BY ORDER OF THE
SECRETARY OF THE AIR FORCE

AIR FORCE MANUAL 15-111

1 SEPTEMBER 2000

Weather

SURFACE WEATHER OBSERVATIONS

NOTICE: This publication is available digitally on the AFDPO WWW site at: http://afpubs.hq.af.mil.

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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 implements World Meteorological Organization (WMO) aviation routine weather reports (METAR) and non-routine aviation weather reports (SPECI/LOCAL) Codes, FM 15 and FM16. 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/XOOP, 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/XOOP 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 instruction in accordance with AFMAN 37-139, *Records Disposition Schedule.*

SUMMARY OF REVISIONS

This revision restructures AFMAN 15-111, with guidance previously contained in **chapter 3** moved to subsequent chapters specific to the given weather criteria. Major additions include updated procedures for the AN/FMQ-13 wind measuring set and automated surface observing systems (ASOS) operation policy. Other additions and changes have been marked using a vertical bar in the left margin.

Chapter 1

INTRODUCTION

1.1. Background Information. This manual prescribes United States Air Force METAR weather observing and reporting procedures based on agreements with WMO, international and domestic aviation interests, and other civil weather services and applies to Air Force and Army permanent-type and non-fixed (tactical or temporary site) operations.

1.2. General Information. FMH-1 establishes standard United States (US) surface weather observation requirements and procedures for US Federal meteorological agencies. This manual incorporates procedures applicable to Air Force 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 all 50 states and Guam. US locations will use statute miles for visibility values while overseas locations will use meters (metric system).

1.3. 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. Guidance on Automated Surface Observing System code format is found in **chapter 13**.

1.3.1. Aviation Routine Weather Reports (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 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, coded and/or plain language information which elaborates on data in the body of the report may be appended to the METAR. This significant information can be found in a section referred to as "Remarks." The contents of the remarks will vary according to the type of weather station.

1.3.2. Aviation Selected Special Weather Report (SPECI). SPECI is an unscheduled observation taken when any of the criteria given in paragraph 2.7 have been observed. SPECI shall contain all data elements found in a METAR plus additional remarks which elaborates on data in the body of the report. All SPECIs shall be made as soon as possible after the relevant criteria are observed.

1.3.3. Aviation Selected Local Weather Report (LOCAL). LOCAL is an unscheduled observation (not meeting SPECI criteria) taken when any of the criteria given in paragraph 2.8. have been observed. LOCAL contents (other than those disseminated to ATC agencies, see **table 2.1.**) are established locally through agreement with the supported agency. All LOCALs shall be made as soon as possible after the relevant criteria are observed.

1.4. Units of Measure. Tables and scales are included in this manual for conversion from one unit of measure to another.

1.4.1. The basic unit of distance at overseas locations is the meter with the following metric equivalencies (mm = millimeter, cm = centimeter, m = meter, km = kilometer): The basic unit of distance in the United States (US) is the statute mile (SM).

1.4.2. Figure 1.1. shows the fundamental relationship between metric and conventional US measures of length.

Figure 1.1. Comparison of Metric and US Measures.

1 mm = .03937 inch	1 inch = 25.4 mm
1 cm = .3937 inch	1 inch = 2.54 cm
1 m = 39.3 inches	1 foot = .3048 m
1 m = 3.2808 feet	1 yard = 0.9144 m

1.5. Designating Applicability of Instructions. Most procedures in this manual are applicable to all observing stations, based on their capability to comply and the code form appropriate to observations taken at the station. In some cases, applicability may be specified within the text of a paragraph (e.g., at non-fixed stations).

1.6. Requirement to Maintain Weather Equipment Technical Orders (TOs). Permanent-type and non-fixed sites will have access to applicable technical orders for each piece of assigned weather equipment. Weather personnel will have operator manuals or handbooks for all assigned equipment, with copies available after deployment, as well as all applicable TOs.

1.7. Observing Procedures.

1.7.1. General. Observing procedures in this manual are based on the premise that routine weather evaluations are made according to established schedules for METARs. Nonroutine weather evaluations are made whenever weather personnel note that certain elements have changed to meet SPECI or LOCAL observation criteria. METAR observations normally reflect the conditions observed at, or seen from, the usual point(s) of observation within 15 minutes of the time ascribed to the observation. Exceptions to these basic concepts are described in specific procedures.

1.7.2. Unique or Unusual Conditions. Add remarks to an observation as necessary to describe unique or unusual weather conditions not covered adequately by this publication. In such situations, weather personnel should use their best judgment to describe the condition to the user, then call the situation to their supervisor's attention for possible referral through channels to Air Force Weather Agency/Operations Directorate (AFWA/XO) for clarification.

1.7.3. Observing Qualification. Before assuming responsibility for taking weather observations, weather personnel will be qualified and task certified according to AFMAN 36-2247, *Planning, Conducting, Administering, and Evaluating Training*, AFI 36-2201, *Developing, Managing, and Conducting Training*, and local training requirements. Air traffic control (ATC) personnel taking visibility (both prevailing and sector) observations from the tower will be task-certified to evaluate tower visibility values by local Weather Flight/Detachment personnel.

1.7.4. 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. ATC personnel certified to evaluate tower visibility will report changes in prevailing visibility to the local weather station when prevailing visibility is less than 4 statute miles (6000 meters) and is different from the weather observing site visibility. Additionally, ATC personnel will notify the observing section of changing weather conditions significantly different than those contained in the observation. Units should ensure tower visibility requirements are coordinated with ATC and specified in a local weather support document.

1.7.5. Weather Watch. A weather watch is conducted at each surface observing station to detect and report significant changes in specified weather elements. Types of weather watch are:

1.7.5.1. Continuous Weather Watch (CWW). At stations 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.

1.7.5.2. Basic Weather Watch (BWW). A BWW is normally conducted from the weather station 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.

1.7.5.2.1. 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:

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

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

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

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

1.7.5.2.1.5. Precipitation (any form).

1.7.5.2.1.6. Fog or Mist.

1.7.5.2.1.7. In addition to the above minimum requirements, weather personnel will remain alert for any other changes in weather conditions which 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.

