.

3.3.19.1.2.3. Prefix the entry (other than 0) with an asterisk, and enter a remark in column 90 to indicate the actual time period applicable to the amount (e.g., *.11 in column 44 and *12-HR PCPN in column 90). At units that do not operate on weekends or holidays, the column 90 remark might be *72-HR PCPN.

3.3.20. Snowfall (Column 45). On the MID TO line (at units taking midnight observations), enter the amount of solid precipitation that has occurred between the midnight observation and the first 6-hourly observation time. At 6-hourly observation times, on the applicable lines 1, 2, 3, and 4, enter the amount of the frozen precipitation occurring in the 6 hours before the respective 6-hourly observations. On the MID lines (at units taking midnight LST observations), enter the amount of precipitation that has occurred between the last 6-hourly observation and the midnight LST observation.

3.3.20.1. Frozen Precipitation. Enter 0 if no frozen precipitation fell in the period. Enter T for a trace (less than 0.05 inch), and if precipitation melted as it fell, enter a remark in column 90 (i.e., T--MELTED AS IT FELL). If no frozen precipitation has occurred before actual precipitation observation time but is observed to occur before coding of the observation, enter T even though a measurable amount may have occurred.

3.3.20.1.1. For a measurable amount, enter the maximum depth of frozen precipitation accumulated in the period to the nearest 0.1-inch. If several occurrences of frozen precipitation occurred in the period (e.g., snow showers) and each fall melted either completely or in part before the next fall occurred, enter the total of the maximum depths accumulated by each of the falls.

3.3.20.1.2. Prefix estimated amounts (except 0 or T) with an E, and enter an appropriate remark in column 90 (e.g., E--ESTIMATED DUE TO MELTING).

3.3.20.1.3. Enter an asterisk as a prefix to the amount if it consists entirely of hail; enter *HAIL in column 90.

3.3.20.2. Limited-Duty Unit Procedures. Use the following procedures for the first precipitation observation at limited-duty units where one or more 6-hourly observations are not made.

3.3.20.2.1. Determine and enter the total accumulation of frozen precipitation since the last recorded 6-hourly observation. Except as specified in **paragraph 3.3.20.2.2.**, make this entry at the time of the current 6-hourly observation.

3.3.20.2.2. At units opening between 1200 and 1400 UTC, determine this precipitation data at the time of the first METAR of the day and enter it on the line corresponding to the 1200Z 6-hourly observation.

3.3.20.2.3. Prefix the entry (other than 0) with an asterisk and enter a remark in column 90 to indicate the actual time period applicable to the amount (e.g., *.1 in column 45 and *12-HR PCPN in column 90). At units that do not operate on weekends, the column 90 remark might be *72-HR PCPN.

3.3.21. Snow Depth (Column 46). Enter the depth of frozen precipitation and ice on the ground at the time of each 6-hourly observation on the lines captioned 1, 2, 3, and 4, and at the time of the midnight LST observation (if applicable) on the line captioned MID. Enter 0 if there is no frozen precipitation or ice on the ground in exposed areas (snow may be present in forested or otherwise protected areas). Enter T for a trace (less than 0.5-inch) on the ground in representative areas. If no solid precipitation or ice is on the ground at the actual precipitation observation time but is observed to occur before coding of the observation, enter T even though a measurable amount may have occurred. Enter measurable depths to the nearest whole inch.

3.3.21.1. Melted Snow Reporting Procedure. If snow melted during the period, prefix the current depth with an asterisk. Enter the maximum depth and the approximate time UTC of occurrence in column 90 (e.g., MAX SNOW DEPTH 1 AT 1530).

3.3.21.2. Hail Reporting Procedure. Prefix the depth with an asterisk if it consists entirely of hail and enter *HAIL in column 90.

3.3.21.3. Limited-Duty Unit Procedures. Use the following procedures for the first precipitation observation at limited-duty units where one or more 6-hourly observations are not made.

3.3.21.3.1. Determine and enter the total depth of frozen precipitation on the ground at the time of the first 6-hourly observation (i.e., except as specified in **paragraph 3.3.21.3.2.**).

3.3.21.3.2. At units opening between 1200 and 1400 UTC, determine this data at the time of the first METAR of the day and enter it on the line corresponding to the 1200Z 6-hourly observation. This depth is also entered in column 70 and requires a remark to indicate the time applicable to the amount.

3.3.22. Station Pressure Computation (Columns 59-65). Not used.

3.3.23. 24-Hour Maximum Temperature (Column 66). Enter the maximum temperature of the day (LST) to the nearest whole degree Celsius. Enter an M (missing) when the temperature cannot be accurately determined.

3.3.24. 24-Hour Minimum Temperature (Column 67). Enter the minimum temperature of the day (LST) to the nearest whole degree Celsius. Enter an M (missing) when the temperature cannot be accurately determined.

3.3.25. 24-Hour Precipitation (Column 68). Enter the total precipitation (water equivalent) for the 24 hours ending at midnight LST. The entry is normally based on a summation of entries in column 44. However, where midnight LST observations are taken, do not include the value of the first 6-hourly observation entered in column 44 when adding column 44 amounts to determine the column 68 entry. Enter 0 if no precipitation occurred in the period. Enter T for a trace (less than 0.005 inch). The sum of all trace entries (from column 44) is a trace unless the unit is equipped with a recording or totaling gauge that indicates 0.005-inch or more. Prefix amounts (except 0 or T) with an E when the total includes an estimated amount.

3.3.25.1. Limited-Duty Unit Procedures. At limited-duty units that do not take a midnight LST observation, make this entry using a summation of the column 44 entries even though the amounts are not limited to the LST day. Prefix amounts (except 0 or T) with an E.

3.3.26. 24-Hour Snowfall (Column 69). Enter the total amount of frozen precipitation that has fallen in the 24 hours ending at midnight LST. The entry is normally based on a summation of entries in column 45. Where midnight LST observations are taken, do not include the value of the first 6-hourly observation entered in column 45. Enter 0 if no frozen precipitation fell during the period. Enter T for a trace (less than 0.05-inch); if the frozen precipitation melted as it fell, enter T--MELTED AS IT FELL in column 90. The sum of all trace entries is a trace unless the unit is equipped with a recording or totaling gauge that indicates 0.05-inch or more. For a measurable amount, enter the total amount that has fallen to the nearest 0.1-inch. The amount entered must be that which has accumulated in the past 24 hours adjusted for any melting or evaporation having taken place. Prefix the amount with an asterisk if it consists entirely of hail and enter *HAIL in column 90. Prefix an estimated amount with an E, and enter a remark in column 90 (e.g., E—ESTIMATED DUE TO MELTING).

3.3.26.1. Limited-Duty Unit Procedures. At limited-duty units not taking a midnight LST observation, make this entry using a summation of the column 45 entries even though the amounts are not limited to the LST day. Prefix amounts (except 0 or T) with an E.

3.3.27. Snow Depth (Column 70). Enter the depth of frozen precipitation and ice on the ground at 1200 UTC or as directed by MAJCOM or higher headquarters. The entry is basically 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, and enter a remark in column 90 to indicate the time UTC (e.g., COL 70 ENTRY OBSVD AT 1120). Enter 0 if there is no frozen precipitation or ice on the ground in exposed areas (snow may be present in surrounding forested or otherwise protected areas). Enter T for a trace (less than 0.5 inch) on the ground in representative areas. Enter a measurable depth on the ground at the time of observation to the nearest whole inch. Prefix the amount with an asterisk if it consists entirely of hail and enter *HAIL in column 90.

3.3.28. Speed of Peak Wind (Column 71). Enter the highest reliable wind speed recorded during the 24 hours ending at midnight LST to the nearest whole knot using two or three digits. For example, a peak wind of 9 would be encoded as 09, a peak wind of 30 would be encoded as 30, and a peak wind of 120 would be encoded as 120.

3.3.29. Direction of Peak Wind (Column 72). Enter the true direction of the peak wind in tens of degrees using three digits. If the direction portion of the recorder is inoperative, estimate and enter the most probable true wind direction from entries in column 9 and prefix the entry with an E. When the peak wind speed has occurred 2 times, enter the direction of the last occurrence on the first line and the direction of the next to last occurrence on the second line.

3.3.30. Time of Peak Wind (Column 73). Enter the time of the peak wind to the nearest minute UTC. When the peak wind speed has occurred 2 times, enter the time of the last occurrence on the first line and the time of the next to last occurrence on the second line.

3.3.31. Direction and Time of Peak Wind (Column 90). When the peak wind speed has occurred more than 2 times, record up to 2 additional peak wind speed occurrences in column 90 (e.g,. PK WND 24030 AT 1415 AND 24030 AT 1301). When the peak wind speed has occurred 5 times or more, encode the latest 4 occurrences as described above and enter a remark such as PK WND OCRD 1 OTR TIME in column 90.

3.3.32. Remarks, Notes, and Miscellaneous Phenomena (Column 90). Use this column to record information considered significant but not recorded elsewhere on the form. Enter time to the nearest minute UTC. Make entries to report the following:

3.3.32.1. Remarks specified in preceding sections (e.g., wind and precipitation).

3.3.32.2. Occurrence of weather conditions that exceed the meteorological equipment's normal operating range. For example, a gust of 120 knots reported by AN/FMQ-13 (operating range 0 to 99 knots). Enter FMQ-13 DATA ESTMD, WND SPDS XCD EQPT OPRG RNG during periods when AN/FMQ-13 recordings exceed 99 knots.

3.3.32.3. Conditions which affect the accuracy or representativeness of properly operating equipment and recorded data. For example, the possible effect of aircraft or construction on instrument readings, ice or snow accumulation on outdoor sensors, etc. For example, enter 1057 FMQ-13 NON-REP DUE TO ACFT to indicate that a helicopter in the area of the wind sensor equipment is causing incorrect indications on the recorder.

3.3.32.4. Enter remarks to maintain a log of equipment outages and to explain the reasons for a change in type of equipment used in taking an observation (e.g., 0440 LBC/RWY 19 OUT, 1137 DBASI INOP, BGN USING ML-102; FMQ-13 INOP, BGN USING TMQ-53; 1837 FMQ-19 PRES SENSORS INOP, BGN USING TMQ-53.

3.3.32.4.1. Enter a remark for changes in instrumentation that are not related to a change in active runway (e.g., a switch in equipment recorders or indicators or use of a sensor for other than the active runway).

3.3.32.5. Reason for omission of mandatory data entries.

3.3.32.6. Time checks of designated unit clock and adjustment of equipment clocks.

3.3.32.7. Operator equipment checks.

3.3.32.8. Change in hours of unit operation (effective dates if temporary or date if change is permanent). Include periods when weather personnel are on duty and/or augmenting automated equipment.

3.3.32.9. Each time the active runway is changed, enter the runway number and the time the weather sensor equipment is changed for dual instrumentation, or enter the runway number and time the runway is changed for single instrumentation.

3.3.32.9.1. On the first page of the form each day, enter the time (or CONT if applicable at a 24-hour unit) and the number of the runway in use.

3.3.32.9.2. The contraction CONT may be entered instead of a time entry on the first page of a new form for a 24-hour unit (i.e., to indicate no change from the last entry on the preceding day's record).

3.3.32.9.3. On subsequent pages for the day, carry forward the last entry from the preceding page (or enter CONT and runway number) and enter all additional changes occurring during the period of time covered by that page.

3.3.32.10. Miscellaneous items (e.g., time notified of an aircraft mishap, time notified of dry runway, etc).

PART 2

MANUAL OBSERVING PROCEDURES

Chapter 4

INTRODUCTION

4.1. Purpose. Part 2 of this manual prescribes surface weather observing, reporting, coding standards, and procedures applicable to weather units engaged in taking and reporting manual surface observations using equipment other than AN/FMQ-19. It provides a framework within which meteorological phenomena can be identified and reported in a standardized and understandable format.

4.2. Observational Procedures. Procedures in Part 2 assume that record observations (METAR) are made hourly and that special observations (SPECI) are made whenever significant changes or occurrences are observed or noted. Weather observations recorded on the Air Force Form 3803/3813 and reported by observing units will reflect only those conditions seen from the designated point(s) of observation and unless otherwise specified, must have occurred within 15 minutes prior to the times recorded on the AF Form 3803/3813.

4.3. Observing Responsibility. Weather personnel will be alert to situations that produce significant changes in weather conditions and will take and disseminate SPECI and LOCAL observations as quickly as possible whenever the changes meet specified SPECI or LOCAL criteria. As part of the Cooperative Weather Watch, ATC personnel certified to evaluate tower visibility report changes to the local weather unit when tower visibility is less than 4 statute miles (6000 meters) and is different from the surface prevailing visibility, and report sector visibility. Additionally, ATC personnel should notify the weather unit of changing weather conditions significantly different from those contained in the observation. Units should ensure tower visibility requirements are coordinated with ATC and specified in a local weather support document (WSD).

4.4. Weather Watch. One of two types of weather watch must be performed: a basic weather watch, or a continuous weather watch.

4.4.1. Basic Weather Watch (BWW). During normal airfield operating hours, a BWW is normally conducted from the weather unit by weather personnel who, because of other weather operations duties, cannot monitor the weather continuously. Due to these other weather duties, weather personnel on duty may not detect and report all weather changes as they occur. The BWW observing program has been implemented to establish the minimum requirements needed to ensure the proper level of weather watch is maintained.

4.4.1.1. During a BWW, weather personnel will recheck weather conditions, at intervals not to exceed 20 minutes since the last observation/recheck, to determine the need for a SPECI or LOCAL observation, when any of the following conditions are observed to be occurring or are forecast to occur within 1 hour:

4.4.1.1.1. Ceiling forms below or decreases to less than 1,500 feet.

4.4.1.1.2. Ceiling dissipates, or increases to equal or exceed 1,500 feet.

4.4.1.1.3. Visibility decreases to less than 3 miles (4800 meters).

4.4.1.1.4. Visibility increases to equal or exceed 3 miles (4800 meters).

4.4.1.1.5. Precipitation (any form).

4.4.1.1.6. Fog.

4.4.1.1.7. In addition to the above minimum requirements, weather personnel will remain alert for any other changes in weather conditions that will require a SPECI or LOCAL observation. Weather personnel will also monitor local area observational and forecast products as often as necessary to keep abreast of changes expected to affect their area of responsibility.

4.4.2. Continuous Weather Watch (CWW). At units that require a CWW, weather personnel will monitor weather conditions continuously and perform no other significant duties. In addition to taking METARs, weather personnel will take and disseminate observations as conditions occur that meet SPECI and LOCAL observation criteria.

Chapter 5

GENERAL PROCEDURES

5.1. Introduction. This chapter prescribes practices for taking and reporting METAR, SPECI, and LOCAL weather observations.

5.2. Contents of Surface Weather Observations. **Table 5.1.** lists the contents of METAR/SPECI/LOCAL observations. **Table 5.2.** contains the transmission requirements for additive data. **Chapter 14** covers the coding and dissemination of all observation elements and remarks.

5.2.1. Unless mission needs dictate otherwise (e.g., forecast of low clouds/fog, issuance of Index of Thermal Stress advisory, etc.), weather units may suspend the requirement to include temperature and dew point on SPECI and LOCAL observations when using a sling psychrometer and psychrometric calculator to obtain the values. Document specific temperature and dew point requirements in the local WSD.

5.3. Official Observation Time. The time ascribed to an observation. It reflects the time, to the nearest minute, that:

5.3.1. The last observation element is observed for a METAR, with the ascribed time of the observation being 55 to 59 minutes past the hour.

5.3.2. The time ascribed to a SPECI or LOCAL reflects the time, to the nearest minute, that the SPECI or LOCAL criteria (except runway change and aircraft mishap criteria) are first met or observed. For a METAR with SPECI criteria, the actual time of the observation will be 55 to 59 minutes past the hour (standard time of a METAR observation).

5.3.3. The time ascribed to a LOCAL taken for a runway change or an aircraft mishap reflects the time, to the nearest minute, that the last observation element is observed.

5.4. Order of Observing. Elements having the greatest rate of change are evaluated last. When conditions are relatively unchanging, evaluate the elements in the following order:

5.4.1. Elements evaluated outdoors. Before taking observations at night, spend as much time as practicable outside to allow your eyes to become adjusted to the limited light of the nighttime sky.

5.4.2. Elements evaluated indoors, with pressure last.

5.5. Special (SPECI) Observations. Special observations are taken at all reporting units when any of the criteria in **Attachment 2** are observed. For Ceiling and Visibility SPECIs:

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

5.5.2. MAJCOM or higher headquarters may replace the criteria values in **Attachment 2** with values from Commander-in-Chief component instructions, manuals or supplements relating to command minima for landing, visual flight rules (VFR) and instrument flight rules (IFR), and alternates.

5.5.3. For joint and multi-national operations, the Joint METOC Officer, or equivalent, may replace the criteria values in **Attachment 2** with values from Joint Operating Instructions or equivalent multi-national operating instructions, relating to minima for landing, visual flight rules (VFR), and instrument flight rules (IFR) criteria.

5.6. LOCAL Observations. LOCAL observations are taken at manual observing units to report changes in conditions significant to local airfield operations that do not meet SPECI criteria. For LOCALs taken in support of aircraft operations, the contents listed in **Table 5.1.** are disseminated. For LOCALs taken and disseminated to other than ATC agencies, the contents may be established locally and specified in a local WSD. Take, disseminate, and (when applicable) record LOCAL observations as indicated below. See **Part 1, paragraph 2.14.3.** for procedures on recording LOCAL observations.

5.6.1. Aircraft Mishap. Take an aircraft mishap LOCAL immediately following notification or sighting of an aircraft mishap at or near the unit unless there has been an intervening METAR or SPECI. Identify the observation by including (ACFT MSHP) in remarks on the AF Form 3803/3813 only. This remark is not disseminated locally. Aircraft Mishap LOCALs will be recorded on the AF Form 3803/3813.

5.6.1.1. A LOCAL 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 LOCAL is then required. **NOTE:** In case of doubt, take the observation.

5.6.2. Change in Runway. Following notification of a change in the runway in use, where the runway is dual-instrumented, weather sensors must be changed and allowed sufficient time to update with current information before taking the observation. If the unit has only single instrumentation for ceiling, visibility, and wind, units will take these LOCALs only if specifically requested by a supported agency.

5.6.3. Altimeter Setting (ALSTG). LOCAL ALSTG observations are taken at an interval not to exceed 35 minutes when there has been a change of 0.01 inch Hg (0.3 hPa) or more since the last ALSTG value. A METAR or SPECI taken within the established time interval will meet this requirement, or the observation may be taken and disseminated as a single element LOCAL.

5.6.4. RVR. Disseminate as a single element LOCAL or appended to a METAR or SPECI being taken at the time of occurrence. Report RVR when:

5.6.4.1. Prevailing visibility is first observed 1SM (Statute Mile/1600 meters) or less, and again when the prevailing visibility goes above 1SM (Statute Mile/1600 meters).

5.6.4.2. RVR for the active runway is observed to decrease to less than or, if below, increase to equal or exceed:

5.6.4.2.1. 6,000 feet (1830 meters).

5.6.4.2.2. 5,000 feet (1520 meters).

5.6.4.2.3. All published RVR minima applicable to the runway in use.

5.6.4.3. 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.

5.6.5. Takeoff Minima. LOCAL criteria will include the takeoff minima applicable to the airfield and local operations (that do not meet SPECI criteria), as listed in Air Force, higher headquarters, MAJCOM, and Army directives.

5.6.6. Precision Approach Critical Areas. If required, report the following conditions in accordance with the precision approach critical areas identified in the base airfield operations instruction.

5.6.6.1. Ceilings less than 800 feet. Required for CAT I and II Instrument Landing System (ILS) Localizer Critical Areas, CAT I and II ILS Glide Slope Critical Areas, Mobil Microwave Landing System (MMLS) Azimuth Critical Area, and MMLS Elevation Critical Area.

5.6.6.2. RVR 2000 feet (0610 meters). Required for CAT I and II ILS Localizer Critical Areas, Precision Approach Radar (PAR) Touchdown Areas, and MMLS Azimuth Critical Area.

5.6.7. Criteria Established Locally. Units will take a LOCAL for any criteria significant to local installation operations (e.g., alert observations). These criteria will be coordinated with base agencies and specified in the installation's weather support document.

5.6.8. Other Meteorological Situations. For any other meteorological situation which is significant to local operations.

Table 5.1. Content of Manual Surface Observations.

Body of Report - Consists of 11 Groups				
Group	**Coding Reference**	**Brief Description**	**METAR**	**SPECI/ LOCAL**
Type of Report	14.5.1	Indicates type of report.	X	X
Station Identifier	14.5.2	A four-character group used to identify the observing location.	X	X
Date and Time of Report	14.5.3	Date and time of the report or when a criterion for a SPECI is met.	X	X
Report Modifier	14.5.4	A report modifier (COR) identifying report as a correction.	X	X
Wind	14.5.5	Indicates wind direction and speed. Gusts are appended if required.	X	X
Visibility	14.5.6	Provides prevailing visibility from the designated point of observation.	X	X
Runway Visual Range	14.5.7	Represents the horizontal visibility a pilot will see down the runway.	X	X
Present Weather	14.5.8	Any weather occurring at the unit or obscurations to vision.	X	X
Sky Condition	14.5.9	State of the sky in terms of sky cover, layers and heights, ceilings and obscurations.	X	X
Temperature and Dew Point	14.5.10	Measure of hotness/coldness of ambient air. Dew point measures saturation point temperature. **(See Note 1).**	X	X
Altimeter	14.5.11	Indicates altitude above mean sea level (MSL) of an aircraft on the ground.	X	X
Remarks Section of Report - Consists of 2 Categories				
Category 1 – Manual, and Plain Language				
Element	**Coding Reference See Attachment 3.**	**Brief Description**	**METAR**	**SPECI/ LOCAL**
Volcanic Eruptions		Name of volcano, LAT/LON, DTG (date/ time group), and other data reported.	X	X
Funnel Cloud (Tornadic Activity)		Report whenever tornados, funnel clouds, or waterspouts begin/end and direction. **(See Note 2).**	X	X
Peak Wind		Wind speed greater than 25 kts. Direction, speed, time of occurrence.	X	NR

Wind Shift		Wind direction change ≥ 45° in less than 15 minutes with sustained winds = 10 kts. **FROPA** included if associated with frontal passage.	X	X
Tower or Surface Visibility		If **SFC_VIS** is lower than **TWR_VIS** report **TWR_VIS** and vice versa.	X	X
Variable Prevailing Visibility		If prevailing visibility <3 miles (4800 meters) and it increases/decreases by 1/2 SM (0800 meters) during observation.	X	X
Sector Visibility		Visibility covers 45° of horizon circle. Reported when differs from surface visibility by one or more reportable values when either the prevailing or sector visibility is <3 miles (4800 meters).	X	X
Lightning		If observed, report frequency, type, and location.	X	X
Beginning Ending of Thunderstorms		When thunderstorms begin or end. **(See Note 2).**	X	X
Thunderstorm Location		Reports time, location, and movement, if known.	X	X
Hailstone Size		Reports diameter of hailstones. No remark required if GS is encoded in body of report. **(See Note 2).**	X	X
VIRGA		Precipitation not reaching ground. Direction from unit is optional.	X	X
Variable Ceiling Height		When height is variable and ceiling layer below 3000 feet.	X	X
Obscuration (surface-based or aloft)		Includes weather causing obscuration, applicable sky cover amount, and applicable height.	X	X
Variable Sky Condition		Sky cover layers below 3,000 feet that vary between one or more reportable values (FEW, SCT, BKN, OVC) during the period of observation.	X	X
Significant Cloud Types		Provides type of clouds, location from unit, and direction of movement.	X	X
Pressure Rising/ Falling Rapidly		Reported when pressure rising or falling rapidly. Rate of at least .06 in/hour and pressure change totals .02 at time of observation.	X	X

Sea Level Pressure		Reported in hectopascals.	X	NR
Aircraft Mishap		Include remark on the AF Form 3803/3813 only if taking intervening METAR/SPECI versus a LOCAL upon notification.	X	X
Snow Increasing Rapidly		Reported in next METAR when snow depth increases ≥1 in/hour.	X	NR
Other Significant Information		May add other information as needed.	X	X
Category 2 - Additive Data				
Element	**Coding Reference See Attachment 3.**	**Brief Description**	**METAR**	**SPECI/ LOCAL**
3- and 6-Hour Precipitation Amount		Amount of precipitation accumulated in the past 3 or 6 hours. **(See Note 1 in Table 5.2.).**	X	NR
24-Hour Precipitation Amount		Amount of precipitation accumulated in the past 24 hours. **(See Note 2 in Table 5.2.).**	X	NR
Snow Depth on the Ground		Include in 00 and 12 UTC report if more than a trace on ground and include in 06 and 18 UTC report if more than a trace on ground and more than a trace of precipitation fell in past 6-hours.	X	NR
6-Hourly Maximum Temperature		Highest Temperature for period reported in tenths of degrees C. **(See Note 3 in Table 5.2.).**	X	NR
6-Hourly Minimum Temperature		Lowest temperature for period reported in tenths of degrees C. **(See Note 3 in Table 5.2.).**	X	NR
3-Hourly Pressure Tendency		Includes changes in pressure over period of time. **(See Note 1 in Table 5.2.).**	X	NR

X - Indicates element included at all units.

NR - Not Required.

NOTES:

1. Unless mission needs dictate otherwise, weather units may suspend the requirement to include temperature and dew point on SPECI and LOCAL observations when using a sling psychrometer and psychrometric calculator to obtain the values.
2. 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 which is 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, GR B37E39 GR 3/4). These B and/or E times are entered for longline transmission only.

Table 5.2. Reporting Requirements for Additive Data (See Notes).

Order and Format of Additive and Sensor Status Data Groups	Reference See Attachment 3.	Times of Transmission (UTC)							
		00	03	06	09	12	15	18	21
3- and 6-Hour Precipitation Amount, 6RRRR. **(See Note 1).**		X	X	X	X	X	X	X	X
24-Hour Precipitation, $7R_{24}R_{24}R_{24}R_{24}$. **(See Note 2).**						X			
Snow Depth on Ground, 4/sss.		X		X		X		X	
6-Hour Maximum Temperature, $1s_nT_xT_xT_x$. **(See Note 3).**		X		X		X		X	
6-Hour Minimum Temperature, $2s_nT_nT_nT_n$. **(See Note 3).**		X		X		X		X	
Pressure Tendency, 5appp. **(See Note 1).**		X	X	X	X	X	X	X	X

NOTES:

This table and Notes 1-3 are applicable to manual observing units transmitting longline on a scheduled basis. Units will encode and transmit longline all data groups not exempted by MAJCOM or higher headquarters supplement.

1. MAJCOM or higher headquarters will determine overseas unit reporting requirements.
2. MAJCOM or higher headquarters will determine overseas unit reporting time requirements.
3. MAJCOM or higher headquarters will determine unit reporting requirements.

5.7. Supplementary Data for an Inactive or Parallel Runway. ATC may occasionally authorize an aircraft to land using an inactive runway. This is a temporary measure and the current (official) observation is not affected since the active runway is not officially changed. However, if weather sensors are installed on the inactive runway, the ATC agency may initiate a requirement for observational data for the control of aircraft using that runway. In the event of such a requirement, specific procedures will be coordinated with ATC and specified in the local WSD. Any requirement must be based on the following factors:

5.7.1. Wind and RVR. These are the only elements, derived from sensors, which are likely to differ between the two runways. Current wind data from sensors near the runway are normally available to the controller by means of a switching capability in the tower. Therefore, procedures for supplementary data are generally necessary only for RVR. If required, RVR for an inactive runway must be reported using the same basic code form as that specified for the active runway (i.e., to include the runway number). Supplemental RVR data will be encoded and transmitted as a remark in column 13. Wind data from dual parallel runways will be reported in the remarks section of a METAR or SPECI observation whenever a 6-knot sustained or gust speed difference exists between the active end wind sensors. Example: WND RWY 32R 300/10G15KT.

5.7.2. Cloud Heights. Cloud heights generally do not differ from one end of a runway to the other. Any variation in sky condition relative to the runways, such as from local PIREPs, will be taken into consideration in the evaluation of sky cover as reported in the official observation. Significant or unusual variations in the sky condition that could affect flying operations will be reported in the remarks section (e.g., CLD LYR AT 400 FT ON APCH RWY 23 RPRTD BY PIREPS).

5.8. Instrumental Procedures.

5.8.1. Manual Augmentation. Weather elements obtained from cloud height, visibility, and wind-measuring instruments will be routinely supplemented by visual observations to ensure instrumental values are representative. When the accuracy or validity of values from meteorological equipment is questionable, discontinue use of such equipment and use backup equipment and methods until corrective maintenance actions have been accomplished.

5.8.1.1. AN/FMQ-13 Limitations. Wind measurements using the FMQ-13 system with the **old wind sensor head** will be considered "estimated" until the sensor is replaced with a new wind sensor head as part of the AN/FMQ-19 system. All observations with winds from the old FMQ-13 wind sensor head will include the remark WND DATA ESTMD. Weather unit leadership will ensure all personnel know which wind sensor head is in use (i.e., old sensor or new AN/FMQ-19 wind sensor).

5.8.1.1.1. Do not report wind speeds exceeding 99 knots from the FMQ-13 **old wind sensor head** in the body of any METAR or SPECI observation. If the AN/FMQ-13 indicates winds exceeding 99 knots, enter 99 as the average wind speed in Column 10 and/or 99 as the maximum wind gust in Column 11. Annotate Column 13 with WND DATA ESTMD.

5.8.1.1.2. If the AN/FMQ-13 wind measurements are determined to be completely unrepresentative, use the wind values from available backup equipment as the primary method. See **Part 1, paragraph 2.5.** for procedures on using backup equipment.

5.8.2. Dual Instrumentation/Outage. At units with weather equipment sensors installed near the approach end of two or more runways, use the sensors installed at the active (approach) end of the runway when the equipment is operational and considered reliable. If cloud height equipment for the active runway is inoperative, data obtained from the inactive runway (or alternate runway) equipment may be used if the measurements are considered representative. If wind equipment is inoperative, determine wind data for the runway in use using the most reliable system available (i.e., inactive runway instrumentation, hand-held anemometer, Beaufort scale, etc.) and include a WND DATA ESTMD remark. If the RVR or transmissometer equipment is inoperative, RVR is reported locally and longline as RVRNO. Do not use the alternate end RVR.

5.9. Recorder Printouts. Install all recorder printouts with reference to UTC. Change the printouts as necessary to prevent loss of record.

5.9.1. Printout Identification. At full-time units, enter a time check (includes date-time group) at the beginning and end of each printout to indicate the time the recording began and ended (respectively). At limited-duty units, enter a time check on the printout when the daily time check is performed. Enter other appropriate identification as necessary if the printout (or any part of it) is provided for special studies, an aircraft accident investigation, etc. If applicable, the AN/FMQ-13 would be annotated at a fixed site and the AN/TMQ-53 (or AN/TMQ-36) at a deployed site.

5.9.2. Time Checks and Adjustments. As a minimum, perform time checks daily. Complete the time checks and make necessary adjustments on the recorder printouts by drawing a short line that intersects the first printout entry. Enter the date-time to the nearest minute UTC. See **Part 1, paragraph 2.6.** for additional guidance on time accuracy.

5.9.3. Annotations for Inoperative Periods. Indicate maintenance shutdowns or other inoperative periods on recorder printouts by entering time checks and date-time groups at the end of one period of operation and the beginning of the next. At the point of outage, enter an appropriate reason, e.g., POWER FAILURE, DETECTOR INOP, etc. Annotate beginning and ending periods of unreliable wind readings with the remark WND DATA DBTFL. When the equipment is returned to service, adjust the printout to the correct time as necessary.

5.10. Printout Retention and Disposition . Retain and dispose of recorder printouts according to Table 15 of AFMAN 37-139, *Records Disposition Schedule.*

Chapter 6

WIND

6.1. Introduction. Wind is measured in terms of velocity, a vector that includes direction and speed. The direction and speed of the wind should be measured in an unobstructed area. This will avoid, to a large degree, the measuring of wind directions and speeds that have been disturbed by local obstructions and will result in the reporting of winds more representative of the general weather patterns.

6.2. Standard Definitions.

6.2.1. Wind. For surface observation purposes, wind is the horizontal motion of the air past a given point.

6.2.2. Wind Direction. The direction from which the wind is blowing.

6.2.3. Variable Wind Direction. The wind direction may be considered variable if, during the 2-minute evaluation period, the wind speed is 6 knots or less. In addition, the wind direction is considered variable if, during the 2-minute evaluation period, it varies by 60 degrees or more when the average wind speed is greater than 6 knots.

6.2.4. Wind Shift. A term applied to a change in wind direction by 45 degrees or more in less than 15 minutes with sustained winds of 10 knots or more throughout the wind shift.

6.2.5. Wind Speed. The rate of movement of the air past a given point.

6.2.6. Calm Wind. The common term used to describe the absence of any apparent motion of the air.

6.2.7. Gust. Maximum wind speed observed during the 10-minute observational period indicated by rapid fluctuations in wind speed with a variation of 10 knots or more between peaks and lulls.

6.2.8. Gust Spread. The instantaneous difference between a peak and lull wind speed. Where the requirement for reporting gust spread exists, the minimum observational period is 10 minutes.

6.2.9. Light Wind. A term used to indicate that the wind speed is 6 knots or less. **NOTE:** Wind direction may be considered variable.

6.2.10. Peak Wind Speed. The highest (maximum) wind speed observed or recorded.

6.2.11. Squall (SQ). A strong wind characterized by a sudden onset, a duration on the order of minutes, and a rather sudden decrease in speed. It is often accompanied by a shower or thunderstorm. For reporting purposes, the term is applied to any sudden onset in which the wind speed increases at least 16 knots and is sustained at 22 knots or more for at least 1 minute.

6.3. General Requirements for Wind Observations. Wind direction, speed, character, wind shifts, and peak wind are determined at all observing units. Provide to ATC agencies wind data representative of conditions at the touchdown area of the active runway. During an outage of the primary (in-use) sensor, determine data using other reliable sources. Data obtained from alternate equipment may be used as a guide for determining winds when the primary sensor output is considered unrepresentative.

6.3.1. Units of Measure. True wind direction to the nearest 10 degrees is required for entries on AF Form 3803/3813 and for observations disseminated longline. Magnetic wind directions are reported locally. Units in extreme northern latitudes, such as Thule AB, Greenland, may report true wind direction locally when runway headings have been changed to reflect true. Wind speeds are reported in nautical miles per hour (knots), to the nearest whole knot. **Table 6.1.** provides a summary of the standards for wind measurements.

Table 6.1. Summary of Wind Observing and Reporting Standards.

PARAMETER	OBSERVING AND REPORTING STANDARD
Wind direction	2-minute average in 10-degree increments with respect to true north.
Wind speed	2-minute average speed in knots.
Wind gust	The maximum instantaneous speed in knots in the past 10 minutes.
Peak wind	The maximum instantaneous speed in knots (since the last scheduled report) will be reported whenever the speed is greater than 25 knots.
Wind shift	A change in wind direction by 45 degrees or more in less than 15 minutes with sustained winds of 10 knots or more throughout the wind shift.

6.3.2. Wind Direction.

6.3.2.1. Values from digital wind instruments are in reference to magnetic North. These values must be converted to true for observational records and longline dissemination. Obtain a 2-minute average for the period immediately preceding the time of observation.

6.3.2.2. The wind direction may be considered variable if, during the 2-minute evaluation period, the wind speed is 6 knots or less.

6.3.2.3. The wind direction will be considered variable if, during the 2-minute evaluation period, the direction varies by 60 degrees or more when the average wind speed is greater than 6 knots.

6.3.2.4. Where instruments are inoperative or not available, determine the magnetic and true wind direction by observing the wind cone or tree, movement of twigs, leaves, smoke, etc., or by facing into the wind in an unsheltered area. Determine the direction based on a 2-minute average. When determining wind direction, note that even small obstacles may cause variations in the wind direction. Do not use the movement of clouds, regardless of how low they are, in determining the surface wind direction. Add WND DATA ESTMD column remark in column 13.

6.3.3. Wind Speed.

6.3.3.1. Obtain a 2-minute average for the period immediately preceding the time of observation.

6.3.3.2. If an instrument value is not available, use the Beaufort Scale (see **Table 6.2.**) as a guide in determining the wind speed. Determine wind speed based on a 2-minute average. Add WND DATA ESTMD remark in column 13.

Table 6.2. Beaufort Scale of Winds.

WIND EQUIVALENT -- BEAUFORT SCALE				
Beaufort #	**MPH**	**KTS**	**International Description**	**Specifications**
0	<1	<1	Calm	Calm; smoke rises vertically.
1	1-3	1-3	Light Air	Direction of wind shown by smoke drift not by wind vanes.
2	4-7	4-6	Light Breeze	Wind felt on face; leaves rustle; vanes moved by wind.
3	8-12	7-10	Gentle Breeze	Leaves and small twigs in constant motion; wind extends light flag.
4	13-18	11-16	Moderate	Raises dust, loose paper; small branches moved.
5	19-24	17-21	Fresh	Small trees in leaf begin to sway; crested wavelets form on inland waters.
6	25-31	22-27	Strong	Large branches in motion; whistling heard in telegraph wires; umbrellas used with difficulty.
7	32-38	28-33	Near Gale	Whole trees in motion; inconvenience felt walking against the wind.
8	39-46	34-40	Gale	Breaks twigs off trees; impedes progress.
9	47-54	41-47	Strong Gale	Slight structural damage occurs.
10	55-63	48-55	Storm	Trees uprooted; considerable damage occurs.
11	64-72	56-63	Violent Storm	Widespread damage.
12	73-82	64-71	Hurricane	

6.3.4. Wind Gusts. Obtain and report wind gusts (as required) with each observation. Determine gusts based on the maximum instantaneous wind speed observed during the 10-minute period before the actual time of observation.

6.3.4.1. Report a wind gust when the wind speed observed varies during the 10-minute observational period by 10 knots or more between peaks and lulls. The value reported is the maximum wind speed.

6.3.5. Hourly Peak Wind Data. The hourly peak wind speed will be the highest instantaneous speed recorded greater than 25 knots since the last routine METAR. The peak wind speed remark is required even if the peak wind speed was transmitted in an intervening SPECI. The peak wind remark is not required if the peak wind occurred and/or reoccurred during the 2-minute observation period prior to the METAR (the peak wind speed will already be in the body of the METAR). If the wind speed occurs more than once during the hour, report the latest occurrence first in the observation. Reporting of other occurrences in the hour is optional. Determine peak wind data for entry in the remarks section of the METAR observation and for summary of the day information using the AN/FMQ-13 recorder printout.

6.3.5.1. If the wind recorder printout is incomplete, data from it may still be used provided there is no indication that the peak wind speed occurred during the period of the missing data. If you believe the peak wind data occurred during a time the recorder was not operating, consider the data as missing.

6.3.5.2. If the wind direction record is incomplete, estimate the direction (e.g., from past directions or from surrounding stations, if representative) to the nearest 10 degrees for remarks on peak wind speed and for peak wind of the day. If the outage period is so extensive a peak gust direction cannot be reasonably estimated, consider the data as missing.

6.3.5.3. At units with multiple sensor locations use the last highest speed observed for the appropriate period, regardless of the active runway at the time of occurrence.

6.3.6. Determination of Wind Shifts. A wind shift is indicated by a change in wind direction of 45 degrees or more over a less than 15-minute period with sustained wind speeds of 10 knots or more. The time of occurrence for a wind shift is considered as the time the shift began (however, reporting of the shift cannot be made until after the shift has actually taken place). Estimate the time of the occurrence if a wind recorder is not available.

6.3.6.1. Wind shifts are often associated with the following phenomena:

6.3.6.1.1. Frontal passage. Winds shift in a clockwise manner in the Northern Hemisphere.

6.3.6.1.2. Rapid drop or rise in temperature and/or dew point.

6.3.6.1.3. Rapid rise or drop in pressure.

6.3.6.1.4. Thunderstorm activity with lightning and hail, rainshowers, or snowshowers.

6.3.6.2. Take a SPECI immediately after a wind shift occurrence and include a remark reporting the wind shift and the time the wind shift occurred. When the shift is associated with a frontal passage, report FROPA in remarks immediately after the time the shift began. If the SPECI containing a wind shift is not disseminated longline, include the wind shift data in the remarks of the next transmitted SPECI or METAR report. The format for the remark is given in **Attachment 3.**

6.3.7. Calm Wind. When no motion of the air is detected, the wind will be reported as calm. Calm winds are encoded as 00000KT.

Table 6.3. Conversion of Miles Per Hour to Knots.

CONVERSION OF MILES PER HOUR TO KNOTS										
MPH	0	1	2	3	4	5	6	7	8	9
	KTS	KTS	KTS	KTS	KTS	KTS	KTS	KTS	KTS	KTS
0	0	1	2	3	3	4	5	6	7	8
10	9	10	10	11	12	13	14	15	16	17
20	17	18	19	20	21	22	23	23	24	25
30	26	27	28	29	30	30	31	32	33	34
40	35	36	36	37	38	39	40	41	42	43
50	43	44	45	46	47	48	49	50	50	51
60	52	53	54	55	56	56	57	58	59	60
70	61	62	63	63	64	65	66	67	68	69
80	70	70	71	72	73	74	75	76	76	77
90	78	79	80	81	82	83	83	84	85	86
NOTE: This table is not reversible. Use **Table 6.4.** to convert knots to miles per hour.										

Table 6.4. Conversion of Knots to Miles Per Hour.

CONVERSION OF KNOTS TO MILES PER HOUR										
KTS	0	1	2	3	4	5	6	7	8	9
	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH
0	0	1	2	3	5	6	7	8	9	10
10	12	13	14	15	16	17	18	20	21	22
20	23	24	25	26	28	29	30	31	32	33
30	35	36	37	38	39	40	41	43	44	45
40	46	47	48	49	51	52	53	54	55	56
50	58	59	60	61	62	63	64	66	67	68
60	69	70	71	72	74	75	76	77	78	79
70	81	82	83	84	85	86	87	89	90	91
80	92	93	94	96	97	98	99	100	101	102
90	104	105	106	107	108	109	110	112	113	114
NOTE: This table is not reversible. Use **Table 6.3.** to convert miles per hour to knots.										

Chapter 7

VISIBILITY

7.1. Introduction. This chapter contains observing practices and identifies procedures used to determine meteorological visibility. Visibility is a measure of the opacity of the atmosphere and is expressed in terms of the horizontal distance at which specified objects can be seen and identified. All visibilities referred to in this chapter are horizontal visibilities. Disseminate prevailing visibility values longline and local in either statue miles or meters.

7.2. Definitions.

7.2.1. Visibility. The greatest horizontal distance at which selected objects can be seen and identified.

7.2.2. Prevailing Visibility. The visibility considered to be representative of the visibility conditions at the weather unit or control tower. This representative visibility is the greatest visibility equaled or exceeded throughout at least half the horizon circle, not necessarily continuous (i.e., it may be composed of sectors distributed anywhere around the horizon circle).

7.2.3. Variable Prevailing Visibility. A condition where the column 4 prevailing visibility value is less than 3 miles (4800 meters) and is rapidly increasing and decreasing by 1/2 mile (0800 meters) or more during the period of observation, e.g., VIS 1 1/8V1 5/8 (VIS 1800V2600). The average of all visibility values observed during the period of observation will be encoded and reported in column 4A or 4B.

7.2.4. Sector Visibility. The visibility in a specified direction that represents at least a 45-degree arc (portion) of the horizon circle.

7.2.5. Surface Visibility. The prevailing visibility determined from the designated point(s) of observation. It normally represents a value observed at a height of 6 feet (1.8 meters) above ground level.

7.2.6. Tower Visibility. The prevailing visibility determined from the control tower

7.2.7. Manual Observing Aids. Dark or nearly dark objects viewed against the horizon sky during the day, or unfocused lights of moderate intensity (about 25 candela) during the night.

7.3. Observing, Determining, and Reporting Procedures.

7.3.1. Reportable Values. See **Table 7.1.** for reportable visibility values in statute miles, meters, and in nautical miles. If the visibility falls halfway between two reportable values, the lower value will be reported.

Table 7.1. Reportable Visibility Values/Conversion Chart (Statute Miles, Meters, Nautical Miles).

Statute Miles	Meters	Nautical Miles	Statute Miles	Meters	Nautical Miles
0	**0000**	0.0	---	3400	1.8
1/16	**0100**	0.05	---	3500	---
1/8	**0200**	0.1	**2 1/4**	**3600**	1.9
3/16	**0300**	0.15	---	3700	---
1/4	**0400**	0.2	---	3800	---
5/16	**0500**	0.25	---	3900	---
3/8	**0600**	0.3	**2 1/2**	**4000**	2.2
---	0700	0.4	---	4100	---
1/2	**0800**	0.45	---	4200	---
---	0900	0.5	---	4300	---
5/8	**1000**	0.55	**2 3/4**	**4400**	2.3
---	1100	0.6	---	4500	2.4
3/4	**1200**	---	---	4600	---
---	1300	0.7	---	4700	2.5
7/8	**1400**	---	**3**	**4800**	2.6
---	1500	0.8	---	4900	---
1	**1600**	---	---	5000	2.7
---	1700	0.9	**4**	**6000**	3.0
1 1/8	**1800**	1.0	---	7000	4.0
---	1900	---	**5**	**8000**	4.3
1 1/4	**2000**	1.1	**6**	**9000**	5
---	2100	---	**7**	**9999**	6
1 3/8	**2200**	1.2	**8**	**9999**	7
---	2300	---	**9**	**9999**	8
1 1/2	**2400**	1.3	**10**	**9999**	9
---	2500	---	**11**	**9999**	10
1 5/8	**2600**	1.4	**12**	**9999**	11
---	2700	---	**13**	**9999**	12
1 3/4	**2800**	1.5	**14**	**9999**	13
---	2900	---	**15**	**9999**	14
1 7/8	**3000**	1.6	**20**	**9999**	15
---	3100	---	**25**	**9999**	20
2	**3200**	1.7	**(Etc., continue in 5-mile increments)**		
---	3300	---			
NOTE: Boldface type indicates authorized reportable values.					

7.3.2. Visibility Standards. Visibility will be evaluated as frequently as practicable. All available visibility aids will be used to determine the greatest distances that can be seen in all directions around the horizon circle.

7.3.2.1. Visibility may be determined at either the surface, the tower level, or both. If visibility observations are made from just one level (e.g., the air traffic control tower), that level will be considered the "designated point of observation" and that visibility will be reported as surface visibility. If visibility observations are made from both levels, the lower value (if less than 4 miles [6000 meters]) will be reported as the visibility in the body of the observation and the other value will be a remark.

7.3.3. Surface Visibility Observations. Determine and report surface visibility data as follows:

7.3.3.1. Point of Observation. The surface observation point should be as free from man-made obstructions as possible to view the entire horizon. Where obstructions exist, move to as many locations around the observation point as necessary and practicable within the period of observation to view as much of the horizon as possible. In this respect, natural obstructions, such as trees, hills, etc., are not obstructions to the horizon but define the horizon.

7.3.3.2. Visibility Determination. Use all available markers to determine the greatest visibility in each direction around the horizon circle. Before taking visibility observations at night, weather technicians will spend as much time as practicable in the darkness to allow their eyes to become accustomed to the limited light.

7.3.3.2.1. Evaluate visibility as frequently as practical. Using all available visibility markers, determine the greatest distances that can be seen in all directions around the horizon circle. When the visibility is greater than the distance to the farthest markers, estimate the greatest distance that can be seen in each direction. Base this estimate on the appearance of all visibility markers. If they are visible with sharp outlines and little blurring of color, the visibility is much greater than the distance to them. If a marker can barely be seen and identified, the visibility is about the same as the distance to the marker. The silhouette of mountains and hills against the sky and the brilliance of stars near the horizon may provide a useful guide to the general clarity of the atmosphere.

7.3.3.3. Determination of Prevailing Visibility. Use the visibility values determined around the horizon circle as a basis for determination of the prevailing visibility. Evaluate observed values using the following guidelines.

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

7.3.3.3.2. Under non-uniform conditions, use the values determined in the various sectors to determine the greatest distance seen throughout at least half the horizon circle (see example in **Table 7.2.**). In the remarks of the observation, report sector visibilities that differ from the prevailing visibility by a reportable value or more if they are less than 3 miles (4800 meters) or otherwise considered operationally significant.

Table 7.2. Example for Determining Prevailing Visibility.

Visibility in Four Sectors			Visibility in Five Sectors		
SM	**Meters**	**Approximate Degrees Azimuth**	**SM**	**Meters**	**Approximate Degrees Azimuth**
5	8000	90	5	8000	100
2 ¾	4000	90	3	4800	90
2	3200	90	2 1/2	4000	60
1 ¾	2400	90	2	3200	50
			1 1/2	2400	60
Prevailing visibility is 2 1/2 (4000) because half of the horizon circle is at least 2 1/2 (4000).			Prevailing visibility is 3 (4800) because more than half of the horizon circle is at least 3 (4800).		

7.3.4. Variable Prevailing Visibility. If the prevailing visibility rapidly increases and decreases by 1/2 mile (0800 meters) or more during the time of the observation and the average prevailing visibility is less than 3 miles (4800 meters), the visibility is considered to be variable and the minimum and maximum visibility values observed will be reported in remarks. The format for the remark is given in **Attachment 3**.

7.3.5. Sector Visibility. When the visibility is not uniform in all directions, divide the horizon circle into arcs (sectors) that have uniform visibility and represent at least one eighth (1/8) of the horizon circle (45 degrees). The visibility that is evaluated in each sector is sector visibility.

7.3.5.1. Sector visibility will be reported in remarks of weather observations when it differs from the prevailing visibility by one or more reportable values and either the prevailing or the sector visibility is less than 3 miles (4800 meters). The format for the remark is given in **Attachment 3.**

Chapter 8

RUNWAY VISUAL RANGE

8.1. Introduction. This chapter contains information on Runway Visual Range (RVR) and the standards and procedures for the observing, determining, and reporting of RVR at manual observing units. Runway Visual Range is an instrumentally derived value that represents the horizontal distance that a pilot can see down the runway.

8.2. Definitions.

8.2.1. Runway Visual Range. 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 line at a height corresponding to the average eye level of pilots at touch-down.

8.2.2. Designated Runway Visual Range (RVR) Runway. Any runway or runways officially designated for the reporting of RVR in aviation observations.

8.3. RVR Reporting Requirements. Units will disseminate RVR longline and/or locally according to the LOCAL observation requirements defined in **Chapter 2** and the SPECI requirement in **Attachment 2**.

8.4. RVR Reporting Procedures.

8.4.1. RVR will be reported locally using a 1-minute or 10-minute average (depending on capability) and disseminated longline when the RVR data is obtained from a system providing a 10-minute RVR average.

8.4.1.1. Units with RVR equipment that provides a 10-minute RVR average (i.e., AN/FMN-1A, etc.), but are unable to transmit the data due to an RVR equipment problem/outage will report the remark RVRNO longline during periods when prevailing visibility is 1 mile (1600 meters) or less or RVR is 6,000 feet (1830 meters) or less. Units without equipment that provides a 10-minute RVR capability are not required to report RVRNO longline.

8.4.2. Units of Measure. The unit of measurement will be the same as that published for the installation in DoD FLIPs; feet in the CONUS and generally in meters at OCONUS locations, unless otherwise determined locally. When no RVR minima are published in the DoD FLIPs, report locally in meters if prevailing visibility is locally disseminated in meters, and in feet if prevailing visibility is reported locally in statute miles.

8.4.3. A knowledge of the following factors is essential to RVR reporting:

8.4.3.1. The location of all RVR equipment on the airfield and the relationship of RVR sensors and readouts to the approach end of the runways.

8.4.3.2. The RVR category minima for all RVR runways on the installation.

8.4.3.3. The active runway and the current light setting. If the runway lights are turned off but are operational, use the light setting that would normally be used if aircraft activity were in progress. (Determine the appropriate light setting in coordination with the local ATC agency.)

8.4.3.4. The applicable time of day (i.e., day or night) condition, when appropriate to the conversion of transmissivity readings in percent.

8.4.4. Report RVR data during periods when prevailing visibility is 1 mile (1600 meters) or less or RVR is 6,000 feet (1830 meters) or less.

8.4.5. When reporting conditions exist, report RVR data in surface observations as follows:

8.4.5.1. Non-Category II RVR units will report RVR data locally for the touchdown zone of the active runway. **NOTE:** Non-category II RVR units do not use the RVR400 system.

8.4.5.2. Category II RVR units will report RVR data locally for the touchdown zone of the active runway. **NOTE:** Category II RVR units use the RVR400 system and will use the following guidelines:

8.4.5.2.1. When advised by an ATC agency of an inoperative digital readout for touchdown RVR, begin reporting touchdown RVR data locally according to SPECI and LOCAL observation criteria and locally established requirements. **NOTE:** In order to have an accredited Category II instrument landing system, FAA standards require ATC agency access to digital readout of touchdown RVR data.

8.4.5.2.2. Touchdown RVR has priority in the event of an outage in which both transmissometers are operational but only one recorder is available in the weather unit for determination of RVR data.

8.4.5.3. Obtain 1-minute or 10-minute average RVR data by direct reading of digital displays when available and runway lights are operational on light setting 3, 4, or 5. **NOTE:** AN/FMN-1A (Computer Set, Runway Visual Range) values also may be used during daytime hours when light setting 2 is in use. Obtain instantaneous RVR data by converting transmissivity readings when digital data are not available (e.g., unit does not have a 10-minute average readout capability, the AN/FMN-1A is inoperative, or runway lights are inoperative). Base computations of RVR data on the current runway light setting 3, 4, or 5 at airfields with published RVR minima. When runway lights are turned off but still operational, base RVR computations on the appropriate light setting normally used by manually setting the LIGHT SETTING switch on the AN/FMN-1A (i.e., as determined in coordination with the local ATC agency). Where runway lights are inoperative or at airfields with no published RVR minima in the DoD FLIPs, compute RVR data using values from the column labeled *other* in transmissivity conversion tables.

8.4.6. Encode RVR as specified in **Chapter 14.**

8.5. Equipment Operation and Instrumental Evaluation. Operate visibility and RVR measuring equipment according to appropriate TOs and/or operating manuals (see **Part 1, paragraph 2.4.4.3.**).

8.5.1. Transmissometer-determined values are applicable only to the specified runway where the instrument is located. Data must not be used during periods when instrumental values are not considered representative for the associated runway.

8.5.2. Almost all short-term fluctuations of visual range as displayed on the recorder and applicable meter, or computer readout are real. The transmissometer is very sensitive to the varying light transmission characteristics of the atmosphere, and variations are more frequent under low visibility conditions. For this reason, caution must be used in rejecting visual range values as erroneous.

8.5.3. Transmissometer. As a general rule, transmissometers must be in continuous operation. **NOTE:** Transmissometer-display values are from the inactive runway when the AN/FMN-1A is in use. Switch sensors before using data from the transmissometer for the active runway.

8.5.4. AN/FMN-1A. The AN/FMN-1A equipment must be in continuous operation during periods when visibility is reduced to, or forecast to be, **2 miles (3200 meters) or less within 3 hours**. The set may be turned off if neither of these conditions exists and there is no local requirement to continue operation.

8.5.5. Recorder-Indicator With Multiple Instrumentation. Operate the recorder-indicator using the following guidelines at units with transmissometers installed near both ends of a runway.

8.5.5.1. At non-Category II RVR units, switch the equipment to the sensors at the inactive end of the runway during periods in which the AN/FMN-1A is in use. However, it must be switched to the active runway during periods in which the AN/FMN-1A is inoperative, not available, or not in use (e.g., when runway lights are turned off or not operational).

8.5.5.2. At Category II RVR units, switch the recorder-indicator to the sensing equipment located near the touchdown end of the active runway.

8.6. Transmissometer Recorder-Indicator Evaluations. Ensure the recorder-indicator is switched to the active runway when necessary to manually determine instantaneous or 1-minute average transmissivity (e.g., digital readout inoperative or not available, or the runway lights are inoperative).

8.7. Transmissivity Conversion. Convert corrected percentages to equivalent RVR or visibility the tables in **Attachment 4** and consider the following factors:

8.7.1. Day-Night Conditions. Select an appropriate time for changing from day tabular values to night tabular values (or vice versa) in conversion of transmissivity to actual distances. In general, use the day scale values until the evening low-intensity lights on or near the airfield complex are clearly visible; use the night scale values in the morning until these lights begin to fade.

8.7.2. Runway Light Setting. Determine the runway light setting in use when converting transmissivity to obtain RVR. Sector visibility is based on visual contrast rather than on the runway light setting.

8.8. Determining RVR Using ASOS Extinction Coefficient Values.

8.8.1. Obtain the extinction coefficient (EXCO) value from ASOS.

8.8.1.1. From 1-minute screen, enter REVUE SENSR 12-HR and read the latest visibility reading. This value is the raw sensor extinction coefficient.

8.8.2. Using **Table A4.6.,** find the EXCO MIN/MAX range the actual EXCO value is within (DAY or NIGHT) and read the RVR from the left column. The length of the RVR baseline and the actual light setting in use are not factors for determining RVR based on the ASOS extinction coefficient. The EXCO values in **Table A4.6.** have accounted for these two variables.

8.9. RVR Examples. **Table 8.1.** provides example RVR reports.

Table 8.1. RVR Examples.

R27/M0180	Runway 27 touchdown is less than 180 meters
R27/M0600FT	Runway 27 touchdown is less than 600 feet
R09/1000FT	Runway 09 touchdown RVR is 1000 feet
R09/0300	Runway 09 touchdown RVR is 300 meters
R32C/2400FT	Runway 32 center touchdown is 2400 feet
R32C/0730	Runway 32 center touchdown is 730 meters
R14/1000V2000FT	Runway 14 touchdown RVR is varying between 1000 and 2000 feet
R14/0300V0610	Runway 14 touchdown RVR is varying between 300 and 610 meters
R09/P6000FT	Runway 09 touchdown RVR is greater than 6000 feet
R09/P1830	Runway 09 touchdown RVR is greater than 1830 meters
RVRNO	10-minute RVR average capability exists, but touchdown RVR not available.

Chapter 9

PRESENT WEATHER

9.1. Introduction. This chapter provides information concerning the identifying, recording, and reporting of present weather conditions. Present weather includes precipitation, obscurations (obstructions to visibility), well-developed dust/sand whirls, squalls, tornadic activity, sandstorms, and duststorms. Methods of evaluating present weather include instrumentally, manually, or a combination of the two.

9.2. Definitions. The following are simple definitions for types of precipitation, obscurations, and other weather phenomena. For more detailed definitions, refer to the Air Force Weather Specialty Qualification Training Package on *Observing*, or other references such as the American Meteorological Society *Glossary of Meteorology* or *Meteorology Today*.

9.2.1. Precipitation. Precipitation is any of the forms of water particles, whether in a liquid or solid state, that fall from the atmosphere and reach the ground. The various types are defined below:

9.2.1.1. Drizzle. Drizzle is a fairly uniform type of precipitation that is composed of fine 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. Unlike fog droplets, drizzle does fall to the ground.

9.2.1.2. Rain. Rain comes in two forms. The first is in the form of drops larger than 0.02-inch (0.5 mm). The second can have smaller drops, but unlike drizzle, they are widely separated.

9.2.1.3. Snow. This type of precipitation contains crystals, most of which are branched in the form of six-pointed stars.

9.2.1.4. Snow Grains. Precipitation of very small, white, opaque grains of ice. When the grains hit hard ground, they do not bounce or shatter. They usually fall in small quantities, mostly from stratus type clouds and never as showers.

9.2.1.5. Ice Crystals (Diamond Dust). Precipitation that falls as unbranched ice crystals in the form of needles, columns, or plates.

9.2.1.6. Ice Pellets. 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. The pellets usually rebound when striking hard ground, and make a sound on impact. There are two main types. One type is composed of hard grains of ice consisting of frozen raindrops, or largely melted and refrozen snowflakes (formerly sleet). This type falls as continuous or intermittent precipitation. The second type consists of snow encased in a thin layer of ice which has formed from the freezing, either of droplets intercepted by the pellets, or of water resulting from the partial melting of the pellets. This type falls as showers.

9.2.1.7. Hail. Small balls or other pieces of ice falling separately or frozen together in irregular lumps.

9.2.1.8. Small Hail and/or Snow Pellets. Small hail or snow pellets are defined as white, opaque grains of ice. The pellets are round or sometimes conical. Diameters range from about 0.08 to 0.2 inch (2 to 5 mm). Snow pellets are brittle and easily crushed. When they fall on hard ground, they bounce and often break up.

9.2.2. Obscurations. Obscurations or obstructions to visibility can be any phenomenon in the atmosphere (not including precipitation) that reduces horizontal visibility. The various kinds are listed below:

9.2.2.1. Mist. A visible aggregate of minute water particles suspended in the atmosphere that reduces visibility to less than 7 statute miles (9999 meters) but greater than or equal to 5/8 statute miles (1000 meters).

9.2.2.2. Fog. A visible aggregate of minute water particles (droplets) that are based at the earth's surface and reduces the horizontal visibility to less than 5/8 statute miles (1000 meters). It does not fall to the ground like drizzle.

9.2.2.3. Smoke. Small particles produced by combustion that are suspended in the air. A transition to haze may occur when smoke particles have traveled great distances (25 to 100 miles or more), and when the larger particles have settled out, the remaining particles have become widely scattered through the atmosphere.

9.2.2.4. Volcanic Ash. Fine particles of rock powder that have erupted from a volcano and remain suspended in the atmosphere for long periods of time.

9.2.2.5. Widespread Dust. Fine particles of earth or other matter raised or suspended in the air by the wind that may have occurred at or away from the unit.

9.2.2.6. Sand. Particles of sand raised to a sufficient height that reduces visibility.

9.2.2.7. Haze. A suspension in the air of extremely small, dry particles invisible to the naked eye and sufficiently numerous to give it an opalescent appearance.

9.2.2.8. Spray. An ensemble of water droplets torn by the wind from the surface of a large body of water, generally from the crest of waves, and carried a short distance into the air.

9.2.3. Other Weather Phenomena.

9.2.3.1. Well-Developed Dust/Sand Whirl. An ensemble of particles of dust or sand, sometimes accompanied by small pieces of litter, that is raised from the ground and takes the form of a whirling column with varying height, small diameter, and an approximate vertical axis.

9.2.3.2. Squall. A strong wind characterized by a sudden onset in which the wind speed increases by at least 16 knots and is sustained at 22 knots or more for at least 1 minute.

9.2.3.3. Funnel Cloud (Tornadic Activity).

9.2.3.3.1. Tornado. A violent, rotating column of air touching the ground. It forms a pendant, usually from a cumulonimbus cloud, nearly always starts as a funnel cloud, and is accompanied by a loud roaring noise.

9.2.3.3.2. Funnel Cloud. A violent, rotating column of air that does not touch the surface. It is usually in the form of a pendant from a cumulonimbus cloud.

9.2.3.3.3. Waterspout. A violent, rotating column of air that forms over a body of water, and touches the water surface.

9.2.3.4. Sandstorm. Particles of sand that are carried aloft by a strong wind. The sand particles are mostly confined to the lowest 10 feet, and rarely rise more than 50 feet above the ground.

9.2.3.5. Duststorm. A severe weather condition characterized by strong winds and dust-filled air over an extensive area.

9.3. Weather Observing Standards. Qualifiers will define weather. Qualifiers fall into two categories: (1) Intensity or Proximity, and (2) Descriptors. Qualifiers may be used in various combinations to describe present weather phenomena. More refined definitions are as follows:

9.3.1. Intensity. Intensity of precipitation is an indication of the amount of precipitation falling at the time of observation. It is expressed as light (-), moderate (no symbol), or heavy (+). No intensity is assigned to hail, ice crystals, or small hail and/or snow pellets. Each intensity is defined with respect to the type of precipitation occurring. Use **Table 9.1.** to estimate the intensity of rain or freezing rain. Use **Table 9.2.** to estimate the intensity of ice pellets. Use **Table 9.3.** to estimated the intensity of rain or ice pellets using rate of fall. Use **Table 9.4.** to estimate the intensity of snow or drizzle based on visibility. **NOTE:** These intensities are based on visibility at the time of observation. When more than one form of precipitation is occurring at a time or precipitation is occurring with an obscuration, the intensities determined will be no greater than that which would be determined if any of the forms were occurring alone. **Table 9.5.** can be use to estimate the intensity of drizzle based on rate of fall.

9.3.1.1. If snow, snow grains, drizzle, and freezing drizzle occur alone, use **Table 9.4.** to determine intensity based on prevailing visibility. If occurring with other precipitation or obscurations, the intensity assigned will be no greater than that determined using visibility criteria if any of the above were occurring alone. With or without other obscuring phenomena, do not report heavy snow (+SN) if the visibility is greater than 1/4 mile, and do not report moderate snow (SN) if the visibility is greater than 1/2 mile.

Table 9.1. Estimating Intensity of Rain.

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.

Table 9.2. Estimating Intensity of Ice Pellets.

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 7 statute miles (9999 meters).
Heavy	Rapid accumulation on ground. Visibility reduced by ice pellets to less than 3 statute miles (4800 meters).

Table 9.3. Intensity of Rain or Ice Pellets Based on Rate-of-Fall.

Intensity	Criteria
Light	Up to 0.10-inches per hour; maximum 0.01-inch in 6 minutes.
Moderate	0.11-inches to 0.30-inches per hour; more than 0.01-inch to 0.03-inches in 6 minutes.
Heavy	More than 0.30-inches per hour; more than 0.03-inches in 6 minutes.

Table 9.4. Intensity of Snow or Drizzle Based on Visibility.

Intensity	Criteria
Light	Visibility > 1/2 mile (0800 meters).
Moderate	Visibility > 1/4 mile (0400 meters) but ≤ 1/2 mile (0800 meters).
Heavy	Visibility ≤ 1/4 mile (0400 meters).
NOTE: Intensity based on snow or drizzle occurring alone without any other obscurations.	

Table 9.5. Estimating Intensity of Drizzle Based on Rate-of-Fall.

Intensity	Criteria
Light	A trace through 0.01 inch (0.3 mm) per hour.
Moderate	Between 0.01 - 0.02 inch (0.3 - 0.5 mm) per hour.
Heavy	Greater than 0.02 inch (0.5 mm) per hour.

9.3.2. Proximity. The proximity qualifier is "vicinity" (**VC**). The location of weather phenomena will be reported as "occurring at the station" if within 5 statute miles of the point of observation; "in the vicinity of the station" if between 5 and 10 statute miles of the point of observation; and "distant from the station" (**DSNT**) when beyond 10 statute miles of the point of observation. Exception: See **paragraph 9.4.1.** for encoding showery precipitation in the vicinity.

9.3.3. Descriptors. These qualifiers further describe weather phenomena and are used with certain types of precipitation and obscurations. The terms used are shallow, partial, patches, low drifting, blowing, shower(s), thunderstorm, and freezing.

9.3.3.1. Shallow. The descriptor shallow is only used to further describe fog that has little vertical extent (less than 6 feet).

9.3.3.2. Partial And Patches. The descriptors partial and patches is used to further describe fog that has little vertical extent (normally greater than or equal to 6 feet but less than 20 feet), and reduces horizontal visibility, but to a lesser extent vertically. The stars may often be seen by night and the sun by day.

9.3.3.3. Low Drifting. A term used to further describe the weather phenomenon when dust, sand, or snow is raised by the wind to less than 6 feet.

9.3.3.4. Blowing. A term used to further describe the weather phenomenon when dust, sand, snow, and/or spray is raised by the wind to heights 6 feet or greater.

9.3.3.5. Shower(s). Precipitation characterized by its sudden starting/stopping, rapid change in intensity, and accompanied by rapid changes in the appearance of the sky.

9.3.3.6. Thunderstorm. A local storm produced by a cumulonimbus cloud that is accompanied by lightning and/or thunder.

9.3.3.7. Freezing. When fog is present, and the temperature is below 0 degrees C, the descriptor FZ will be used to describe the phenomena (FZFG). The descriptor will also be used to describe rain (or drizzle) that falls in liquid form but freezes upon impact to form a coating of glaze ice upon the ground and on exposed objects. See **Attachment 1** for a complete definition of freezing rain and glaze ice.

9.4. Present Weather Reporting Procedures. As noted above, weather phenomena fall into three categories, which are precipitation, obscurations, and other phenomena. The categories will be combined with the qualifiers to identify the present weather that is reported when it is occurring at, or in the vicinity of, the unit and at the time of observation. Follow the reporting precedence in **Table 9.6.** when more than one type of present weather is reported at the same time. **NOTE:** When more than one type of present weather is reported, they will be encoded in order of decreasing dominance, with the intensity based on the most dominant precipitation type. **Table 9.7.** provides reporting notations to be used on the METAR/SPECI.

Table 9.6. Reporting Precedence.

(1) Tornadic Activity—Tornado, Funnel Cloud, or Waterspout
(2) Thunderstorm(s) with/without associated precipitation
(3) Present weather in order of decreasing predominance—Most dominant reported first
(4) Left-to-right—Columns 1-5, in **Table 9.7.**

Table 9.7. Notations for Reporting Present Weather.

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

1. The weather groups will be constructed by considering columns 1 to 5 in the table above in sequence, i.e., intensity, followed by description, followed by weather phenomena, e.g., heavy rain shower(s) is encoded as +SHRA.

2. To denote moderate intensity, no entry or symbol is used.

3. See paragraphs **9.3.2.** and **9.4.1.** for vicinity definitions.

4. Tornados and Waterspouts will be encoded as +FC.

9.4.1. Precipitation. Precipitation will be reported when occurring at the point of observation. Precipitation not occurring at the point of observation but within 10 statute miles will be reported as "showers in the vicinity (VCSH)." Precipitation will be reported as listed in **Table 9.8.**.

Table 9.8. Precipitation Reporting.

PRECIPITATION TYPE	REPORTING CRITERIA
Drizzle	When observed
Rain	When observed
Rainshowers	When abruptly starts/stops/changes intensity
Freezing rain	Freezes upon impact and/or forms glaze on ground or other objects
Freezing drizzle	Freezes upon impact with ground/other objects
Snow	When observed
Snowshowers	When abruptly starts/stops/changes intensity
Blowing snow	Raised by wind to height sufficient to reduce horizontal visibility
Low drifting snow	When observed
Snow grains	When observed
Ice crystals	When observed
Ice pellets	When observed
Ice pellet showers	When abruptly starts/stops/changes intensity
Hail	When hailstones 1/4" or larger in diameter; small hail and/or snow pellets reported when less than 1/4" in diameter. Event reported when starts/in progress/stops
Hail showers	When starts/stops/changes intensity
Small hail and/or snow pellets	When observed
Small hail and/or snow pellet showers	When starts/stops/changes intensity

9.4.2. Obscurations. An obscuration will be reported in the body of the report if the prevailing visibility is less than 7 statute miles (9999 meters) or considered operationally significant.

9.4.2.1. Volcanic ash is **always** reported when observed regardless of the visibility. Low drifting dust (DRDU), low drifting sand (DRSA), low drifting snow (DRSN), shallow fog (MIFG), partial fog (PRFG), and patches of fog (BCFG) may be reported when visibility is equal to or greater than 7 miles. If these conditions are not met, but an obscuration is observed that is considered operationally significant, it will be reported in the remarks section as not at the unit.

9.4.2.2. Fog will be reported when minute water particles reduce the horizontal visibility to **less than 5/8 statute mile** (1000 meters). **Table 9.9.**. lists reportable obscurations.

Table 9.9. Obscurations.

Mist	Smoke	Widespread dust
Shallow (ground) fog	Volcanic ash	Blowing dust
Partial fog	Sand	Low drifting dust
Patches (of) fog	Blowing sand	Haze
Freezing fog	Low drifting sand	Blowing spray

9.4.3. Other Weather Phenomena. Other weather phenomena will be reported as listed in **Table 9.10.**

Table 9.10. Other Weather Phenomena.

PHENOMENA TYPE	REPORTING CRITERIA
Well-developed Dust/Sand Whirls	When observed
Squalls	When observed
Tornado/Waterspout/Funnel Cloud	When recognized by a certified weather technician to begin/in progress/end
Sandstorm	When visibility is reduced to between 5/8 and 5/16 statute mile (1000 and 0500 meters). If visibility less than 5/16 statute mile (0500 meters), then heavy sandstorm reported
Duststorm	When visibility is reduced to between 5/8 and 5/16 statute mile (1000 and 0500 meters). If visibility less than 5/16 statute mile (0500 meters), then heavy duststorm reported

9.4.4. Thunderstorm. A thunderstorm with or without precipitation will be reported in the body or remarks of the observation when observed to begin, be in progress, or to end. Remarks concerning the location, movement, and direction (if known) of the storm will be added to the METAR/SPECI that reported the thunderstorm. See **paragraph 9.4.5.** for reporting thunderstorm times.

9.4.4.1. For reporting purposes, a thunderstorm is considered to have begun and to be occurring "at the station" when (1) thunder is first heard, (2) when hail is falling or lightning is observed at or near the airfield and the local noise level is such that resulting thunder cannot be heard, or (3) lightning detection equipment indicates lightning strikes with 5NM of the airfield. **NOTE:** VCTS will not be reported if thunder is heard and the location of the storm cannot be determined (e.g., no radar or lighting detector). If thunder is heard and the location is unknown, the thunderstorm will be reported as occurring "at the station."

9.4.4.2. A thunderstorm is considered to have ended 15 minutes after the last occurrence of any of the criteria in **paragraph 9.4.4.1.**

9.4.5. Beginning/Ending Times for Tornadic Activity, Thunderstorms, and Hail.

9.4.5.1. 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 which is transmitted longline.

9.4.5.2. Report the beginning or ending time to the nearest minute. Enter the indicator B and/or E and the appropriate time(s) immediately following the phenomena reported (e.g., TSB35 12 SW

MOV E, GR B37E39 GR 3/4). These B and/or E times are entered for longline transmission only. Times for separate thunderstorms will be reported only if there is a gap of greater than 15 minutes between the events.

9.5. Other Significant Weather Phenomena. Weather personnel will be alert to weather phenomena that are visible from but not occurring at the unit. Examples are fog banks, localized rain, snow blowing over runways, etc. These type phenomena will be reported when considered operationally significant. Volcanic eruptions will also be reported in the remarks section of a report. Table 9.11. indicates the types and combinations of present weather.

Table 9.11. Observed Present Weather.

Type of Present Weather	Reporting Notation	Type of Present Weather	Reporting Notation
Drizzle	DZ	Smoke	FU
Rain	RA	Volcanic Ash	VA
Freezing Rain	FZRA	Dust	DU
Freezing Drizzle	FZDZ	Blowing Dust	BLDU
Snow	SN	Blowing Sand	BLSA
Blowing Snow	BLSN	Haze	HZ
Snow Grains	SG	Blowing Spray	BLPY
Ice Crystals	IC	Well-developed Dust/Sand Whirls	PO
Ice Pellets	PL	Squalls	SQ
Hail	GR	Funnel Cloud (Tornadic Activity)	FC
Small Hail and/or Snow Pellets	GS	Sandstorm	SS
Mist	BR	Duststorm	DS
Fog	FG	Thunderstorm (See Note)	TS
Freezing Fog	FZFG		
NOTE: Thunderstorm (TS) is actually a descriptor, but may be reported alone if there is no precipitation associated with it.			

9.6. Summary of Weather. Table 9.12. contains a summary of the present weather observing and reporting standards.

Table 9.12. Summary of Present Weather Observing and Reporting Standards.

Present Weather	Reporting Standards
Funnel Cloud (Tornadic Activity)	Report +FC (Tornado & Waterspout), or FC (Funnel Cloud), and in remarks TORNADO, FUNNEL CLOUD, WATERSPOUT, time of beginning and time of ending (if required), location and distance if known, and direction of movement.
Thunderstorms	Report TS, time of beginning/ending (if required), location and distance if known, and movement.
Hail (≥ 1/4" diameter)	Report GR, time of beginning and time of ending (if required), estimated size of largest hailstone in 1/4-inch increments preceded by "GR."
Small hail and/or snow pellets	Report GS, time of beginning and time of ending.
Obscurations	Report BR, FG, PRFG, FU, DU, HZ, SA, BLSN, BLSA, BLDU, SS, DS, BLPY, and VA.
	Reports non-uniform weather and obscurations.
Precipitation	Report RA, SHRA, DZ, FZRA, FZDZ, SN, SHSN, SG, GS, IC, GR, PL, and SHPL.
	Report descriptor with precipitation.
	Report the intensity of precipitation, other than IC, GR, and GS as light, moderate, or heavy.
	May report 3-, 6-, and 24-hour accumulation of precipitation (water equivalent of solid).
	May report depth and accumulation of solid precipitation.
	Report size of GR.
Freezing Precipitation (FZDZ, FZRA)	Whenever liquid precipitation is occurring and ice is forming on the ground or exposed objects, report FZDZ/FZRA in a METAR or SPECI.
Squall	Report SQ.

Chapter 10

SKY CONDITION

10.1. Introduction. This chapter provides information on sky condition that is a description of the appearance of the sky. It will also prescribe the standards and procedures for observing and reporting sky condition in METAR/SPECI reports. The *WMO International Cloud Atlas*, Volume II, and *Cloud Types for Observers* (available from AFCCC) contain detailed guidance and photographs for identifying the various cloud forms. Cloud forms are also available by selecting "Links" on the AFWA Field Support Division (AFWA/XOP) web page.

10.2. Observing Standards and Definitions.

10.2.1. Field Elevation. The officially designated elevation of an airfield above mean sea level. It is the elevation of the highest point on any of the runways of the airfield or heliport.

10.2.2. Horizon. For aviation observation purposes, the actual lower boundary (local horizon) of the observed sky or the upper outline of terrestrial objects, including nearby natural obstructions such as trees and hills. It is the distant line along which the earth (land and or water surface) and the sky appear to meet. The local horizon is based on the best practical points of observation, near the earth's surface, which have been selected to minimize obstruction by nearby buildings, towers, etc.

10.2.3. Celestial Dome. That portion of the sky, which would be visible, provided there was an unobstructed view (due to the absence of buildings, hydrometeors, lithometeors, etc.) of the horizon in all directions from the observation site.

10.2.4. Cloud. A visible accumulation of minute water droplets or ice particles in the atmosphere above the earth's surface. Clouds differ from ground fog, fog, or ice fog only in that the latter are, by definition, in contact with the earth's surface.

10.2.5. Layer. Clouds or obscuring phenomena (not necessarily all of the same type) whose bases are at approximately the same level. It may be either continuous or composed of detached elements. A trace of cloud or obscuration aloft is always considered as a layer. However, a surface-based obscuring phenomenon is classified as a layer only when it hides 1/8th or more sky. If present, a partly obscured condition is always considered to be the lowest layer.

10.2.6. Layer Height. The height of the bases of each reported layer of clouds and/or obscurations. It can also be the vertical visibility into an indefinite ceiling.

10.2.7. Interconnected Cloud Layers. The condition in which cumuliform clouds develop below other clouds and reach or penetrate them. Also, by horizontal extension, swelling cumulus or cumulonimbus may form stratocumulus, altocumulus, or dense cirrus.

10.2.8. Summation Principle. The basis on which sky cover classifications are made. This principle states that the sky cover at any level is equal to the summation of the sky cover of the lowest layer plus the additional sky cover present at all successively higher layers up to and including the layer being considered. No layer can be assigned a sky cover less than a lower layer, and no sky cover can be greater than 8/8ths. This concept applies to evaluating total sky cover as well as determining ceiling layer.

10.2.9. Layer Opacity. All cloud layers and obscurations are considered opaque.

10.2.10. Ceiling. The lowest layer aloft reported as broken or overcast or the vertical visibility into an indefinite ceiling. If the sky is totally obscured, the vertical visibility will be the ceiling.