1.7.5.2.2. When the airfield is closed and the base/post weather organization is responsible for both the surface and radar weather watch, SPECI and LOCAL observations are required only for those locally established criteria (defined from the local weather support document) that could threaten life and property, i.e., tornadic activity, thunderstorms, heavy precipitation, high winds, and aircraft mishaps. Units should ensure this variance is coordinated with local customers and specified in a local weather support document.

1.7.5.3. Cooperative Weather Watch. All weather units with a surface observing function will establish a cooperative weather watch with Air Traffic Control (ATC) and other appropriate base/post agencies. Of primary concern is the occurrence of previously unreported weather conditions that could affect flight safety or could be critical to the safety or efficiency of other local operations and resources. Supervisors will ensure weather personnel are thoroughly familiar with the local cooperative weather watch agreement.

1.7.5.3.1. When a reliable source (tower personnel, pilots, etc.) reports weather conditions different from the last disseminated observation (e.g., different ceiling height), weather personnel will reevaluate the weather conditions.

1.7.5.3.1.1. Based on reevaluation of the different weather conditions reported and local policy, weather personnel will:

1.7.5.3.1.1.1. Take and disseminate a SPECI or LOCAL observation if the different conditions warrant immediate dissemination.

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

1.7.5.3.2. Units should ensure cooperative weather watch requirements are coordinated with the appropriate base/post agencies and specified in a local weather support document.

Chapter 2

GENERAL PROCEDURES

2.1. General Information. This chapter explains various types of surface weather observations and prescribes recording practices.

2.2. Standard Definitions:

2.2.1. Observed. Indicates reported weather information was determined visually by weather personnel, or weather sensing equipment, or by using radar. No distinction will be made when reporting and encoding phenomena determined visually, versus phenomena determined by weather sensing equipment, or determined by radar and lightning detection equipment. Each observing method is equally valid.

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

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

2.2.2.2. 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 (Record-Special METAR), the actual time of the observation will be 55 to 59 minutes past the hour (standard time of a METAR observation).

2.2.2.3. 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.

2.2.3. Darkness Adaptation. 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.

2.2.4. Surface Weather Observation. An evaluation of one or more meteorological elements that describes the state of the atmosphere at the location (weather observing station) where the METAR, SPECI, or LOCAL observation is taken.

2.2.5. Unofficial Weather Reports. A report of one or more weather elements made by an individual who is not qualified to take official observations. These unofficial reports provide additional and supplemental information that is of possible interest to the public and to aviation.

2.2.5.1. When received, these reports may be included and transmitted in the next METAR or SPECI as a plain language remark. When appended to any observation, the unofficial report is considered as additional data and not as SPECI criteria. Exception: An unofficial weather report concerning tornadic activity may be transmitted as a single element SPECI (see paragraph 4.4).

2.3. Basic Observing Conventions and Concepts.

2.3.1. Weather Observing Station. The weather observing station is the location from which weather observations are normally taken.

2.3.1.1. Station. The term station is used throughout this manual to indicate any weather site (permanent-type or non-fixed location) that performs a weather observing function.

2.3.2. Points of Observation. Normally, points of observation are confined to an area within 2 statute miles (3200 meters) of the observing station to include phenomena affecting the runway complex, drop zone or landing zone. For non-fixed locations (tactical and mobile weather teams), the point of observation is determined by the local situation. Weather observations may also contain information on phenomena occurring at other than the location of the station (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:

2.3.2.1. The weather observing station for pressure and for visually determined elements such as prevailing surface visibility, present weather and obscurations, cloud coverage, and type of cloud.

2.3.2.2. The center of the runway complex for temperature, dewpoint, pressure, lightning (CB remark) and wind when sensors are not installed at touchdown areas.

2.3.2.3. Near the approach end of a runway for touchdown runway visual range (RVR), wind, and cloud height.

2.3.2.4. The aircraft control tower for tower prevailing visibility.

2.3.3. Observing Station and Facilities. The observing station is established where it will permit adequate visual evaluation of the various elements of the observation. Additionally, the site will be a location with adequate communications. Ensure the structure provides adequate space, equipment arrangement, safety, field of view, and human comfort facilities. **NOTE:** Meteorological sensing equipment should be located IAW the Federal Standard for Siting Meteorological Equipment at Airports.

2.3.4. Alternate Observing Sites (AOS). If required by the local command, observing units will establish an AOS when the primary site is evacuated. The continued support requirement will be coordinated with the local command and specified in a local weather support document.

2.3.4.1. The AOS will be a location with adequate communications and a view of the airfield complex.

2.3.4.2. Observations will begin immediately upon arrival at the AOS.

2.3.4.2.1. Observations from the AOS will contain, at a minimum, the prevailing visibility, present weather and obscurations, sky condition, wind direction and speed, temperature and dewpoint. Additionally, an altimeter setting will be included if necessary equipment is available.

2.3.4.2.2. At a minimum, weather personnel must be able to complete an initial observation containing the minimum required elements (prevailing visibility, present weather and obscurations, sky condition, wind direction and speed, temperature and dewpoint, and altimeter setting) within 10 minutes of arriving at the AOS. Upon resumption of observing services, disseminate an observation if established METAR, SPECI, and LOCAL criteria have occurred, or are occurring.

2.3.5. Accuracy of Time. The accuracy of the time ascribed to weather observations is of the utmost importance in aviation safety investigations. Weather units will designate a single timepiece as the standard clock and conduct time checks against the U.S. Naval Observatory master clock, at a frequency not to exceed every six hours. Limited duty locations will conduct a time check within one hour of opening and at a frequency not to exceed every six hours from that point thereafter. Adjust the standard clock whenever it deviates from the Naval Observatory by one minute or more. Annotate a time check in Column 90 on the AF Form 3803, **Surface Weather Observations (METAR/SPECI)** if not annotated elsewhere. NOTE: Do not use computer generated time settings for any piece of equipment connected to a network (such as NTFS) as this time can be changed by network control without an operator's input.