10.2.11. Indefinite Ceiling. The vertical visibility, measured in hundreds of feet, into a surface-based total obscuration that hides the entire celestial dome (8/8ths).

10.2.12. Sky Cover. The amount of the sky hidden by clouds and/or obscuration phenomena. This includes cloud cover or obscuring phenomena which hides the sky, but through which the sun or moon (not stars) may be dimly visible.

10.2.12.1. Sky Cover Amounts.

10.2.12.1.1. Layer Sky Cover. The amount of sky cover at a given level, estimated to the nearest 1/8th.

10.2.12.1.2. Total Sky Cover. The total amount of sky covered by all layers present. This amount cannot be greater than 8/8ths.

10.2.13. Sky Cover Classifications. The terms used to reflect the degree of cloudiness in sky condition evaluations based on a summation of the amount cloud cover or obscuring phenomena at and below the level of a layer aloft. The basic classification terms are as follows:

10.2.13.1. Clear. A term used to describe the absence of clouds or obscuring phenomena. Encoded as **SKC**.

10.2.13.2. Few. A summation sky cover of a trace through 2/8ths. Note that a trace of cloud or obscuration aloft is considered as 1/8th when it is the lowest layer. Encoded as **FEW**.

10.2.13.3. Scattered. A summation sky cover of 3/8ths through 4/8ths. Encoded as **SCT**.

10.2.13.4. Broken. A summation sky cover of 5/8ths through less than 8/8ths. More than 7/8ths but less than 8/8ths is considered as 7/8ths for reporting purposes. Encoded as **BKN**.

10.2.13.5. Overcast. A summation sky cover of 8/8ths. Encoded as **OVC**.

10.2.13.6. Obscured. A condition in which surface-based obscuring phenomena (e.g., fog or snow) are hiding 8/8ths of the sky. The terms *obscuration* and *indefinite ceiling* may also be used in relation to this sky condition and is encoded as $VVh_sh_sh_s$.

10.2.13.7. Partly Obscured. A condition in which surface-based obscuring phenomena are hiding at least 1/8th, but less than 8/8ths, of the sky or higher layers. The term *partial obscuration* may also be used in relation to this sky condition. Fog obscuring 2/8ths of the sky would be encoded as FEW000 and clarified in remarks as FG FEW000. See **Attachment 3**, Table of Remarks.

10.2.14. Surface. For layer height determinations, the term denotes the horizontal plane whose elevation above mean sea level equals the field elevation. At units where the field elevation has not been established, the term refers to the ground elevation at the observation site.

10.2.15. Variable Ceiling. When the height of the ceiling layer is variable (rapidly increases and decreases during the period of evaluation) and the ceiling layer is below 3,000 feet, a remark will be included in the report giving the range of variability. See **Attachment 3**, Table of Remarks.

10.2.16. Variable Sky Condition. A term used to describe a sky condition below 3,000 feet that varies between one or more reportable values (FEW, SCT, BKN, OVC) during the period of observation.

10.2.17. Vertical Visibility. A term used to indicate a height value for a surface-based obscuring phenomena (obscured sky). It is based on:

10.2.17.1. The distance that weather personnel can see vertically upward into the obscuring phenomena.

10.2.17.2. The height corresponding to the upper limit of a laser beam ceilometer reading.

10.3. Observing Procedures. Sky condition will be evaluated in all METAR and SPECI observations. Weather technicians will evaluate all clouds and obscurations that are visible. In addition, sky cover information from local PIREPs will be used to help determine cloud heights in the body of the observation if, in the judgment of weather technician, it is representative of conditions over the airfield. Convert cloud bases reported in PIREPs above mean sea level (MSL) to above ground level (AGL) before using in observations. Reevaluate sky cover and ceiling heights upon receipt of local pilot reports indicating an operationally significant deviation from the current observation.

10.3.1. Observing Layers. All layers visible from the unit will be reported in sky cover reports. The report will be based on the eighths (or oktas) of sky covered by each layer in combination with any lower layers. The amount of sky cover for each layer will be the eighths of sky cover attributable to clouds or obscurations (i.e., smoke, haze, fog, etc.) in the layer being evaluated. Additionally, all layers composed of cumulonimbus or towering cumulus will be identified by appending the contractions **CB** and **TCU**, respectively to the sky condition. When TCU or CB is appended to the layer report accompanied by the remark (e.g., TCU NW or CB NW MOV E), it is implied that the TCU or CB is associated with the layer and within 10 statue miles. When TCU or CB is outside 10 statute miles, a DSNT remark is appropriate (e.g., TCU DSNT NW). In this case, TCU or CB would not be appended to the layer in the body of the METAR. If more than six layers are observed, they will be reported in accordance with reporting priorities in **Table 10.1.**

Table 10.1. 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
9	Second Lowest Few Layer
10	Highest Few Layer

10.3.1.1. Mentally divide the sky into halves or quarters and estimate the layer amount in eighths in each section. Add the total amount of eighths estimated from each quadrant to arrive at a celestial dome coverage estimate. The inverse of this procedure can be done by estimating the amount of clear sky. Subtract this amount from 8/8ths to obtain an estimate of layer coverage.

10.3.1.2. To estimate the amount of an advancing (or receding) layer which extends to the horizon, determine the angular elevation above the horizon of the forward or rear edge of the layer as seen against the sky. Convert the angle to a sky cover amount using **Table 10.2.** When the layer does not extend to the horizon, determine the angular elevation of the forward and rear edges and the eighths of sky cover corresponding to each elevation angle. The difference will equal the actual sky cover.

10.3.1.3. To estimate the amount of a continuous layer surrounding the unit and extending to the horizon, determine the angular elevation of the edge of the layer and convert it to a sky cover amount using **Table 10.2.** This method is most useful in determining the amount of sky hidden for a partly obscured condition.

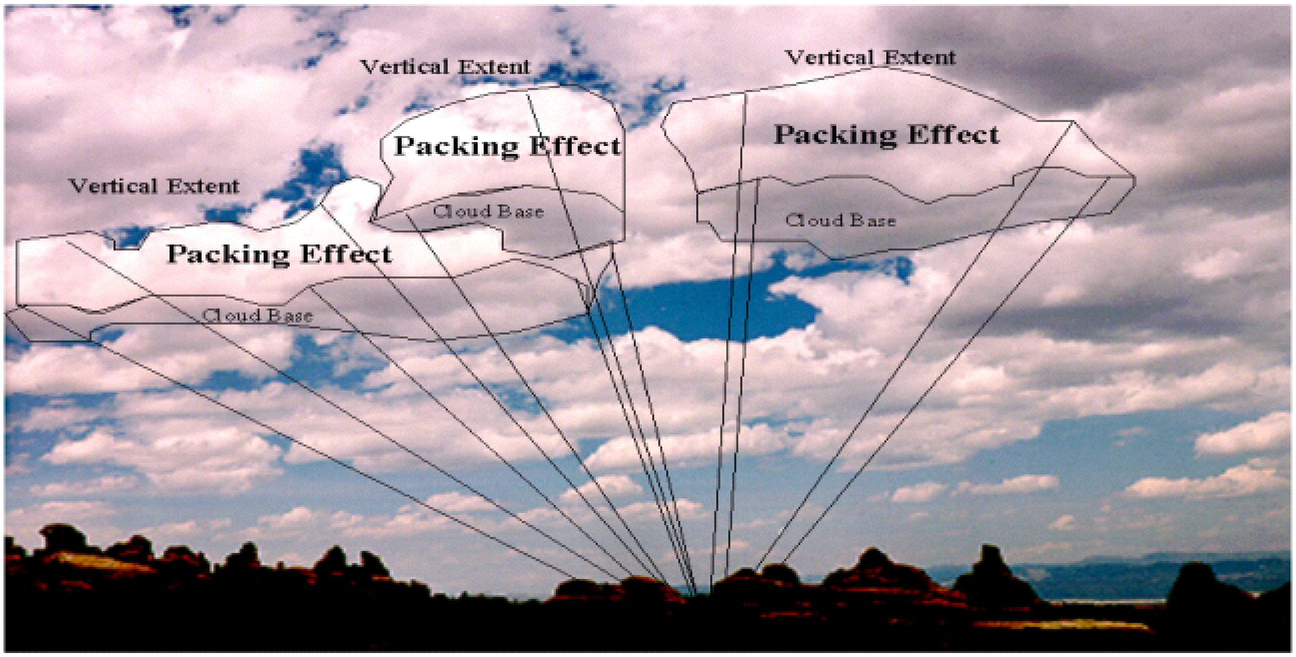
Table 10.2. Sky Cover Evaluation.

Angle of Advancing or Receding Layer Edge	Eighths of Sky Cover	Angular Elevation of Layer Surrounding Unit
> 0 to 50 degrees	1	> 0 to 10 degrees
51 to 68 degrees	2	11 to 17 degrees
69 to 82 degrees	3	18 to 24 degrees
83 to 98 degrees	4	25 to 32 degrees
99 to 112 degrees	5	33 to 41 degrees
113 to 129 degrees	6	42 to 53 degrees
130 to 179 degrees	7	54 to 89 degrees
180 degrees	8	90 degrees

10.3.2. Evaluation of Interconnected Layers. Clouds formed by the horizontal extension of swelling cumulus or cumulonimbus, that are attached to a parent cloud, will be regarded as a separate layer only if their bases appear horizontal and at a different level from the parent cloud. Otherwise, the entire cloud system will be regarded as a single layer at a height corresponding to the base of the parent cloud.

10.3.2.1. Cumuliform clouds tend to produce a packing effect. The packing effect occurs when the sides and tops of the clouds are visible, making clouds appear more numerous toward the horizon (see **Figure 10.1.** for an illustration of this effect). Estimate layers of sky cover based on the amount of sky actually covered (i.e., to include both the base and sides of the cloud or obscuration).

Figure 10.1. Illustration of Packing Affect.



10.3.3. Summation Layer Amount. The summation amount for any given layer is equal to the sum of the sky cover for the layer being evaluated plus the sky cover of all lower layers including partial obscurations. Portions of layers aloft detected through lower layers aloft will not increase the summation amount of the higher layer. A summation amount for a layer cannot exceed 8/8ths. See **Table 10.3.** for examples of sky condition summation.

Table 10.3. Examples of Sky Condition Summation.

Sky Cover Layer	Summation	Sky Condition	Remarks
3/8 obscured by fog	3/8	SCT000	FG SCT000
5/8 stratus at 1,000 feet	5/8	SCT000 BKN010	FG SCT000
2/8 stratocumulus at 4,000 feet	7/8	SCT000 BKN010 BKN040	FG SCT000
Less than 1/8 stratus fractus at 500 feet	1/8	FEW005	
1/8 stratus at 2,000 feet	1/8	FEW005 FEW020	
4/8 cumulonimbus at 3,000 feet	4/8	FEW005 FEW020 BKN030CB	CB W MOV E
8/8 altostratus at 9,000 feet	8/8	FEW005 FEW020 BKN030CB OVC090	CB W MOV E
2/8 smoke at 500 feet	2/8	FEW005	FU FEW005
Indefinite ceiling obscured by snow, vertical visibility 1,000 feet	8/8	FEW005 VV010	FU FEW005
1/8 obscured by fog	1/8	FEW000	FG FEW000
5/8 stratocumulus at 1,000 feet	5/8	FEW000 BKN010	FG FEW000
2/8 towering cumulus at 5,000 feet	7/8	FEW000 BKN010 BKN050TCU	FG FEW000
Sky hidden by snow, vertical visibility 1,000 feet	8/8	VV010	

10.3.4. Layer Heights. Heights of layers will be reported in hundreds of feet and rounded to the nearest reportable increment. When a value falls halfway between two reportable increments, the lower value will be reported. When a cloud layer is 50 feet or less above the surface, the height reported is 000. **Table 10.4.** provides the increments of reportable values of sky cover height

Table 10.4. Increments of Reportable Values of Sky Cover Height

Range of Height Values (feet)	Reportable Increments (feet)
≤ 50 feet	Round down to 000 feet
> 50 feet but ≤ 5,000 feet	To the nearest 100 feet
> 5,000 feet but ≤ 10,000 feet	To the nearest 500 feet
> 10,000 feet	To the nearest 1,000 feet

10.3.5. Observing Sky Cover. Evaluations of sky cover will include any clouds or obscurations (partial and indefinite ceilings) detected from the observing location. It will be evaluated with reference to the surface.

10.3.5.1. Evaluate sky cover amounts as follows, beginning with the lowest layer and preceding in ascending order of height.

10.3.5.2. Estimate the amount of sky cover for the lowest layer present to include surface-based obscurations. Consider a trace of cloud or obscuration as one-eighth when it is the lowest layer. At mountain locations, if the cloud layer is below the unit's station elevation, the height of the layer will be reported as ///.

10.3.5.3. For each additional layer of cloud or obscuration present above the lowest layer, estimate the amount of sky cover for the individual layer, and the summation total sky cover. In determining the summation total, disregard amounts that are visible through lower clouds.

10.3.6. Observing Variable Amounts of Sky Cover. The sky cover will be considered variable if a sky condition below 3,000 feet varies by one or more reportable values (FEW, SCT, BKN, or OVC) during the period of evaluation.

10.3.6.1. Report a variable sky condition remark if the sky cover below 3,000 feet varies by one or more reportable values (FEW, SCT, BKN, OVC) during the period of observation. For example, a cloud layer at 1,400 feet varying between broken and overcast would be encoded BKN014 V OVC. See **Attachment 3**, Table of Remarks for encoding procedures.

10.3.7. Observing Variable Ceiling Height. A term that describes a sky condition when the ceiling height below 3,000 feet is rapidly increasing and decreasing during the period of observation by the criteria listed in **Table 10.5.** Report variable ceilings only if considered operationally significant.

10.3.7.1. When a ceiling height below 3,000 feet is varying during the period of observation, encode and report the range of variability in remarks. See **Attachment 3**, Table of Remarks for encoding procedures.

Table 10.5. Criteria for Variable Ceiling.

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

10.3.8. Observing Stratification of Sky Cover. Sky cover will be separated into layers with each layer containing clouds and/or obscurations, (i.e., smoke, haze, fog, etc.) with bases at about the same height.

10.3.9. Observing Obscurations. The portion of sky (including higher clouds, the moon, or stars) hidden by weather phenomena at the surface or aloft.

10.3.10. Observing Vertical Visibility. Vertical visibility will be one of the following:

10.3.10.1. The distance a weather technician can see vertically into an indefinite ceiling.

10.3.10.2. The height corresponding to the upper limit of a laser beam ceilometer reading.

10.3.11. Observing the Ceiling. The lowest layer that is reported as broken or overcast will be called the ceiling. If the sky is totally obscured, the height of the vertical visibility will be the ceiling.

10.3.12. Height of Sky Cover. A ceilometer or known heights of unobscured portions of abrupt, isolated objects within 1 1/2 statute miles (2400 meters) of a runway will be used to measure the height of layers aloft. The height of a layer will be the average height of the cloud bases or obscurations for the evaluated layer. Layers of clouds 50 feet or less will be regarded as layers aloft and have a height of 0 feet. Additional ceiling height methods include:

10.3.12.1. AN/TMQ-53, Tactical Meteorological Observing System (TMOS), or other tactical meteorological (TACMET) equipment.

10.3.12.2. Tactical Laser Range Finder. 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 will display cloud bases at a height greater than the actual height.

10.3.12.3. Pilot Weather Reports (PIREPs). Use sky cover information from local PIREPs to help determine cloud heights in the body of the observation if, in the judgment of weather technician, it is representative of conditions over the airfield. Convert cloud bases reported in PIREPs above mean sea level (MSL) to above ground level (AGL) before using in observations. Reevaluate sky cover and ceiling heights upon receipt of local pilot reports indicating an operationally significant deviation from the current observation.

10.3.12.4. Known heights of unobscured portions of natural landmarks or objects within 1 1/2 statute miles (2400 meters) from the airfield.

10.3.12.5. Ascension rate of a ceiling balloon.

10.3.12.6. Use of Convective Cloud-Base Height Diagram. Use the diagram in **Table 10.6.** only to estimate the height of cumulus clouds formed in the vicinity of your unit. It cannot be used at units in mountainous or hilly terrain, or to determine the height of other than cumulus clouds. This diagram is most accurate when used to determine the height of cloud bases below 5,000 feet. Use the dry-bulb temperature and dew point to obtain the height of cloud bases above the point of observation.

Table 10.6. Convective Cloud Height Estimates.

CONVECTIVE CLOUD-BASE HEIGHT TABLE			
Dewpoint Depression (°C)	**Estimated Cloud Base Height (ft)**	**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

10.3.12.7. The apparent size of cloud elements, rolls, or features visible in the layer. Large rolls or elements greater than 5 degrees wide (three fingers is about 5 degrees when at arms length) usually indicate the layer is relatively low. Small rolls or elements between 1 and 5 degrees wide (the little finger is about 1 degree wide when at arms length) usually indicate the layer is relatively high.

10.3.12.8. The reflection of city or other lights at night can be used. At night, lights may reflect off the base of a layer. This could help estimate the layers height. For example, a cloud layer over a city to the west may be noticeably illuminated when the base is 5,000 feet or lower. However, a layer may be 1,000 feet or lower for any appreciable illumination from a small town to the northeast of the unit's location.

Chapter 11

TEMPERATURE AND DEW POINT

11.1. Introduction. This chapter describes observing, determining, and reporting the temperature and dew point temperature in a surface observation. Dew point and relative humidity are calculated with respect to water at all temperatures.

11.2. Definitions.

11.2.1. Air Temperature. A measure of the average kinetic energy of the molecules of the air. It is commonly measured according to the Fahrenheit and Celsius scales. See **Table 11.1.** for a Fahrenheit to Celsius temperature conversion chart.

11.2.2. Dew Point. The temperature to which a given parcel of air must be cooled at constant pressure and constant water vapor content in order for saturation to occur.

11.2.3. Dry-bulb. Technically, the ambient temperature that is registered by the dry-bulb thermometer of a psychrometer. However, it is identical with the temperature of the air and may also be used in that sense.

11.2.4. Wet-bulb. The temperature an air parcel would have if cooled adiabatically to saturation at constant pressure by evaporation of water into it, all latent heat being supplied by the parcel. It differs from the dry-bulb temperature by an amount dependent on the moisture content of the air and, therefore, is generally the same as or lower than the dry-bulb temperature.

11.2.5. Psychrometer. An instrument used for measuring the water vapor content of the air. It consists of two ordinary glass thermometers; a dry bulb and a wet bulb. The wet bulb thermometer is covered with a clean muslin wick that is saturated with water before an observation. When the bulbs are properly ventilated, they indicate the wet- and dry-bulb temperatures of the atmosphere. Ventilation is achieved by whirling the thermometers with a handle and a swivel link until the maximum wet-bulb depression has been obtained. This is commonly known as the sling psychrometer.

11.2.6. Psychometric Calculator. A circular slide rule used to compute dew point and relative humidity from known values of dry- and wet-bulb temperature and the normal unit atmospheric pressure. Instructions for the use of this calculator are printed on it.

11.2.7. Psychometric Tables. Tables prepared from a psychrometric formula and used to obtain dew point and relative humidity from known values of dry- and wet-bulb temperature.

11.2.8. Relative Humidity. The ratio, expressed as a percentage, of the actual vapor pressure of the air to the saturation vapor pressure.

11.2.9. Wet-Bulb Depression. The mathematical difference between the dry- and wet-bulb temperatures.

11.3. Observing Procedures. For aircraft operations, temperature data is required in reference to the airfield runways. Normally, data measured at another location on the airfield are sufficiently representative of the temperature over the runway.

11.3.1. Unit of Measure. Temperature data are required with respect to the Celsius scale in METAR observations. The accuracy of an individual temperature is dependent upon its use, as stated below.

11.3.1.1. To the nearest whole degree in the body of METAR/SPECI/LOCAL observations.

11.3.1.2. To the nearest 0.1 degree when used in computations and when reported in remarks.

11.3.2. Observation Periods. As a minimum, air and dew point temperatures are required to be reported in each METAR, SPECI, and a LOCAL observation taken for an aircraft mishap. Maximum and minimum temperatures, where appropriate, are normally determined at 6-hourly synoptic times and midnight LST as specified in **Part 1**.

11.3.3. Determination of Air and Dew point Temperatures. When an automatic sensing system (e.g., AN/FMQ-8) is available and functioning within operational limits, obtain air and dew point temperatures by direct reading of the respective indicators. Otherwise, obtain the data from a psychrometer and psychrometric calculator, or from the AN/TMQ-53, Tactical Meteorological Observing System (TMOS), or other tactical meteorological (TACMET) equipment. Obtain data from the psychrometer according to procedures in **paragraph 11.4.,** or according to the equipment TO and/or operating manual for the AN/TMQ-53 and TACMET..

11.3.4. Maximum and Minimum Temperatures. The maximum and minimum temperatures are the highest and the lowest temperature values respectively for a particular day. Obtain maximum and minimum temperatures using the following procedures or priorities:

11.3.4.1. Instrumental. Determine the maximum and minimum temperature extremes of the day from digital readout or temperature recording equipment (e.g., AN/FMQ-8).

11.3.4.2. Maximum and Minimum Thermometers. Determine the maximum and minimum temperatures using maximum and minimum thermometers if available.

11.3.4.3. Hourly Temperature Record. If maximum or minimum thermometers are not available, use the air temperature entries from column 7 of the AF Form 3803/3813 (24-hour units only).

11.3.5. Relative Humidity. When a local requirement exists, calculate relative humidity (RH) using observed temperature data and the psychrometric calculator. Instructions for obtaining RH are printed on the calculator disks.

11.4. Use of Sling Psychrometer. Obtain dry-bulb and wet-bulb temperature values by following the instructions below, or the appropriate TO or operating manual.

11.4.1. Exposure. Prior to actual use for temperature measurements, the psychrometer must be exposed to the outside free air (in a shaded location) long enough to allow the instrument to reach thermal equilibrium (normally 15 minutes). When not in use, it should be kept in a clean, dust-free location to prevent the wick from getting dirty.

11.4.2. Moistening the Wet-Bulb Wick. Water used to moisten the wet-bulb thermometer wick must be free of mineral matter to prevent the wick from becoming stiff and the bulb encrusted with minerals. Use distilled water, rainwater, or melted snow. Store the water in a covered container and replace it as often as necessary (usually once a week).

11.4.2.1. The wick must be kept clean to obtain accurate readings. Change the wick as often as necessary to ensure a clean wick is used. Moisten the wick before ventilating the psychrometer as follows:

11.4.2.1.1. When the wet-bulb temperature is above 37°F (3°C), moisten the wick just before ventilating (even if the humidity is high and the wick appears wet). If the wet-bulb temperature is expected to be 32°F (0°C) or less, moisten the wick several minutes before ventilation so a drop of water forms on the end of the bulb.

11.4.2.1.2. Use pre-cooled water whenever practical in areas where the temperature is high and the relative humidity is low. Moisten the wick thoroughly several minutes before and again at the time of ventilation. This helps reduce the temperature and prevents the wick from drying out during ventilation. When this procedure is not completely effective, keep the wick extended into an open container of water between observations.

11.4.2.1.3. At dry-bulb temperatures of 37°F (3°C) or below, use room temperature water to completely melt any accumulation of ice on the wick. Moisten the wick thoroughly (at least 15 minutes before ventilation) to permit the latent heat of fusion (released when water freezes) to dissipate before ventilation begins. Do not allow excess water to remain on the wick since a thin ice coating is necessary for accurate data. If the wick is not frozen at wet-bulb temperatures below 32°F (O°C), touch the wick with clean ice, snow, or other cold objects to induce freezing. If you are unable to induce freezing, use the low temperature range of the psychrometric calculator for computation.

11.4.3. Preparation of the Dry Bulb. When appropriate, take the following actions before ventilating the psychrometer:

11.4.3.1. When dew or frost is expected, check the dry-bulb thermometer 10 to 15 minutes before ventilation. Remove any collection of dew or frost from the thermometer with a soft cloth and allow sufficient time for the dissipation of extraneous heat before ventilation.

11.4.3.2. The dry-bulb temperature must be obtained before beginning ventilation when precipitation is occurring. If there is moisture on the thermometer, wipe it dry with a soft cloth and shield the thermometer from the precipitation to permit dissipation of any extraneous heat before reading the temperature.

11.4.4. Ventilating the Psychrometer. To insure proper ventilation of the sling psychrometer, the air should pass over the psychrometer bulbs at a minimum of 15 feet per second. Using the sling psychrometer as a backup, swing the instrument so it revolves at two revolutions per second. Select a shady spot with no obstructions within a radius of 3 to 4 feet and face into the wind. Hold the instrument to your front and waist high while slinging it. Keep the instrument in the shade of your body as much as practical, but not so close that body heat affects the readings. After the wick of the wet-bulb thermometer has been properly moistened, use the following steps as a guide in ventilating the sling psychrometer:

11.4.4.1. Begin by ventilating the psychrometer for about 15 seconds. Read the wet-bulb thermometer, making a note of the reading.

11.4.4.2. Ventilate for another 10 seconds and again note the wet-bulb reading. Continue this process at 10-second intervals until successive readings are within 1°F or less of each other. Then ventilate the instrument at 5-second intervals, reading the indication after each ventilation.

11.4.4.3. When two consecutive readings show no further decrease, the wet-bulb temperature has been reached. Read this temperature to the nearest 0.1°F. As quickly as possible, read the dry-bulb temperature to the nearest 0.1°F. Record both temperatures. **NOTE:** If the wet-bulb temperature rises between successive readings, remoisten the wick and ventilate again.

11.4.5. Dew point Equal to or Exceeding Air Temperature. Provided the sling psychrometer in use is functioning within operational limits, obtain dew point temperature using the following procedures when it equals or exceeds the dry-bulb temperature:

11.4.5.1. If fog (other than ice fog) is present or the wick of the wet bulb is not frozen, assume the wet-bulb and dew point temperatures, with respect to water, to be the same as the dry-bulb temperature.

11.4.5.2. If ice fog is present or the wet-bulb wick is frozen, assume the wet-bulb and the dew point temperatures, with respect to ice, to be the same as the dry-bulb temperature. Convert them to their water equivalent, using the psychrometric calculator.

11.4.5.3. If the dry-bulb temperature is -30°F (-34°C) or below, assume that the dew point with respect to ice is the same as the dry-bulb temperature and convert it to the corresponding dew point with respect to water using a psychrometric calculator.

11.5. Use of the Psychrometric Calculator. Use the pressure scale (colored ring) on the calculator based on the current station pressure. Instructions for the use of the calculator are printed on the disks.

11.5.1. Determine the wet-bulb depression to compute the dew point temperature. Algebraically subtract the wet-bulb temperature from the dry-bulb temperature. **Figure 11.1.** provides an example.

Figure 11.1. Example Wet-bulb Depression.

Dry-bulb	Wet-bulb	Wet-bulb Depression
33.8	23.5	10.3
-6.7	-7.4	0.7
1.2	-0.7	1.9

Table 11.1. Conversion of Temperature—Fahrenheit to Celsius.

From	To	oC	From	To	oC	From	To	oC	From	To	oC
128.3	130.0	54	83.3	85.0	29	38.3	40.0	04	-4.6	-3.1	M20
126.5	128.2	53	81.5	83.2	28	36.5	38.2	03	-6.6	-4.7	M21
124.7	126.4	52	79.7	81.4	27	34.7	36.4	02	-8.4	-6.7	M22
122.9	124.6	51	77.9	79.6	26	32.9	34.6	01	-10.2	-8.5	M23
121.2	122.8	50	76.1	77.8	25	32.0	32.8	00	-12.0	-10.3	M24
119.3	121.0	49	74.3	76.0	24	31.2	31.9	M00	-13.8	-12.1	M25
117.5	119.2	48	72.5	74.2	23	29.4	31.1	M01	-15.6	-13.9	M26
115.7	117.4	47	70.7	72.4	22	27.6	29.3	M02	-17.4	-15.7	M27
113.9	115.6	46	68.9	70.6	21	25.8	27.5	M03	-19.2	-17.5	M28
112.1	113.8	45	67.1	68.8	20	24.0	25.7	M04	-21.0	-19.3	M29
110.3	112.0	44	65.3	67.0	19	22.2	23.9	M05	-22.8	-21.1	M30
108.5	110.2	43	63.5	65.2	18	20.4	22.1	M06	-24.6	-22.9	M31
106.7	108.4	42	61.7	63.4	17	18.6	20.3	M07	-26.4	-24.7	M32
104.9	106.6	41	59.9	61.6	16	16.8	18.5	M08	-28.2	-26.5	M33
103.1	104.8	40	58.1	59.8	15	15.0	16.7	M09	-30.0	-28.3	M34
101.3	103.0	39	56.3	58.0	14	13.2	14.9	M10	-31.8	-30.1	M35
99.5	101.2	38	54.5	56.2	13	11.4	13.1	M11	-33.6	-31.9	M36
97.7	99.4	37	52.7	54.4	12	9.6	11.3	M12	-35.4	-33.7	M37
95.9	97.6	36	50.9	52.6	11	7.8	9.5	M13	-37.2	-35.5	M38
94.1	95.8	35	49.1	50.8	10	6.0	7.7	M14	-39.0	-37.3	M39
92.3	94.0	34	47.3	49.0	09	4.2	5.9	M15	-40.8	-39.1	M40
90.5	92.2	33	45.5	47.2	08	2.4	4.1	M16	-42.6	-40.9	M41
88.7	90.4	32	43.7	45.4	07	0.6	2.3	M17	-44.4	-42.7	M42
86.9	88.6	31	41.9	43.6	06	-1.2	0.5	M18	-46.2	-44.5	M43
85.1	86.8	30	40.1	41.8	05	-3.0	-1.3	M19	-48.0	-46.3	M44

NOTE: Temperature exceeding the extremes in this table may be converted using the Smithsonian Meteorological Tables or the formula: 5/9(F-32) = °C. For example:

For 131.0°F: 5/9(131-32) = 5 X 11 = 55ºC

For –48.5ºF: 5/9(-48.5-32) = 5/9 X –80.5 = -402.5/9 = -44.7 or -45ºC

Chapter 12

PRESSURE

12.1. General Information. This chapter contains instructions for making routine pressure determinations and instrumental comparisons. Do not use any pressure-measuring instrument with known or suspected erroneous indications.

12.2. Standard Definitions.

12.2.1. Altimeter Setting (QNH). Altimeter setting defines the pressure value to which an aircraft altimeter scale is set so that the altimeter indicates the altitude above mean sea level of an aircraft on the ground at the location for which the value was determined.

12.2.2. Atmospheric Pressure. The pressure exerted by the atmosphere at a given point.

12.2.3. Barometric Pressure. The atmospheric pressure measured by a barometer.

12.2.4. Density Altitude (DA). The pressure altitude corrected for virtual temperature deviations from the standard atmosphere.

12.2.5. Field Elevation (Ha). 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.

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

12.2.7. Non-tactical Barometer. A barometer tasked for use as the primary pressure instrument or as the primary alternate for a Digital Barometer and Altimeter Setting Indicator (DBASI) at a permanent-type site and not intended for deployment.

12.2.8. Pressure-Altitude (PA). The altitude, in the standard atmosphere, at which a given pressure will be observed. It is the indicated altitude of a pressure altimeter at an altitude setting of 29.92 inches (1013.2 hPa) of mercury and is therefore the indicated altitude above or below the 29.92 inches constant-pressure surface.

12.2.9. Pressure Falling Rapidly. A fall in station pressure at the rate of 0.06-inch Hg (2.0 hPa) or more per hour with a total fall of at least 0.02-inch Hg (0.7 hPa) at the time of an observation.

12.2.10. Pressure Rising Rapidly. A rise in station pressure at the rate of 0.06-inch Hg (2.0 hPa) or more per hour with a total rise of at least 0.02-inch Hg (0.7 hPa) at the time of observation.

12.2.11. Pressure Tendency. The pressure characteristic and amount of pressure change during a specified period, usually the 3-hour period preceding an observation.

12.2.12. Q-Signals. Encoded abbreviations used to ask questions, answer questions, and send information. Common signals used to request or identify pressure data are listed below:

12.2.12.1. QNH. This term designates the altimeter setting. At times, the pilot may request this value in hPa. If requested, convert the current altimeter setting in inches to hPa using **Table 12.5.**, and round the value down to the nearest whole hPa, e.g., QNH = 29.41 inches = 995.9 hPa = 995 hPa.

12.2.12.2. QFE. This term designates station pressure. At times the pilot may request this value in hPa. When such a request is received, the current station pressure in inches will be converted to hPa and rounded down to the nearest whole hPa, e.g., QFE = 30.14 inches = 1020.7 hPa = 1020 hPa.

12.2.12.3. QNE. This term designates pressure altitude.

12.2.12.4. QFF. This term designates sea-level pressure.

12.2.13. Removal Correction. A value applied to a pressure reading to compensate for the difference in height between the elevation of the pressure instrument and station elevation.

12.2.14. Sea Level Pressure. A pressure value obtained by 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 unit (station) and the properties of the hypothetical atmosphere are related to conditions observed at the unit.

12.2.15. Standard Atmosphere. A hypothetical vertical distribution of the atmospheric temperature, pressure, and density, which by international agreement, is considered representative of the atmosphere for pressure altimeter calibrations and other purposes.

12.2.16. Station Pressure. The atmospheric pressure at the unit's assigned station elevation (Hp).

12.2.17. Tactical Barometer**.** A pressure-measuring device (regardless of nomenclature) tasked for deployment (mobility), contingencies, or exercises.

12.3. Observing Procedures.

12.3.1. General. All atmospheric pressure measurements are made on the basis of instrumental evaluation. They will vary according to local requirements and the type of equipment used. Each unit with surface observing responsibilities must establish a barometry program. Instructions in the following paragraphs are generally limited to those aspects of barometry required by weather personnel in making routine pressure measurements for aviation observations.

12.3.1.1. Units of Measure. In the United States and at military units overseas, data is normally expressed with respect to inches of mercury for station pressure and altimeter setting, and with respect to hectopascals (hPa) for sea-level pressure. The common international unit of measure is hPa for all pressure data (one hPa = one millibar). When required for international aviation purposes, provide pressure data in whole hPa (rounding down in disposing of tenths of an hPa). However, until hectopascals are totally accepted in the verbal and written terminology, the term *millibar* may be used interchangeably with hPa.

12.3.1.2. Priority of Instruments. Obtain pressure data for routine observations using an instrument from the following priority list. The listing is based on instrument availability and the assumption the respective instrument is properly calibrated.

12.3.1.2.1. Digital Barometer and Altimeter Setting Indicator (DBASI), ML-658.

12.3.1.2.2. Aneroid Barometer (ML-488/UM, FA-185260, or ML-102).

12.3.1.2.3. Altimeter Setting Indicator (ASI).

12.3.1.2.4. AN/TMQ-53, Tactical Meteorological Observing System (TMOS), hand-held tactical aneroid barometer (AFWA-approved), or other tactical meteorological (TACMET) equipment.

12.3.1.2.5. Aircraft altimeter.

NOTE: All permanent manual observing locations providing direct observing support to flying operations will have a DBASI as the primary pressure instrument, and all DBASI locations should have a backup pressure measuring device.

12.3.1.3. Estimated Pressure Values. Although all pressure data are instrumentally derived, values must be classified as estimated under certain conditions. The altimeter, station pressure, and all other pressure data will be classified as estimated as follows:

12.3.1.3.1. Any correction factor is based on an approximation.

12.3.1.3.2. The unit's DBASI has not been calibrated within the past 120 days.

12.3.1.3.3. The horizontal distance between the DBASI and the backup pressure instrument exceeds 1 mile (1600 meters) or the difference in elevation exceeds 100 feet (30 meters) and the barometer is in use.

12.3.1.3.4. The aneroid instrument is not standardized quarterly with the unit's DBASI. At locations without a DBASI, discontinue use of the pressure instrument if not calibrated the past 12 months.

12.3.1.3.5. The aneroid pressure observation is made during periods of gusty or high surface winds, in the range of 25 knots or greater, and there is any indication that the wind is adversely affecting instrumental values. Example indications include a visible pumping (or vibration) effect in the aneroid barometer pointer.

12.3.1.3.6. A scheduled barometer comparison is delayed and the reliability of the previous correction is suspected to be in error by more than 0.010 inch Hg (0.30 hPa). This decision should be as objective as practical and based on such factors as past instrument performance, the length of the delay, and the reason for the delay.

12.3.1.3.7. Anytime pressure readings are suspect in the opinion of weather personnel.

12.3.1.3.8. When tactical equipment is used s a back up to the DBASI. See **Part 1, paragraph 2.5.** for additional information on using backup pressure equipment.

12.3.2. Determination of Station Pressure. Determine station pressure as necessary for use in the surface observation and for computation of other pressure or pressure-related data. The following procedures summarize the common steps used to determine station pressure:

12.3.2.1. Obtain a pressure reading from the appropriate instrument.

12.3.2.2. Determine and apply appropriate corrections to the pressure reading, e.g., algebraically add the posted correction to an aneroid barometer reading.

12.3.2.3. When necessary, convert the corrected pressure reading from hPa to inches of mercury.

12.3.3. Determination of Altimeter Setting. Read directly from the DBASI or compute an altimeter setting based on a current station pressure value using the method of determination applicable to the unit (e.g., pressure reduction computer, reduction constant, or altimeter setting table).

12.3.3.1. Determine altimeter settings as necessary for use in surface observations, upon request, and as otherwise necessary to meet local requirements (i.e., as determined through coordination with using agencies). Normally, compute values to the nearest 0.01-inch Hg, i.e., unless required in hPa for international aviation purposes.

12.3.3.2. During periods between record (hourly) observations, determine an altimeter setting at an interval not to exceed 35 minutes since the last determination. Report this value (e.g., as a single element LOCAL or in a METAR or SPECI taken within the established time interval) when there has been a change of 0.01 inch Hg (0.3 hPa) or more since the last locally disseminated value.

12.3.3.3. During periods in which there is limited air traffic, no ATC personnel on duty, etc., the following procedures may be used as an alternative to the requirement specified in **paragraph 12.3.3.2.** In such cases, a formal agreement must be established (and reconfirmed annually) with the airfield commander and local agencies concerned. The agreement must include the following requirements for updating altimeter settings during periods when this procedure is applicable:

12.3.3.3.1. The ATC agency must ensure weather personnel are notified at least 30 minutes before each aircraft arrival and departure.

12.3.3.3.2. As soon as possible following each notification of aircraft arrival and departure, weather personnel will determine and report a current altimeter setting if the last locally disseminated value was determined more than 30 minutes before the time of notification.

12.3.3.3.3. At locations where an operational ASI is installed in the control tower, the requirement in **paragraph 12.3.3.2.** may be considered not applicable provided the control tower is the only ATC agency requiring altimeter settings and ATC personnel routinely check the ASI for accuracy. A formal agreement must be established (and reconfirmed annually) with the airfield commander and the commander or authorized representative of the local ATC agency to establish the conditions above and to reaffirm the exemption from the requirement in **paragraph 12.3.3.2.**

12.3.4. Pressure Tendency. Pressure tendency and amount of change (reported in the Additive Data 5appp group) are computed automatically by N-TFS equipment for every 3-hour observation. To determine pressure tendency and amount of change manually, use the following procedures:

12.3.4.1. Determine the pressure tendency character (the "a" in the 5appp group) from the 3-hour trend of the altimeter settings entered in column 12 of AF Form 3803/3813. Using the code figures in **Table 12.1.**, choose the figure which best describes the character of the change from the altimeter trend.

12.3.4.2. Determine the net change in station pressure (the "ppp" in the 5appp group) for the preceding 3 hours to the nearest 0.005-inch by subtracting the current station pressure from the station pressure from 3 hours ago recorded in column 17 of AF Form 3803/3813. Disregard the +/- sign; is not significant to determining net change. Use **Table 12.2.** to select the code figure that corresponds to the net change. Limited-duty units can access the Automated Observing System (AOS) to obtain past pressure information, if available.

12.3.4.3. 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.

Table 12.1. Pressure Tendency Character.

Primary Requirement	Description	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, the 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 12.2. Amount of Barometric Change in Last 3 Hours.