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

2.3.7. Rounding Cloud Height, Visibility, and Pressure Values.

2.3.7.1. 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 ¼ miles (8250 meters) and 5 ½ miles (8500 meters) are reported as 5 miles (8000 meters).

2.3.7.2. 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 ¾ miles (7750 meters) is reported as 5 miles (8000 meters).

2.3.7.3. When computations of pressure values require that a number be rounded to comply with standards on reportable values, the number shall 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 rounded down to 29.24.

2.3.7.3.1. Altimeter settings provided for international aviation purposes and reported in whole hectopascals (hPa) are rounded down when disposing of tenths of hPas; e.g., 1,009.9 hPas and 1,009.1 hPas are both rounded down to 1,009 hPas.

2.3.8. Observational Form. Use AF Form 3803, **Surface Weather Observations (METAR/SPECI/LOCAL)** or AF Form 3813, **Federal Meteorological Surface Weather Observations (METAR/SPECI/LOCAL).** Prepare the station observation record according to applicable procedures in this publication.

2.3.8.1. AF Form 3803. This form will be used at permanent-type or non-fixed weather observing stations. Start a new page of the form with the first observation of each new calendar day local standard time (LST). Prepare an original and one duplicate. The duplicate may be a carbon copy, reproduced copy, or computer-generated equivalent approved by HQ USAF/XOW.

2.3.8.1.1. At locations where surface observations are taken for tactical weather operations or for other local-use purposes, prepare the AF Form 3803 in one copy. Data for more than 1 day may be recorded 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.

2.3.8.2. AF Form 3813. This form may be used at NTFS permanent-type weather observing stations. This form is an electronically generated official record and compilation of daily surface weather observations. Execute the print option daily at 0000 LST and start a new form each calendar day. Annotate hand written entries as needed. Prepare an original and one duplicate. The duplicate may be a reproduced copy.

2.3.9. Recording of Surface Observations. All METAR and SPECI observations, and LOCAL observations taken for aircraft mishaps, are recorded on the form. 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., LWDS, NTFS. Normally, when such a recording device is inoperative or not available, all LOCAL observations are recorded on the form. However, single element altimeter setting LOCALs are not entered on the form if a record of the values is maintained on a local dissemination log or a tape-recording.

2.3.10. Disposition of Records. All surface observing records will be disposed of in accordance with AFMAN 37-139, *Records Disposition Schedule*. Units will complete and send the original plus two copies of Standard Form 135, *Records Transmittal and Receipt*, with their original records. Send original records to:

AFCCC/DOB

151 Patton Avenue, Room 120

Asheville, NC 28801-5002

2.4. Observing Requirements.

2.4.1. Time References.

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

2.4.1.2. Actual Date and Time of Report. The actual date and time of METAR and LOCAL taken for a runway change or an aircraft mishap shall be the time the last element of the report was observed. The actual time of a SPECI or LOCAL shall be the time the SPECI or LOCAL criteria (except runway change and aircraft mishap criteria) was first met or observed. For a METAR with SPECI criteria (Record-Special METAR), the actual time will be 55 to 59 minutes past the hour (standard time of a METAR observation).

2.4.1.3. Time Disseminated in Reports. All times disseminated in reports shall reference the 24-hour UTC clock. The times 0000 and 2359 shall indicate the beginning and ending of the day, respectively.

2.4.1.4. Date and Time Entered in Reports. All dates and times entered in reports shall be with reference to the 24-hour clock and based on one of the 24 standard time zones of the globe. The zone in use is determined by the geographic location of the station and, therefore, is not subject to change. The times disseminated as part of the report shall be entered in UTC. The time standard selected shall be clearly indicated on all records and, if LST is used, the conversion to UTC shall also be indicated.

2.4.1.5. Local Standard Time. A time based on one of the 24 standard time zones of the globe. The zone in use is determined by the geographic location of the station and, therefore, is not subject to change.

2.4.1.6. Standard Time of Observation. The hour to which a METAR applies. It is with reference to (UTC).

2.4.1.7. Coordinated Universal Time (UTC). An atomic time scale that is the basis for broadcast time signals. UTC differs from International Atomic Time by an integral number of seconds; it is maintained within 0.9 seconds of UT1 (see Universal Time) by introduction of Leap Seconds. The rotational orientation of the Earth, specified by UT1, may be obtained to an accuracy of a tenth of a second by applying the UTC to the increment DUT1 (where DUT1 = UT1 - UTC) that is broadcast in code with the time signals. Also called UTC.

2.4.1.8. Universal Time. A measure of time that conforms, within a close approximation, to the mean diurnal rotation of the Earth and serves as the basis of civil timekeeping, Universal Time (UT1) is determined from observations of the stars, radio sources, and also from ranging observations of the Moon and artificial Earth satellites. The scale determined directly from such observations is designated Universal Time Observed (UTO); it is slightly dependent on the place of observation. When UTO is corrected for the shift in longitude of the observing station caused by polar motion, the time scale UT1 is obtained. When an accuracy better than one second is not required, Universal Time can be used to mean UTC. Universal time is also called ZULU or Greenwich Mean Time.

2.4.2. Order of Observing. Elements having the greatest rate of change (i.e., pressure, wind) are evaluated last. Between pressure and wind, pressure will be obtained last. When conditions are relatively unchanging, evaluate the elements outdoors first, then evaluate the elements obtained indoors with pressure last.

2.4.3. Recency of Observed Elements. Normally, individual elements entered in an observation must, as closely as practical, reflect conditions existing at the actual time of observation. However, in some cases, specific elements are required to be reported when a condition is observed during the period of observation. This period may be indicated in the reporting instructions; e.g., peak speed of gusts in the 10-minute period before the actual time of observation. Otherwise, when the period is not specified, an element or condition must have been observed within 15 minutes of the actual time of observation. Supplement elements evaluated instrumentally with visual observations to ensure accuracy.