Amount of Rise or Fall											
ppp						Ppp					
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.											

12.3.5. Determination of Pressure Altitude and Density Altitude. Compute PA and DA based on a current station pressure value and the method of determination applicable to the unit (e.g., pressure reduction computer or table for PA, density altitude computer for DA). Determine and report data as necessary to meet locally established requirements, e.g., in conjunction with each determination of altimeter setting. Compute data to at least the nearest 10 feet.

12.3.6. Determination of Sea-Level Pressure. Compute sea-level pressure (QFF) based on a current station pressure value and the method of determination applicable to the station (pressure reduction computer, reduction constant, or Sea Level Pressure table). Determine QFF values hourly, to the nearest 0.1 hPa. The QFF must be considered as estimated when the 12-hour mean temperature used in computations is based on an estimate of the air temperature 12 hours previously.

12.3.7. Determination of Significant Pressure Changes. When pressure is falling or rising rapidly at the time of an observation, report the condition in the remarks of the observation. When the pressure is rising or falling at a rate of 0.06-inch Hg per hour or more, totaling a change 0.02-inch Hg or more at the time of observation, the remark **PRESRR** (pressure rising rapidly) or **PRESFR** (pressure falling rapidly) will be included in the observation. These conditions may be considered operationally significant and included with an altimeter setting LOCAL or other observation disseminated to ATC personnel.

12.4. Standardization and Comparison Procedures. The unit's barometry program will be established and managed according to this manual. The instructions in this manual are generally limited to those procedures required by weather personnel in performing routine comparisons as a part of the unit's program. For requirements and actions beyond those presented in this manual, notify the supervisor for appropriate assistance. Management options in resolving a faulty aneroid are to: first, re-standardize the aneroid; next, reset and standardize; then, lastly, turn in the aneroid to supply (and order a replacement).

12.4.1. Standardization of Non-tactical Aneroid Barometers. Non-tactical aneroid barometers collocated with a DBASI will be standardized with the unit DBASI. Locations with a non-tactical aneroid barometer, but without a DBASI will coordinate with their supporting maintenance office to have a DBASI brought to their location annually to certify the aneroid barometer.

12.4.1.1. Criteria for Standardization. The requirement for standardization of a non-tactical aneroid barometer involves the determination of a correction to be applied to instrumental readings to obtain accurate pressure measurements. At units equipped with a DBASI, non-tactical aneroid barometers will be standardized as follows:

12.4.1.1.1. When a DBASI is initially installed, replaced, or relocated.

12.4.1.1.2. Within 10 days after return of the DBASI from the Test Measurement and Diagnostic Equipment Laboratory (TMDEL) following any calibration.

12.4.1.1.3. Quarterly, figured from the previous standardization (this will generally be near the midpoint between DBASI calibrations).

12.4.1.1.4. When an aneroid barometer is installed, reset, or relocated.

12.4.1.1.5. When a verified difference between station pressure from the DBASI and the corrected reading of the aneroid barometer is more than .010-inch Hg (0.30 hPa).

12.4.1.1.6. When any of the instruments have been subjected to a serious disturbance or shock, or other conditions or treatment that could adversely affect instrument performance. Carefully study the results from these comparative readings in an effort to determine the extent of any damage to the instrument and the effect on instrumental corrections. If instrument performance or calibration is suspect, contact the supervisor for appropriate assistance.

12.4.1.2. Standardization Procedures. All non-tactical aneroid barometers will be set to a zero correction against the DBASI from which they are compared. This may be accomplished by the supervisor and should not be done immediately after calibration by TMDEL without the supervision of qualified maintenance personnel. A note will be affixed to each aneroid instrument showing the field elevation and actual height (MSL) of the aneroid instrument during the standardization. Wait a minimum of 1 1/2 hours after resetting the instrument before accomplishing the following steps:

12.4.1.2.1. Make 10 comparisons of the aneroid with the DBASI and note the difference. If practical, take readings at hourly intervals, but as a minimum, take readings at an interval of no less than 15 minutes. Monitor each comparison for any indication of unreliable performance.

12.4.1.2.1.1. The correction of the current comparison should not differ from the preceding comparison by more than .010-inch Hg (0.30 hPa). If the difference exceeds this tolerance, immediately verify (preferably by another certified individual) by making a second comparison. If the first of these two comparisons appears to be erroneous disregarded and use the second comparison as one of the ten.

12.4.1.2.1.2. If comparisons reflect any evidence of unreliable performance, contact the supervisor for appropriate assistance.

12.4.1.2.2. Upon completion of the last of the 10 comparisons, compute the mean of the corrections (algebraically add the corrections and divide by 10). This will be your correction factor and should be marked on the face of the aneroid barometer.

12.4.1.2.3. If the correction factor exceeds the previous correction factor by 010-inch Hg (0.30 hPa), verify the correction by making a second comparison, preferably by another certified individual.

12.4.1.2.4. If an instrument cannot be standardized after a second attempt, notify the supervisor for appropriate assistance.

12.4.2. Standardization of Tactical Barometers. Tactical barometers (regardless of their type-digital or aneroid) will be qualified for operational use through a series of comparisons. At minimum, compare digital barometers against the unit's standard barometer semi-annually, and compare aneroid barometers quarterly. Most importantly, complete a comparison before deployment (when possible) and upon return from a deployment.

12.4.2.1. For digital barometers (i.e., AN/TMQ-53, Tactical Meteorological Observing System (TMOS), etc.), set up and operate the equipment IAW the TO and/or the operating manual.

12.4.2.2. For tactical aneroid barometers, set the barometer to read atmospheric pressure at the height of the unit's standard barometer (that is, the tactical barometer reflects the station pressure when the removal correction is applied). Then allow the tactical barometer to stabilize for 1 1/2 hours before beginning comparisons.

12.4.2.3. Make a series of at least four comparisons, not less than 15 minutes apart, against the unit standard. Establish a mean correction from the comparisons.

12.4.2.3.1. For digital barometers, apply the mean correction to the pressure readings, or adjust the pressure software to reflect the correction. If the mean correction exceeds .010-inch Hg (0.30 hPa), discontinue use and have maintenance performed on the pressure sensor.

12.4.2.3.2. For tactical aneroid barometers if the mean correction exceeds 0.03-inch Hg/1.0 hPa, adjust the aneroid pressure reading to a zero correction and reaccomplish the comparisons (after first allowing 1 1/2 hours for the aneroid to stabilize). Otherwise, apply the mean correction to the aneroid pressure readings until a new mean correction is determined.

12.4.2.3.3. Barometers at Locations with No Unit Standard. Compare each tactical barometer against any available calibrated pressure instrument (e.g., an aircraft altimeter; a nearby NWS/FAA ASI, aneroid barometer) following the same procedures as for locations with a unit standard.

12.4.2.4. Deployed Barometers. Conduct a daily barometer comparison against the most reliable calibrated pressure device available (a second deployed barometer or an aircraft altimeter). Redetermine the mean correction after each new series of four comparisons (use only comparisons made at the deployed site); use each new mean as the posted correction. The mean correction determined in garrison will be used at the deployed site until four on-site comparisons are made. While deployed, tactical barometers will not be reset; continue to use posted corrections determined after every fourth comparison. Wait until returning to garrison to reset the barometer. Do not use any pressure-measuring instrument with known or suspected erroneous indications.

12.4.3. Conditions for Delaying Non-tactical Aneroid Comparisons. The following guidelines summarize special limitations that weather personnel must consider in making routine barometer comparisons:

12.4.3.1. At units where the DBASI and the aneroid instrument are separated by more than 1 mile (1600 meters), a large horizontal pressure gradient may affect the representativeness of instrumental readings for comparison purposes. There is no practical means of determining the specific amount of such pressure gradients; however, there are a few indicators that may be used as a guide. These include the occurrence of significant pressure changes (see **paragraph** 12.3.7.) and a larger than usual difference in readings between the aneroid barometer and the DBASI. If there is any indication of a large pressure gradient affecting the pressure readings, delay making a scheduled barometer comparison.

12.4.3.2. High wind speeds occurring at the time of an aneroid pressure measurement generally induce an error in instrumental readings. Therefore, as a general practice, delay scheduled barometer comparisons during periods of gusty or high wind speeds in the range of 25 knots or greater.

12.4.3.3. Potentially significant errors can result if rapid temperature changes or steep horizontal and vertical temperature gradients exist in the proximity of the barometer. Delay a scheduled barometer comparison if there is any indication temperature changes are in fact affecting the accuracy of the reading.

12.4.4. Altimeter Setting Indicator (ASI). At units equipped with and using an ASI, establish a standardization and comparison program based on procedures comparable to those specified for the non-tactical aneroid barometer.

12.4.5. DBASI Calibration. Calibration of the DBASI is required every 120 days and accomplished by the base TMDEL personnel. Normally the only requirements for weather unit personnel in securing calibration of the DBASI are to:

12.4.5.1. Ensure calibrations are accomplished when required and calibration meets standards (TMDEL puts a white label on the DBASI).

12.4.5.2. Coordinate with maintenance personnel to ensure that the DBASI obtains a reasonable repair and calibration priority at the base TMDEL.

12.4.5.3. Ensure thumb-wheel switches have been returned to the proper settings after the DBASI is reinstalled.

12.5. Equipment Operation and Instrumental Evaluation.

12.5.1. General. Operate and use pressure-measuring instruments according to the appropriate TO and/or operating manuals.

12.5.2. DBASI (ML-658). Once the DBASI is installed, it will be used as the unit's standard measuring instrument. It is used to display the altimeter setting and station pressure.

12.5.3. Aneroid Barometer. Operation and use of an aneroid barometer depends primarily on whether it is used at a permanent-type location or in non-fixed operations. The appropriate TO and/or operating manual has procedures on reading each-type instrument.

12.5.4. Tactical Digital Instruments For digital barometers (i.e., AN/TMQ-53, Tactical Meteorological Observing System (TMOS), etc.) operate the equipment IAW the TO and/or the operating manual.

12.5.5. Tactical Aneroid Instruments. The following instructions summarize requirements for the use of aneroid instruments during mobile observing operations:

12.5.5.1. If the instrument has been transported by air, if it has otherwise been subjected to a rapid change of pressure of 100 hPa (3 inches Hg) or more, or if the temperature of the instrument is changed suddenly by an amount exceeding 10°F (5°C), wait at least 1 1/2 hours before taking a pressure reading from the instrument.

12.5.5.2. If possible, install the instrument indoors in a location least affected by drafts, heat, and the sun, i.e. where the temperature is as constant as practical.

12.5.5.3. A removal correction must be determined and applied to deployed aneroid barometers. This correction, along with the instrument correction, must be applied to all pressure values obtained from the instrument. The removal correction must be recomputed anytime an aneroid is relocated. See **paragraph 12.5.6.** for procedures.

12.5.5.4. The posted correction is the sum of the instrumental, temperature, and removal corrections.

12.5.5.5. A temperature correction for aneroid instruments is not normally required. However, if the instrument is located and used in an outdoor environment, a correction may be necessary for each pressure observation made. Refer to the TO or operating manual for the instrument being used to determine if a correction is required.

12.5.6. Aneroid Removal Correction Procedures. A removal correction is applied to a tactical aneroid barometer when the elevation of the instrument differs from field elevation. A removal correction is also applied to a non-tactical aneroid barometer when it is used in an alternate observation site **NOTES:** (1) The following depicts the standardization of an aneroid backup to a unit's DBASI. Both are located at the weather observing site. (2) Apply the alternate observing location (AOL) removal correction to the aneroid when it is in use at the AOL. Apply an instrument correction if applicable. Example AOL removal correction computation: (481' - 498') x .001 = -.017 (-.6hPa). The correction is negative because the aneroid is lowered when moved to the AOL. The correction used at the AOL is .1 + (-.6) = -.5 hPa (instrument correction removal correction).

12.5.6.1. Subtract the old aneroid barometer elevation from the new aneroid barometer elevation. If the elevation decreased, the sign of the difference will be negative. If the elevation increased, the sign of the difference will be positive.

12.5.6.2. Multiply the elevation difference (**12.5.6.1.**) by the pressure change factor of .001 (a statistical pressure change value for each 1 foot of height change). The result is a mean removal correction and may be used as a constant value.

12.5.7. Aircraft Altimeter. In the event an aircraft altimeter is the only instrument available, it may be used in obtaining estimated pressure data for the surface observation. Set the altitude scale to indicate the actual elevation of the instrument and take readings to the nearest 0.01-inch Hg.

12.5.8. Pressure Reduction Computer. The following procedures outline requirements in using the pressure reduction computer for computation of pressure data:

12.5.8.1. Altimeter Setting. Step-by-step procedures are printed on side II of the reduction computer. Compute the altimeter setting using station pressure to the nearest 0.005 inch Hg and station elevation to the nearest foot. If the station pressure is in hectopascals, the value can be readily converted to inches of mercury using the scale on side I of the computer. **Table 12.3.** provides examples of this process

Table 12.3. Determine Altimeter Setting.

	A	B	C	D
Station Pressure (inches Hg)	29.065	28.820	23.555	30.070
Station Elevation (feet)	763	1238	6545	165
Altimeter setting (inches Hg)	29.88	30.14	30.00	30.25

12.5.8.2. Pressure Altitude. Side II of the pressure reduction computer contains instructions for determining pressure altitude as a function of station pressure. Use station pressure (to the nearest 0.005-inch Hg) and read the pressure altitude from the computer to at least the nearest 10 feet. **Table 12.4.** provides examples of this process.

Table 12.4. Determine Pressure Altitude.

	A	B	C	D
Station Pressure (inches Hg)	29.065	28.820	23.555	30.070
Corresponding PA (feet)	+800	+1030	+6470	-140

Table 12.5. Conversion of Altimeter Setting From Inches of Mercury to Hectopascals.

Inch HG	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
	Hectopascals									
28.0	948.2	948.5	948.9	949.2	949.5	949.9	950.2	950.6	950.9	951.2
28.1	951.6	951.9	952.3	952.6	952.9	953.3	953.6	953.9	954.3	954.6
28.2	955.0	955.3	955.6	956.0	956.3	956.7	957.0	957.3	957.7	958.0
28.3	958.3	958.7	959.0	959.4	959.7	960.0	960.4	960.7	961.1	961.4
28.4	961.7	962.1	962.4	962.8	963.1	963.4	963.8	964.1	964.4	964.8
28.5	965.1	965.5	965.8	966.1	966.5	966.8	967.2	967.5	967.8	968.2
28.6	968.5	968.8	969.2	969.5	969.9	970.2	970.5	970.9	971.2	971.6
28.7	971.9	972.2	972.6	972.9	973.2	973.6	973.9	974.3	974.6	974.9
28.8	975.3	975.6	976.0	976.3	976.6	977.0	977.3	977.7	978.0	978.3
28.9	978.7	979.0	979.3	979.7	980.0	980.4	980.7	981.0	981.4	981.7
29.0	982.1	982.4	982.7	983.1	983.4	983.7	984.1	984.4	984.8	985.1
29.1	985.4	985.8	986.1	986.5	986.8	987.1	987.5	987.8	988.2	988.5
29.2	988.8	989.2	989.5	989.8	990.2	990.5	990.9	991.2	991.5	991.9
29.3	992.2	992.6	992.9	993.2	993.6	993.9	994.2	994.6	994.9	995.3
29.4	995.6	995.9	996.3	996.6	997.0	997.3	997.6	998.0	998.3	998.6
29.5	999.0	999.3	999.7	1000.0	1000.4	1000.7	1001.0	1001.4	1001.7	1002.0
29.6	1002.4	1002.7	1003.1	1003.4	1003.7	1004.1	1004.4	1004.7	1005.1	1005.4
29.7	1005.8	1006.1	1006.4	1006.8	1007.1	1007.5	1007.8	1008.1	1008.5	1008.8
29.8	1009.1	1009.5	1009.8	1010.2	1010.5	1010.8	1011.2	1011.5	1011.9	1012.2
29.9	1012.5	1012.9	1013.2	1013.5	1013.9	1014.2	1014.6	1014.9	1015.2	1015.6
30.0	1015.9	1016.3	1016.6	1016.9	1017.3	1017.6	1018.0	1018.3	1018.6	1019.0
30.1	1019.3	1019.6	1020.0	1020.3	1020.7	1021.0	1021.3	1021.7	1022.0	1022.4
30.2	1022.7	1023.0	1023.4	1023.7	1024.0	1024.4	1024.7	1025.1	1025.4	1025.7
30.3	1026.1	1026.4	1026.7	1027.1	1027.4	1027.8	1028.1	1028.4	1028.8	1029.1
30.4	1029.5	1029.8	1030.1	1030.5	1030.8	1031.2	1031.5	1031.8	1032.2	1032.5
30.5	1032.9	1033.2	1033.5	1033.9	1034.2	1034.5	1034.9	1035.2	1035.5	1035.9
30.6	1036.2	1036.6	1036.9	1037.3	1037.6	1037.9	1038.3	1038.6	1038.9	1039.2
30.7	1039.6	1040.0	1040.3	1040.6	1041.0	1041.3	1041.7	1042.0	1042.3	1042.7
30.8	1043.0	1043.3	1043.7	1044.0	1044.4	1044.7	1045.0	1045.4	1045.7	1046.1
30.9	1046.4	1046.7	1047.1	1047.4	1047.8	1048.1	1048.4	1048.8	1049.1	1049.5
NOTE: When provided for use by international aviators, the altimeter setting is rounded down to the nearest whole hectopascal, e.g., 29.14 inches Hg = 986.8 hPa, rounded down to 986 hPa.										

Chapter 13

PRECIPITATION MEASUREMENT

13.1. General Information. This chapter contains a description of the methods used to measure precipitation amounts and depth.

13.2. Equipment Operation and Instrumental Evaluation.

13.2.1. General. Precipitation measurements at garrison units are normally made by means of a standard 8-inch rain and snow gauge, the ML-17 (rain gauge). The ML-217 (a 4-inch plastic gauge) and automatic precipitation measuring devices also are used. For non-fixed location measurements, use the ML-217 or equivalent.

13.2.2. Installation of the Rain Gauge. Install the rain gauge in the open, away from such obstructions as buildings and trees. Low obstructions (e.g., bushes, walls, or fences) are usually beneficial in breaking the force of the wind. However, place the gauge no closer to an obstruction than a distance equal to the height of the object. If the gauge is mounted on top of a building, place it in the center of the roof whenever practical. The gauge must be made as level as is possible and installed securely so that it will not be blown over.

13.2.3. Use of the Rain Gauge for Precipitation Measurements. Measure precipitation amounts collected in the rain gauge as necessary for observing and reporting requirements established in **Part 1, Chapter 3**, normally at 3- and 6-hourly synoptic times and at midnight LST. The gauge may be emptied more frequently if necessary for local purposes, provided a record of precipitation amounts is maintained for use in determining the total amounts for applicable 3- and 6-hourly and midnight LST observations. Obtain precipitation amounts by means of the rain gauge using the following procedures as a guide:

13.2.3.1. Measurement of Liquid Precipitation. Determine the amount of liquid precipitation amounts by measuring the collection in the rain gauge using the ML-75 measuring stick to the nearest 0.01-inch. If only liquid precipitation has occurred during the period, the rain gauge will normally be emptied only after the 6-hourly measurement.

13.2.3.1.1. For the ML-17, slowly insert the ML-75 measuring stick into the measuring tube. Permit the stick to rest on the bottom for 2 to 3 seconds, withdraw the stick, and read the depth as the upper limit of the wet portion.

13.2.3.1.2. Whenever more than 2 inches of precipitation has fallen, the measuring tube will have overflowed, with the excess spilling into the overflow can. In such cases, obtain the total precipitation amount as follows.

13.2.3.1.3. Carefully remove and empty the measuring tube (when brimful, the tube contains exactly 2 inches of liquid precipitation).

13.2.3.1.4. Pour the liquid from the overflow container (if any) into the measuring tube and measure the amount as in **paragraph 13.2.3.1.1.**

13.2.3.1.5. If the measuring tube is filled one or more times, record 2 inches for each instance and continue to refill the tube until the last of the overflow has been measured.

13.2.3.1.6. Obtain the total precipitation by adding the individual amounts measured from the overflow container and measuring tube.

13.2.3.1.7. When measurements have been completed, empty the measuring tube (when appropriate) and reassemble the gauge.

13.2.3.2. Measurement of Water Equivalent for Frozen/Freezing Precipitation. When frozen/freezing precipitation is expected, remove the funnel and measuring tube from the gauge and store them indoors. Determine the amount of precipitation for the observation period based on the collection in the overflow container.

13.2.3.2.1. If the collection in the overflow container is considered representative, determine the water equivalent using the following procedure as a guide.

13.2.3.2.2. Add a measured quantity of warm water to the overflow container in order to melt the contents.

13.2.3.2.3. Pour the liquid into the measuring tube, obtain a measurement, and subtract an amount equal to that of the warm water added. The result is the actual precipitation amount measured to the nearest 0.01-inch (i.e., the water equivalent of the frozen/freezing precipitation).

13.2.3.2.4. If the collection in the overflow can is considered unrepresentative (e.g., due to strong winds), discard the catch and obtain a measurement by means of vertical core sampling or by estimation.

13.2.3.3. Core Sampling for Water Equivalent of Frozen/Freezing Precipitation. When the collection in the rain gauge is considered unrepresentative, precipitation amounts may be determined by means of core sampling. A core sample is a section cut from the snow/ice cover at a unit to determine the amount of water present in the solid state. Obtain the core sample in conjunction with snowfall and snow/ice depth measurements using the following procedures as a guide:

13.2.3.3.1. Invert the overflow container over the top of the snow/ice pack and lower it to the snowboard or other reference point for the new snowfall. Use the snowboard or other object to collect the sample within the area of the container.

13.2.3.3.2. Melt the collection to obtain the water content (as explained in **paragraphs 13.2.3.2.2.** and **13.2.3.2.3.**). Classify the amount as estimated if it is not considered representative of the actual snowfall.

13.3. Precipitation Measurement Procedures.

13.3.1. General. The measurement of precipitation is expressed in terms of vertical depth of water (or water equivalent in the case of solid forms) that reaches the surface during a specified period. In METAR observations, requirements for the measurement of precipitation are established to include both liquid and frozen amounts that have fallen and the total depth of solid forms on the ground at the time of observation. **NOTE:** The term solid is sometimes used as a synonym for frozen forms of precipitation.

13.3.2. Unit of Measurement. The basic unit of measurement is the inch. MAJCOMs or higher headquarters may require units to report in millimeters (mm) for liquid precipitation (or water equivalent) and centimeters (cm) for frozen precipitation and snow depth. Table 13.1. provides guidance for converting values from inches to millimeters.

13.3.2.1. Liquid precipitation (or water equivalent): To the nearest 0.01-inch. Less than 0.005-inch is termed a trace.

13.3.2.2. Frozen/Freezing precipitation: To the nearest 0.1-inch. Less than 0.05-inch is termed a trace.

13.3.2.3. Snow depth (any solid form): To the nearest whole inch. Less than 0.5-inch is termed a trace.

13.3.3. Observation Periods. Precipitation and snow depth measurements are normally obtained at 3- and 6-hourly synoptic times and at midnight LST. Make measurements more frequently when necessary to meet local or other support requirements.

13.3.4. Representative Area for Measurement of Solid Forms. In obtaining samples or measurements of snowfall and depth of snow on the ground, select an area that is smooth, level, preferably grass covered, and as free from drifting as possible. Avoid using paved areas and low spots where water tends to collect. Select an area that permits measurements to be taken in undisturbed snow.

13.3.4.1. As an aid in obtaining the measurement of new snowfall, place snowboards on top of the snow after each measurement. The next measurement can then be taken from the top of the snow to the snowboard.

13.3.4.2. A snowboard is an aid for measuring new snow fall. The snowboard can be a thin, light-colored wooden board or a thin light-colored, lightweight composite material board (composite material must be a poor conductor of heat). The snowboard must be at least 2 feet-by-2 feet (about 60 cm) square and should be at least 1/2 inch thick. Flag or mark snowboards in such a way that it is left undisturbed by non-weather personnel.

13.3.4.3. In using the area, start measurements along the edge nearest the unit to avoid unnecessary tracking of the snow. Unless the snow is very deep and drifting is pronounced, take a measurement 2 feet (about 60 cm) from previous measurements.

13.3.4.4. Irregularities caused by uneven terrain, drifting, and footsteps before sampling, etc., tend to introduce unavoidable errors in the measurements. Therefore, classify amounts as estimated if they are not considered representative.

13.3.5. Measurement of Precipitation Amounts (Water Equivalent). Water equivalent is an expression used to reflect the amount of liquid produced by the melting of solid forms of precipitation. Obtain precipitation amounts (or water equivalent) using the following procedures as a guide:

13.3.5.1. Under normal circumstances, obtain liquid precipitation amounts and the water equivalent of frozen/freezing precipitation using the collection in the rain gauge.

13.3.5.2. If the rain gauge collection is not considered representative, disregard the catch and classify the amount of precipitation as undeterminable when it consists entirely of liquid types. If possible, obtain water equivalent by means of core sampling or estimation when precipitation during the period consisted entirely of solid forms.

13.3.5.3. To estimate water equivalent of solid forms of precipitation, first obtain a measurement of the snowfall. Convert the actual depth to its water equivalent based on a 1:10 ratio (or other ratio if known to be representative for the unit or the snowfall). For example, if 1.6 inches of snow has fallen, the water equivalent is approximately .16 inch (1.6 divided by 10 = .16) in using a 1:10 ratio. For 4 cm (40 mm) of snowfall, the water equivalent is approximately 4 mm in using a 1:10 ratio.

13.3.5.3.1. Use **Table 13.2.** to help determine the water equivalent of new snowfall. Packing and melting/freezing has a substantial effect on the density of the snow pack and is not accounted for in this table.

13.3.6. Measurement of Snowfall (Solid Precipitation). For the purpose of snowfall measurements, the term snow also includes other types of freezing and frozen precipitation that fell during the measurement period. Obtain snowfall amounts using the following procedures as a guide.

13.3.6.1. Using a standard ruler (graduated in inches) or other suitable measuring device, measure the depth in several locations, preferably at points where the snow has fallen and is undisturbed by the wind. If practical, make these measurements using snowboards or a surface that has been cleared of previous snowfall. If the previous snowfall has crusted, the new fall may be measured by permitting the end of the ruler to rest on the crust.

13.3.6.1.1. If a suitable spot is not available and snowboards are not in place, the snowfall amount may be obtained by measuring the total depth of snow and subtracting the depth previously measured. This will normally be an estimation due to the effects of melting, sublimation, etc.

13.3.6.1.2. When melting or settling occurred between measurements, estimate the depth of new snow that would have collected if the melting or settling had not occurred. For instance, if several snow showers occur between observations and each melts before the following one occurs, the total snowfall for the period will be the sum of the maximum depth (measured or estimated) for each occurrence.

13.3.6.2. Obtain an average of the several measurements to the nearest 0.1-inch. Consider the amount as estimated if there is any doubt as to its accuracy, e.g., due to melting, drifting, etc.

13.3.6.3. When an accurate water equivalent of frozen precipitation has been obtained; the snowfall amount may be estimated based on a 1:10 ratio (or other ratio if known to be representative for the unit or the snowfall), i.e. as an alternative to procedures in **10.3.6.1.** For example, if the water equivalent of snowfall from the rain gauge is 0.16 inch, the actual amount of snowfall is approximately 1.6 inches (.16 times 10 = 1.6) using a 1:10 ratio. If the water equivalent is 4 mm, the actual amount of snowfall is approximately 40 mm (or 4 cm) using the 1:10 ratio.

13.3.7. Measurement of Total Snow Depth. For the purpose of snow depth measurements, the term snow also includes other types of frozen precipitation (e.g., ice pellets, hail) and sheet ice formed directly or indirectly from precipitation. Obtain total depth of snow in conjunction with snowfall measurements using the following procedures as a guide.

13.3.7.1. Using a standard ruler or other suitable measuring device, measure the total depth in several locations, preferably at points where the snow is undisturbed by the wind.

13.3.7.1.1. If the ground is covered with ice, cut through the ice with some suitable implement and measure its thickness. Add the thickness of the ice to the depth of snow above the ice.

13.3.7.1.2. When the snow has drifted, include the greatest and least depths in measurements from the representative area. For example, if spots with no snow are visible, use zero as one of the values.

13.3.7.1.3. Obtain an average of the several measurements, to the nearest whole inch.

13.3.7.2. Estimates of total depth may be obtained using snow stakes at units where this method is considered necessary and practical. In such cases, place several stakes in the most representative area available, i.e. where the snow is least likely to be disturbed within a few feet (or meters) of the stakes. Obtain an average depth by reference to graduated markings on the stakes.

Table 13.1. Conversion of Inches to Millimeters.

Inches	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
	Millimeters									
0.00	0.0	0.3	0.5	0.8	1.0	1.3	1.5	1.8	2.0	2.3
0.10	2.5	2.8	3.1	3.3	3.6	3.8	4.1	4.3	4.6	4.8
0.20	5.1	5.3	5.6	5.8	6.1	6.4	6.6	6.9	7.1	7.4
0.30	7.6	7.9	8.1	8.4	8.6	8.9	9.1	9.4	9.7	9.9
0.40	10.2	10.4	10.7	10.9	11.2	11.4	11.7	11.9	12.2	12.5
0.50	12.7	13.0	13.2	13.5	13.7	14.0	14.2	14.5	14.7	15.0
0.60	15.2	15.5	15.8	16.0	16.3	16.5	16.8	17.0	17.3	17.5
0.70	17.8	18.0	18.3	18.5	18.8	19.1	19.3	19.6	19.8	20.1
0.80	20.3	20.6	20.8	21.1	21.3	21.6	21.8	22.1	22.4	22.6
0.90	22.9	23.1	23.4	23.6	23.9	24.1	24.4	24.6	24.9	25.2
1.00	25.4	25.7	25.9	26.2	26.4	26.7	26.9	27.2	27.4	27.7
1.10	27.9	28.2	28.5	28.7	29.0	29.2	29.5	29.7	30.0	30.2
1.20	30.5	30.7	31.0	31.2	31.5	31.8	32.0	32.3	32.5	32.8
1.30	33.0	33.3	33.5	33.8	34.0	34.3	34.5	34.8	35.1	35.3
1.40	35.6	35.8	36.1	36.3	36.6	36.8	37.1	37.3	37.6	37.9
1.50	38.1	38.4	38.6	38.9	39.1	39.4	39.6	39.9	40.1	40.4
1.60	40.6	40.9	41.2	41.4	41.7	41.9	42.2	42.4	42.7	42.9
1.70	43.2	43.4	43.7	43.9	44.2	44.5	44.7	45.0	45.2	45.5
1.80	45.7	46.0	46.2	46.5	46.7	47.0	47.2	47.5	47.8	48.0
1.90	48.3	48.5	48.8	49.0	49.3	49.5	49.8	50.0	50.3	50.6
2.00	50.8	51.1	51.3	51.6	51.8	52.1	52.3	52.6	52.8	53.1
2.10	53.3	53.6	53.9	54.1	54.4	54.6	54.9	55.1	55.4	55.6
2.20	55.9	56.1	56.4	56.6	56.9	57.2	57.4	57.7	57.9	58.2
2.30	58.4	58.7	58.9	59.2	59.4	59.7	59.9	60.2	60.5	60.7
2.40	61.0	61.2	61.5	61.7	62.0	62.2	62.5	62.7	63.0	63.3
2.50	63.5	63.8	64.0	64.3	64.5	64.8	65.0	65.3	65.5	65.8
2.60	66.0	66.3	66.6	66.8	67.1	67.3	67.6	67.8	68.1	68.3
2.70	68.6	68.8	69.1	69.3	69.6	69.9	70.1	70.4	70.6	70.9
2.80	71.1	71.4	71.6	71.9	72.1	72.4	72.6	72.9	73.2	73.4
2.90	73.7	73.9	74.2	74.4	74.7	74.9	75.2	75.4	75.7	76.0
3.00	76.2	76.5	76.7	77.0	77.2	77.5	77.7	78.0	78.2	78.5
3.10	78.7	79.0	79.3	79.5	79.8	80.0	80.3	80.5	80.8	81.0
3.20	81.3	81.5	81.8	82.0	82.3	82.6	82.8	83.1	83.3	83.6
3.30	83.8	84.1	84.3	84.6	84.8	85.1	85.3	85.6	85.9	86.1
3.40	86.4	86.6	86.9	87.1	87.4	87.6	87.9	88.1	88.4	88.7
3.50	88.9	89.2	89.4	89.7	89.9	90.2	90.4	90.7	90.9	91.2
3.60	91.4	91.7	92.0	92.2	92.5	92.7	93.0	93.2	93.5	93.7
3.70	94.0	94.2	94.5	94.7	95.0	95.3	95.5	95.8	96.0	96.3
3.80	96.5	96.8	97.0	97.3	97.5	97.8	98.0	98.3	98.6	98.8

Inches	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
	Millimeters									
3.90	99.1	99.3	99.6	99.8	100.1	100.3	100.6	100.8	101.1	101.4
4.00	101.6	101.9	102.1	102.4	102.6	102.9	103.1	103.4	103.6	103.9
4.10	104.1	104.4	104.7	104.9	105.2	105.4	105.7	105.9	106.2	106.4
4.20	106.7	106.9	107.2	107.4	107.7	108.0	108.2	108.5	108.7	109.0
4.30	109.2	109.5	109.7	110.0	110.2	110.5	110.7	111.0	111.3	111.5
4.40	111.8	112.0	112.3	112.5	112.8	113.0	113.3	113.5	113.8	114.1
4.50	114.3	114.6	114.8	115.1	115.3	115.6	115.8	116.1	116.3	116.6
4.60	116.8	117.1	117.4	117.6	117.9	118.1	118.4	118.6	118.9	119.1
4.70	119.4	119.6	119.9	120.1	120.4	120.7	120.9	121.2	121.4	121.7
4.80	121.9	122.2	122.4	122.7	122.9	123.2	123.4	123.7	124.0	124.2
4.90	124.5	124.7	125.0	125.2	125.5	125.7	126.0	126.2	126.5	126.8

NOTE: To convert inches to centimeters, find the equivalent millimeter value and divide by 10 (e.g., 4.6 inches equals 116.8 millimeters/10 = 11.7 centimeters rounded up.

Table 13.2. New Snowfall to Water Equivalent Conversion.

Melt Water Equivalent (WE) in Inches	New Snowfall (inches)						
	Temperature (oC)						
	01-M02	M03-M07	M07-M09	M10-M12	M13-M18	M18-M29	M30-M40
Trace	Trace	0.1	0.2	0.3	0.4	0.5	1.0
.01	0.1	0.2	0.2	0.3	0.4	0.5	1.0
.02	0.2	0.3	0.4	0.6	0.8	1.0	2.0
.03	0.3	0.5	0.6	0.9	1.2	1.5	3.0
.04	0.4	0.6	0.8	1.2	1.6	2.0	4.0
.05	0.5	0.8	1.0	1.5	2.0	2.5	5.0
.06	0.6	0.9	1.2	1.8	2.4	3.0	6.0
.07	0.7	1.1	1.4	2.1	2.8	3.5	7.0
.08	0.8	1.2	1.6	2.4	3.2	4.0	8.0
.09	0.9	1.4	1.8	2.7	3.6	4.5	9.0
.10	1.0	1.5	2.0	3.0	4.0	5.0	10.0
.11	1.1	1.7	2.2	3.3	4.4	5.5	11.0
.12	1.2	1.8	2.4	3.6	4.8	6.0	12.0
.13	1.3	2.0	2.6	3.9	5.2	6.5	13.0
.14	1.4	2.1	2.8	4.2	5.6	7.0	14.0
.15	1.5	2.3	3.0	4.5	6.0	7.5	15.0
.16	1.6	2.4	3.2	4.8	6.4	8.0	16.0
.17	1.7	2.6	3.4	5.1	6.8	8.5	17.0
.18	1.8	2.7	3.6	5.4	7.2	9.0	18.0
.19	1.9	2.9	3.8	5.7	7.6	9.5	19.0
.20	2.0	3.0	4.0	6.0	8.0	10.0	20.0
.21	2.1	3.1	4.2	6.3	8.4	10.5	21.0
.22	2.2	3.3	4.4	6.6	8.8	11.0	22.0
.23	2.3	3.4	4.6	6.9	9.2	11.5	23.0
.24	2.4	3.6	4.8	7.2	9.6	12.0	24.0
.25	2.5	3.8	5.0	7.5	10.0	12.5	25.0
.30	3.0	4.5	6.0	9.0	12.0	15.0	30.0
.35	3.5	5.3	7.0	10.5	14.0	17.5	35.0
.40	4.0	6.0	8.0	12.0	16.0	20.0	40.0
.45	4.5	6.8	9.0	13.5	18.0	22.5	45.0
WE Ratio	1:10	1:15	1:20	1:30	1:40	1:50	1:100

Melt Water Equivalent (WE) in Inches	New Snowfall (inches)						
	Temperature (oC)						
	01-M02	M03-M07	M07-M09	M10-M12	M13-M18	M18-M29	M30-M40
.50	5.0	7.5	10.0	15.0	20.0	25.0	50.0
.60	6.0	9.0	12.0	18.0	24.0	30.0	60.0
.70	7.0	10.5	14.0	21.0	28.0	35.0	70.0
.80	8.0	12.0	16.0	24.0	32.0	40.0	80.0
.90	9.0	13.5	18.0	27.0	36.0	45.0	90.0
1.00	10.0	15.0	20.0	30.0	40.0	50.0	100.0
2.00	20.0	30.0	40.0	60.0	80.0	100.0	200.0
3.00	30.0	45.0	60.0	90.0	120.0	150.0	300.0
WE Ratio	1:10	1:15	1:20	1:30	1:40	1:50	1:100
NOTE: For temperatures above 34ºF (1ºC) or for slushy, wet snow, a 1:8 ratio may be appropriate, e.g., 0.10" WE = 0.8" snowfall, 0.15" WE = 1.2" snowfall.							

Chapter 14

CODING AND DISSEMINATION

14.1. Introduction. This chapter prescribes the standards and procedures for coding a manual weather observation in METAR or SPECI format. The coding procedures in this chapter conform to WMO Code Forms FM 15-IX Ext. and FM 16-IX Ext., respectively. It also complies with the Regional Codes and National Coding Practices of the United States, which reflect the differences with the national observing practices and the practices outlined in the WMO *Manual on Codes* (WMO-No. 306).

14.2. Format and Content of the METAR/SPECI.

14.2.1. A METAR/SPECI has two major sections: the Body (consisting of a maximum of 11 groups) and the Remarks (consisting of a maximum of 2 categories). Together, the body and remarks make up the complete METAR/SPECI report. In general, the remarks are encoded in the order depicted above and established in the remainder of this chapter.

14.2.1.1. Body of Report. The underline character "_" indicates a required space between the groups. If a group is not reported, the preceding space is also not reported.

14.2.1.1.1. Type of Report - METAR/SPECI.

14.2.1.1.2. Station Identifier - CCCC.

14.2.1.1.3. Date and Time of Report - YYGGggZ.

14.2.1.1.4. Report Modifier – COR.

14.2.1.1.5. Wind - $dddff(f)Gf_mf_m(f_m)KT\_d_nd_nd_nVd_xd_xd_x$.

14.2.1.1.6. Visibility - VVVVVSM (or VVVV in meters at OCONUS units).

14.2.1.1.7. Runway Visual Range - $RD_RD_R/V_RV_RV_RV_RFT$, $RD_RD_R/V_NV_NV_NV_NVV_XV_XV_XV_XFT$ (or $V_RV_RV_RV_R$ or $RD_RD_R/V_NV_NV_NV_NVV_XV_XV_XV_X$ in meters at OCONUS units), or RVRNO.

14.2.1.1.8. Present Weather - w'w'.

14.2.1.1.9. Sky Condition - $N_sN_sN_sh_sh_sh_s$ or $VVh_sh_sh_s$ or SKC.

14.2.1.1.10. Temperature and Dew Point - $T'T'/T'_dT'_d$.

14.2.1.1.11. Altimeter - $AP_HP_HP_HP_H$.

14.2.1.2. Remarks Section of Report—RMK.

14.2.1.2.1. Automated, Manual, and Plain Language.

14.2.1.3. Additive Data.

14.3. METAR/SPECI Code.

METAR or SPECI	**_CCCC_YYGGggZ_COR_dddff(f)G$f_m f_m (f_m)$KT_$d_n d_n d_n$V$d_x d_x d_x$_ VVVVVSM** or **VVVV_RDRDR/VRVRVRVRFT, RDRDR/VNVNVNVNVVXVXVXVXFT,** or **RDRDR/VRVRVRVR, RDRDR/VNVNVNVNVVXVXVXVX,** or **RVRNO _ w'w'._NsNsNshshshs** or **VVhshshs** or **SKC_T'T'/T'dT'd_APHPHPHPH_ RMK_(Automated, Manual, Plain Language)_(Additive Data)**

NOTE: Visibilities and RVR values are in meters at overseas locations (OCONUS).

14.4. Coding Missing Data in METAR and SPECI. When an element does not occur, or cannot be observed, the corresponding group and preceding space are omitted from that particular report.

14.5. Coding the Body of the METAR/SPECI.

14.5.1. Type of Report (METAR and SPECI). The type, METAR or SPECI, will be included in all reports. The type of report will be separated from elements following it by a space. Whenever SPECI criteria are met at the time of the routine METAR, the type of report will be METAR.

14.5.2. Station Identifier (CCCC). The station (unit) identifier, CCCC, will be included in all reports to identify the unit to which the encoded report applies. The station identifier will consist of four alphabetic-only characters if the METAR/SPECI is transmitted longline. The agency with operational control when the unit is first established will be responsible for coordinating the location identifier with the FAA. A list of approved identifiers can be found in the FAA Manual 7350 Series, *Location Identifiers*.

14.5.3. Date and Time of Report (YYGGggZ). The date, YY, and time, GGgg, will be included in all reports. The time will be the actual time of the report or when the criteria for a SPECI is met or noted. If the report is a correction to a previously disseminated report, the time of the corrected report will be the same time used in the report being corrected. The date and time group always ends with a Z indicating Zulu time (or UTC). For example, METAR KADW 210855Z would be the 0900 scheduled report from unit KADW taken at 0855 UTC on the 21st of the month.

14.5.4. Report Modifiers (COR). The report modifier, COR**,** identifies the METAR/SPECI as a corrected report.

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

14.5.5.1. The standards and procedures for observing and reporting wind are described in **Chapter 6**.

14.5.5.2. The wind direction, ddd, will be encoded in tens of degrees using three figures. Directions less than 100 degrees will be preceded with a 0. For example, a wind direction of 90° is encoded as 090. The wind speed, ff(f), will be encoded in two or three digits immediately following the wind direction.

14.5.5.3. The wind speed will be encoded, in whole knots, using the units and tens digits and, if required, the hundreds digit. Speeds of less than 10 knots will be encoded using a leading zero. The wind group will always end with KT to indicate that wind speeds are reported in knots. For example, a wind speed of 8 knots will be encoded 08KT, a wind speed of 112 knots will be encoded 112KT.

14.5.5.3.1. Gust. Wind gusts will be encoded in the format, $Gf_mf_m(f_m)$. The wind gust will be encoded in two or three digits immediately following the wind speed. The wind gust will be 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 would be encoded 27020G35KT.

14.5.5.3.2. 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 would be encoded VRB03KT.

14.5.5.3.3. Variable Wind Direction (speeds greater than 6 knots). Wind direction varying 60 degrees or more with wind speed greater than 6 knots will be encoded in the format, $d_nd_nd_n$ $Vd_xd_xd_x$. The variable wind direction group will immediately follow the wind group. The directional variability will be encoded in a clockwise direction. For example, if the wind is variable from 180° to 240° at 10 knots, it would be encoded 21010KT 180V240.

14.5.5.3.4. Calm Wind. Calm wind will be encoded as 00000KT.

14.5.6. Visibility Group.

14.5.6.1. The standards and procedures for observing and reporting visibility are described in **Chapter 7.**

14.5.6.2. The prevailing visibility, VVVVVSM, (VVVV meters for OCONUS) will be encoded in statute miles using the values listed in **Chapter 7.** A space will be encoded between whole numbers and fractions of reportable visibility values. Suffix visibility values with SM at US locations (including Guam, Alaska, and Hawaii), e.g., 7SM, to indicate that visibilities are in statute miles. For example, a visibility of one and a half statute miles would be encoded 1 1/2SM.

14.5.7. Runway Visual Range (RVR) Group. Only RVR data obtained from a system providing a ten-minute RVR average readout may be disseminated longline. Units with a 10-minute average capability, but are unable to transmit the data due to an RVR equipment problem/outage will report RVRNO longline. Disseminate in either feet or meters, as required. The unit of measurement in the US will be feet (FT), and all transmissions will have "FT" appended. Overseas units will use measurement values as published in the DoD FLIPs. The standards and procedures for reporting RVR are described in **Chapter 8**.

14.5.7.1. RVR will be encoded in the format $RD_RD_R/V_RV_RV_RV_RFT$ ($RD_RD_R/V_RV_RV_RV_R$ meters for OCONUS), where R indicates that the runway number follows, D_RD_R is the runway number. Parallel runways should be distinguished by appending to D_RD_R the letters L, C, or R indicating the left, center, or right parallel runway respectively. A suitable combination of these letters may be used for up to, and including, five parallel runways (i.e., LL, L, C, R, RR). $V_RV_RV_RV_R$ is the constant reportable value (feet or meters), and FT indicates that units of measurement are feet in the CONUS.

14.5.7.2. RVR that is varying will be encoded in the format, $RD_RD_R/V_NV_NV_NV_NVV_XV_XV_X$ V_XFT ($RD_RD_R/V_NV_NV_NV_NVV_XV_XV_XV_X$ meters for OCONUS), where R indicates that the runway number follows, D_RD_R is the runway number (an additional D_R may be used for runway approach directions, such as R for right, L for left, and C for center), $V_NV_NV_NV_N$ is the lowest reportable value in feet or meters, V separates lowest and highest visual range values, $V_XV_XV_XV_X$ is the highest reportable value (feet of meters), and FT indicates that units of measurement are feet. The 10-minute RVR for runway 01L varying between 1,000 and 5,000 feet would be encoded R01L/1000V5000FT (R01L/0300V1520).

14.5.7.3. 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 will be preceded by a P. For example, an RVR of less than 600 feet (0180 meters) will be encoded M600FT (M0180 meters); an RVR of greater than 6,000 feet (1830 meters) will be encoded P6000FT (P1830 meters).

14.5.7.4. RVR System Not Available (RVRNO) indicates the 10-minute average touchdown RVR for the in-use runway is not available (i.e., equipment failure) during periods when prevailing visibility is 1 mile (1600 meters) or less or RVR is 6,000 feet (1830 meters) or less.

14.5.8. Present Weather Group (w'w').

14.5.8.1. The standards and procedures for observing and reporting present weather are described in **Chapter 9**. The following general rules apply when coding present weather for a METAR or SPECI:

14.5.8.1.1. Weather occurring at the point of observation (at the station) or in the vicinity of the station will be encoded in the body of the report. Weather observed but not occurring at the point of observation (at the station) or in the vicinity of the station will be encoded in remarks.

14.5.8.1.2. With the exception of volcanic ash, low drifting dust, low drifting sand, and low drifting snow, obscurations will be encoded in the body of the report if the surface visibility is less than 7 miles (9999 meters) or considered operationally significant. Volcanic ash will always be encoded when observed.

14.5.8.1.3. Separate groups will be used for each type of present weather. Each group will be separated from the other by a space. A METAR/SPECI will contain no more than three present weather groups.

14.5.8.2. Intensity or Proximity Qualifier.

14.5.8.2.1. Intensity will be encoded with precipitation types (except hail, ice crystals, and small hail and/or snow pellets) including those associated with a thunderstorm (TS) and those of a showery nature (SH). Tornados and waterspouts will be encoded as +FC. No intensity will be ascribed to the obscurations of blowing dust (BLDU), blowing sand (BLSA), blowing snow (BLSN). Only moderate and heavy intensity will be ascribed to sandstorm (SS), and duststorm (DS).

14.5.8.2.2. The proximity qualifier for vicinity, VC, (weather phenomena observed in the vicinity of but not at the point(s) of observation) will be encoded in combination with thunderstorms (TS), fog (FG), shower(s) (SH), well-developed dust/sand whirls (PO), blowing dust (BLDU), blowing sand (BLSA), blowing snow (BLSN), sandstorm (SS), and duststorm (DS). Intensity qualifiers will not be encoded with VC. **NOTE:** VCTS will not be reported if thunder is heard and the location of the storm cannot be determined (e.g., no radar or lighting detector). If thunder is heard and the location is unknown, the thunderstorm will be reported as occurring "at the station."

14.5.8.2.2.1. VCFG will be encoded to report any type of fog in the vicinity of the point(s) of observation.

14.5.8.2.2.2. Precipitation not occurring at the point of observation but within 10 statute miles will be encoded as showers in the vicinity (VCSH).

14.5.8.3. Descriptor Qualifier. Only one descriptor will be encoded for each weather phenomena group, e.g., "-FZDZ." Mist (BR) will not be encoded with any descriptor.

14.5.8.3.1. The descriptors shallow (MI), partial (PR), and patches (BC) will only be encoded with FG, e.g., "MIFG."

14.5.8.3.2. The descriptors low drifting (DR) and blowing (BL) will only be 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.

14.5.8.3.3. When blowing snow is observed with snow falling from clouds, both phenomena are reported, e.g., "SN BLSN." If there is blowing snow and the weather technician cannot determine whether or not snow is also falling, then BLSN will be reported. Spray (PY) will be encoded only as blowing (BLPY).

14.5.8.3.4. The descriptor shower(s) (SH) will be encoded only with one or more of the precipitation types of rain (RA), snow (SN), ice pellets (PL), small hail (GS), or large hail (GR). The SH descriptor indicates showery-type precipitation. When showery-type precipitation is coded with VC (VCSH), the intensity and type of precipitation will not be coded.

14.5.8.3.5. The descriptor thunderstorm (TS) may be encoded by itself, i.e., a thunderstorm without associated precipitation, or it may be encoded with the precipitation types of rain (RA), snow (SN), ice pellets (PL), small hail and/or snow pellets (GS), or hail (GR). The intensity attached to it will be the intensity ascribed to the precipitation as described in **paragraph 14.5.8.2.1.** For example, a thunderstorm with snow and small hail and/or snow pellets would be encoded as "TSSNGS." TS will not be encoded with SH.

14.5.8.3.6. The descriptor freezing (FZ) will only be encoded in combination with fog (FG), drizzle (DZ), or rain (RA), e.g., "FZRA." FZ will not be encoded with SH.

14.5.8.4. Precipitation. Up to three types of precipitation may be encoded in a single present weather group. They will be encoded in order of decreasing dominance, with the intensity based on the most dominant precipitation type.

14.5.8.4.1. Drizzle will be encoded as DZ; rain will be encoded as RA; snow will be encoded as SN; snow grains will be encoded as SG; ice crystals will be encoded as IC; ice pellets will be encoded as PL, hail will be encoded as GR, and small hail and/or snow pellets will be encoded as GS.

14.5.8.5. Obscuration.

14.5.8.5.1. Mist will be encoded as BR; fog will be encoded as FG; smoke will be encoded as FU; volcanic ash will be encoded as VA; widespread dust will be encoded as DU; sand will be encoded as SA; and haze will be encoded as HZ.

14.5.8.5.2. Patches of fog (BCFG) and partial fog (PRFG) may be encoded with prevailing visibility of 7 statute miles (9999 meters) or greater.

14.5.8.5.3. Spray will be encoded only as BLPY.

14.5.8.6. Other Weather Phenomena.

14.5.8.6.1. Well-developed dust/sand whirls will be encoded as PO; squalls will be encoded as SQ; sandstorm will be encoded as SS; and duststorm will be encoded as DS.

14.5.8.6.2. Tornados and waterspouts will be encoded as +FC. Funnel clouds will be encoded as FC.

14.5.9. Sky Condition Group ($N_sN_sN_sh_sh_sh_s$ or $VVh_sh_sh_s$ or SKC). The standards and procedures for observing and reporting sky condition are described in **Chapter 10**.

14.5.9.1. Sky condition will be 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 layer. There will be no space between the amount of sky cover and the height of the layer. Sky condition will be encoded in an ascending order up to the first overcast layer. At mountain locations, if the cloud layer is below the unit's station elevation, the height of the layer will be encoded as ///.

14.5.9.2. Vertical visibility will be 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. There will be no space between the group identifier and the vertical visibility.

14.5.9.3. Clear skies will be encoded in the format SKC, which is the abbreviation used by manual units to indicate no clouds are present.

14.5.9.3.1. Each layer will be separated from other layers by a space. The sky cover for each layer reported will be encoded by using the appropriate reportable contraction FEW, SCT, BKN, or OVC. The report of clear skies (SKC) is a complete layer report within itself. The reportable contraction will be followed, without a space, by the height of the cloud layer.

14.5.9.3.2. The height of the base of each layer, $h_sh_sh_s$, will be encoded in hundreds of feet above the surface using three digits.

14.5.9.3.3. Cumulonimbus (CB) or towering cumulus (TCU) will be appended to the layer. For example, a scattered layer of towering cumulus at 1,500 feet would be encoded "SCT015TCU" and would be followed by a space if there were additional higher layers to encode. Additional remarks elaborating on CBs and TCUs are required. See **Attachment 3** for reporting significant cloud type remarks.

14.5.10. Temperature/Dew Point Group ($T'T'/T'_dT'_d$).

14.5.10.1. The standards and procedures for observing and reporting temperature and dew point are given in **Chapter 11**. The temperature will be separated from the dew point with a solidus ("/").

14.5.10.2. The temperature and dew point will be encoded as two digits rounded to the nearest whole degree Celsius. Sub-zero temperatures and dew points will be prefixed with an M. 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 will be encoded as "M00." Exception: On the electronic AF Form 3803, use a minus sign (-) rather than an M to indicate below zero temperatures/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.

14.5.10.3. 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 will be encoded followed by a solidus

"/" and no entry made for dew point. For example, a temperature of 1.5°C and a missing dew point would be encoded as "02/."

14.5.11. Altimeter ($AP_HP_HP_HP_H$).

14.5.11.1. The standards and procedures for observing and reporting altimeter are described in **Chapter 12**.

14.5.11.2. The altimeter group always starts with an A in the observation (the international indicator for altimeter in inches of mercury). The altimeter will be 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. The altimeter indicator A is automatically inserted in the observation by N-TFS software.

14.6. Remarks (RMK). Remarks will be included in all METAR and SPECI, as appropriate. The reporting requirement for specific additive data remarks from manual units will be determined by MAJCOM or higher headquarters (see **Part 2**, **Table 5.2.**).

14.6.1. Remarks will be separated from the body of the report by a space and the contraction RMK. If there are no remarks, the contraction RMK is not required.

14.6.2. METAR/SPECI remarks fall into 2 major categories: (1) Automated, Manual, and Plain Language; and (2) Additive Data.

14.6.2.1. Remarks will be made in accordance with the following:

14.6.2.1.1. Where plain language is called for, authorized contractions, abbreviations, and symbols should be used to conserve time and space. However, in no case should an essential remark, of which the weather technician is aware, 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 **Attachment 1** and FAA Order 7340 Series, *Contractions*.

14.6.2.1.2. Time entries will be made in minutes past the hour if the time reported occurs during the same hour the observation is taken. Hours and minutes will be used if the hour is different, or this Handbook prescribes the use of the hour and minutes.

14.6.2.1.3. Present weather encoded in the body of the report as VC may be further described, (i.e., direction from the unit, if known). Weather phenomena beyond 10 statute miles of the point(s) of observation may be encoded as distant (DSNT) if the actual distance is unknown but believed to be beyond 10 statute miles, followed by the direction from the unit. For example, precipitation of unknown intensity within 10 statute miles east of the unit's location would be encoded as "VCSH E"; lightning approximately 25 statute miles west of the unit would be encoded as "LTG DSNT W." If known, the distance in statute miles (CONUS) or meters (OCONUS) may be included in the remark. In the case of a tornado, the exact location should be included if possible.

14.6.2.1.4. Movement of clouds or weather, if known, will be encoded with respect to the direction toward which the phenomena is moving. For example, a thunderstorm 9 miles north moving toward the northeast would be encoded as "TS 9N MOV NE."

14.6.2.1.5. Directions will use the eight points of the compass encoded in a clockwise order beginning with north.

14.6.3. See **Attachment 3,** Table of Remarks, for order of entry, format, and complete instructions on reporting remarks.

14.7. Dissemination. All observations will be disseminated local and longline. Most weather units will use N-TFS is the primary local and longline dissemination system. During periods when N-TFS is unavailable, units should use the Joint Air Force & Army Information Network (JAAWIN) or another unit to disseminate observations longline.

14.7.1. As capability exists, weather units will configure N-TFS to provide an **URGENT** alert to users on the Local Weather Network System (LWNS) upon receipt of reports for Tornadic Activity and Volcanic Eruptions, and for other reports of severe weather that could cause an immediate threat to life or property.

14.7.2. Corrections (COR) to Transmitted Data. When correcting observations, the COR will be disseminated in the same manner as the observation being corrected. Disseminate CORs 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, along with a remark containing the UTC time of transmission. See **Attachment 3,** Table of Remarks.

14.7.3. Local Dissemination. During N-TFS outages or if N-TFS is not available, disseminate METAR, SPECI, and LOCAL observations first to the positions that control local air traffic. 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 WSD. Non-N-TFS locations should disseminate observations locally as follows:

14.7.3.1. Precede reports of Tornadic Activity and Volcanic Eruptions, and other reports of severe weather that could cause an immediate threat to life or property, with the term **URGENT**.

14.7.3.2. Pressure altitude (PA) and density altitude (DA) are normally only 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. Exception: When reported, runway condition remarks will be last.

14.7.3.3. Disseminate wind direction in degrees magnetic (unless otherwise specificed, see **paragraph 6.3.1.**) using three digits. Disseminate calm winds as CALM.

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

14.7.3.5. Maintain a hard copy of all observations disseminated locally.

14.7.4. Local Dissemination Examples. See **Figure 14.1.** for examples of locally disseminated observations for weather units not equipped with N-TFS. Units having another type of local dissemination system should use this format or use the METAR format used for longline transmission. These examples do not necessarily reflect local requirements at any specific location (visibility in miles versus meters).

Figure 14.1. Examples of Non-N-TFS Local Dissemination Formats.

METAR	SPECI	LOCAL
ETAR METAR 0756	RJTY SPECI 1614	EGUN LOCAL 1930
07007KT 040V100 1300	03005KT 3/8	23003KT 8000 HZ
R09/1220 –RA BR	R36/2400 –RA FG	SCT037 BKN280
SCT000 SCT008 OVC012	FEW000 SCT006	ALSTG 29.89
01/M01	BKN016 10/09	31/BP
ALSTG E29.38	ALSTG 29.81	
CIG 010V015 VIS N 3200	VIS 1/4V3/4 TWR VIS 5/8	
TWR VIS 1600	FG SCT000	
BR SCT000	CIG LWR W	
PA +210 WR// 57/DR	PA+560 16/DY	

14.7.5. Non-N-TFS Longline Coding and Dissemination. Units without N-TFS will disseminate all observations using the METAR code format. This includes longline dissemination via JAAWIN and the Secure Joint Air Force and Army Weather Information Network (JAAWIN-S).

14.7.6. 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, RAPCON, GCA), 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:

14.7.6.1. Actual time of observation (UTC).

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

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

14.7.6.4. Initials of the weather person making the dissemination and the initials of the receiving customer.

14.7.7. Supplementary Identification of Observations. At limited-duty units 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 3803/3813, as applicable.

14.7.8. 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. When the scheduled report is ready to transmit, send according to instructions in **paragraph** 14.7.

14.7.9. Reports Filed But not Transmitted. When an 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.

14.7.9.1. 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. **Figure 14.2.** illustrates this procedure for CONUS units using statute miles in column 4B (overseas locations would use meters in column 4A).

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

Figure 14.2. Examples of FIBI Observations.

Column								
1	**2**	**9/10**	**4B**	**5**	**3**	**7/8**	**12**	**13**
METAR	011958	21005KT	10SM		BKN025	10/06	A2992	SLP982 8/500 9/600
SPECI	012016	23010KT	7SM	-RA	BKN025	11/10	A2992	(FIBI)
SPECI	012020	23012KT	10SM		BKN025	11/10	A2992	(FIBI)
In this example, light rain began at 16 minutes past the hour and ended 4 minutes later (before the first SPECI was completed). Both SPECI were considered FIBI because the change between the last transmitted report and the current report do not meet SPECI criteria.								

14.7.10. Communication Failure. If all longline communication services have failed, telephone the METAR or SPECI after the failure to the nearest unit with communication capability. After the initial transmission, disseminate only the 0000, 0600, 1200, and 1800 UTC record observations. All other observations will be taken, recorded and disseminated locally and marked "FIBI" in remarks (Column 13, AF Form 3803/3813). The remark "FIBI" will be placed in parentheses.

14.7.11. Longline Dissemination By Other Units. Enter a record of longline dissemination by another units in parentheses in column 13 of AF Form 3803/3813. Identify which unit transmitted the observation longline and the initials of the individual that received the data, e.g., (BY KOFF/DM), (BY 28OWS/DTK), etc.

14.7.12. Longline Dissemination Examples. **Figure 14.3.** contains examples of longline dissemination of observations for weather units not equipped with N-TFS.

Figure 14.3. Examples of Longline Dissemination.

METAR Observations
METAR ETAR 010756Z VRB06KT 040V100 1400 R09/1220 -RA BR SCT000 SCT008 OVC012 01/M01 A2938 RMK CIG 010V015 VIS N 3200 TWR VIS 1600 BR SCT000 SLPNO ESTMD ALSTG 8/5// WR//;
METAR RJTY 011058Z COR 02010G17KT 1400 R36/4000 HZ SCT007 BKN020 OVC070 20/17 A3019 RMK VIS N 3200 TWR VIS 1600 SLP015 ALSTG/SLP ESTMD 8/55/ COR 1104;
METAR KBLV 011158Z 27004KT 3/4SM R32/P6000FT-RA BR FEW000 SCT005 OVC020 00/M01 A2992 RMK TWR VIS 2 BR FEW000 SLP982 ALSTG/SLP ESTMD 60100 70010 4/002 8/5// 10010 21002 52010 WR//;
METAR ETIU 011157Z 30003KT 9999 SKC M04/M10 A3003 RMK SLP985 70010 4/002;
METAR RKSY 010358Z 00000KT 0800 RVRNO FG VV011 24/24 A2998 RMK TWR VIS 1000 SLP982;
METAR ETAB 010655Z 24010G18KT 9999 TS SCT020CB BKN035 30/27 A2993 RMK TS 5SW MOV NE OCNL LTGCACC SLPNO 8/900;
METAR KLTS 011157Z 24012KT 10SM -TSRA FEW008 FEW025TCU SCT030CB 25/ A2992 RMK TS 5NE MOV SE OCNL LTGCG SCT030 V BKN PK WND 28045/10 FU FEW008 TCU SE-S SLPNO 60010 70010 8/300 52010;

SPECI Observations (SPECI)
SPECI ETAR 010731Z 25003KT 1600 BR BKN006 10/06 A3002 RMK CIG 004V008 TWR VIS 2000;
SPECI RJTY 011614Z 02005KT 0600 R36/2400 -DZ FG SCT000 SCT006 SCT016 M02/M03 A2981 RMK VIS 0400V0800 TWR VIS 1000 FG SCT000 OCNL CIG LWR W;
SPECI ETIH 010013Z UNOFFICIAL TORNADO 6SW MOV UNKN 2352;
SPECI KBLV 010812Z 24020G40KT 1 1/2SM +FC +TSRAGR SQ FEW030CB SCT040 BKN050 25/22 A2992 RMK TORNADO 5SW MOV NE FUNNEL CLOUD B02E09 3W MOV NE TSB59 5S-3W MOV NE FRQ LTGCCCACG GR 1/2 VIS SW 1 1/2 TWR VIS 2 1/2 PK WND 24041/01 PRESFR WR//;

PART 3

AUTOMATED OBSERVING PROCEDURES

Chapter 15

INTRODUCTION

15.1. Purpose. Part 3 addresses automated observing systems (i.e., AN/FMQ-19, ASOS, or AFWA/MAJCOM-certified automated systems) that prepare observations for transmission without a certified weather person on duty. Automated observing systems will be referred to as AN/FMQ-19 in Part 3 and Part 4.

15.1.1. In Part 3, all references to AN/FMQ-19 outputs are to unmanned (i.e., closed) units and unedited output. While the automated system and the human may differ in their methods of data collection and interpretation, both produce an observation quite similar in form and content.

15.1.2. For the "objective" elements; such as pressure, temperature, dew point, and wind; both AN/FMQ-19 and the weather technician use a fixed location and time-averaging technique. The quantitative differences between the weather technician and the AN/FMQ-19 observation of these elements are negligible.

15.1.3. For the "subjective" elements; such as sky condition, visibility, and present weather; the weather technicians use a fixed time, spatial averaging technique to describe the visual elements, while the AN/FMQ-19 uses a fixed location, time averaging technique. Although this is a fundamental change, manual observing techniques and AN/FMQ-19 techniques yield remarkably similar results within the limits of their respective capabilities. The differences in some cases are subtle, and need to be fully understood for optimum utilization of the information provided by the AN/FMQ-19.

15.2. Scope. The AN/FMQ-19 is designed to support US Air Force and Army aviation operations and weather forecast activities (i.e., OWS forecast products and CWT MEFP products) and, at the same time, support weather observation climatological and meteorological research communities. The AN/FMQ-19 provides continuous minute-by-minute observations and performs the basic observing functions necessary to generate an observation.

15.2.1. AN/FMQ-19 uses algorithms that conform with the *Federal Standard Algorithms for Automated Weather Observing Systems Used for Aviation Purposes,* published by the Office of the Federal Coordinator for Meteorology (OFCM). Individual elements encoded into the AN/FMQ-19 observation, as closely as possible, reflect conditions existing at the actual time of observation.

15.2.2. For those elements that the weather technician evaluates using spatial averaging techniques (e.g., sky cover and visibility) the AN/FMQ-19 substitutes time averaging of the sensor data. Therefore, in an AN/FMQ-19 observation, sky condition is an evaluation of sensor data gathered during the 30-minute period ending at the actual time of observation. All other elements evaluated are based on sensor data that is within 10 minutes or less of the actual time of observation.

Chapter 16

GENERAL PROCEDURES

16.1. Introduction. The AN/FMQ-19 referred to in this manual is a highly sophisticated data sensing, processing, and dissemination system. The system uses an array of sensors to evaluate sky condition, visibility, pressure, temperature, dew point, wind, present weather, and obscurations (obstructions to vision). The AN/FMQ-19 processes sensor data once a minute and, using appropriate integration times, produces a METAR or SPECI observation.

16.2. Automated Surface Observing System Operations.

16.2.1. Automated surface observing systems certified by the USAF for operational use (i.e., AN/FMQ-19, ASOS) can be operated in an unaugmented mode at USAF and US Army controlled airfields to provide the official METAR and SPECI observations **except** under the conditions specified **Part 4, Chapter 24**. In the unaugmented mode, the system continually senses and measures the atmosphere for the following weather parameters: Wind, Visibility, Precipitation/Obstructions to Vision, Cloud Height, Sky Cover, Temperature, Dew Point, and Altimeter. The system will also format and report specific automated remarks as detailed in **Chapter 23** and **Attachment 3**.

16.2.2. Non-USAF or non-US Army controlled airfields (i.e., those not owned and operated by US military authorities) may be supported by automated surface observing systems. Likewise, at USAF or US Army controlled airfields when the local ATC tower is closed, a certified USAF automated surface observing system can be used unaugmented as the official observation. There are many locations to include ranges, training areas, drop zones, Military Operation Areas, and uncontrolled airfields where automated surface observing systems provide stand-alone weather information.

16.2.2.1. MAJCOMs will update Flight Information Publication (FLIP) references IAW AFI 11-201, *Flight Information Publications,* to specify those USAF and US Army controlled airfields operating with an unaugmented automated surface observing system.

16.3. Disseminating Automated Observations. AN/FMQ-19 automated observations will be disseminated through the Air Force Weather Weapon System (AFWWS) communications interface (i.e., currently, the New Tactical Forecast System/N-TFS).

16.4. Documenting Automated Observations. AN/FMQ-19 automated observations will be documented on AF Form 3813, Federal Meteorological Surface Weather Observations (METAR/SPECI), an electronically generated observation record on N-TFS.

Chapter 17

WIND

17.1. Introduction. Wind is measured in terms of velocity, a vector that includes direction and speed. The absence of apparent motion of the air is termed "calm." This chapter prescribes the observing and reporting standards for wind data in automated AN/FMQ-19 reports.

17.2. Standard Definitions. See **Part 2, Chapter 6**, for detailed definitions of standard wind terminology.

17.3. Wind Algorithms. In accordance with the *Federal Standard Algorithms for Automated Weather Observing Systems Used for Aviation Purposes*, the AN/FMQ-19 wind algorithm uses 5-second average wind directions and speeds to compute 2-minute averages for reporting direction and speed. The 5-second average speed represents an instantaneous wind and is used to determine gusts, squalls, and peak wind data. The 2-minute average direction is used to determine wind shifts and the range of variability for variable wind direction reports. The wind direction and speed sensors provide the system processor with sufficient data to compute 5-second and 2-minute average wind speeds and directions.

17.4. Determining and Reporting Standards.

17.4.1. Wind Determining Standards. AN/FMQ-19 will determine the wind direction, speed, character, wind shifts, and peak wind at all automated units.

17.4.1.1. Determining Wind Direction. The wind direction is determined by averaging the direction over a 2-minute period.

17.4.1.2. Determining Variable Wind Direction. The wind direction may be determined as variable if, during the 2-minute evaluation period, the wind speed is 6 knots or less. Also, the wind direction is determined variable if, during the 2-minute evaluation period, it varies by 60 degrees or more when the average wind speed is greater than 6 knots.

17.4.1.3. Determining Wind Speed. The wind speed is determined by averaging the speed over a 2-minute period.

17.4.1.4. Determining Wind Character. The wind speed data for the most recent 10 minutes is examined to evaluate the occurrence of gusts. Gusts are indicated by rapid fluctuations in wind speed with a variation of 10 knots or more between peaks and lulls. The speed of a gust is the maximum 3-second peak wind speed measured in the last 10 minutes.

17.4.1.5. Determining Peak Wind Speed. Peak wind data is determined by using the internal storage of wind data. The peak wind speed is the highest 3-second wind speed measured since the last record observation.

17.4.1.6. Determining Wind Shifts. The 2-minute averages of wind data are examined to determine the occurrence of a wind shift. A wind shift is indicated by a change in wind direction of 45 degrees or more in less than 15 minutes with sustained winds of 10 knots or more throughout the wind shift.

17.4.2. Wind Reporting Conditions.

17.4.2.1. Reporting Wind Direction and Speed. Wind direction and speed are reported in the body of all AN/FMQ-19 automated observations. Direction is reported in tens of degrees with reference to true north and speed is reported in whole knots.

17.4.2.2. Reporting Calm Conditions. When no motion of air is detected (£ 2 knots), this condition is reported as CALM (i.e., both the direction and speed are reported as 00000KT).

17.4.2.3. Reporting Variable Wind Direction. The wind direction may be reported as variable if, during the 2-minute evaluation period, the wind speed is 6 knots or less. Also, the wind direction is reported as variable if, during the 2-minute evaluation period, it varies by 60 degrees or more when the average wind speed is greater than 6 knots. The format for the Variable Wind Direction is in **Part 3**, **paragraphs 23.5.5.4.** and **23.5.5.5.**

17.4.2.4. Reporting Wind Character. When a gust is detected within 10 minutes prior to an observation, the character of the wind and the associated speed are reported in the body of the observation.

17.4.2.5. Reporting Peak Wind Data. Peak wind data is reported in the remarks of a METAR whenever the peak wind speed exceeds 25 knots. The format for the remark is in **Attachment 3.**

17.4.2.6. Reporting Wind Shifts. A SPECI is generated when a wind shift occurs. A remark reporting the wind shift and the time the wind shift occurred (began) is included in the observation; however, it cannot be included until the shift is complete. The format for the remark is given in **Attachment 3.**

Table 17.1. Summary of Wind Observing and Reporting Standards.

Data	AN/FMQ-19 Unit
Wind Direction	2-minute average in ten-degree increments with respect to true north.
Wind Speed	2-minute average speed in knots.
Wind Gust	The gust with the maximum instantaneous speed in knots in the past 10 minutes.
Peak Wind	The maximum instantaneous speed in knots (since the last METAR) reported whenever the speed is greater than 25 knots.
Wind Shift	Wind shift and the time the shift occurred (began) is reported.

Chapter 18

VISIBILITY AND RUNWAY VISUAL RANGE

18.1. Introduction. 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. An automated instrumentally derived visibility value is a sensor value converted to an appropriate visibility value using standard algorithms. As a result, an instrumentally derived visibility is considered functionally equivalent to the visibility derived manually.

18.2. Standard Definitions. See **Part 2, Chapter 7** for detailed definitions of standard visibility terminology.

18.3. Visibility Algorithms. In accordance with the *Federal Standard Algorithms for Automated Weather Observing Systems Used for Aviation Purposes*, the visibility algorithm calculates an average visibility. The visibility data during the averaging period are examined to determine if variable visibility should be reported. Where the AN/FMQ-19 has meteorological discontinuity sensors, the data from the additional sensors are examined to determine if their values meet criteria for generating a visibility remark.

18.4. Determining and Reporting Standards.

18.4.1. Reporting Surface Visibility. Surface visibility is reported in the body of all observations.

18.4.2. Reporting Variable Prevailing Visibility. Variable prevailing visibility is determined when the prevailing visibility rapidly increases and decreases by 1/2 mile (0800 meters) or more during the time of the observation, and the average prevailing visibility is less than 3 miles (4800 meters). AN/FMQ-19 will report the minimum and maximum visibility values observed in remarks of the METAR/SPECI. The format for the remark is given in **Attachment 3**.

18.4.3. Reporting Visibility at Second Location. At units equipped with two or more visibility sensors, the visibility at the designated discontinuity sensor will be encoded in remarks. The AN/FMQ-19 will generate the remark only when the visibility at the second location is lower than the visibility in the body of the observation by a reportable value. The format for the remark is given in **Attachment 3.**

18.4.4. Visibility Sensor Range. Visibility sensors evaluate visibility from less than one-quarter statute mile (M1/4, M0400 meters) to 10 (9999 meters) statute miles.

18.4.5. Reportable Visibility Values. The reportable visibility values in statute miles and meters are provided in **Table 18.1.**

Table 18.1. Reportable Visibility Values.

Reportable Visibility Values		
Automated		
M1/4 (M0400)	1 1/2 (2400)	5 (8000)
1/4 (0400)	13/4 (2800)	6 (9000)
1/2 (0800)	2 (3200)	7 (9999)
3/4 (1200)	2 1/2 (4000)	8 (9999)
1 (1600)	3 (4800)	9 (9999)
1 1/4 (2000)	4 (6000)	10 (9999)

18.5. Runway Visual Range (RVR). AN/FMQ-19 will report RVR in the body of the observation whenever the prevailing visibility is 1 statute mile (1600 meters) or less and/or the RVR for the designated instrument runway is 6000 feet or less when reporting in feet and 1500 meters or less when in OCONUS. See **Attachment 4**, **Table A4.1.**, Reportable Values by System Type, for appropriate values. **NOTE:** AN/FMQ-19 determines RVR in 50-meter increments, IAW WMO Manual on Codes (WMO-No. 306).

18.6. Summary of Visibility and RVR Observing and Reporting Standards. **Table 18.2.** summarizes the applicability of visibility standards and procedures.

Table 18.2. Summary of Visibility & RVR Observing and Reporting Standards.

Visibility	Reporting Standards
	Automated
Surface	Represents 10-minutes of sensor outputs
Variable	Reported when the prevailing visibility varies by 1/2 mile (0800 meters) or more and the average visibility is less than 3 miles (4800 meters)
Runway Visual Range	When prevailing visibility is ≤1 statute mile (1600 meters) and/or RVR is ≤ 6000 feet (1500 meters)

Chapter 19

PRESENT WEATHER

19.1. Introduction. This chapter contains standards for reporting weather and obscurations at automated AN/FMQ-19 units. For the purpose of Part 3 of this handbook, weather is a category of atmospheric phenomena that includes only precipitation. Obscurations are those phenomena that reduce visibility but are not a form of precipitation.

19.2. Weather and Obscurations Algorithms. AN/FMQ-19 uses the algorithms contained in the *Federal Standard Algorithms for Automated Weather Observing Systems Used for Aviation Purposes*. In accordance with those algorithms, AN/FMQ-19 reports the type and intensity of precipitation, times of beginning and ending of precipitation, precipitation accumulation, and obscurations.

19.3. Types of Precipitation and Obscurations. The types of weather and obscurations reported in surface weather observations vary according to the type of observing unit. **Table 19.1.** indicates the types of weather and obscurations reported by AN/FMQ-19. Definitions of these phenomena as they apply to AN/FMQ-19 are given in the following paragraphs:

19.3.1. Precipitation. Any of the forms of water particles, whether liquid or solid, that fall from the atmosphere and reach the ground. The types of precipitation reported by AN/FMQ-19 are:

19.3.1.1. Unknown Precipitation. Light precipitation that is reported when the precipitation discriminator detects, but cannot recognize, the type of precipitation. Reported as -UP.

19.3.1.2. Liquid Precipitation. Any form of precipitation that does not fall as frozen precipitation and does not freeze upon impact. AN/FMQ-19 reports liquid precipitation as -DZ, DZ, +DZ; and -RA, RA, +RA.

19.3.1.3. Freezing Precipitation. Any form of precipitation that does not fall as frozen precipitation and freezes upon impact and/or forms a glaze on the ground or other exposed surfaces. AN/FMQ-19 reports freezing precipitation as –FZDZ, FZDZ, +FZDZ; and -FZRA, FZRA, +FZRA.

19.3.1.4. Solid Precipitation. Snow is the only solid precipitation reported by AN/FMQ-19. Reported as -SN, SN, or +SN.

19.3.2. Obscurations. Any phenomenon in the atmosphere, other than precipitation, that reduces the horizontal visibility (reported in the METAR when horizontal visibility is reduced to less than 7 miles [9999 meters]). Obscurations reported by AN/FMQ-19 are fog, freezing fog, mist, and haze (FG, FZFG, BR or HZ).

19.4. Qualifiers.

19.4.1. Intensity and Proximity Qualifier.

19.4.1.1. Intensity. AN/FMQ-19 will encode and report light (-), moderate (no symbol), and heavy (+) intensities with all reportable precipitation types except Unknown Precipitation, which is reported as light (-UP).

19.4.1.2. Proximity. Used only with thunderstorms (TS). With the lightning sensor enabled, AN/FMQ-19 will report TS as "occurring at the station" if the lightning sensor detects either cloud-to-cloud or cloud-to-ground strikes within 5 nautical miles of the point of observation, and "in the vicinity of the station" (VCTS) if between 5 and 10 nautical miles of the point of observation. Lightning strikes detected beyond 10 but less than 30 nautical miles are reported in remarks as LTG DSNT followed by the direction.

19.4.1.2.1. AN/FMQ-19 will include an automated remark with the beginning time of the thunderstorm. It will end the thunderstorm when no lightning strikes are detected within 15 minutes of the last detected strike. A remark with the thunderstorm ending time will be appended to the observation ending the thunderstorm. The beginning and ending times are reported in four digits, e.g., a report of TSB1635 indicates a thunderstorm began at 1635Z.

19.4.2. Descriptor. AN/FMQ-19 will report the descriptor thunderstorm (TS); and freezing (FZ) with drizzle, rain, and fog.