2.4.4. SPECI and LOCAL Observation Requirements. Post and maintain in a SOP or quick reference list, all applicable SPECI and LOCAL observation criteria for the immediate reference of observing personnel. Include requirements based on published airfield minima for ceiling (CIG), prevailing visibility (PV), and runway visual range (RVR). For changes in these airfield minima, check Military Aviation Notices, each new edition of the appropriate Department of Defense Flight Information Publications (DoD FLIP), higher headquarters or MAJCOM publications, and local NOTAMs (See **figure 2.1.** and **figure 2.2.**). AFW locations with automated observing systems will update SPECI criteria tables or software to ensure automated equipment takes and disseminates SPECI observations.

Figure 2.1. Extract from DoD Flight Information Publication (CONUS).

NELLIS AFB, NV (Las Vegas) (30 Mar 95 USAF) ELEV 1868

RADAR – Ctc NELLIS APP CON 124.95 279.7

	RWY	GS/TCH/RPI	CAT	DH/MDA/VIS	HAT/HAA	CEIL-VIS
PAR a b	3R	3.0°/52/952	ABCDE	1932-1/4	100	(100-1/4)
	21L	3.0°/46/948	ABCDE	1964-1/4	100	(100-1/4)
	3L	3.0°/52/949	ABCDE	1940-1/2	100	(100-1/2)
	21R	3.0°/50/999	ABCDE	1968/1/2	100	(100-1/2)

CAUTION-GP advsy not avbl inside Decision Height (DH). **Missed apch climb rate to 6500

CAUTION-*ATC missed apch climb rate to 9000

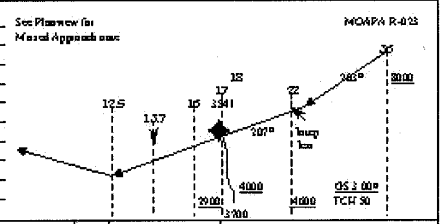
		Knots	60	120	180	240	300	360
PAR	3R*	FPM	465	930	1395	1860	2325	2790
	3L*	FPM	480	960	1440	1920	2400	2880
	3L/R**	FPM	290	580	870	1160	1450	1740
	21L/R**	FPM	355	710	1065	1420	1775	2130

	RWY	GS/TCH/RPI	CAT	DH/MDA/VIS	HAT/HAA	CEIL-VIS
ASR a b	3R		AB	2300-1/2	468	(500/1/2)
			C	2300-3/4	468	(500/3/4)
			D	2300-1	468	(500/1)
			E	2300-11/4	468	(500-11/4)
	3L		AB	2300-1	460	(500-1)
			C	2300-11/4	460	(500-11/4)
			D	2300-11/2	460	(500-11/2)
			E	2300-11/2	460	(500-11/2)
	21L		AB	2420-1/2	556	(600-1/2)
			C	2420-1	556	(600-1)
			D	2420-11/4	556	(600-11/4)
			E	2420-11/2	556	(600-11/2)
	21R		A	2620	752	(800-1)
			B	2620-11/4	752	(800-11/4)
			C	2620-21/4	752	(800-21/4)
			D	2620-21/2	752	(800-21/2)
			E	2620-23/4	752	(800-23/4)
CIR c	3L/R		A	2420-1	552	(600-1)
			B	2560-1	692	(700-1)
			C	2560-2	692	(700-2)
			D	2560-21/4	692	(700-21/4
			E	2780-3	912	(1000-3)
	21L		A	2420-1	552	(600-1)
			B	2560-1	692	(700-1)
			C	2560-2	692	(700-2)
			D	2560-21/4	692	(700-21/4)
			E	2780-3	912	(1000-3)
	21R		A	2620-1	752	(800-1)
			B	2620-11/4	752	(800-11/4)
			C	2620-21/4	752	(800-21/4)
			D	2620-21/2	752	(800-21/2)
			E	2780-3	912	(1000-3)

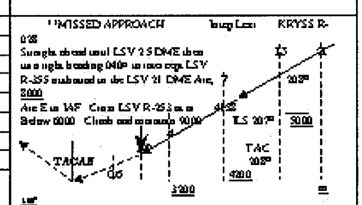
CAUTION-*ATC missed apch climb rate to 9000. **Missed apch climb rate to 5100. ***Missed apch climb rate to 6500.

		Knots	60	120	180	240	300	360
ASR	3R/L*	FPM	445	890	1335	1780	2225	2670
	3R/L**	FPM	260	520	780	1040	1300	1560
	21L/R***	FPM	290	580	870	1160	1450	1740

a-No. NOTAM preventive maint sked PAR-1200-1400Z++ Mon-Fri. 1800-2000Z++ Sat-Sun. ASR 0800-1000Z++ Mon-Fri. 1600-1800Z++ Sat-Sun. b-When NELLIS APP CON ASR is out, PAR avbl Rwy 21L for TACAN equipt acft. c-Circling not authorized EAST of Rwy 3R-21L.



ILS/DME 2 RWY 21L



TACAN or ILS/DME 1 RWY 21L

Figure 2.2. Extract from DOD Flight Information Publication (Overseas).

SPANGDAHLEM AB, (BINSFELD) GERMANY (4 FEB 93 USAF) ELEV 1196
RADAR – EIFEL APP (E) 141.1 242.525 290.4 384.2

	RWY	GB/TCH/HPI	CAT	DH/MDA/VIS	HAT/HAA	CEIL/VIS
PAR a	05	2.5°/46/855	ABCDE	1256/1190m	100	(100-400m)
	23	3.0°/38/748	ABCDE	1446/1520m	250	(300-1600m)
ASR b	05		ABCDE	1540/1220m	384	(400-1200m)
	23		AB	1780/1520m	584	(600-1600m)
			C	1780/1830m	584	(600-2000m)
			D	1780/2400m	584	(600-2400m)
			E	1780-2800m	584	(600-2800m)
CIR c	05		AB	1680-1800m	484	(500-1800m)
			C	1680-2400m	484	(500-2400m)
			DE	1780-3200m	564	(600-3200m)
	23		AB	1780-2000m	584	(600-2000m)
			C	1780-2400m	584	(600-2400m)
			DE	1780-3200m	584	(600-3200m)

a-PAR MP 0600-0800Z ++ Mon-Fri. 0700-0900Z ++ Sat-Sun. b-ASR MP 0300-0500Z ++ Mon-Fri 0900-1100Z ++ Sat-Sun. c-Circling not authorized NW of Rwy 05-23 due to proximity of Bitburg AB.

*MISSED APPROACH
Climb left to 5000 out if 180 cross 9 DME at 5000 then left heading 050° to intercept 14 DME Arc

2.4.5. Aviation Routine (METAR), Special (SPECI), and Local (LOCAL) Surface Weather Observations. Classified according to their purpose as described in the following paragraphs. Data included in an observation, which is based on information in an unofficial report, must be properly identified as specified in this publication.

2.5. METAR/SPECI/LOCAL Code.

2.5.1. Figure 2.3 and 2.4 provide METAR, SPECI, and LOCAL coding, format, and content for the United States and Overseas reporting locations.

Figure 2.3. METAR/SPECI/LOCAL Code.

United States METAR/SPECI/LOCAL Code
METAR/SPECI/LOCAL CCCC YYGGggZ COR dddffGf_mf_mKT $d_nd_nd_n$V$d_xd_xd_x$ VVVVVSM $RD_RD_R/V_RV_RV_RV_R$FT or $RD_RD_R/V_NV_NV_NV_N$V$V_XV_XV_XV_X$FT w'w' $N_sN_sN_sh_sh_sh_s$ [or VV$h_sh_sh_s$ or SKC] T'T'/T'$_d$ T'$_d$ A$P_HP_HP_HP_H$ RMK;
Overseas METAR/SPECI/LOCAL Code
METAR/SPECI/LOCAL CCCC YYGGggZ COR dddffGf_mf_mKT $d_nd_nd_n$V$d_xd_xd_x$ VVVV $RD_RD_R/V_RV_RV_RV_R$ $RD_RD_R/V_NV_NV_NV_N$V$V_XV_XV_XV_X$ w'w' $N_sN_sN_sh_sh_sh_s$ [or VV$h_sh_sh_s$ or SKC] T'T'/T'$_d$T'$_d$A$P_HP_HP_HP_H$ RMK;

Figure 2.4. Observation Format and Content.

Code for the United States METAR/SPECI/LOCAL	
Type of Report	**METAR/SPECI/LOCAL**
Station Identifier	**CCCC**
Date and Time of Report	**YYGGggZ**
Only allowable Report Modifiers	**COR or AUTO**
Wind	$dddff(f)Gf_mf_m(f_m)KT\_d_nd_nd_nVd_xd_xd_x$
Visibility	**VVVVVSM**
Runway Visual Range	$RD_RD_R/V_RVRV_RV_RFT$ **or** $RD_RD_R/V_NV_NV_NV_NVV_XV_XV_X$-$V_XFT$
Present Weather	**w'w'**
Sky Condition	$N_sN_sN_sh_sh_sh_s$ **or** $VVh_sh_sh_s$ **or SKC/CLR (CLR IS ASOS ONLY)**
Temperature/Dew Point	$T'T'/T'_d{}'_d{}'$
Altimeter	$AP_HP_HP_HP_H$
Column 13 Remarks	**RMK**
Format and Content of the Overseas METAR/SPECI/LOCAL	
Type of Report	**METAR/SPECI/LOCAL**
Station Identifier	**CCCC**
Date and Time of Report	**YYGGggZ**
Only allowable Report Modifiers	**COR or AUTO**
Wind	$dddff(f)Gf_mf_m(f_m)KT\_d_nd_nd_nVd_xd_xd_x$
Visibility	**VVVV**
Runway Visual Range	$RD_RD_R/V_RV_RVRV_R$ **or** $RD_RD_R/V_NV_NV_NV_NVV_XV_XV_XV_X$
Present Weather	**w'w'**
Sky Condition	$N_sN_sN_sh_sh_sh_s$ **or** $VVh_sh_sh_s$ **or SKC/CLR (CLR IS ASOS ONLY)**
Temperature/Dew Point	$T'T'/T'_d{}'_d{}'$
Altimeter	$AP_HP_HP_HP_H$
Column 13 Remarks	**RMK**

2.6. METAR Observation Reporting Requirements . Complete observations are taken every hour the weather station is open and are disseminated longline and locally as METAR observations. They are encoded on the AF Form 3803 using the designator SA (METAR) or RS (Record-Special METAR) and on the AF Form 3813 using the designator METAR. The contents of METAR/SPECI/LOCAL observations are given in **table 2.1.** Additional information on hourlies, 3-hourlies (0300, 0900, 1500, 2100 UTC), and 6-hourlies (0000, 0600, 1200, 1800 UTC) are given in **table 2.2.**

Table 2.1. Content Of Surface Weather Observation in METAR/SPECI/LOCAL Code.

Element [1]	**Transmission Code Form**			**Type of Observation** [3]	
		METAR	SPECI	LOCAL (for ACFT MSHP)	LOCAL (for other rqrmts)
Time (UTC)	YYGGggZ	X	X	X	X
Report Modifier	COR or AUTO	X	X	X	X
Wind direction and speed, and maximum wind speed	$DddffGf_mf_mKT$	X	X	X	X
Wind variability	$d_nd_nd_nVd_xd_xd_x$	X	X	X	X
Prevailing visibility (statute miles)	VVVVVSM	$X^{2,4}$	$X^{2,4}$	$X^{2,4}$	$X^{2,4}$
Prevailing visibility (meters)	VVVV	X^2	X^2	X^2	X^2
RVR (feet)	$RD_RD_R/V_RV_RV_RV_RFT$	X	X	X	X
RVR (meters)	$RD_RD_R/V_RV_RV_RV_R$	X	X	X	X
Present weather	w'w'	X	X	X	X
Sky condition	$N_sN_sN_sh_sh_sh_s$ (CCC) or $VVh_sh_sh_s$ or SKC	X	X	X	X
Air temperature (°C)	T'T'	X	X	X^5	
Dewpoint temperature (°C)	T'd T'd	X	X	X^5	
Altimeter setting	$AP_HP_HP_HP_H$	X	X	X	X
Remark indicator	RMK	X	X	X	X
SLP and coded additive data groups	(see table 2.2)	X^3	X^3	X^3	X^3

NOTES:

1. When practical, reevaluate ceiling and sky condition, PV, RVR, and present weather before dissemination of the observation.