19.5. Other Weather Phenomena. The wind speed data for the most recent 10 minutes is examined to evaluate the occurrence of squalls. AN/FMQ-19 reports a squall (SQ) when a strong wind characterized by a sudden onset in which the wind speed increases at least 16 knots and is sustained at 22 knots or more for at least 1 minute is observed.

Table 19.1. AN/FMQ-19 Present Weather Reporting.

Type	Reporting Notation
Vicinity	VC (used with TS only)
Thunderstorm	TS
Freezing	FZ
Unknown Precipitation	-UP
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

19.6. Determining and Reporting Weather and Obscurations. Weather is reported in the body of the observation only when it is detected at the station (unit) at the time the observation is prepared for dissemination. Obscurations are reported in the body of the observation only when the algorithms determine they are occurring at the station at the time the observation and the surface visibility is less than 7 miles (9999 meters). Other data pertaining to weather and obscurations may be reported in remarks, e.g., time of beginning/ending of weather. The notations in **Table 19.1.** are used to report weather and obscurations in the body of the AN/FMQ-19 observation.

19.6.1. Order for Reporting Multiple Types of Weather and Obscurations. AN/FMQ-19 reports only one type of precipitation per observation (i.e., UP, DZ, RA, or SN), and only one type of obscuration (i.e., FG, FZFG, BR, or HZ). When precipitation and an obscuration along with a squall are reported at the same time, the precipitation is reported first, followed immediately by the obscuration and then the squall. When rain and snow are occurring at the same time, AN/FMQ-19 reports the dominant type of precipitation.

19.6.2. Precipitation Occurrence. Precipitation is considered to be occurring when it is accumulating at a rate of at least 0.01 inch/hour (liquid equivalent).

19.6.3. Determining the Intensity of Precipitation. Unknown precipitation is always reported as light (-UP). Otherwise, the intensity of precipitation is identified as light, moderate, or heavy in accordance with one of the following:

19.6.3.1. Intensity of Liquid and Freezing Precipitation. AN/FMQ-19 determines intensity from particle size and fall velocity through the sensor field. Intensities derived are functionally equivalent to those obtained from the manual rate-of-fall method.

19.6.3.2. Intensity of Snow. When snow is occurring alone, the intensity of snow is based on the reported surface visibilities listed in **Table 19.2.**. If occurring with other precipitation or obscurations, the intensity assigned will be no greater than that determined using the visibility criteria if snow was occurring alone. With or without other obscuring phenomena, AN/FMQ-19 will not report heavy snow (+SN) if the visibility is greater than 1/4 mile, and moderate snow (SN) if the visibility is greater than 1/2 mile.

Table 19.2. Intensity of Snow Based on Visibility

Intensity	Criteria
Light	Visibility 3/4 mile (1200 meters) or greater.
Moderate	Visibility 1/2 mile (0800 meters).
Heavy	Visibility 1/4 mile (0400 meters) or less.

19.6.4. Reporting Beginning and Ending Times of Precipitation. The time precipitation begins or ends is reported in remarks of all observations up to, and including, the next METAR. Times for separate periods of the same type of precipitation (e.g., RA, SN) are reported only if the intervening time of no precipitation exceeds 15 minutes. The format for the remark is given in **Attachment 3.**

Chapter 20

SKY CONDITION

20.1. Introduction. Sky condition is a description of the sky from the surface of the earth. An automated sky condition is derived instrumentally by detecting the frequency and height of clouds passing over the sensor (ceilometer) over a period of 30 minutes. An algorithm processes the data from the sensor into data on layers, amounts, and heights of clouds. The sensor derived sky condition is considered functionally equivalent to a manually derived sky condition. AN/FMQ-19 reports sky condition from 100 feet up to a minimum of 12,000 feet. AN/FMQ-19 does not report sky condition above the range of the sensor.

20.2. Sky Condition Algorithms. In accordance with the *Federal Standard Algorithms for Automated Weather Observing Systems Used for Aviation Purposes*, the sky condition algorithm processes the sensor output to determine the sky condition. The sky condition data is then examined to determine if variable heights exist. Where the AN/FMQ-19 has meteorological discontinuity sensors, the data from the additional sensors are examined to determine if their values should be reported in remarks.

20.3. Determining and Reporting Standards.

20.3.1. Sky Cover. All sensor output of clouds or obscuring phenomena aloft is considered to be opaque sky cover.

20.3.2. Determining the Height of Sky Cover. The laser-beam ceilometer is used to measure the height of layers aloft or the vertical visibility into obscuring phenomena.

20.3.3. Determining Height of Surface-Based Layers. The height ascribed to surface-based layers is the vertical visibility, in feet, into the phenomenon.

20.3.4. Determining Non-Uniform Sky Condition. At AN/FMQ-19 units that have multiple ceilometers, the data from the meteorological discontinuity sensors are examined and compared with the data from the primary sensor to determine if remarks are required to report non-uniform conditions.

20.3.5. Number of Layers Reported. AN/FMQ-19 reports no more than three (3) layers of clouds or obscuring phenomena. The layers reported are selected in accordance with **Table 20.1.**

Table 20.1. 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

20.3.6. Reporting Layer Amounts. AN/FMQ-19 algorithms produce reportable layer amounts according to the reportable values in **Table 20.2.**

Table 20.2. Reportable Values for Sky Cover Amount.

Reportable Contraction	Meaning	Summation Amount of Layer
VV	Vertical Visibility	8/8
CLR (see Note)	Clear	0
FEW	Few	Trace - 2/8
SCT	Scattered	3/8 - 4/8
BKN	Broken	5/8 - 7/8
OVC	Overcast	8/8
NOTE: The abbreviation **CLR** is used at automated units when no clouds at or below 12,000 feet are reported.		

20.3.7. Reporting Layer Heights. Heights of layers are reported in hundreds of feet above the ground, rounded to the nearest reportable increment. Cloud layer from the surface to 5,000 feet are reported to the nearest 100 feet, to the nearest 500 feet for layers from > 5,000 feet to = 10,000 feet, and to the nearest 1,000 feet for layers > 10,000 feet. When a value falls halfway between two reportable increments, the lower value is reported.

20.3.8. Reporting Ceiling. The lowest layer reported as broken or overcast indicates a ceiling layer; or if the sky is totally obscured, the vertical visibility is the ceiling.

20.3.9. Reporting Variable Ceiling. When the height of the ceiling layer is variable and the reported ceiling is below 3,000 feet, a remark is included in the observation giving the range of variability. The format for the remark is given in **Attachment 3.**

20.3.10. Reporting Ceiling at Second Location. At units equipped with two or more ceilometers, the ceiling at the designated discontinuity sensor will be encoded in remarks. The AN/FMQ-19 will generate the remark only when the ceiling at the second location is lower than the ceiling height in the body of the observation. The format for the remark is given in **Attachment 3.**

Table 20.3. Summary of Automated Sky Condition Observing and Reporting Standards.

Parameter	Reporting Standard
Sky Cover (General)	Sky condition is included in all reports.
Height/Number of Layers	Report a maximum of three (3) layers between 100 and 12,000 feet at automated units.
Variable Ceiling Height	Evaluated at all units.
Non-Uniform Sky Condition	Evaluated at automated units with multiple sensors.

Chapter 21

TEMPERATURE AND DEW POINT

21.1. Introduction. This chapter contains standards for reporting temperature and dew point in AN/FMQ-19 observations. The chapter also defines maximum and minimum temperature and prescribes appropriate reporting standards.

21.2. Temperature and Dew Point Algorithms. At AN/FMQ-19 units, in accordance with the *Federal Standard Algorithms for Automated Weather Observing Systems Used for Aviation Purposes*, the temperature and dew point algorithms calculate 5-minute average values of temperature and dew point in degrees Celsius. The maximum and minimum temperatures are based on the highest and lowest 5-minute average temperatures during the period of evaluation.

21.3. Determining and Reporting Standards.

21.3.1. Determining Temperature and Dew Point. Temperature and dew point are determined at all units.

21.3.2. Determining Maximum and Minimum Temperature. The maximum and minimum temperatures that occurred in the previous 6 hours are determined to the nearest tenth of a degree Celsius for the 0000, 0600, 1200, and 1800 UTC observations. The maximum and minimum temperatures for the previous 24 hours are determined for the MIDNIGHT (0000 LST) observation.

21.3.3. Units of Measure and Resolution for Reporting Temperature and Dew Point. The units of measure and reporting resolution for the various temperatures and the dew point are in degrees Celsius, to the nearest whole degree in the body of the report, and to the nearest tenth of a degree in the remarks section. Dew point is calculated with respect to water at all temperatures.

21.3.4. Reporting Frequency for Temperature and Dew Point. The temperature and dew point are reported in the body of all METAR/SPECI reports. METAR reports also contain an hourly temperature and dew point group in the remarks section.

21.3.5. Reporting Frequency for Maximum and Minimum Temperatures. The maximum and minimum temperatures are reported as additive data in the 0000, 0600, 1200, and 1800 UTC and 0000 LST observations.

21.3.6. Reporting Procedure. Temperature and dew point are reported in the body of the observation in accordance with coding instructions in **Table 21.1.** and **paragraph 23.5.10.** The maximum and minimum temperatures are reported in remarks in accordance with encoding instructions in **Attachment 3.**

Table 21.1. Summary of Temperature and Dew Point Observing and Reporting Standards.

Data	AN/FMQ-19
Temperature	Reported in whole degrees Celsius.
Dew Point	Reported in whole degrees Celsius.
Hourly Temperatures and Dew Point	Reported to the nearest tenth of a degree Celsius in METAR, as **TsnT'T'T'snT'dT'dT'd**.
Maximum and Minimum Temperatures	Reported at 0000, 0600, 1200, and 1800 UTC as **1snTxTxTx** or **2snTnTnTn**.
24-Hour Maximum and Minimum Temperatures	Reported at 0000 LST as **4snTxTxTxsnTnTnTn**.

Chapter 22

PRESSURE

22.1. Introduction. Atmospheric pressure is the pressure exerted by the atmosphere at a given point. This chapter describes the standards and procedures for determining and reporting the various forms of atmospheric pressure. In this chapter, the term "barometric pressure" refers to the actual pressure sensor value.

22.2. Pressure Algorithms . In accordance with the *Federal Standard Algorithms for Automated Weather Observing Systems Used for Aviation Purposes*, the pressure algorithms compute a pressure relative to the field elevation 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, a pressure algorithm also generates pressure change and pressure tendency remarks for possible inclusion in the observations.

22.3. Standard Definitions. See **Part 2, Chapter 12** for detailed definitions of standard pressure parameters.

22.4. Units of Measure and Resolution. Table 22.1. gives the units of measure and the resolution for the pressure parameters.

Table 22.1. Units of Measure and Resolution of Pressure Parameters.

Parameter	Unit of Measure	Resolution
Station Pressure	Inches of Mercury	0.005 inch
Altimeter Setting	Inches of Mercury	0.01 inch
Sea Level Pressure	Hectopascals	0.1 Hectopascal
Pressure Altitude	Feet	10 feet
Density Altitude	Feet	10 feet

22.5. Pressure Sensor Range. AN/FMQ-19 pressure sensors are capable of measuring pressure from 17.5 to 32.5 inches of mercury (600 to 1100 hectopascals [hPa]).

22.6. Pressure Reporting Standards. Altimeter setting is reported in the body of the observation. Other pressure data, such as pressure rising or falling rapidly, sea level pressure and pressure tendency, when reported, are reported in remarks.

22.6.1. Reporting Frequency of Altimeter Setting. Altimeter setting is reported in all observations.

22.6.2. Reporting Frequency of Pressure Remarks. The pressure change remarks (PRESFR, PRESRR) are included in all observations when appropriate. The Sea-Level Pressure is included in the remarks section of all METARs. The pressure tendency remark (5appp) is only included in 3- and 6-hourly observations. The format for these remarks and additive data are given in **Attachment 3.**

Table 22.2. Summary of Pressure Observing and Reporting Standards.

Data	AN/FMQ-19 Unit
Altimeter Setting	Reported in inches of mercury.
Remarks: - Rising Rapidly - Falling Rapidly - Sea Level Pressure - Tendency	Reported as **PRESRR**. Reported as **PRESFR**. Reported in Hectopascals as **SLPppp**. Reported as **5appp**.

Chapter 23

CODING OF AUTOMATED OBSERVATIONS

23.1. Introduction. This chapter prescribes the standards for coding an automated weather observation in routine weather report (METAR) or selected special weather report (SPECI) format. The coding procedures in this chapter conform to WMO Code Forms FM 15-IX Ext. and FM 16-IX Ext., respectively, and the Regional Codes and National Coding Practices of the United States established with the WMO.

23.2. METAR/SPECI Code.

METAR or SPECI **_CCCC_YYGGggZ_AUTO_dddff(f)Gfmfm(fm)KT_dndndnVdxdxdx_VVVVVSM** or **VVVV_RD$_R$D$_R$/V$_R$V$_R$V$_R$V$_R$FT, RD$_R$D$_R$/V$_N$V$_N$V$_N$V$_N$VV$_X$V$_X$V$_X$V$_X$FT**, or **RDRDR/VRVRVRVR, RDRDR/VNVNVNVNVVXVXVXVX_w'w'_NsNsNshshshs** or **VVhshshs** or **CLR_T'T'/T'dT'd_APHPHPHPH_ RMK_(Automated)_(Automated Additive Data and Maintenance Indicators)**

23.2.1. METAR/SPECI has two major sections: the Body (consisting of a maximum of 11 groups) and the Remarks (consisting of a maximum of 2 categories). Together, the body and remarks make up the complete METAR/SPECI report. In general, the remarks are encoded in the order depicted above and established in the remainder of this chapter.

23.2.2. The underline character "_" indicates a required space between the groups. If a group is not reported, the preceding space is also not reported.

23.3. Format and Content of the METAR/SPECI. Table 23.1. contains the format and contents of the Body and Remarks section of an automated METAR/SPECI observation.

Table 23.1. METAR/SPECI Format and Contents.

Body of Report
(1) Type of Report - **METAR or SPECI**
(2) Station Identifier **- CCCC**
(3) Date and Time of Report - **YYGGggZ**
(4) Report Modifier - **AUTO**
(5) Wind - **dddff(f)Gfmfm(fm)KT_dndndnVdxdxdx**
(6) Visibility - **VVVVVSM**
(7) Runway Visual Range **- (RD$_R$D$_R$/V$_R$V$_R$V$_R$V$_R$FT** or **RD$_R$D$_R$/V$_N$V$_N$V$_N$V$_N$VV$_X$V$_X$V$_X$V$_X$FT)**
(8) Present Weather - **w'w'**
(9) Sky Condition - **N$_s$N$_s$N$_s$h$_s$h$_s$h$_s$ or VVh$_s$h$_s$h$_s$ or CLR**
(10) Temperature and Dew Point - **T'T'/T'dT'd**
(11) Altimeter - **AP$_H$P$_H$P$_H$P$_H$**

Remarks Section of Report—RMK
(1) Automated
(2) Automated Additive and Maintenance Data

23.4. Coding Missing Data in METAR and SPECI. When AN/FMQ-19 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 and maintenance technicians that the system requires maintenance.

23.5. Coding of Automated METAR/SPECI Observations.

23.5.1. Type of Report (METAR and SPECI). The type, METAR or SPECI, is included in all reports. The type of report will be separated from elements following it by a space. Whenever SPECI criteria are met at the time of the routine METAR, the type of report will be METAR.

23.5.2. Station Identifier (CCCC). The station (unit) identifier, CCCC, is included in all reports to identify the station to which the encoded report applies. The station identifier consists of four alphabetic-only characters if the METAR/SPECI is transmitted longline.

23.5.3. Date and Time of Report (YYGGggZ). The date, YY, and time, GGgg, is included in all reports. The time is the actual time of the report is transmitted longline. The date and time group always ends with a Z indicating Zulu time (or UTC). For example, METAR KEDW 210855Z would be the 0900 scheduled report from KEDW taken at 0855 UTC on the 21st of the month.

23.5.4. Report Modifier (AUTO). The report modifier, AUTO, identifies the METAR/SPECI as a fully automated report with no human intervention.

23.5.5. Wind Group (dddff(f)G$f_mf_m(f_m)$KT_$d_nd_nd_n$V$d_xd_xd_x$). The standards for observing and reporting wind are described in **Chapter 3**.

23.5.5.1. Wind Direction. The wind direction, ddd, 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 as "090."

23.5.5.2. Wind Speed. The wind speed, ff(f), is encoded in two or three digits immediately following the wind direction. Speeds of less than 10 knots is encoded using a leading zero. The wind group always ends with KT to indicate that 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.

23.5.5.3. Gust. Wind gusts are encoded in the format G$f_mf_m(f_m)$. 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 would be encoded 27020G35KT.

23.5.5.4. 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 would be encoded VRB03KT.

23.5.5.5. Variable Wind Direction (speeds greater than 6 knots). Wind direction varying 60 degrees or more with wind speed greater than 6 knots will be encoded in the format, $d_nd_nd_n$ $Vd_xd_xd_x$. The variable wind direction group will immediately follow the wind group. The directional variability will be encoded in a clockwise direction. For example, if the wind is variable from 180° to 240° at 10 knots, it would be encoded 21010KT 180V240.

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

23.5.6. Visibility Group (VVVVVSM) or (VVVV—meters—OCONUS). The standards and procedures for observing and reporting visibility are described in **Chapter 4**.

23.5.6.1. The surface visibility, VVVVVSM (VVVV), is encoded in statute miles in the US and in meters at OCONUS units using the values listed in **Table 18.1.** A space will be encoded between whole numbers and fractions of reportable visibility values. The visibility group always ends with SM (CONUS) to indicate that visibilities are in statute miles. For example, a visibility of one and a half statute miles would be encoded "1 1/2SM" (2400 meters).

23.5.6.2. Automated units use an M to indicate "less than" when reporting visibility. For example, "M1/4SM" (M0400 meters) means a visibility of less than one-quarter statute mile.

23.5.7. Runway Visual Range Group ($RD_RD_R/V_RV_RV_RV_RFT$). RVR is encoded in the format $RD_RD_R/V_RV_RV_RV_RFT$, where R indicates the runway number follows, D_RD_R is the runway number (an 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, and FT indicates the units of measurement are feet. Overseas units will use measurement values as published in the DoD FLIPs (typically meters).

23.5.7.1. RVR that is varying is encoded in the format, $RD_RD_R/V_NV_NV_NV_NVV_XV_XV_XV_XFT$ ($RD_RD_R/V_NV_NV_NV_NVV_XV_XV_XV_X$ meters for OCONUS), where R indicates the runway number follows, D_RD_R is the runway number (an additional D_R may be used for runway approach directions, such as R for right, L for left, and C for center), $V_NV_NV_NV_N$ 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, and FT indicates the units of measurement are feet. The indicator FT is not used if RVR is reported in meters. The 10-minute RVR for runway 01L varying between 1,000 and 5,000 (0300 and 1500 meters) feet would be encoded "R01L/1000V5000FT" (R01L/0300V1500).

23.5.7.2. 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 $V_XV_XV_XV_X$ group is preceded by a P. For example, an RVR of less than 100 feet (0050 meters) will be encoded "M0100FT" (M0050); an RVR of greater than 6,000 feet (1500 meters) will be encoded "P6000FT" (P1500).

23.5.8. Present Weather Group (w'w'). The standards and procedures for observing and reporting present weather are described in **Chapter 19**. The appropriate notations found in **Table 23.2.** are used to encode present weather. The following general rules apply when present weather is encoded for a METAR or SPECI:

Table 23.2. Notations for Reporting Present Weather.

QUALIFIER		WEATHER PHENOMENA		
INTENSITY OR PROXIMITY **1**	**DESCRIPTOR** **2**	**PRECIPITATION** **3**	**OBSCURATION** **4**	**OTHER** **5**
Light (**-**) Moderate[1] Heavy (+) Vicinity (**VC**)	**FZ** Freezing **TS** Thunderstorm	**DZ** Drizzle **RA** Rain **SN** Snow **UP** Unknown Precipitation	**BR** Mist **FG** Fog **HZ** Haze	**SQ** Squalls
The weather groups are constructed by considering columns 1 to 5 in the table above in sequence, i.e., intensity, followed by description, followed by weather phenomena, e.g., heavy freezing rain is encoded as +FZRA. 1. To denote moderate intensity, no entry or symbol is used.				

23.5.8.1. With the exception of thunderstorms in the "vicinity," only weather detected at the station is encoded in the body of the report. Obscurations are encoded in the body of the report only if the surface visibility is less than 7 miles (9999 meters).

23.5.8.2. 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.

23.5.8.2.1. Intensity. Intensity is encoded with precipitation types. Intensity is not reported with thunderstorms. If precipitation is reported in combination with thunderstorms, the intensity of the precipitation precedes the thunderstorm descriptor (e.g., +TSRA would be decoded as thunderstorms with heavy rain).

23.5.8.2.2. Proximity. Used only with thunderstorms (TS). With the lightning sensor enabled, AN/FMQ-19 will report TS as "occurring at the station" if the lightning sensor detects either cloud-to-cloud or cloud-to-ground strikes within 5 nautical miles of the point of observation, and "in the vicinity of the station" (VCTS) if between 5 and 10 nautical miles of the point of observation. Lightning strikes detected beyond 10 but less than 30 nautical miles are reported in remarks as LTG DSNT followed by the direction.

23.5.8.2.3. Descriptor Qualifier. AN/FMQ-19 uses the descriptors freezing (FZ) and thunderstorm (TS). The descriptor freezing (FZ) is encoded in combination with fog (FG), rain (RA), and drizzle (DZ) (e.g., FZFG/FZRA/FZDZ).

23.5.8.2.4. Precipitation. AN/FMQ-19 can encode four types of precipitation (i.e., DZ, RA, SN, UP). Only one type is reported at any given time.

23.5.8.2.4.1. At automated units, precipitation of unknown type will be encoded as UP when the precipitation discriminator cannot identify the precipitation with any greater precision.

23.5.8.2.5. Obscuration. AN/FMQ-19 can encode three types of obscurations (i.e., BR, FG, HZ). Only one type is reported at any given time.

23.5.8.2.6. Other Weather Phenomena. Squalls are encoded as SQ.

23.5.9. Sky Condition Group ($N_sN_sN_sh_sh_sh_s$ or $VVh_sh_sh_s$ or CLR). The standards and procedures for observing and reporting sky condition from automated units are described in **Part 3, Chapter 20.**

23.5.9.1. 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 layer. There is no space between the amount of sky cover and the height of the layer. Sky condition is encoded in an ascending order up to the first overcast layer.

23.5.9.2. 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. There is no space between the group identifier and the vertical visibility.

23.5.9.3. Clear skies are encoded in the format of CLR, where CLR is the abbreviation used by automated units to indicate no clouds are detected at or below 12,000 feet.

23.5.9.4. 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 from **Table 20.2.** The reports of clear skies (CLR) are complete layer reports within themselves. The abbreviations FEW, SCT, BKN, and OVC are followed, without a space, by the height of the cloud layer.

23.5.9.5. The height of the base of each layer, $h_sh_sh_s$, is encoded in hundreds of feet above the surface using three digits in accordance with **Table 23.3.**

Table 23.3. 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

23.5.10. Temperature/Dew Point Group ($T'T'/T'_dT'_d$). The standards for observing and reporting temperature and dew point are given in **Chapter 21.** The temperature is separated from the dew point with a solidus "/."

23.5.10.1. The temperature and dew point are encoded as two digits rounded to the nearest whole degree Celsius. Sub-zero temperatures and dew points are prefixed with an M. 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."

23.5.10.2. If the temperature is not available, the entire temperature/dew point group is not encoded. If the dew point is not available, the temperature is encoded followed by a solidus "/" and no entry made for dew point. For example, a temperature of 1.5°C and a missing dew point would be encoded as 02/.

23.5.11. 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. See **Chapter 22.**

23.6. Remarks (RMK). Remarks are included in all METAR and SPECI, if appropriate. Remarks are separated from the body of the report by a space and the contraction RMK. If there are no remarks, the contraction RMK is not encoded.

23.6.1. METAR/SPECI remarks fall into 2 major categories: (1) Automated and (2) Additive and Maintenance Data. UTC time entries are made in 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. **Table 24.1.** in **Part 4** shows the remarks AN/FMQ-19 will include in all automated observations. **Attachment 3** provides the coding of all remarks.

23.6.2. The automatic reporting of Additive Data information will be IAW 24-hour UTC time for all AN/FMQ-19 units.

PART 4

AUGMENTATION/BACKUP OBSERVING PROCEDURES

Chapter 24

INTRODUCTION

24.1. Purpose. Part 4 describes the augmentation and backup procedures for USAF and Army Weather Observing Operations.

24.2. Augmenting Automated Surface Observing Systems. Augmentation is the process of manually adding data to an observation generated by an automated surface weather observing system (AN/FMQ-19 or certified like system) that is beyond that system's capabilities. Backup (editing) is the process of providing meteorological data when the primary automated method is unavailable, or when an element is occasionally unrepresentative and operationally significant.

24.2.1. **Table 24.1.** contains parameters that have been identified for augmentation and backup. When augmenting the automated observing system, the weather technician must maintain situational awareness of current weather conditions and the system-generated observation. While some days may require more effort to maintain situational awareness than others, the system is set-up and designed to require minimal review.

24.2.2. Augmentation of the AN/FMQ-19 by a certified weather technician is mandatory at USAF and US Army controlled airfields with Combat Weather Teams (CWTs) assigned when any of the following criteria are met:

24.2.2.1. ATC tower located on the airfield is open to support military flight operations.

24.2.2.2. When the Severe Weather Action Procedures (SWAP) are implemented for tornadoes or large hail (augment), and high winds (backup).

24.2.2.3. Volcanic ash (augment) is observed from the airfield.

24.3. Augmentation Requirements. During automated surface observing system augmentation, certified weather personnel are responsible for the completeness and accuracy of the weather observation. Automated weather observing systems are, by design, viewing a smaller area than a human weather technician. Therefore, the weather technician is responsible for adding operationally significant information to AN/FMQ-19 observations that is beyond the system's capability to sense. Augmentation of automated observations will be provided in accordance with the guidelines presented in **Chapter 25.**

24.3.1. AFMAN 15-135, *Combat Weather Team Operations*, organizes the Combat Weather Team (CWT) into three elements: Staff Weather Element, Mission Weather Element, and the Airfield Services Element. Weather technicians certified to "take" observations and perform the "eyes forward" function reside in the Airfield Services Element. As AF weather automates the observing function, the role of the airfield services element, and more importantly the certified weather technician's role, must be clearly defined.

24.3.2. In the Airfield Services Element, weather technicians may perform more than observing functions. The unit must maintain and post duty priorities as suggested in AFMAN 15-129 to de-conflict potential instances of conflicting tasks. Unit leadership must coordinate these actions with its customers, and document results in the local Weather Support Document (WSD) and Operational Weather Squadron-CWT Memorandum of Agreement (MOA).

24.4. Backup of Automated Surface Observing Systems.

24.4.1. Backup of AN/FMQ-19 provides the minimum acceptable level of available data. The following functions of AN/FMQ-19 will be backed up; wind speed and direction, visibility, selected present weather elements and obscurations, sky cover up to an including 12,000 feet, temperature and dew point temperature, altimeter setting, some remarks and additive data. Weather technicians will perform backup (i.e., "edit" the observation) if they judge the difference between what AN/FMQ-19 is reporting and manually observed conditions are operationally significant or unrepresentative.

24.4.2. For most parameters, backup will only be provided to the extent and capabilities of a properly functioning AN/FMQ-19. **Backup (editing) is not the mechanism for adding data that is not within the capabilities of AN/FMQ-19**. For example, snow depth is not a function of AN/FMQ-19, but will be added or appended to the AN/FMQ-19 report as an augmented parameter. If AN/FMQ-19 reports a heavy rain event, but determines the precipitation amount to be a trace, then backup would be required and a more representative amount must be determined and reported.

24.5. Backup Requirements . Task-certified weather technicians are responsible for the completeness and accuracy of the weather observation. If the complete automated observation is unavailable due to sensor/system malfunction, communications failure, and/or non-representative data, weather technicians will provide backup information in accordance with the guidelines in **Chapter 26**. Except for some automated remarks, backup refers to the weather technicians providing the same reporting capability as that provided by the automated weather sensor, consistent operational status. Backup information is required for longline dissemination, for OWS aerodrome forecast (TAF) production, and for local ground-to-air dissemination to sustain air operations at the airfield (i.e., ATC functions and/or the Automatic Terminal Information Service/ATIS).

24.6. Entering Augmented/Backup Information. AF weather units will use the New Tactical Forecast System (N-TFS) to enter augmented or backup information. If N-TFS is not available for use in augmentation and backup, units will use the AN/FMQ-19 Operator Interface Device (OID) to perform these functions.

24.7. Disseminating Augmented/Backup Observations. AN/FMQ-19 augmented/backup observations will be disseminated through the N-TFS. In the event of a communications outage that prohibits dissemination via N-TFS, units will develop back up procedures to disseminate AN/FMQ-19 observations locally and longline. See **Part 2, Chapter 14** for additional dissemination guidance.

24.8. Documenting Augmented/Backup Observations. AN/FMQ-19 augmented/backup observations will be documented on AF Form 3813, Federal Meteorological Surface Weather Observations (METAR/SPECI), an electronically generated form on N-TFS. If the N-TFS system fails, weather units will document AN/FMQ-19 observation on the electronic or paper version of Air Force Form 3803, Surface Weather Observations.

24.9. System Administration.

24.9.1. System Administrators. AF weather units with AN/FMQ-19 will designate a primary and alternate System Administrator, and ensure they are fully trained and qualified before assuming the responsibility.

24.9.1.1. Following applicable 33 Series, Communications and Information directives, AN/FMQ-19 System Administrators will work with the unit Information System Security Officer (ISSO) to establish user names, passwords, and user profiles for all authorized FMQ-19 users, including personnel designated to log onto AN/FMQ-19 equipment in ATC facilities (if equipped).

24.9.2. Log-On/Log-Off Requirements. At augmented units, the weather technician must log onto the AN/FMQ-19 for the entire shift. Logging onto the AN/FMQ-19 automatically logs-off the previous weather technician, and removes the AUTO report modifier from METAR/SPECI observations. AN/FMQ-19 will only allow one weather technician to be logged on.

24.9.2.1. At part-time units, the weather technician coming on duty after a break in manual coverage will log-on to the AN/FMQ-19. The last weather technician on duty before a break in manual coverage must log-off to change the report modifier to AUTO and place the AN/FMQ-19 in a fully automated mode of operation.

24.9.3. Contingency Plan Requirement. AF weather units with AN/FMQ-19 will develop procedures to implement and exercise (as required) the Contingency Plan for the Air Force Weather Observing System – 21st Century (OS-21) Fixed Base System (FBS). The Contingency Plan requirements are in Appendix L of the System Security Authorization Agreement (SSAA) documentation. MAJCOMs will ensure all AN/FMQ-19 units have a copy of the Contingency Plan and other required SSAA documents.

Table 24.1. Summary of Elements and Parameters to Augment and Backup.

Body of Report - Consists of 10 Groups			
Group	**Reference**	**Augment**	**Backup**
Type of Report **(METAR/SPECI)**	27.4.1		X
Station Identifier **(CCCC)**	27.4.2		X
Date and Time of Report **(YYGGggZ)**	27.4.3		X
Report Modifier **(COR)**	27.4.4		X
Wind **(dddff(f)Gfmfm(fm)KT_dndndnVdxdxdx)**	27.4.5		X
Visibility **(VVVVVSM) or (VVVVV)**	27.4.6	Note 1.	X
Runway Visual Range **(RDRDR/VRVRVRVRFT) or (RDRDR/VNVNVNVNVVXVXVXVXFT)**	27.4.7.		RVRNO
<u>Present Weather</u> (**w'w'**)	27.4.8	X	X
Tornadic Activity: Tornado (**+FC**), Funnel Cloud			X
(**FC**), Waterspout (**+FC**)			X
Thunderstorm (**TS**)			X
Rain (**-RA**, **RA**, **+RA**)			X
Freezing Rain (**-FZRA**, **FZRA**, **+FZRA**)			X
Drizzle (-**DZ, DZ, +DZ**)			
Freezing Drizzle **(-FZDZ, FZDZ, +FZDZ**)		X	
Snow (**-SN**, **SN**, **+SN**)		X	
Ice Pellets (**PL**)			
Hail (**GR** or **GS**)			X
			X
<u>Obstructions to Visibility</u>			X
Fog (**FG**)			X
Freezing Fog (**FZFG**)			X
Mist (**BR**)			
Haze (**HZ**)		X	
Squall (**SQ**)		X	
Volcanic Ash (**VA**)		X	
Smoke (**FU**)		X	
Sand (**SA**)			
Widespread Dust (**DU**)		X	
Any weather element deemed **operationally significant** by the weather technician.			
Sky Condition **(NsNsNshshshs or VVhshshs or CLR)**	27.4.9	Note 2.	X
Temperature and Dew Point **(T'T'/T'dT'd)**	27.4.10		X
Altimeter **(APHPHPHPH)**	27.4.11		X

NOTES:

X - Indicates required data.
1. Values < 1/4 mile (if required).
2. Operationally significant cloud layers above 12,000 feet (if required).

Remarks Section of Report - Consists of 2 Categories			
Category 1 - Automated, Manual, and Plain Language			
Element	**Reference** Note 3.	**Augment**	**Backup**
Volcanic Eruptions		X	
Funnel Cloud **(Tornadic Activity _B/ E(hh)mm_LOC/DIR_(MOV))**		X	
Augmented Unit Indicator **(AO2A)**			X
Peak Wind **(PK_WND_dddff(f)/(hh)mm)**			X
Wind Shift **(WSHFT_(hh)mm)**			X
Tower/Surface Visibility **(TWR_VIS_vvvvv or SFC_VIS_vvvvv)**		X	
Variable Prevailing Visibility **(VIS_vnvnvnvnvnVvxvxvxvxvx)**			X
Sector Visibility (**VIS**_[**DIR**]_vvvvv)		X	
Visibility at Second Location **(VIS_vvvvv_[LOC])**			VISNO_LOC
Lightning **(LTG[LOC])**			X
Beginning/Ending of Precipitation **(w'w'B(hh)mmE(hh)mm)**			X
Beginning/Ending of Thunderstorms **(TSB(hh)mmE(hh)mm)**			X
Thunderstorm Location **(TS_LOC_(MOV_DIR)) [Plain Language]**		X	
Hailstone Size **(GR_[size]) [Plain Language]**		X	
VIRGA **(VIRGA_[DIR]) [Plain Language]**		X	
Variable Ceiling Height (**CIG_**$h_n h_n h_n V h_x h_x hx$)			X
Partial Obscurations (surface-based or aloft) **(w'w'_**$[N_S N_S N_S] h_S h_S h_S$**) [Plain Language]**		X	
Variable Sky Condition ($N_S N_S N_S (h_S h_S h_S)$**_V_**$N_S N_S N_S$) **[Plain Language]**			X
Significant Cloud Types: Cumulonimbus (**CB**) or Cumulonimbus Mammatus (**CBMAM**), Towering Cumulus (**TCU**), Altocumulus Castellanus (**ACC**), Standing Lenticular clouds (**SCSL**), (**ACSL**), (**CCSL**), Rotor Clouds (**ROTOR CLD**)		X	
Ceiling Height at Second Location **(CIG_hhh_[LOC])**			CHINO_LOC

Pressure Rising/Falling Rapidly **(PRESRR/PRESFR)**			X
Sea Level Pressure **(SLPppp)**			X
Snow Increasing Rapidly **(SNINCR_[inches-hour/inches on ground])**		X	
Other Significant Information **[Plain Language]**: (w'w' not at station). May include additional operational significant remarks as deemed appropriate or operationally significant by the weather technician.		X	

NOTES:

X - Indicates required data.

1. Values <1/4 mile (if required).

2. Operationally significant cloud layers above 12,000 feet (if required).

3. All Remarks and Additive Data reference are provided in **Attachment 3.**

Category 2 – Additive Data

Element	**Reference** Note 3.	**Augment**	**Backup**
3- and 6-Hour Precipitation Amount **(6RRRR)**			X
24-Hour Precipitation Amount **(7R24R24R24R24)**			X
Snow Depth on the Ground **(4/sss)**		X	
Hourly Temperature and Dew Point **(TsnT'T'T'snT'dT'dT'd)**			Not Required
6-Hourly Maximum Temperature **(1snTXTXTX)**			X
6-Hourly Minimum Temperature **(2snTnTnTn)**			X
24-Hour Maximum and Minimum Temperature **(4snTxTxTxsnTnTnTn)**			Not Required
3-Hourly Pressure Tendency **(5appp)**			X
RVRNO		X	
Maintenance Indicator **($)**			X

NOTES:

X - Indicates required data.

1. Values <1/4 mile (if required).

2. Operationally significant cloud layers above 12,000 feet (if required).

3. All Remarks and Additive Data reference are provided in **Attachment 3.**

Chapter 25

AUGMENTATION

25.1. Introduction. Augmentation is the process of adding data to an automated observation that is beyond the capabilities of the automated weather observing system.

25.2. Mandatory Augmentation Requirements for All AF Weather Units. **Table 25.1.** summarizes the mandatory and optional augmentable elements that AF weather units will report. All weather units will augment the elements in **Table 25.1.** marked with an asterisk (*) as mandatory. Units will augment the remaining elements and remarks as other higher-priority duties allow (see **paragraph 24.3.2.**). MAJCOMs or higher headquarters may mandate the augmentation of other elements and remarks by supplementing this manual. All units will perform backup as indicated in **Table 24.1.**

25.3. Augmentation Responsibilities. To perform augmentation duties, the weather technician must maintain situational awareness of current weather conditions and AN/FMQ-19-generated observations. AF weather units will develop augmentation procedures and clearly defined duty priorities to direct duties that conflict with augmentation requirements. In all cases, the highest priority will be flight safety.

Table 25.1. Augmentable Parameters.

Body of Observation
Visibility: Values <1/4 Mile (if required)
Present Weather: *** Funnel Cloud (Tornadic Activity)** *** Ice Pellets** *** Hail** *** Volcanic Ash** Smoke Sand Widespread Dust Any weather elements considered operationally significant by the weather technician
Sky Condition: Operationally significant clouds above 12,000 feet (if required)
Remarks
*** Volcanic Eruptions** *** Tornadic Activity** *** Tower/Surface Visibility** Sector Visibility Thunderstorm Location Hailstone Size (1/4" or larger in diameter) VIRGA Partial Obscurations (surface-based and aloft) Variable Sky Condition Significant Cloud Types Snow Increasing Rapidly Other Significant Information Snow Depth on Ground RVRNO (Sensor Status Indicator)
*** Mandatory Augmentation for all AF weather units.**

25.4. Validity and Recency.

25.4.1. Validity of Data. Once an observation has been augmented, the weather technician must ensure the validity of the augmented data by deleting or changing the data as required.

25.4.2. Recency of Observed Elements. Data augmented in an observation must have been evaluated within 15 minutes of the actual time of the report.

25.5. Augmenting Procedures and SPECI Criteria. To support local customers, some weather units may have to generate SPECI observations for weather elements/thresholds that are beyond the AN/FMQ-19 reporting capability (e.g., visibilities less than 1/4 mile, etc.). Weather units will coordinate the requirement for reporting SPECIs for additional elements/thresholds with local customers. The additional requirements will be documented in the local WSD. Refer to **Attachment 2**, Table of Special Criteria, for augmented SPECI criteria. The following paragraphs detail these additional requirements:

25.5.1. Augmenting Visibility. Surface visibility values of 0, 1/16, 1/8, and 3/16 (0000, 0100, 0200, 0300 meters) can be augmented to meet local requirements.