2. Local customer requirement will dictate local transmission visibility criteria (i.e., statute miles or meters).

3. Local or longline dissemination of remarks and coded additive data groups will be in accordance with the separate instructions in **table 2.2.** and in **chapter 3**, **chapter 4**, and **chapter 11**. Note that the contractions "ACFT MSHP" and "FIBI" (filed, but impractical to transmit) are not disseminated locally or longline.

4. Use statute miles for longline dissemination in the United States and Guam.

5. The requirement to include temperature and dewpoint on SPECI observations may be suspended when weather personnel are using a sling psychrometer and psychrometric calculator to obtain the values, unless mission needs dictate continued reporting of temperature and dewpoint.

Table 2.2. Transmission Requirements For SLP and Coded Additive Data Groups.

		Transmission Time (UTC)							
Code Form and Order (Note 1)	**Reference Paragraph**	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
SLPppp	3.12.2.1.1.	All METAR Hourly Reports							
(6RRRR)	3.12.2.1.2.	X[2]	X[2]	X[2]	X[2]	X[2]	X[2]	X[2]	X[2]
($7R_{24}R_{24}R_{24}R_{24}$)	3.12.2.1.3.					X[3]			
(4/sss)	3.12.2.1.4.	X		X		X		X	
($8/C_LC_MC_H$)	3.12.2.1.5.	All METAR Hourly Reports							
($9/C_LC_MC_H$)	3.12.2.1.5.	All METAR Hourly Reports							
1SnTxTxTx	3.12.3.1.6.	X[4]		X[4]		X[4]		X[4]	
2SnTnTnTn	3.12.3.1.6.	X[4]		X[4]		X[4]		X[4]	
5appp	3.12.3.1.7.	X[2]	X[2]	X[2]	X[2]	X[2]	X[2]	X[2]	X[2]

NOTES:

1. This table is applicable to Air Force Weather units with observing facilities which transmit longline on a scheduled basis. Units will code and transmit longline all data groups not exempted by higher headquarters or MAJCOM. Additive data groups in parentheses will be sent only when conditions are appropriate.

2. Higher headquarters or MAJCOMs will determine overseas unit coding and transmission requirements.

3. Higher headquarters or MAJCOMs will determine overseas unit transmission time requirements.

4. Higher headquarters or MAJCOMs will determine unit coding requirements.

2.7. SPECI Observation Reporting Requirements. SPECI observations are taken to report significant changes in weather elements at units which are required and scheduled to transmit surface observations on longline communications. These observations are disseminated longline as SPECI observations and disseminated locally as SPECI observations. They are encoded on the AF Form 3803 using the designator SP (SPECI) and on the AF Form 3813 using the designator SPECI. The contents of SPECIs are given in **table 2.1.** Take, disseminate, and record SPECI to report significant changes in weather elements when criteria, as indicated below, are observed.

2.7.1. Ceiling. The ceiling is observed to form below, decrease to less than or, if below, increase to equal or exceed:

2.7.1.1. 3,000 feet.

2.7.1.2. 1,500 feet.

2.7.1.3. 1,000 feet.

2.7.1.4. 700 feet.

2.7.1.5. 500 feet.

2.7.1.6. 300 feet (at bases with assigned air defense aircraft).

2.7.1.7. All published landing minima (including circling) applicable to the airfield, as listed in DoD FLIPs and appropriate Air Force, Army, and higher headquarters or MAJCOM flying instructions and publications. If none published, use 200 feet (See figures 2.3. and 2.4. for a depiction of minimums in the DoD FLIPs).

2.7.1.8. Ceiling minima, as applicable to range support, covered in governing directives and support agreements.

NOTES:

1. Range criteria may take the place of the criteria in 2.7.1.1 through 2.7.1.7.

2. Higher headquarters or MAJCOMs may replace ceiling criteria values in 2.7.1.1 through 2.7.1.5 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.

3. For joint and multi-national operations, the Joint METOC Officer, or equivalent, may replace ceiling criteria values in 2.7.1.1. through 2.7.1.5. 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.

2.7.2. 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.

2.7.3. Prevailing Visibility. Weather observing site prevailing visibility is observed to decrease to less than or, if below, increase to equal or exceed:

2.7.3.1. 3 miles (4800 meters).

2.7.3.2. 2 miles (3200 meters).

2.7.3.3. 1 mile (1600 meters).

2.7.3.4. All published landing minima (including circling) applicable to the airfield, as listed in the DoD FLIPs, appropriate Air Force, Army, higher headquarters or MAJCOM instructions and publications. If none is published, use ½ mile (800 meters).

2.7.3.5. Visibility minima as applicable to range support, covered in governing directives and support agreements.

NOTES:

1. Range criteria may take the place of the criteria listed in 2.7.3.1 through 2.7.3.4.

2. Higher headquarters or MAJCOMs may replace visibility criteria values in 2.7.3.1 through 2.7.3.4 with values from theater higher headquarters or MAJCOM regulations or supplements relating to command minima for landing, VFR and IFR, and alternates.

3. IAW FAAH 7110.65 tower personnel must use the lower prevailing visibility from either the usual point of observation or from the tower level for aircraft operations when the visibility at either location is less than 4 miles (6000 meters).

2.7.4. Tornado, Funnel Cloud, or Waterspout.

2.7.4.1. Is observed.

2.7.4.2. Disappears from sight.

2.7.5. Thunderstorm.

2.7.5.1. Begins (a SPECI is not required to report the beginning of a new thunderstorm if one is currently reported as in progress at the station).

2.7.5.2. Ends (15 minutes after last occurrence of criteria for a thunderstorm).

2.7.6. Precipitation.

2.7.6.1. Hail begins or ends.

2.7.6.2. Freezing precipitation begins, ends, or changes in intensity.

2.7.6.3. Ice pellets begin, end, or change in intensity.

2.7.6.4. Any other type of precipitation begins or ends. Note that, 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).

2.7.7. Squall (SQ). 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 one minute. A SPECI is not required to report a squall if one is currently in progress. **NOTE:** A squall cannot be determined by an AFW wind system with no wind trace capability (e.g., AN/FMQ-13).

2.7.8. Wind Shift. The wind direction changes by 45 degrees or more in less than 15 minutes with sustained winds of 10 knots or more throughout the wind shift

2.7.9. 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.

2.7.10. Tower Visibility. Upon receipt of a reportable tower prevailing visibility value, when either the weather observing site or tower prevailing visibility is less than 4 miles (6000 meters) and the tower prevailing visibility differs from the weather observing site visibility by a reportable value, transmit a SPECI with the tower visibility as a remark.

2.7.10.1. After initial transmission, include tower visibility in each subsequent METAR and SPECI until tower visibility conditions are no longer met or the tower closes.

2.7.11. RVR . The highest value from the designated RVR runway decreases to less than, or if below, increases to equal or exceed 2400 feet (0730 meters).

NOTE: The RVR SPECI observations will be taken but will only be transmitted longline by those units with a ten-minute RVR average readout capability. Units without 10 minute average capability will report RVRNO longline.

2.7.12. Miscellaneous.

2.7.12.1. 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.

2.7.12.2. Volcanic Ash. When first observed.

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

2.7.13. Single Element SPECI. Single element SPECIs will be taken when a delay in reporting all elements of the SPECI would cause an immediate threat to life or property, e.g., TORNADO 3 SW MOV NE or for timely longline reporting, e.g., WR//.

2.7.14. SPECI Upon Resumption of Observing Services. Take, disseminate, and record a SPECI within 15 minutes after returning to duty following a break in hourly coverage if a METAR was not filed as scheduled during that 15-minute period.

2.8. LOCAL Observation Reporting Requirements. LOCAL observations are primarily taken to report changes in conditions significant to local airfield operations but the changes do not meet SPECI criteria. These observations are disseminated locally, and when required, encoded on the AF Form 3803 using the designator L (LOCAL) and on the AF Form 3813 using the designator LOCAL. For LOCALs taken in support of aircraft operations, the contents indicated in **table 2.1.** are disseminated. For LOCALs taken and disseminated to other than ATC agencies, the contents may be established locally and then specified in a local weather support document with the supported agency. Take, disseminate, and (when applicable) record LOCAL observations as indicated below.

2.8.1. Aircraft Mishap. Aircraft mishap is a term used to denote any event resulting in damage to, or destruction of an aircraft to include lightning strikes, inadvertent departure from the paved runway or taxiway surface, aircraft or Aerospace Ground Equipment (AGE) fires, and forced landings due to in-flight emergencies. Take an aircraft mishap LOCAL immediately following notification or sighting of an aircraft mishap at or near the station unless there has been an intervening METAR or SPECI.

2.8.1.1. These observations consist of elements normally included in a locally disseminated METAR (see **table 2.1.**) and are identified in remarks as (ACFT MSHP). This remark is not disseminated locally or longline.

2.8.1.2. LOCAL observations are not required for in-flight emergencies; i.e., those declared to reflect an unsafe condition which 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.

2.8.2. 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 station has only single instrumentation for ceiling, visibility, and wind, these LOCALs need be taken only if specifically requested by a supported agency.

2.8.3. 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 locally determined 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.

2.8.4. RVR. May be taken and disseminated as a single element LOCAL or appended to a METAR or SPECI being taken at the time. Report RVR when:

2.8.4.1. Prevailing visibility conditions for reporting RVR are first observed, and again when the prevailing visibility conditions for reporting RVR are observed to no longer exist.

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

2.8.4.2.1. 6,000 feet or 1830 meters.

2.8.4.2.2. 5,000 feet or 1520 meters.

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

2.8.4.3. 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.

2.8.5. Takeoff Minimums. For ceiling and visibility takeoff minimums applicable to the airfield (that do not meet SPECI criteria), as listed in DoD FLIPs and appropriate Air Force, higher headquarters, MAJCOM, and Army publications.

2.8.6. Alert Forces. By stations supporting alert forces whenever the klaxon sounds or when alert notification is received by any other method. Minimum content of these observations will be described in command regulations, instructions, or supplements. Weather units will document additional criteria in local weather support documents.

2.8.7. Criteria Established Locally. For any criteria established locally because of significance to local operations. These criteria will be coordinated with base agencies and specified in a local weather support document. Review the requirements for the LOCALs at least annually.

2.8.8. AN/FMQ-13. When Detachment/Weather Flight (Det/WF) personnel suspect an out-of-tolerance or erroneous wind recording from the AN/FMQ-13, the observer will inform Air Traffic Control (ATC):

2.8.8.1. The AN/FMQ-13 is out of service and should not be used.

2.8.8.2. To use winds from the latest official observation.

2.8.8.2.1. The observer will then immediately take and disseminate a single element local wind observation using an alternate method.

2.8.8.2.2. If no SPECI criteria are met during the period of suspect winds, the observer will continue to take single element local wind observations at 15, 30, and 45 minutes past the hour for the tower to use until the AN/FMQ-13 is deemed reliable again.

2.8.8.2.3. The observer will measure and report winds more frequently to adequately support local flying operations

2.8.8.3. To continue using the official observation until Det/WF personnel are confident AN/FMQ-13 winds are representative, based on a comparison with an alternate means.