25.5.2. Present Weather.

25.5.2.1. Order for Reporting Present Weather. When augmenting additional types of weather (e.g., Tornadic Activity or GR) or obstructions to vision (e.g., VA or FU) to the automated observation, they will be reported in the following order:

(1) Tornadic Activity (Tornado [+FC], Waterspout [+FC], Funnel Cloud [FC])

(2) Present weather in order of decreasing dominance (most dominant reported first)

(3) Left-to-right in **Table 27.5.** (Columns 1-5)

25.5.2.2. Augmenting Tornadic Activity.

25.5.2.2.1. Tornado(s), waterspout(s), or funnel cloud(s) will be reported in a METAR/SPECI whenever they are observed to begin (first seen), are in progress, or disappear (end). A SPECI will be generated with the beginning or ending of tornado, waterspout, or funnel cloud.

25.5.2.2.2. The standard contraction +FC" for Tornado or Waterspout is entered into the PRESENT WX field. In the case of a Funnel Cloud, FC is the contraction that is used. Refer to **Attachment 3**, Table of Remarks, for other required remarks besides the beginning and/or ending times.

25.5.2.3. Augmenting Ice Pellets. Ice pellets (PL) will be reported in a METAR/SPECI whenever it begins, is in progress, or ends. Weather units will generate a SPECI when ice pellets begin, end, or change intensity. Indicate the intensity of ice pellets as light, moderate or heavy using **Table 25.2.** or **Table 25.3.** When ice pellets are augmented into the body of the report, a remark should be included to report the beginning or ending time (see **Attachment 3** for precipitation start/end entries)

Table 25.2. Estimating Intensity of Ice Pellets.

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 7 statute miles (9999 meters).
Heavy	Rapid accumulation on ground. Visibility reduced by ice pellets to less than 3 statute miles (4800 meters).

Table 25.3. Intensity of Ice Pellets Based on Rate-of-Fall.

Intensity	Criteria
Light	Up to 0.10-inches per hour; maximum 0.01-inch in 6 minutes.
Moderate	0.11-inches to 0.30-inches per hour; more than 0.01-inch to 0.03-inches in 6 minutes.
Heavy	More than 0.30-inches per hour; more than 0.03-inches in 6 minutes.

25.5.2.4. Augmenting Hail.

25.5.2.4.1. Hail (GR) will be reported in a METAR/SPECI whenever it begins, is in progress, or ends. When hail is augmented into the body of the report, a remark should be included to report the beginning or ending time. In addition, the weather technician should report the hailstone size in remarks when hailstones 1/4" or larger in diameter occur. Refer to **Attachment 3**, Table of Remarks, for reporting hailstone size.

25.5.2.4.2. Hail begins at the time it is first observed and ends when it is no longer falling. No intensity is assigned to hail. Depth of hail on the ground is not reported in the METAR/SPECI report.

25.5.2.5. Augmenting Volcanic Ash. Volcanic Ash (VA) will be reported whenever it is observed falling to the ground at the unit. VA is always encoded in the body of the report, regardless of the visibility and no remarks are required. No intensity is assigned to volcanic ash.

25.5.2.6. Augmenting Smoke. Report FU if smoke reduces visibility to below 7 miles (9999 meters). No SPECI observation for smoke is required unless it reduces visibility below established criteria. FU is entered in the PRESENT WX.

25.5.2.7. Augmenting Sand and Widespread Dust. Report SA for sand, and DU for widespread dust, if either one of these reduces visibility to below 7 miles (9999 meters). No SPECI observation for sand or dust is required unless it reduces visibility below established criteria.

25.5.2.8. Augmenting Sky Condition Above 12,000 Feet. No more than three layers are reported by AN/FMQ-19, but three additional layers may be augmented. Some AF weather units may report operationally significant cloud layers above 12,000 feet if required by supported customers, or by MAJCOM supplement to this manual. Units will coordinate the operationally significant sky condition requirement with supported customers. Significant cloud layer requirements will be documented in the local WSD.

25.5.2.8.1. To augment sky condition above 12,000 feet, weather technicians will report all cloud layers in ascending order up to the first overcast layer; the 12,000 foot restriction will not apply. No more than six (6) layers will be reported. If more than six layers are observed during backup, weather technicians will use **Table 27.6.** in **Chapter 27** to help determine which layers are to be reported.

25.5.2.8.2. While augmenting above 12,000 feet with AN/FMQ-19 reporting CLR, the weather technician will need to edit out this entry with the augmented information (e.g., CLR becomes OVC140). A sky condition report of CLR OVC140 is not acceptable.

25.5.2.8.3. At cloud layers below 12,000 feet, AN/FMQ-19 will accept the contractions CB or TCU to be attached to the appropriate height, (e.g., BKN050 can be augmented to report BKN050CB). Refer to **Attachment 3**, Table of Remarks, to enter significant cloud types.

25.5.2.9. Augmenting Remarks. Remarks will be included in all METAR/SPECI reports when required.

25.5.2.9.1. METAR/SPECI remarks fall into two major categories: (1) Automated, Manual, and Plain Language, and (2) Additive Data. Coding of the specific remarks, order of entry, and content is located in **Chapter 27**; and **Attachment 3**, Table of Remarks. Remarks will be separated from the body of the report by a space and the contraction RMK.

25.5.2.9.2. Weather technicians will include any additional remarks they deem operationally significant. This includes information from local PIREPs reporting significant or unusual variations in the local weather that could affect flying operations, e.g., CLD LYR AT 400 FT ON APCH RWY 23 RPRTD BY PIREPS, CIG VIS LWR ON APCH RWY14L.

Chapter 26

BACKUP

26.1. Introduction. Backup (editing) is the process of providing meteorological data, documentation, and/or communication of an AN/FMQ-19 weather observation when the primary automated method is unavailable or unrepresentative. Backup of the AN/FMQ-19 by the weather technician provides the minimum acceptable level of available data for meteorological operations and the support of aviation operations in the event of a partial or total AN/FMQ-19 failure. Weather units performing augmentation will also augment during backup operations.

26.1.1. To perform backup duties, the weather technician must remain aware of current weather conditions and AN/FMQ-19 observations. In the case of conflicting responsibilities or tasks, the weather technician will use the posted unit duty priorities to determine which takes precedence, with the highest priority being safety of flight.

26.2. Backup Requirements. **Table 24.1.** lists the AN/FMQ-19 elements all AF weather units will back up. For most parameters, backup will only be provided to the extent and capabilities of a properly functioning AN/FMQ-19. For example, if augmentation is not required for cloud layers above 12,000 feet, units need only report three (3) layers of clouds or obscuring phenomena up to and including 12,000 feet. In addition, the weather technician would need to backup the Variable Ceiling Height and Sky Condition remarks, if required.

26.2.1. Units required to augment sky condition above 12,000 feet will perform backup to the same level. While performing backup, weather technicians will report all cloud layers in ascending order up to the first overcast layer; the 12,000-foot restriction will not apply. No more than six (6) layers will be reported. If more than six layers are observed during backup, weather technicians will use **Table 27.6.** to help determine which layers are to be reported.

26.3. Backup Application. Backup applies to all AN/FMQ-19 units when certified personnel are available to backup the automated elements of the report.

26.4. Determining Backing-Up Observation Elements. Weather units will use the following guidance, along with that in **Part 1**, **paragraph 2.5.**; and **Part 2**, Manual Observing Procedures, while performing back up operations.

26.4.1. If the thunderstorm location cannot be determined while performing backup during a lightning sensor outage, the weather technician will manually begin a thunderstorm and report it as "occurring at the station" when thunder is first heard, or when hail is falling or lightning is observed at or near the airfield and the local noise level is such that resulting thunder cannot be heard. During backup operations, a thunderstorm is ended 15 minutes after the last occurrence of thunder, or the last observance of lightning over the station when the local noise level is sufficient to prevent hearing thunder.

26.5. Validity of Data. Once an observation has been edited through backup actions, the weather technician must impart a higher level of awareness to ensure the validity of the backed-up data.

26.6. Backup Equipment. Units should use available meteorological equipment (i.e., FMQ-19 discontinuity sensors, AN/TMQ-53, Tactical Meteorological Observing System (TMOS), non-tactical aneroid barometer, other tactical meteorological (TACMET), or MAJCOM-approved equipment) to back up the AN/FMQ-19 sensors. During backup, winds and pressure values will be reported as "Estimated." Document the use of backup observing equipment in Column 90 of the AF Form 3803/3813 (as applicable). Weather units will contact their MAJCOM or higher headquarters for additional guidance on the use of back up weather equipment. See **Part 1, paragraph** 2.5. **NOTE:** Pilot reports of cloud heights will be used to help back up the Sky Condition, if available.

26.7. AN/FMQ-19 Quality Control.

26.7.1. If the AN/FMQ-19 report, in the weather technician's judgment, is unrepresentative of current conditions, the technician should intervene by backing up (editing) the AN/FMQ-19 report. The weather technician should determine the appropriate action to be taken depending on the assessment of the situation. The weather technician must also be cognizant of the characteristics of AN/FMQ-19 (e.g., use of time averaging vs. spatial averaging) and the siting of the system when determining unrepresentativeness.

26.7.2. The weather technician must use discretion in determining whether to turn off report processing for a sensor. Turning off report processing creates a maintenance indicator ($) and places it in the next observation. If this is the weather technician's intent, they should turn off report processing; if not, backup (editing) will be performed. Weather technicians should turn off Report processing only for a failed sensor and immediately initiate maintenance procedures.

26.8. AN/FMQ-19 Maintenance Procedures. The following is an overview of the procedures weather units will implement if there is a partial or complete failure of the AN/FMQ-19 sensor.

26.8.1. When AN/FMQ-19 sensors fail; go to the backup mode of operation to provide the data that the AN/FMQ-19 sensor would have provided. As soon as practicable, initiate maintenance actions by notifying ATC, the AFWA Operations Center, and the local maintenance point of contact of the extent of the AN/FMQ-19 failure. During backup operations of an AN/FMQ-19 failure, take METAR and SPECI reports according to guidance in **Part 2**. The reports will be encoded and disseminated in the same format used by AN/FMQ-19.

26.8.1.1. The AFWA Customer Service Center provides 24 hours a day assistance in resolving problems with the AN/FMQ-19. After calling the local maintenance point of contact to report an outage or problem, the weather technician must call the AFWA Customer Service Center. AFWA tracks all outages and trouble reports to ensure all software, hardware, and procedural trends are identified. This is a key step in the process to insure all problems are identified and corrected as soon as possible.

26.8.1.2. The local maintenance point of contact will contact METNAV for repair. If the scope of the repair is beyond the local maintenance capability, the METNAV technician will notify the weather technician to contact the AFWA Customer Service Center to get assistance from the vendor. After the repair is made, the weather technician must call the AFWA Customer Service Center to report that the problem has been resolved. **Table 26.1.** shows the steps in the AN/FMQ-19 support process.

Table 26.1. AN/FMQ-19 Support Process.

1. Weather technician encounters problem that cannot be resolved at unit level.
2. Weather technician contacts local maintenance point of contact for METNAV assistance.
3. Weather technician contacts AFWA Operations Center using one of the methods described in **paragraph 26.8.1.2.**, and requests a ticket be opened for tracking.
4. Local maintenance point of contact contacts METNAV.
5. METNAV fixes the problem or tells the weather technician to contacts AFWA Operations Center for assistance.
6. When problem is resolved, the weather technician contacts AFWA Operations Center to report the problem fixed.

26.8.2. During periodic maintenance of the AN/FMQ-19, where the METNAV technician turns off report processing for a sensor thus causing a maintenance indicator ($) in the observation, the weather technician must contact the AFWA Operations Center to disregard any maintenance actions. The AFWA Operations Center monitors AN/FMQ-19 observations for maintenance indicators ($), and is normally aware of the need for maintenance before being called by the weather unit.

26.8.2.1. When METNAV performs periodic maintenance of the AN/FMQ-19 precipitation gauge, they are required to inject water into the tipping bucket. Because the sensor is an analog sensor, and even though it is disabled, the sensor memory remembers the injected amount of water and reports it when the sensor is re-enabled. The algorithms process this data and then report it into the daily and monthly summary messages. The weather technician must ask METNAV how much water was injected, annotate the amount, and later backup (edit) appropriately and remove the amount from the daily precipitation readings. Even though the issue of analog sensor and reporting may be corrected in the future, if sensors are not carefully managed during maintenance, errors can occur.

Chapter 27

CODING OF AUGMENTED/BACKUP OBSERVATIONS

27.1. Introduction. This chapter contains the coding of weather elements and parameters into the AN/FMQ-19 observation report when performing augmentation/backup of the observation.

27.2. METAR/SPECI Code. The AN/FMQ-19 augmentation/backup METAR/SPECI report has two major sections: the Body (consisting of a maximum of 11 groups) and the Remarks (consisting of a maximum of 2 categories). Table 27.1. contains the format and contents of the Body and Remarks section of a METAR/SPECI observation. Table 27.2. contains the METAR/SPECI code. Together, the body and remarks make up the complete AN/FMQ-19 METAR/SPECI coded report and are encoded in the following order:

Table 27.1. METAR/SPECI Format and Contents.

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** (when closed)
(5) Wind - **dddff(f)Gfmfm(fm)KT_dndndnVdxdxdx**
(6) Visibility - **VVVVVSM**
(7) Runway Visual Range **- (**$RD_RD_R/V_RV_RV_RV_RFT$ or $RD_RD_R/V_NV_NV_NV_NVV_XV_XV_XV_XFT$)
(8) Present Weather - **w'w'**
(9) Sky Condition - **NsNsNshshshs or VVhshshs or CLR**
(10) Temperature and Dew Point - **T'T'/T'dT'd**
(11) Altimeter - **APHPHPHPH**
Remarks Section of Report—RMK
(1) Automated, Manual, and Plain Language
(2) Additive and Maintenance Data

Table 27.2. METAR/SPECI Code.

METAR or SPECI	**_CCCC_YYGGggZ_COR** or **AUTO_dddff(f)Gfmfm(fm)KT_dndndnVdxdxdx_ VVVVVSM** or **VVVV_**$RD_RD_R/V_RV_RV_RV_RFT$**,** $RD_RD_R/V_NV_NV_NV_NVV_XV_XV_XV_XFT$, or **RDRDR/VRVRVRVR, RDRDR/VNVNVNVNVVXVXVXVX_w'w'_NsNsNshshshs** or **VVhshshs** or **CLR_T'T'/T'dT'd_APHPHPHPH_ RMK_(Automated, Manual, Plain Language)_(Additive Data and Automated Maintenance Indicators)**

27.2.1. The underline character "_" indicates a required space between the groups. The actual content of the report depends on the observation program at the individual unit.

27.3. 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. However, at units where sea level pressure is normally reported, when sea level pressure is not available it will not be omitted, but will be encoded as SLPNO.

27.4. Coding the Body of the METAR or SPECI Report. Table 27.3. list the 11 groups in the body of METAR/SPECI reports and provides a brief description of the element. References in the table indicate the sections where the elements are discussed and explained.

Table 27.3. Body of AN/FMQ-19 Observations.

Body of Report - Consists of 11 Groups		
Group	Reference	Brief Description
Type of Report	27.4.1	Indicates type of report.
Station Identifier	27.4.2	A four-character group used to identify the observing location.
Date and Time of Report	27.4.3	Date and time of the report.
Report Modifier	27.4.4	A report modifier **(COR)** identifying report as a correction, or AUTO indicating the unit has no augmentation or backup.
Wind	27.4.5	Indicates wind direction and speed. Gusts are appended if available.
Visibility	27.4.6	Provides prevailing visibility from the designated point of observation.
Runway Visual Range	27.4.7.	10-minute RVR or varying RVR in hundreds of feet.
Present Weather	27.4.8	Any weather occurring at the unit (station) or obscurations (obscurations) to vision.
Sky Condition	27.4.9	State of the sky in terms of sky cover, layers and heights, ceilings and obscurations.
Temperature and Dew Point	27.4.10	Measure of hotness/coldness of ambient air. Dew point measures saturation point temperature.
Altimeter	27.4.11	Indicates altitude above MSL of an aircraft on the ground.

27.4.1. Type of Report (METAR or SPECI). The type of report, METAR or SPECI, is included in all reports. The type of report is separated from elements following it by a space. When SPECI criteria are met at the time of a routine report (METAR), the type of report will be a METAR.

27.4.2. Station Identifier (CCCC). The station (unit) identifier, CCCC, is included in all reports to identify the station to which the encoded report applies. The station identifier consists of four alphabetic-only characters if the METAR/SPECI is transmitted longline. The station identifier is separated from elements following it with a space.

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

27.4.4. Report Modifier (AUTO or COR). The report modifier can be either of the following two elements:

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

27.4.4.2. 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 AN/FMQ-19 indicating the observations are no longer augmented or backed up.

27.4.4.3. AUTO and COR will not be seen in the same observation. If the term COR is used, the observation cannot be AUTO, because a weather technician is correcting it.

27.4.5. Wind Group ($dddff(f)Gf_mf_m(f_m)KT\_d_nd_nd_nVd_xd_xd_x$). The true direction, ddd, from which the wind is blowing 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." 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 hundreds digit (if not zero) and the tens and units digits. The group always ends with KT to indicate the wind speeds are reported in knots. Speeds of less than 10 knots are encoded using a leading zero. For example, a wind speed of 8 knots is encoded 08KT. A wind speed of 112 knots is encoded 112KT.

27.4.5.1. Gust. Wind gusts are encoded in the format, $Gf_mf_m(f_m)$. 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 would be encoded 27020G35KT.

27.4.5.2. 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 would be encoded VRB03KT.

27.4.5.3. Variable Wind Direction (speeds greater than 6 knots). Wind direction varying 60 degrees or more with wind speed greater than 6 knots will be encoded in the format, $d_nd_nd_n$ $Vd_xd_xd_x$. The variable wind direction group will immediately follow the wind group. The directional variability will be encoded in a clockwise direction. For example, if the wind is variable from 180° to 240° at 10 knots, it would be encoded 21010KT 180V240.

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

27.4.6. Visibility Group (VVVVVSM). The surface visibility, VVVVVSM (VVVV—in meters for OCONUS), is encoded in statute miles using the values listed in **Table 27.4.** A space will be encoded between whole numbers and fractions of reportable visibility values. For example, a visibility of 1 1/

2 statute miles is encoded 1 1/2SM. The visibility group always ends in SM to indicate that visibilities are in statute miles. Only automated units 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).

Table 27.4. Reportable Visibility Values.

AN/FMQ-19 Reportable Visibility Values		
M1/4 (M0400 meters)	1 3/4 (2800)	7 (9999)
1/4 (0400)	2 (3200)	8 (9999)
1/2 (0800)	2 1/2 (4000)	9 (9999)
3/4 (1200)	3 (4800)	10 (9999)
1 (1600)	4 (6000)	
1 1/4 (2000)	5 (8000)	
1 1/2 (2400)	6 (9000)	
Visibility values of 0, 1/16, and 1/8 can be augmented in the visibility field of AN/FMQ-19 to meet local operational requirements.		

27.4.7. Runway Visual Range Group ($RD_RD_R/V_RV_RV_RV_RFT$). RVR is encoded in the format $RD_RD_R/V_RV_RV_RV_RFT$, where R indicates the runway number follows, D_RD_R is the runway number (an 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, and FT indicates the units of measurement are feet. Overseas units will use measurement values as published in the DoD FLIPs (typically meters).

27.4.7.1. RVR that is varying is encoded in the format, $RD_RD_R/V_NV_NV_NV_NVV_XV_XV_XV_XFT$, where R indicates the runway number follows, D_RD_R is the runway number (an additional D_R may be used for runway approach directions, such as R for right, L for left, and C for center), $V_NV_NV_NV_N$ 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, and FT indicates the units of measurement are feet. The indicator FT is not used if RVR is reported in meters. The 10-minute RVR for runway 01L varying between 1,000 and 5,000 (0300 and 1500 meters) feet would be encoded "R01L/1000V5000FT" (R01L/0300V1500).

27.4.7.2. 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 meters) will be encoded "M0100FT" (M0050); an RVR of greater than 6,000 feet (1500 meters) will be encoded "P6000FT" (P1500).

27.4.8. Present Weather Group (w'w'). The following general rules apply when coding present weather in a METAR or SPECI report: The appropriate notations in **Table 27.5.**. will be used to encode present weather.

Table 27.5. Notations for Reporting Present Weather.

QUALIFIER		WEATHER PHENOMENA		
INTENSITY OR PROXIMITY 1	**DESCRIPTOR 2**	**PRECIPITATION 3**	**OBSCURATION 4**	**OTHER 5**
- Light	**MI** Shallow	**DZ** Drizzle	**BR** Mist	**PO** Well-Developed Dust/Sand Whirls
Moderate[1]	**PR** Partial	**RA** Rain	**FG** Fog	**SQ** Squalls
+ Heavy	**BC** Patches	**SN** Snow	**FU** Smoke	**FC** Funnel Cloud(s) Tornado, or Waterspout[2]
VC In the Vicinity	**DR** Low Drifting[3]	**SG** Snow Grains[3]	**VA** Volcanic Ash	**SS** Sandstorm
	BL Blowing	**IC** Ice Crystals[3]	**DU** Widespread Dust	**DS** Duststorm
	SH Showers[3]	**PL** Ice Pellets	**SA** Sand	
	TS Thunderstorm	**GR** Hail	**HZ** Haze	
	FZ Freezing	**GS** Small Hail and/or Snow Pellets	**PY** Spray	
		UP Unknown Precipitation		
The weather groups are constructed by considering columns 1 to 5 in the table above in sequence, i.e., intensity, followed by description, followed by weather phenomena.				
1. To denote moderate intensity no entry or symbol is used.				
2. Tornado and Waterspout will be encoded +FC				
3. Qualifier and/or weather phenomena must be entered in remarks, e.g., PRESENT WX DRSN				

27.4.8.1. AN/FMQ-19 encodes weather occurring at the point of observation (at the station) in the PRESENT WX field in the body of the report. Significant weather observed by the weather technician, but not occurring at the point of observation (at the station) or in the vicinity of the station, will be encoded with an augmented Remark.

27.4.8.2. With the exception of volcanic ash, obscurations are encoded in the body of the report if the surface visibility is less than 7 miles (9999 meters) or considered operationally significant. Volcanic ash must always be encoded when observed. MIFG, BCFG, and PRFG may be reported when the visibility is equal to or greater than 7 miles (9999 meters).

27.4.8.3. Separate groups are used for each type of present weather; however, up to 3 types of precipitation can be encoded in a single group. Each group is separated from the other by a space. A METAR/SPECI will contain no more than three present weather groups.

27.4.8.4. The weather groups are constructed by considering columns 1 through 5 in **Table 27.5.** in sequence, i.e., intensity, followed by descriptor, followed by weather phenomena (e.g., heavy freezing rain is encoded +FZRA).

27.4.8.4.1. Intensity or Proximity Qualifier.

27.4.8.4.1.1. Intensity Qualifier. Intensity will be encoded with all precipitation types, except ice crystals and hail, including those associated with a thunderstorm (TS) and those of a showery nature (SH). 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 with the indicator "+", e.g., +FC, while a funnel cloud is always be encoded FC. Only moderate or heavy intensity are ascribed to sandstorm (SS) and duststorm (DS).

27.4.8.4.1.2. Proximity Qualifier. The proximity qualifier for vicinity, VC (weather phenomena observed in the vicinity of, but not at the point of observation), will only be encoded in combination with fog (FG), shower(s) (SH), well-developed dust/sand whirls (PO), blowing dust (BLDU), blowing sand (BLSA), blowing snow (BLSN), sandstorm (SS), duststorm (DS), and thunderstorms (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 10 statute miles will be encoded in remarks as showers in the vicinity (VCSH).

27.4.8.4.2. Descriptor Qualifier. Only one descriptor will be encoded for each weather phenomena group, e.g., "-FZDZ." Mist (BR) will not be encoded with any descriptor.

27.4.8.4.2.1. The descriptors shallow (MI), partial (PR), and patches (BC) is only encoded with FG, e.g., "MIFG." For MIFG (shallow fog) to be encoded, fog 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 meters) or more, while the apparent visibility in the fog layer is less than 5/8SM (1000 meters). For PRFG (partial fog) to be encoded, fog must cover a substantial part of the station; extend to at least 6 feet above the ground with visibility in the fog less than 5/8SM (1000 meters). For BCFG (fog patches) to be encoded, fog must randomly cover part of the station, extend to at least 6 feet above the ground, with the apparent visibility in the fog patch or bank less than 5/8SM (1000 meters) while visibility over other parts of the station is greater than or equal to 5/8SM (1000 meters).

27.4.8.4.2.2. The descriptors low drifting (DR) and blowing (BL) is 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. When blowing snow is observed with snow falling from clouds, both phenomena are reported (e.g., SN BLSN). When, because of blowing snow, the weather technician cannot determine whether or not snow is also falling, then only "BLSN" will be reported. BL may also be encoded with spray (PY).

27.4.8.4.2.3. The descriptor shower(s) (SH) is encoded only with one or more of the precipitation types of rain (RA), snow (SN), ice pellets (PL), small hail (GS), or large hail (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.

27.4.8.4.2.4. The descriptor thunderstorm (TS) may be encoded by itself, i.e., a thunderstorm without associated precipitation, or it may be encoded with the precipitation types of rain (RA), snow (SN), ice pellets (PL), small hail and/or snow pellets (GS), or hail (GR). For example, a thunderstorm with snow and small hail and/or snow pellets would be encoded as "TSSNGS."

27.4.8.4.2.5. The descriptor freezing (FZ) is only encoded in combination with fog (FG), drizzle (DZ), or rain (RA) (e.g., FZRA, FZFG, FZDZ).

27.4.8.4.3. Precipitation. Up to three types of precipitation may be encoded in a single present weather group. They will be encoded in decreasing dominance based on intensity. Only one intensity indicator (+ or -) may be encoded and it will refer to the first type of precipitation reported. Drizzle is encoded as DZ; rain as RA; snow as SN; snow grains as SG; ice crystals as IC; and ice pellets as PL.

27.4.8.4.3.1. Hail is encoded as GR when the diameter of the largest stones observed is 1/4 inch or more. Small hail and/or snow pellets are encoded as GS when the diameter of the largest hailstones is less than 1/4 inch.

27.4.8.4.3.2. At automated units, precipitation of unknown type will be encoded as UP when the precipitation discriminator cannot identify the precipitation with any greater precision. The weather technician performing backup should change the entry to the proper type of precipitation.

27.4.8.4.4. Obscurations.

27.4.8.4.4.1. Mist is encoded as BR when the obscuration consists of water droplets or ice crystals and the visibility is at least 5/8SM (1000 meters) but, less than 7 statute miles (9999 meters).

27.4.8.4.4.2. Fog is encoded as FG when the obscuration consists of water droplets or ice crystals (fog or freezing fog). For FG to be reported without the qualifiers shallow (MI), partial (PR), or patches (BC), the prevailing visibility in the fog must be less than 5/8 SM (1000 meters). Freezing (FZ) is only reported with FG when visibility is less than 5/8 SM (1000 meters) and temperature is less than 0 degrees Celsius. Patches of fog (BCFG) and partial fog (PRFG) may be encoded with prevailing visibility of 7 statute miles (9999 meters) or greater.

27.4.8.4.4.3. Smoke is encoded as FU and reported only when the prevailing visibility is restricted to less than 7 statute miles (9999 meters).

27.4.8.4.4.4. Volcanic Ash is encoded as VA and is reported when present, regardless of the prevailing visibility.

27.4.8.4.4.5. Widespread dust is encoded as DU and reported only when the prevailing visibility is restricted to less than 7 statute miles (9999 meters).

27.4.8.4.4.6. Sand is encoded as SA and reported only when the prevailing visibility is restricted to less than 7 statute miles (9999 meters).

27.4.8.4.4.7. Haze is encoded as HZ and reported only when the prevailing visibility is restricted to less than 7 statute miles (9999 meters).

27.4.8.4.4.8. Spray (PY) is encoded only when used with the descriptor BL when the prevailing visibility is restricted to less than 7 statute miles (9999 meters).

27.4.8.4.5. Other Weather Phenomena.

27.4.8.4.5.1. Well-developed dust/sand whirls are encoded as PO.

27.4.8.4.5.2. Squalls are encoded as SQ 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.

27.4.8.4.5.3. Funnel clouds are encoded as FC. Tornadoes or waterspouts must be encoded as +FC.

27.4.8.4.5.4. Sandstorms are encoded as SS; duststorms as DS.

27.4.9. Sky Condition Group ($N_sN_sN_sh_sh_sh_s$ or $VVh_sh_sh_s$ or CLR). The procedures for coding sky condition are as follows:

27.4.9.1. 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 layer. There is no space between the amount of sky cover and the height of the layer.

27.4.9.2. Sky condition is encoded in ascending order up to the first overcast layer. At this time, layers above 12,000 feet are not reported by AN/FMQ-19 sky condition sensors. At mountain locations, if the cloud layer is below the unit's station elevation, the height of the layer will be reported in the body of the METAR or SPECI as "///."

27.4.9.3. No more than three layers are reported by AN/FMQ-19, but three additional layers may be augmented (if required by local customers). While performing augmentation or backup for layers 12,000 feet, weather technicians will report all cloud layers in ascending order up to the first overcast layer; the 12,000 foot restriction will not apply. No more than six layers will be reported. If more than six layers are observed during backup, weather technicians will use **Table 27.6.** to help determine which layers are to be reported.

Table 27.6. Priority for Reporting Cloud 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
9	Second lowest few layer
10	Highest few layer

27.4.9.4. 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.

27.4.9.5. Clear skies are encoded in the format, CLR, where CLR is the abbreviation used by all automated units to indicate no clouds are present at or below 12,000 feet, the current design limit of the ceilometer. The remark SKC will not be used during augmentation/backup, (i.e., if augmenting above 12,000 feet and no clouds are present, CLR will be used).

27.4.9.6. 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 from **Table 27.7.** The report of clear skies (CLR) as a complete layer reports within itself. The abbreviations FEW, SCT, BKN, and OVC will be followed, without a space, by the height of the cloud layer. When augmenting above the 12,000 feet, the weather technician must remove the AN/FMQ-19 generated CLR layer before augmenting for higher layers.

Table 27.7. Contractions for Sky Cover.

Reportable Contraction	Meaning	Summation Amount of Layer
VV	Vertical Visibility	8/8
CLR (see Note)	Clear	0
FEW	Few	Trace - 2/8
SCT	Scattered	3/8 - 4/8
BKN	Broken	5/8 - 7/8
OVC	Overcast	8/8
NOTE: The abbreviation **CLR** is used at automated units when no clouds at or below 12,000 feet are reported.		

27.4.9.7. The height of the base of each layer, $h_sh_sh_s$, is encoded in hundreds of feet above the surface using three digits in accordance with **Table 27.8.**

Table 27.8. 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

27.4.9.8. Weather technicians will identify cumulonimbus or towering cumulus by appending the contractions CB or TCU, respectively, to the layer report. When the CB or TCU is appended to the layer report, accompanied by a remark, e.g., "CB NW MOV E" OR "TCU NW," it is implied that the CB or TCU is associated with the layer and is within 10 SM. When the CB or TCU is outside of 10 SM, a DSNT remark is appropriate, for example, "TCU DSNT NW." (In this case, CB or TCU would not be appended to the layer in the body of the METAR.)

27.4.10. Temperature/Dew Point Group ($T'T'/T'_dT'_d$).

27.4.10.1. The temperature is separated from the dew point following it by a solidus (/).

27.4.10.2. The temperature and dew point is encoded as two digits rounded to the nearest whole degree Celsius. Sub-zero temperatures and dew points will be prefixed with an M. 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."

27.4.10.3. If the temperature is not available, the entire temperature/dew point group will not encoded. If the dew point is not available, the temperature is encoded followed by a solidus (/) 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/."

27.4.11. 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.

27.5. Remarks (RMK). Remarks generally elaborate on parameters reported in the body of the report, and will be included in all METAR and SPECI observations, if appropriate. 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.

27.5.1. METAR/SPECI remarks fall into 2 major categories: (1) Automated, Manual, and Plain Language; and (2) Additive Data. **Attachment 3** gives an overview of remarks and their order of entry.

27.5.2. Remarks will be made in accordance with the following:

27.5.2.1. 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, of which the weather technician is aware, 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 FAA Order 7340 Series, *Contractions.*

27.5.2.2. Time Entries in Remarks. UTC time entries are made in 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.

27.5.2.3. The automatic reporting of Additive Data information will be IAW 24-hour UTC time for all AN/FMQ-19 units.

27.5.2.3.1. Report Snow Depth in the 0000 and 1200 UTC observation whenever there is more than a trace of snow on the ground. Encode snow depth in the 0600 and 1800 UTC observation if there is more than a trace of snow on the ground and more than a trace of precipitation (water equivalent) has occurred within the past 6 hours. **NOTE:** MAJCOMs or higher headquarters may determine the reporting requirement of snow depth for limited-duty units by supplement to this manual.

27.5.2.4. Location Entries. With the exception of lightning and thunderstorms detected by an automated weather observing unit, the location of phenomena within 5 statute miles of the point of observation will be reported as occurring at the station. Phenomena between 5 and 10 statute miles will be reported as vicinity (VC), followed by direction from the unit, if known. Phenomena beyond 10 statute miles of the point of observation may be reported as distant (DSNT) if the actual distance is unknown but believed to be beyond 10 statute miles, followed by the direction from the unit. In the case of a tornado, the exact location should be included if possible.

27.5.2.5. Movement Entries. Movement of clouds or weather, if known, will be encoded with respect to the direction toward which the phenomenon is moving.

27.5.2.6. Direction. Directions will use the eight points of the compass encoded in a clockwise order beginning with north.

27.6. Forms Prescribed.

27.6.1. AF Form 3803, Surface Weather Observations (METAR/SPECI).

27.6.2. AF Form 3813, Federal Meteorological Surface Weather Observations (METAR/SPECI).

RONALD E. KEYS, Lt General, USAF
DCS/Air & Space Operations

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

AFDD 1, *Air Force Basic Doctrine*

AFPD 15-1, *Atmospheric and Space Environmental Support*

AFI 11-102*, Flight Information Publications*

AFI 13-203, *Air Traffic Control*

AFI 36-2201, *Developing, Managing, and Conducting Training*

AFMAN 15-129, *Aerospace Weather Operations - Processes and Procedures*

AFMAN 15-135, *Combat Weather Team Operations*

AFMAN 36-2247, *Planning, Conducting, Administering, and Evaluating Training*

AFI 37-138, *Records Disposition--Procedures and Responsibilities*

AFMAN 37-139, *Records Disposition Schedule*

DoD Flight Information Publications (FLIPS)

Federal Meteorological Handbook No. 1 (FMH-1), *Surface Weather Observations and Reports*

FAAH 7340.1, *Federal Aviation Administration Handbook, Contractions Manual*

FAAH 7350.6, *Federal Aviation Administration Handbook, Location Identifiers*

FAAO 7110.65, *Air Traffic Control*

World Meteorological Organization (WMO) International Cloud Atlas VII, *Cloud Types for Observers*

Abbreviations and Acronyms

- —Light intensity

(no symbol)—Moderate intensity

+—Heavy intensity

/—Indicates visual range data follows; separator between temperature and dew point data.

ACC—Altocumulus Castellanus

ACFT MSHP—Aircraft Mishap

ACSL—Altocumulus Standing Lenticular Cloud

AEROB—Airborne Environmental Release Observation

AFCCC—Air Force Combat Climatology Center

AFWA—Air Force Weather Agency

ALSTG—Altimeter Setting

AMS—Automatic Meteorological Station

AO2—Remark included in METAR/SPECI observations from automated units without augmentation

AO2A—Remark included in METAR/SPECI observations from units with manual augmentation

AOL—Alternate Operating Location

APRNT—Apparent

APRX—Approximately

ASOS—Automated Surface Observing System

ATC—Air Traffic Control

ATIS—Automatic Terminal Information Service

AURBO—Aurora

AUTO—Automated Report

AWOS—Automated Weather Observing System

B—Began

BC—Patches

BKN—Broken

BL—Blowing

BR—Mist

BWW—Basic Weather Watch

C—Center (With Reference To Runway Designation)

CA—Cloud-Air Lightning

CB—Cumulonimbus Cloud

CBMAM—Cumulonimbus Mammatus Cloud

CC—Cloud-Cloud Lightning

CCSL—Cirrocumulus Standing Lenticular Cloud

CG—Cloud-Ground Lightning

CHI—Cloud-Height Indicator

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

CIG—Ceiling

CINC—Commander In Chief

CLR—Clear

CONS—Continuous

CONTRAILS—Condensation Trails

CONUS—Continental United States

COR—Correction to A Previously Disseminated Report

CWW—Continuous Weather Watch

DOC—Department Of Commerce

DOD—Department Of Defense

DOT—Department Of Transportation

DR—Low Drifting

DS—Duststorm

DSNT—Distant

DU—Widespread Dust

DZ—Drizzle

E—East, Ended

ESTMD—Estimated

FAA—Federal Aviation Administration

FC—Funnel Cloud

FEW—Few Clouds

FG—Fog

FIBI—Filed But Impracticable To Transmit

FIRST—First Observation Before A Break In Coverage At A Manual Observing Unit

FLIP—Flight Information Publication

FMH-1—Federal Meteorological Handbook No. *1, Surface Weather Observations & Reports*

FROPA—Frontal Passage

FRQ—Frequent

FT—Feet

FU—Smoke

FZ—Freezing

FZRANO—Freezing Rain Information Not Available

G—Gust

GEN—Indicates General Aeronautical Contraction Usage

GR—Hail

GS—Small Hail and/or Snow Pellets

hPa—Hectopascals (millibars)

HZ—Haze

IC—Ice Crystals, In-Cloud Lightning

ICAO—International Civil Aviation Organization

IFR—Instrument Flight Rules

ILS—Instrument Landing System

JAAWIN—Joint Army and Air Force Weather Information Network

JAAWIN-S—Joint Army and Air Force Weather Information Network-Secure

KT—Knots

L—Left (With Reference To Runway Designation)

LAST—Last Observation Before A Break In Coverage At A Manual Observing Unit

LBC—Laser-Beam Ceilometer

LST—Local Standard Time

LTG—Lightning

LWNS—Local Weather Network System

LWR—Lower

M—Minus, Less Than

MACOM—Major Army Command

MAJCOM—Major Air Force Command

METAR—Aviation Routine Weather Report

MI—Shallow

MMLS—Mobil Microwave Landing System

MOV—Moving

MOVD—Moved

MT—Mountains

N—North

N/A—Not Applicable

NE—Northeast

N-TFS—New Tactical Forecast System

NW—Northwest

NWS—National Weather Service

OCNL—Occasional

OCONUS—Outside Continental United States

OFCM—Office of the Federal Coordinator for Meteorology

OID—Operator Interface Device

OS-21—Observing System, 21st Century (original name for AN/FMQ-19 AMS)

OHD—Overhead

OVC—Overcast

P—Greater Than

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

PV—Prevailing Visibility

PWINO—Precipitation Identifier Sensor Not Available

PY—Spray

R—Right (With Reference To Runway Designation)

RA—Rain

RCR—Runway Condition Reading

RCRNR—Runway Condition Reading Not Reported

RMK—Remark

RSC—Runway Surface Condition

RVR—Runway Visual Range

RVRNO—Runway Visual Range System 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)

SKC—Sky Clear

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 (An unscheduled report taken when certain criteria have been met)

SQ—Squall

SS—Sandstorm

SW—Southwest

TCU—Towering Cumulus

TS—Thunderstorm

TSNO—Thunderstorm Information Not Available

TWR—Tower

UNKN—Unknown

UP—Unknown Precipitation

US—United States

UTC—Coordinated Universal Time

V—Variable

VA—Volcanic Ash

VC—In the Vicinity

VFR—Visual Flight Rules

VIS—Visibility

VISNO LOC—Visibility at Secondary Location Not Available

VRB—Variable

VV—Vertical Visibility

W—West

WMO—World Meteorological Organization

WND—Wind

WSD—Weather Support Document

WSHFT—Wind Shift

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

Terms

At the Station—Used to report present weather phenomena when within 5 statute miles/8000 meters of the point(s) of observation.

Automated Weather Network—A global communications network used for collecting and distributing alphanumeric terrestrial and space environmental weather data throughout the Air Force Weather Weapon System; Navy and Army weather systems; and federal and foreign meteorological, space, and aviation centers.

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

Distant from the Station—Used to report present weather phenomena more than 10 statute miles/16 kilometers from the point(s) of observation.

File Time—The time a weather message or bulletin is scheduled to be transmitted. Expressed either as a specific time or a specific time block during which the message will 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. While the temperature of the ground surface and glazed objects initially must be near or below freezing, it is necessary that the water drops be supercooled before striking. (AMS, Glossary of Meteorology, 1989)

Glaze—A coating of ice, generally clear and smooth but usually containing some air pockets, formed on exposed objects by the freezing of a film of superscooled water deposited by rain, drizzle, fog, or possible condensed from supercooled water vapor. Glaze is denser, harder and more transparent then either rime or hoarfrost. Its density may be as high as 0.8 or 0.9 gm per cm3. Factors which favor glaze formation are large drop size, rapid accretion, slight supercooling, and slow dissipation of heat fusion. (AMS, Glossary of Meteorology, 1989)

ICAO Identifier—A specifically authorized 4-letter identifier assigned to a location and documented in ICAO Document 7910.ICAO (used by N-TFS): An ICAO identifier with a fifth character appended which designates a specific N-TFS functional area (reference N-TFS Positional Handbooks).

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

Issue Time—Time the last agency was notified. Exclude follow-up notifications when determining issue time.

Limited-Duty Unit—A weather unit that provides less than 24-hour a day forecast service.

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

New Tactical Forecast System (N-TFS)—An integrated automated system designed to provide weather and air traffic control products to support the missions of CWTs, weather support units, air traffic control agencies, and command posts of the DoD.

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.

Scheduled—The time that a weather report or bulletin is due to be transmitted. The scheduled transmission time may be expressed as a specific time or a specific block of time during which the data must be transmitted.

Severe Thunderstorm—A thunderstorm that produces hail greater than or equal to 3/4 inch in diameter and/or surface wind greater than or equal to 50 knots, or any thunderstorm that poses a hazard to property or life.

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

Vicinity—Used to report present weather phenomena 5 statute miles/8000 meters to 10 statute miles/16 kilometers from the point(s) of observation.

Attachment 2

SPECIAL (SPECI) CRITERIA

Table A2.1. Table of SPECI Criteria.

Reference Number	Criteria	Pertinent Data	Manual	Automated	Augmented
1	**Visibility** (1) 3 miles (4800 meters). (2) 2 miles (3200 meters). (3) 1 mile (1600 meters). (4) All published airfield landing minima (including circling), as listed in the DoD FLIPs, appropriate Air Force, Army, higher headquarters or MAJCOM instructions and publications. If none is published, use 1/2 mile (800 meters). (5) Visibility minima as applicable to range support, covered in governing directives and support agreements.	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**
	(6) All published airfield takeoff minima—AN/FMQ-19 units only.			**X**	**X**

Reference Number	Criteria	Pertinent Data	Manual	Automated	Augmented
2	**Ceiling** (1) 3,000 feet. (2) 1,500 feet. (3) 1,000 feet. (4) 700 feet. (5) 500 feet. (6) 300 feet (at bases with assigned air defense aircraft). (7) All published airfield landing minima (including circling), as listed in DoD FLIPs and appropriate USAF, Army, and higher headquarters or MAJCOM flying instructions and publications. If none published, use 200 feet. (8) Ceiling minima, as applicable to range support, covered in governing directives and support agreements. (9) All published airfield takeoff minima—AN/FMQ-19 units only. (10) 800 feet. If required for precision approach critical areas—AN/FMQ-19 units only.	The ceiling (rounded off to reportable values) forms or dissipates below, decreases to less than, or if below, increases to equal or exceed.	X	X X X	X X X
3	**Sky Condition**	A layer of clouds or obscuring phenomena aloft is observed below 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.	X	X	X
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	X
5	**Squall**	When squalls occur.	X	X	X
6	**Volcanic Eruption** (See Remark 1, Table A3.1.)	Eruption first noted.	X		X

Reference Number	Criteria	Pertinent Data	Manual	Automated	Augmented
7	**Thunderstorm** (occurring at the 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
8	**Precipitation**	**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).			
	(1) Hail begins or ends.		X		X
	(2) Freezing precipitation begins, ends, or changes intensity.		X	X	X
	(3) Ice pellets begin, end, or change intensity.		X		X
	(4) Any other type of precipitation begins or ends.		X	X	X
9	**Tornado, Funnel Cloud, Or Waterspout** (1) Is observed. (2) Disappears from sight or ends.		X		X
10	**Runway Visual Range (RVR)**	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:			
	2,400 feet (0730 meters legacy systems, 0750 AN/FMQ-19). <u>AN/FMQ-19 units only.</u>		X	X X	X X
	(1) Prevailing visibility first observed ≤ 1SM/1600 meters, again when prevailing visibility goes above 1SM/1600 meters. (2) RVR for active runway decrease to less than or, if below, increase to equal or exceed: 6,000 feet (P1500 meters). 5,000 feet (1500 meters). (3) 2,000 feet (0600 meters). If required for precision approach critical areas. (4) All published RVR minima applicable to runway in use.	**NOTE:** The RVR SPECI observations will be taken, but will only be transmitted longline by units with a 10-minute RVR average readout capability.			

Reference Number	Criteria	Pertinent Data	Manual	Automated	Augmented
11	**Tower Visibility**	Transmit a SPECI with either the tower or the surface visibility as a remark (see Col 13, remark # 6): (1) Upon receipt of a reportable tower visibility value, when either the weather observing site or tower prevailing visibility is less than 4 miles (6000 meters) and the tower visibility differs from the weather observing site visibility by a reportable criteria value. (2) Tower visibility differs from the weather observing site visibility by a SPECI value listed in reference 1 above.	**X**		**X**
12	**Nuclear Accident**	When notified of a real world nuclear accident, take and disseminate (locally and longline) a SPECI. Append the remark **AEROB** as the last remark to the SPECI	**X**		**X**
13	**Upon Resumption Of Observing Function**	A special (SPECI) observation will be taken within 15-minutes after the weather technician returns to duty following a break in observing coverage or augmentation at the unit unless a record observation is filed during that 15-minute period	**X**		
14	**Single-Element SPECI**	Single-element specials are authorized for **Tornadic Activity** and **Volcanic Eruptions**	**X**		**X**

Reference Number	Criteria	Pertinent Data	Manual	Automated	Augmented
15	**Runway Conditions**	Upon receipt (with exception of a receipt of a dry runway report), transmit runway condition readings as a SPECI or append to a METAR or SPECI being taken at the time of notification. This is non-weather criteria and is treated as a SPECI only for purposes of timely longline reporting. When appended to any observation, the report is considered as additional data and not as SPECI criteria.	**X**		**X**
16	**Miscellaneous**	Any other meteorological situation that in the weather technician's opinion is critical	**X**		**X**

Attachment 3

REMARKS AND REFERENCE TABLES

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

Remark Number	When Condition Observed is a	Enter in Remarks Section	Manual	Automated	Augmented
1	**Volcanic Eruption**	Report the following information, if known: (1) Name of volcano, (2) Latitude and longitude or direction and distance from unit, (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 70 MILES SW ERUPTED 231505 LARGE ASH CLOUD EXTENDING TO APRX 30000 FT MOV NE.	**X**		**X**
2	**Tornadic Activity** (See Note1)	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 unit, 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 6 statute miles northeast of the unit.	**X**		**X**
3	**Type of Automated Unit**	**(AO2 or AO2A).** Encode **AO2** in all METAR/SPECI from automated units without augmentation. Encode **AO2A** in all METAR/SPECI from automated units with manual augmentation.		**X**	**X**

Remark Number	When Condition Observed is a	Enter in Remarks Section	Manual	Automated	Augmented
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 solidus "/" (without spaces) will separate the wind direction/speed group and the time. 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 (manual units). FMQ-19 reports 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 is the remark identifier and (hh)mm is the time the wind shift began. The contraction **FROPA** may be manually entered by the weather technician 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."	X	X	X
6	**Tower or Surface Visibility**	Encode tower visibility or surface visibility (< 4 miles (6000 meters) in formats, **TWR_VIS_vvvvv** or **SFC_VIS_vvvvv,** respectively, where vvvvv is the observed tower/surface visibility value. There is a space between each of the remark elements. For example, the control tower visibility of 1 1/2 statute miles (2400 meters) would be encoded "TWR VIS 1 1/2" (TWR VIS 2400).	X		X

Remark Number	When Condition Observed is a	Enter in Remarks Section	Manual	Automated	Augmented
7	**Variable Prevailing Visibility**	Encode variable prevailing visibility (visibility < 3 miles (4800 meters) increases/decreases by 1/2 SM (0800 meters) during observation) in format **VIS_$v_nv_nv_nv_nv_n$V$v_xv_xv_xv_xv_x$**, 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 letter V and the lowest/highest values. For example, a visibility that was varying between 1/2 and 2 statute miles would be encoded "VIS 1/2V2."	X	X	X
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 < 3 miles (4800 meters) 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 in statute miles or meters, using the appropriate set of values. For example, a visibility of 2 1/2 statute miles (4000 meters) in the northeastern octant would be encoded "VIS NE 2 1/2" (VIS NE 4000).	X		X
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) at the unit. Include the remark only when the condition is lower than that contained in the body of the report. For example, a visibility of 2 1/2 statute miles (4000 meters) measured by a second sensor located at runway 11 would be encoded "VIS 2 1/2 RWY11" (VIS 4000 RWY11).		X	X

Remark Number	When Condition Observed is a	Enter in Remarks Section	Manual	Automated	Augmented
10	**Lightning**	**1. Manual Units.** When lightning is observed at a manual units, the frequency, type of lightning, and location will be reported. The remark will be encoded in the format **Frequency_LTG(type)_[LOC]**. The contractions for the type and frequency of lightning will be based on **Table A3.2.** Encode the location and direction in accordance with paragraph 11.6.2.1.3. in Part 2. For example, "OCNL LTGICCG OHD," "FRQ LTG VC," or "LTG DSNT W." **2. Automated/Augmented Units.** When lightning is detected by an automated/augmented units: – 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, it will report it as LTG DSNT followed by the direction from the sensor (e.g., **LTG DSNT W)**. .	**1X**	**2X**	**2X**
11	**Beginning and Ending of Precipitation**	Encode beginning and ending of precipitation in format, **w'w'B(hh)mmE(hh)mm**, 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 is 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	When Condition Observed is a	Enter in Remarks Section	Manual	Automated	Augmented
12	**Beginning and Ending of Thunder-storms** (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 is no spaces between the elements. For example, if a thunderstorm began at 0159 and ended at 0230, the remark would be encoded "TSB0159E30." AN/FMQ-19 automatically provides a remark both when the thunderstorm begins and ends (e.g., TSB1635 indicates a thunderstorm began at 1635Z).	X	X	X
13	**Thunder-storm 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 unit, and MOV_DIR is the movement with direction, if known. For example, a thunderstorm 23 miles southeast of the unit and moving toward the northeast would be encoded "TS 23SE MOV NE."	X		X
14	**Hailstone Size** (See Note1)	Encode Hailstone size (1/4" or larger) in format, **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 1/4 inch increments. For example, "GR 1 3/4" would indicate that the largest hailstones were 1 3/4 inches in diameter. If **GS** is encoded in the body of the report, no hailstone size remark is required.	X		X
15	**VIRGA**	Encode VIRGA (precipitation not reaching ground) in format, **VIRGA_(DIR)_[Plain Language]**, where VIRGA is the remark identifier and DIR is the direction from the unit. The direction of the phenomena from the unit is optional (e.g., "VIRGA" or "VIRGA SW").	X		X
16	**Variable Ceiling Height**	Encode variable ceiling height (height variable and ceiling layer below 3000 feet) in format, **CIG_$h_nh_nh_n$V$h_xh_xh_x$**, 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 1,000 feet.	X	X	X

Remark Number	When Condition Observed is a	Enter in Remarks Section	Manual	Automated	Augmented
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 2,000 feet would be encoded "FU BKN020."	**X**		**X**
18	**Variable Sky Condition**	Encode variable sky condition (sky condition below 3,000 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 $N_sN_sN_s$($h_sh_sh_s$) and $N_sN_sN_s$ identify the two operationally significant sky conditions and V denotes the variability between the two ranges. For example, SCTVBKN" 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, a cloud layer at 1,400 feet that is varying between broken and overcast would be coded "BKN014 V OVC."	**X**	**X**	**X**

Remark Number	When Condition Observed is a	Enter in Remarks Section	Manual	Automated	Augmented
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, (for which 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 unit, 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 up to 21 statute miles west of the unit moving toward the east would be encoded "CB 21W MOV E." If a CB is more than 10 statute 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 unit. Separate the cloud type entries by a space. For example, a towering cumulus cloud up to 10 statute miles west of the unit 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 unit. Separate the cloud type entries by a space. For example, an ACC cloud 5 to 10 statute miles northwest of the unit would be encoded "ACC NW." (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 unit. Separate the cloud type entries by a space. For example, ACSL clouds observed southwest through west of the unit would be encoded "ACSL SW-W"; an apparent rotor cloud northeast of the unit would be encoded "APRNT ROTOR CLD NE"; and CCSL clouds south of the unit would be encoded "CCSL S."	X		X

Remark Number	When Condition Observed is a	Enter in Remarks Section	Manual	Automated	Augmented
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 unit. 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	X
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-inch Hg per hour or more, totaling a change 0.02-inch Hg 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." For a METAR, if sea level pressure is not available, it is encoded as "**SLPNO.**"	X	X	X
23	**Aircraft Mishap**	At manual units, 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		
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 and the total depth on the ground from each other by a solidus "/". 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."	X		X

Remark Number	When Condition Observed is a	Enter in Remarks Section	Manual	Automated	Augmented
25	**Other Significant Information**	**[Plain Language Remarks]** Added to report information significant to safety of aircraft and other operations or force protection. Used to amplify entries in the body of the observation. Some plain language remarks will use an order of entry the same as the encoded data the remark most closely relates (e.g., a VIS LWR E remark would have the same order of entry as a sector visibility remark). (1) **Significant PIREP Information**. Any information from local PIREPs that may affect local flying operations, e.g., CLD LYR AT 400 FT ON APCH RWY 23 RPRTD BY PIREPS, CIG VIS LWR ON APCH RWY14L. (2) **Runway Condition**. Indicates runway condition, state of ground, weather modification or rawinsonde data, i.e. RSC/RCR, FOG DISPERSAL, WND RWY 32R 300/10G15KT, R32R PSR12, R32L IR10, etc. (3) **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 backup equipment is being used. (4) **Significant Atmospheric Phenomena not Reported Elsewhere.** Augmented present weather observed but not occurring at the point of observation (at the unit) or in the vicinity (e.g., SHRA OVR MTNS N). State of ground, weather modification, wind speed difference between dual parallel runways, etc. (5) **Nuclear Accident.** When notified of a real world nuclear accident, append the remark **AEROB** as the last remark to the SPECI. (6) **Aurora** observed in the past hour. Include **AURBO** in the next METAR and subsequent METARs throughout period of occurrence. (7) **Condensation Trails.** Include **CONTRAILS** to indicate condensation trails are observed.	X		X

Remark Number	When Condition Observed is a	Enter in Remarks Section	Manual	Automated	Augmented
26	**Hourly Precipitation Amount**	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. Omit the group if no precipitation occurred since the last METAR.		X	X
27	**3- and 6-Hour Precipitation Amount** (See Note 2)	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 (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."	X	X	X
28	**24-Hour Precipitation Amount** (See Note 2. Augmented units see Part 4, paragraph 26.8.2.1.)	Encode the 24-hour precipitation amount in format, $\mathbf{7R_{24}R_{24}R_{24}R_{24}}$, 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) report 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	X

Remark Number	When Condition Observed is a	Enter in Remarks Section	Manual	Automated	Augmented
29	**Snow Depth on Ground** (See Note 3)	Encode the total snow depth on the ground group in the 0000 and 1200 UTC observation whenever there is more than a trace of snow on the ground. Encode in the 0600 and 1800 UTC observation if there is more than a trace of snow on the ground and more than a trace of precipitation (water equivalent) has occurred within the past 6 hours. The remark is encoded in the format, **4/sss**, where 4/ is the group indicator and sss is the snow depth in whole inches using three digits. For example, a snow depth of 21 inches will be encoded as "4/021."	X		X
30	**Hourly Temperature and Dew Point**	Encode the hourly temperature and dew point group to the tenth of a degree Celsius in format, $\mathbf{Ts_nT'T'T's_nT'_dT'_dT'_d}$, 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	X
31	**6-Hourly Maximum Temperature** (See Note 2)	Encode the 6-hourly maximum temperature group in format, $\mathbf{1s_nT_xT_xT_x}$, 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."	X	X	X

Remark Number	When Condition Observed is a	Enter in Remarks Section	Manual	Automated	Augmented
32	**6-Hourly Minimum Temperature** (See Note 2)	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 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."	X	X	X
33	**24-Hour Maximum and Minimum Temperature**	Encode the 24-hour maximum temperature and the 24-hour minimum temperature in format, $4s_nT_xT_xT_xs_nT_nT_nT_n$, 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	X
34	**3-Hourly Pressure Tendency** (See Note 2)	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."	X	X	X

Remark Number	When Condition Observed is a	Enter in Remarks Section	Manual	Automated	Augmented
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
		(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 a 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 automatically appended at the end of the report when automated weather systems (i.e., AN/FMQ-19, ASOS) detect that maintenance is needed on the system.		X	X

Remark Number	When Condition Observed is a	Enter in Remarks Section	Manual	Automated	Augmented
37	**(1) LAST** (manual units only)	(1) At limited-duty manual units 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**		**X**
	(2) FIRST (See Note 2)	(2) The FIRST remark may be used to facilitate collection of observations from limited-duty in-theater, garrison, and tactical manual observing units.	**X**		
	(3) COR (manual and augmented units)	(3) If the correction is disseminated locally, or locally and longline, enter COR in column 13 followed by the time (to the nearest minute UTC) the correction was locally disseminated. In the case of longline-only dissemination (e.g., a correction for additive data), enter COR and the approximate time UTC the correction was transmitted (e.g., COR 1426).	**X**		**X**

NOTES:

1. At manual units, 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 which is 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, GR B37E39 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 for manual units.

3. Or as directed by MAJCOM or Higher Headquarters supplement for manual and augmented units.

Table A3.2. Lightning Type and Frequency.

Type of Lightning		
Type	**Contraction**	**Definition**
Cloud-ground	CG	Lightning occurring between cloud and ground.
In-cloud	IC	Lightning which takes place within the thundercloud.
Cloud-cloud	CC	Streaks of lightning reaching from one cloud to another.
Cloud-air	CA	Streaks of lightning that 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.

Table A3.3. Pressure Tendency.

Pressure Tendency		
Primary Requirement	**Description**	**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

Attachment 4

RUNWAY VISUAL RANGE TABLES

Table A4.1. RVR Reportable Values by System Type.

AN/FMQ-19 CONUS (Feet)	AN/FMQ-19 OCONUS (Meters)	Legacy CONUS RVR Systems (Feet)	Legacy OCONUS RVR Systems (Meters)
M0100			
0100	M0050		
0200	0050		
0300	0100		
0400			
0500	0150	M0600	M0180
0600		0600	0180
0700	0200		0240
0800	0250	0800	
0900			
1000	0300	1000	0300
1200	0350	1200	0360
	0400		
1400		1400	0420
	0450		
1600	0500	1600	0490
1800	0550	1800	0550
2000	0600	2000	0610
	0650		
2200		2200	0670
	0700		
2400	0750	2400	0730
2600	0800	2600	0790
2800		2800	0850
3000	0900	3000	0910
	1000		
	1100		
3500		3500	1070
4000	1200	4000	1220
	1300		
4500		4500	1370
	1400		
5000	1500	5000	1520
5500	P1500	5500	1670
6000		6000	1830
P6000		P6000	P1830

NOTE: This table is not a conversion table. Select RVR system and geographic area, and use the reportable values listed.

Table A4.2. RVR (Meters/Feet)—Transmissivity Conversion for 250-Foot Baseline—DAY.

RVR		DAY			
Meters	Feet	Light Setting 5	Light Setting 4	Light Setting 3	Other
M0180	M0600	.000-.030	.000-.067	.000-.150	.000-.235
0180	0600	.031-.104	.068-.184	.151-.328	.236-.355
0240	0800	.105-.197	.185-.309	.329-.447	.356-.447
0300	1000	.198-.290	.310-.419	.448-.517	.448-.517
0360	1200	.291-.375	.420-.511	.518-.572	.518-.572
0420	1400	.376-.448	.512-.586	.573-.617	.573-.617
0490	1600	.449-.511	.587-.647	.618-.653	.618-.653
0550	1800	.512-.564	.648-.683	.654-.683	.654-.683
0610	2000	.565-.610	.684-.708	.684-.708	.684-.708
0670	2200	.611-.650	.709-.730	.709-.730	.709-.730
0730	2400	.651-.684	.731-.748	.731-.748	.731-.748
0790	2600	.685-.714	.749-.764	.749-.764	.749-.764
0850	2800	.715-.739	.765-.779	.765-.779	.765-.779
0910	3000	.740-.777	.780-.800	.780-.800	.780-.800
1070	3500	.778-.819	.801-.824	.801-.824	.801-.824
1220	4000	.820-.843	.825-.843	.825-.843	.825-.843
1370	4500	.844-.858	.844-.858	.844-.858	.844-.858
1520	5000	.859-.871	.859-.871	.859-.871	.859-.871
1670	5500	.872-.882	.872-.882	.872-.882	.872-.882
1830	6000	.883-.890	.883-.890	.883-.890	.883-.890
P1830	P6000	.891 and above	.891 and above	.891 and above	.891 and above

Table A4.3. RVR (Meters/Feet)—Transmissivity Conversion for 250-Foot Baseline—NIGHT.

RVR		NIGHT			
Meters	**Feet**	**Light Setting 5**	**Light Setting 4**	**Light Setting 3**	**Other**
M0180	M0600	.000-.001	.000-.003	.000-.007	.000-.018
0180	0600	.002-.011	.004-.020	.008-.036	.019-.064
0240	0800	.012-.035	.021-.055	.037-.086	.065-.126
0300	1000	.036-.071	.056-.102	.087-.147	.127-.192
0360	1200	.072-.113	.103-.155	.148-.211	.193-.255
0420	1400	.114-.159	.156-.208	.212-.272	.256-.314
0490	1600	.160-.205	.209-.259	.273-.329	.315-.366
0550	1800	.206-.249	.260-.308	.330-.381	.367-.413
0610	2000	.250-.291	.309-.353	.382-.427	.414-.455
0670	2200	.292-.331	.354-.394	.428-.469	.456-.492
0730	2400	.332-.367	.395-.432	.470-.507	.493-.525
0790	2600	.368-.401	.433-.466	.508-.541	.526-.555
0850	2800	.402-.433	.467-.497	.542-.571	.556-.581
0910	3000	.434-.482	.498-.546	.572-.617	.582-.622
1070	3500	.483-.541	.547-.603	.618-.671	.623-.671#
1220	4000	.542-.591	.604-.649	.672-.714	.672-.714#
1370	4500	.592-.632	.650-.687	.715-.748	.715-.748#
1520	5000	.633-.666	.688-.719	.749-.777	.749-777#
1670	5500	.667-.696	.720-.746	.778-.800	.778#-.800#
1830	6000	.697-.721	.747-.769	.801-.820	.801#-.820#
P1830	P6000	.722 and above	.770 and above	.821 and above	.821# and above

NOTES:

1. This table is designed for use at locations with airfield minima published in either meters or feet.

2. Before entering the table with a transmissivity value:

   a. Subtract background illumination.

   b. Divide by five if value was obtained while in HIGH mode.

3. Use column labeled *Other* when runway lights are inoperative or otherwise not available.

4. Values identified by # were adjusted to accomplish necessary compatibility between respective equations.

5. If the RVR is less than the lowest reportable value, prefix the value with an M.

6. If the RVR is greater than the highest reportable value, and an RVR report is required, prefix the value with a P.

Table A4.4. RVR (Meters/Feet)—Transmissivity Conversion for 500-Foot Baseline—DAY.

RVR		DAY			
Meters	Feet	Light Setting 5	Light Setting 4	Light Setting 3	Other
M0300	M1000	.000-.039	.000-.095	.000-.200	.000-.200
0300	1000	.040-.084	.096-.175	.201-.268	.201-.268
0360	1200	.085-.140	.176-.261	.269-.328	.269-.328
0420	1400	.141-.201	.262-.343	.329-.380	.329-.380
0490	1600	.202-.261	.344-.419	.381-.426	.381-.426
0550	1800	.262-.319	.420-.466	.427-.466	.427-.466
0610	2000	.320-.373	.467-.501	.467-.501	.467-.501
0670	2200	.374-.422	.502-.532	.502-.532	.502-.532
0730	2400	.423-.468	.533-.560	.533-.560	.533-.560
0790	2600	.469-.509	.561-.584	.561-.584	.561-.584
0850	2800	.510-.547	.585-.606	.585-.606	.585-.606
0910	3000	.548-.581	.607-.626	.607-.626	.607-.626
0970	3200	.582-.612	.627-.644	.627-.644	.627-.644
1030	3400	.613-.640	.645-.661	.645-.661	.645-.661
1100	3600	.641-.665	.662-.676	.662-.676	.662-.676
1160	3800	.666-.689	.677-.689	.677-.689	.677-.689
1220	4000	.690-.711	.690-.711	.690-.711	.690-.711
1370	4500	.712-.737	.712-.737	.712-.737	.712-.737
1520	5000	.738-.759	.738-.759	.738-.759	.738-.759
1670	5500	.760-.777	.760-.777	.760-.777	.760-.777
1830	6000	.778-.793	.778-.793	.778-.793	.778-.793
P1830	P6000	.794 and above	.794 and above	.794 and above	.794 and above

Table A4.5. RVR (Meters/Feet)—Transmissivity Conversion for 500-Foot Baseline—NIGHT.

RVR		NIGHT			
Meters	Feet	Light Setting 5	Light Setting 4	Light Setting 3	Other
M0300	M1000	.000-.001	.000-.003	.000-.007	.000-.016
0300	1000	.002-.005	.004-.010	.008-.022	.017-.037
0360	1200	.006-.013	.011-.024	.023-.044	.038-.065
0420	1400	.014-.025	.025-.043	.045-.074	.066-.098
0490	1600	.026-.042	.044-.067	.075-.108	.099-.134
0550	1800	.043-.062	.068-.095	.109-.145	.135-.171
0610	2000	.063-.085	.096-.124	.146-.183	.172-.207
0670	2200	.086-.109	.125-.155	.184-.220	.208-.242
0730	2400	.110-.135	.156-.186	.221-.257	.243-.276
0790	2600	.135-.161	.187-.217	.258-.292	.277-.308
0850	2800	.162-.187	.218-.247	.293-.326	.309-.338
0910	3000	.188-.213	.248-.276	.327-.358	.339-.366
0970	3200	.214-.239	.277-.305	.359-.389	.367-.393
1030	3400	.240-.263	.306-.331	.390-.417	.394-.418
1100	3600	.264-.287	.332-.357	.418-.444	.419-.444
1160	3800	.288-.310	.358-.382	.445-.469	.445#-.469#
1220	4000	.311-.349	.383-.422	.470-.509	.470#-.509#
1370	4500	.350-.399	.423-.473	.510-.560	.510#-.560#
1520	5000	.400-.444	.474-.517	.561-.603	.561#-.603#
1670	5500	.445-.484	.518-.557	.604-.640	.604#-.640#
1830	6000	.485-.520	.558-.591	.641-.672	.641#-.672#
P1830	P6000	.521 and above	.592 and above	.673 and above	.673# and above

NOTES:

1. This table is designed for use at locations with airfield minima published in either meters or feet.

2. Before entering the table with a transmissivity value:

   a. Subtract background illumination.

   b. Divide by five if value was obtained while in HIGH mode.

3. Use column labeled *Other* when runway lights are inoperative or otherwise not available.

4. Values identified by # were adjusted to accomplish necessary compatibility between respective equations.

5. If the RVR is less than the lowest reportable value, prefix the value with an M.

6. If the RVR is greater than the highest reportable value, and an RVR report is required, prefix the value with a P.

Table A4.6. Determining RVR Using ASOS Extinction Coefficient Values.

RVR (Meters/Feet) Using ASOS Extinction Coefficient Values					
RVR		Day		Night	
Meters	Feet	Min Exco	Max Exco	Min Exco	Max Exco
M0180	M0600	Infinity	46.018	Infinity	90.653
180	600	46.018	29.703	90.653	59.185
240	800	29.703	21.320	59.185	43.995
300	1000	21.320	16.245	43.995	34.712
360	1200	16.245	12.872	34.712	28.614
420	1400	12.872	10.538	28.614	24.132
490	1600	10.538	8.811	24.132	20.797
550	1800	8.811	7.516	20.797	18.245
610	2000	7.516	6.487	18.245	16.200
670	2200	6.487	5.653	16.200	14.510
730	2400	5.653	4.984	14.510	13.155
790	2600	4.984	4.421	13.155	11.992
850	2800	4.421	3.969	11.992	10.984
910	3000	3.969	3.311	10.984	9.578
1070	3500	3.311	2.620	9.578	8.062
1220	4000	2.620	2.241	8.062	6.902
1370	4500	2.241	2.010	6.902	6.022
1520	5000	2.010	1.813	6.022	5.334
1670	5500	1.813	1.648	5.334	4.756
1830	6000	1.648	1.529	4.756	4.293
P1830	P6000	1.529	0.000	4.293	0.000

Attachment 5

EARTHQUAKE USGS REPORT

A5.1. Bulletin Heading: SEXX XXXX

A5.2. Heading and text:

SEXX XXXX DTG

CCCC

Earthquake felt (a) at (b) for (c) seconds by (d) persons in the vicinity of (e) with (f) damage:

(g)

(h)

End of text functions.

A5.3. Breakdown of items that should be contained in the body of the text:

a. Very strongly, strongly, moderately, faintly, unknown.

b. Location: Fairchild AFB, WA, 10SW Scott AFB, IL, etc.

c. Time (duration).

d. Few, many, unknown, etc.

e. Give locality or localities, e.g., Base Area, W of Base, etc.

f. Considerable, moderate, slight, no.

g. Description of damage, e.g., chimneys broken, tower felled, walls cracked, windows broken, buildings shifted, structures destroyed, unknown, etc.

h. Other information considered pertinent such as injuries within the area.

Attachment 6

STATION INFORMATION

Table A6.1. 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 (or decimal degrees if possible). - Field Elevation. - Station Elevation. - Elevation of Primary Barometer.
Observing Operation	- Full automated operations (provide operating hours). - Automated observations with augmentation and backup. Provide hours system augmented/backed up, and hour operated in AUTO mode. - Manual observations (provide hours observations are available).
Sensor Data	- AN/FMQ-19. Date installed and commissioned. - Location of AN/FMQ-19 sensors. - ASOS. Date installed. - Location of ASOS sensors. - Legacy Fixed-Base Sensors (list all). - Location of legacy sensors. - Explain any non-standard siting of sensors. - Provide listing of backup equipment for automated sensors.
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.

Attachment 7

SAMPLE AF FORM 3803, SURFACE WEATHER OBSERVATIONS

Figure A7.1. Sample AF From 3803 (Part-time Unit).

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
	38° 58'N	104° 49'W	+6572 Feet (MSL)	+7 Hrs.	+10 Deg.	1	MAR	2003	USAFA AFLD, CO

SYNOPTIC DATA					
TIME (UTC) (41) MID (LST) TO:	TIME (LST) (42) MID TO:	NO (43)	PRECIP (water equiv.) (44)	SNOW FALL (45)	SNOW DEPTH (46)
1150	0450	(1)	*.62	*6.2	6
1750	1050	(2)	0.12	1.2	3
		(3)			
		(4)			
MID (LST)	MID (LST)				

SUMMARY OF DAY			
24-HR MAX TEMP (°C) (66)	PRECIP (water equiv.) (68)	SNOW FALL (69)	SNOW DEPTH (70)
M	E.74	E7.4	6
24-HR MIN TEMP (°C) (67)	SPEED (knots) (71)	DRCTN (true) (72)	TIME (UTC) (73)
M	29	310	1846
		350	1143

ACTIVE RNWY AND EQUIP CHANGE	
TIME (UTC)	RNWY NO.
1150	34

(90) REMARKS, NOTES, AND MISCELLANEOUS PHENOMENA (ALL times UTC)

TIME CHECK: 1130
*18-HR PCPN
1:10 RATIO USED
1720 - RWY DRY
GMQ-32 CONT OUT
PK WND 34029 1130

TYPE (1)	TIME (UTC) (2)	WIND DRCTN (True) (9A)	WIND SPEED (Knots) (10)	MAX WIND (Knots) (11)	VARIABLITY (True) (9B)	VISIBILITY METERS (4A)	VISIBILITY STATUTE MILES (SM) (4B)	RUNWAY VISUAL RANGE LOCAL (4C)	WEATHER AND OBSTRUCTIONS TO VISION (5)	SKY CONDITION (3)	TEMP (°C) (7)	DEW POINT (°C) (8)	ALSTG (Inches) (12)	STA PRES-SURE (Inches) (17)	TOTAL SKY CVR (21)	OBS INIT (18)
M	1155	330	19	28	300V360		1/4	RVRNO	+SN BLSN FG	VV005	M03	M03	2982	23.380	8	LB
(13) RMK	VIS W 1/2 PK WND 35029/43 SLP033 SLP ESTMD 6//// 70062 4/006 52032 RCRNR															
S	1214	350	18	24	320V020		1/2	RVRNO	SN BLSN BR	SCT000 BKN010 OVC033	M03	M03	2983			LB
(13) RMK	TWR VIS 1 BR SCT000 PSR08															
S	1225	360	12	18			2 1/2		-SN DRSN BR	SCT013 BKN035 OVC080	M04	M05	2985			LB
(13) RMK	VIS 2V3 TWR VIS 3															
S	1243	360	10	16			5		-SN DRSN BR	BKN035 BKN080 BKN250	M04	M06	2987			LB
(13) RMK																
M	1255	350	08	15			7		-SN DRSN	BKN035 BKN080 BKN250	M05	M07	2990		7	LB
(13) RMK	PK WND 35026/1159 PRESRR SLP113 SLP ESTMD SLR12															
S	1325	350	11	18			12		DRSN	FEW002 FEW035 SCT080 BKN250	M04	M07	2991			LB
(13) RMK	FU FEW002															
M	1355	330	09				12			FEW100 BKN250	M02	M07	2992		5	LB
(13) RMK	FU DSIPTD SLP074 SLP ESTMD-PSR14															
M	1455	320	08				12			FEW050 SCT100 SCT200	01	M06	2996	23.490	4	RS
(13) RMK	ROTOR CLD ALQDS ACSL N-E-S SLP090 SLP ESTMD 60012 51037 PSR15P WET															
M	1555	320	10				12			FEW050TCU SCT100 SCT250	02	M04	2998		4	RS
(13) RMK	TCU DSNT NW ACSL N-E-S SLP070 SLP ESTMD WR//															
M	1655	330	10	16			12			SCT050CB BKN100 BKN250	03	M01	2999		6	RS
(13) RMK	CB DSNT W-NW MOV SE ACSL N SLP049 SLP ESTMD WR//															
M	1755	330	12				10			SCT050CB BKN100 BKN250	02	00	2999	23.525	7	RS
(13) RMK	CB 5W AND DSNT N MOV SE SLP049 SLP ESTMD 60013 51012															
S	1835	330	12	18			8		-TSRA	BKN040CB BKN100 BKN250	02	00	2997			RS
(13) RMK	TS OHD-N MOV SE OCNL LTG CACG															
M	1857	320	17	25	290V350		2		TS RASN	FEW020 BKN035CB BKN090 BKN250	01	M01	2996		7	RS
(13) RMK	TS OHD MOV E FRQ LTGICCG PK WND 31029/46 SLP033 SLP ESTMD WR// LAST															

Figure A7.2. Sample AF Form 3803 (Full-time Unit).

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
	30° 10'N	79° 01'W	+218 Feet (MSL)	+5 Hrs.	- 10 Deg.	2	MAR	2003	0 Pope AFB, NC

SYNOPTIC DATA

TIME (UTC) (41)	TIME (LST) (42)	NO (43)	PRECIP (water equiv.) (44)	SNOW FALL (45)	SNOW DEPTH (46)
MID (LST) TO: 0550	MID TO: 0050		0.00	0.0	
0550	0050	(1)	0.05	0.0	0
1150	0650	(2)	0.00	0.0	0
1750	1250	(3)	0.00	0.0	0
2350	1850	(4)	0.89	*T	0
MID (LST)	MID (LST)		T	0.0	0

SUMMARY OF DAY

24-HR MAX TEMP (°C) (66)	PRECIP (water equiv.) (68)	SNOW FALL (69)	SNOW DEPTH (70)
28	0.89	*T	0

24-HR MIN TEMP (°C) (67)	SPEED (knots) (71)	DRCTN (true) (72)	TIME (UTC) (73)
06	53	260	1854

ACTIVE RNWY AND EQUIP CHANGE: TIME (UTC)	RNWY NO.	(90) REMARKS, NOTES, AND MISCELLANEOUS PHENOMA (ALL times UTC)
		TIME CHECK: 0520
		GMQ-32 CONT OUT/ 05 END (LOGGED OUT ON 20 APR)
CONT	23	RWY DRY AT 0630
		FMQ-8 OUT AT 1430/ SLING IN USE
		FMQ-8 BACK IN USE 1540
		28C AT 1750
		RWY DRY AT 0330
		*HAIL

TYPE (1)	TIME (UTC) (2)	WIND DRCTN (True) (9A)	WIND SPEED (Knots) (10)	MAX WIND (Knots) (11)	VARIABLITY (True) (9B)	VISIBILITY METERS (4A)	VISIBILITY STATUTE MILES (SM) (4B)	RUNWAY VISUAL RANGE LOCAL (4C)	WEATHER AND OBSTRUCTIONS TO VISION (5)	SKY CONDITION (3)	TEMP (°C) (7)	DEW POINT (°C) (8)	ALSTG (Inches) (12)	STA PRES-SURE (Inches) (17)	TOTAL SKY CVR (21)	OBS INIT (18)
M	0455	230	06				7			FEW050 SCT250	17	13	3006		4	DJ
(13) RMK	SLP180 WR//															
M	0555	230	05				7			FEW250	16	13	3007	29.835	2	DJ
(13) RMK	SLP183 60005 53008 WR//															
M	0655	220	04				7			FEW050	15	12	3008		1	DJ
(13) RMK	SLP185															
M	0755	210	04				7			SKC	14	12	3008		0	DJ
(13) RMK	SLP185															
M	0855	200	03				7			SKC	13	12	3008	29.845	0	DJ
(13) RMK	SLP186 51003															
M	0955	VRB	03				5		BR	SKC	13	12	3008		0	DJ
(13) RMK	SLP186															
M	1055	VRB	04				2 1/2		BR	SKC	12	12	3007		0	DC
(13) RMK	VIS S-SW2 SFC VIS 3 SLP183															
M	1055	VRB	04				2 1/2		BR	SKC	12	12	3007		0	DC
(13) RMK	VIS S-SW2 SFC VIS 3 SLP183															
M	1155	190	05				5		BR	SKC	14	12	3006	29.825	0	DC
(13) RMK	SLP180 70011 58007															
M	1255	200	06				6		HZ	SKC	17	13	3005		0	DC
(13) RMK	SLP177															
M	1355	210	08				7			SKC	20	14	3003		0	DC
(13) RMK	SLP171															
M	1455	220	10	18			7			FEW030	23	16	3001	29.770	1	DC
(13) RMK	SLP165 58019															
M	1555	230	13	21			7			SCT035	25	17	2999		3	DC
(13) RMK	SLP160															
M	1655	230	15	24			7			SCT035TCU	26	18	2997		4	DC
(13) RMK	TCU S AND DSNT NW SLP154															