2.8.8.4. The observer will inform ATC when they can use AN/FMQ-13 winds again.

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

2.9. 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 a local weather support document. Any requirement must be based on the following factors:

2.9.1. 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 and provided, 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 six knot sustained or gust speed difference exists between the active end wind sensors. Example: WND RWY 32R 300/10G15KT.

2.9.2. Cloud heights . Cloud heights are based on height above field elevation and, therefore, do not generally differ from one end of a runway to the other. Any variation in sky condition relative to the runways is taken into consideration in the evaluation of sky cover as reported in the official observation. Significant or unusual variations in the sky condition are reported in the remarks section of the observation.

2.10. Midnight Observations. The midnight observation is taken to complete the climatological record of the LST day at stations 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 **chapter 3**).

2.11. Instrumental Procedures.

2.11.1. Manual Augmentation. Data 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 indications from meteorological equipment is questionable, discontinue use of such equipment until corrective maintenance actions have been accomplished.

2.11.1.1. AN/FMQ-13 Limitations. Det/WF personnel will be trained on the technical limitations of the AN/FMQ-13 Wind Sensor. Accurate wind measurements exceeding 99 knots are not possible with the AN/FMQ-13. Therefore, do not report AN/FMQ-13 derived wind speeds exceeding 99 knots in the body of any METAR or SPECI observation.

2.11.1.2. The observer will use alternate wind measurements to carefully evaluate AN/FMQ-13 readings when the following conditions are encountered and the wind values appear unrepresentative based on observer and/or forecaster judgement after an evaluation of meteorological conditions:

2.11.1.2.1. Periods of heavy rainfall (rate exceeding 0.3 inches per hour) accompanied by wind gusts of 30 knots or greater. The AN/FMQ-13 may over-report sustained and gust wind speeds during these conditions.

2.11.1.2.2. Periods of extreme directional variability, usually greater than sixty degrees in a two-minute period (10 minutes overseas). The AN/FMQ-13 may under-report sustained wind speeds during these conditions.

2.11.1.3. If the AN/FMQ-13 indicates winds exceeding 99 knots, the observer will 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 DBTFL. Annotate Column 90 with "FMQ-13 WND DBTFL, SPDS XCD EQPT OPRG RNG."

2.11.1.4. If the AN/FMQ-13 indicates unrepresentative or inaccurate winds and an alternate wind method is used, the observer will annotate Column 13 with "WND DATA ESTMD. Annotate "FMQ-13 INOP, WND DATA ESTMD USING XXXX" where XXXX is the alternate wind sensing method used during the period when the FMQ-13 recording was determined erroneous.

2.11.2. Dual Instrumentation/Outage . At stations 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. If the RVR or transmissometer equipment is inoperative, RVR is reported locally and longline as RVRNO. Do not use the alternate end RVR.

2.11.3. Airfield and Tower Closure . During periods when the airfield is closed, tower controllers are not on duty to make runway changes, and the weather unit is taking observations or augmenting automated equipment, report data using sensors installed on the primary instrument runway of the airfield. Establish local procedures to ensure the sensors are changed to the primary instrument runway at the time the airfield closes. However, if the capability exists in the weather station, procedures may be locally established to change sensors when the airfield is closed. In such cases, change sensors by applying runway change criteria used by the local ATC agency. Units will ensure the change sensor procedures are coordinated with ATC and specified in a local weather support document.

2.12. Recorder Charts and Printouts. Install all recorder charts and printouts with reference to UTC.

2.12.1. Chart Identification. At the beginning and end of each chart enter a time check (includes date-time group) to indicate the time the recording began and ended (respectively). Enter other appropriate identification as necessary if the chart (or any part of the chart) is provided for special studies, an aircraft accident investigation, etc. If applicable, the AN/FMQ-13 would be annotated in a fixed site and the AN/TMQ-36 at a deployed/non-fixed site.

2.12.2. Time Checks. Make time checks on the recorder chart of recording-type instruments and/or printouts by drawing a short line that intersects the trace on the chart and/or the first printout entry. Enter the date-time to the nearest minute UTC. As a minimum, time checks are required daily or when notified of an aircraft mishap.

2.12.3. Time Adjustments. Adjust the AN/FMQ-13 and NTFS equipment to the correct time whenever the time error is more than 1 minute (when compared to UTC). Record any time corrections to equipment in column 90; e.g., 0605 NTFS CLOCK ADJUSTED +2 MINUTES.

2.12.4. Annotations for Inoperative Periods. Indicate maintenance shutdowns or other inoperative periods on recorder charts 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 AN/FMQ-13 wind readings with the remark “WND DATA DBTFL”. When the equipment is returned to service, adjust the chart to the correct time as necessary.

2.12.5. Changing Charts. Change the wind recorder chart as necessary to prevent loss of record.

2.12.6. Chart Disposition. Dispose of recorder charts according to AFI 37-139, *Records Disposition Schedule.*

Chapter 3

FORM ENTRIES ON AF FORMS 3803/3813

3.1. Basic Entries on Forms. All entries on AF Forms 3803 and 3813 will follow procedures in this publication. The AF Form 3803 or standardized computer-generated version will be used by non-NTFS units and may be used in place of the NTFS-generated AF Form 3813. NTFS stations have the option of using the AF Form 3803 or standardized computer-generated version. Higher headquarters or MAJCOMs may require additional entries. See figure 3.12 for a sample completed AF Form 3803/3813 (part-time hours.) See figure 3.13 for a sample completed AF Form 3813/3813 (full-time hours).

3.1.1. Authorization To Make Entries on Form. Normally, only qualified personnel are authorized to make entries on the form. Trainees may make entries on the form only when under the immediate supervision of a qualified person who attests to the validity of the entries by initialing in column 18 (trainee's initials go outside of the margin).

3.1.1.1. Qualified weather personnel will ensure the form has no cuts, tears, stains, or staples. Once the document is received at AFCCC/DOB, it is reformatted (microfiche) for permanent record.

3.1.2. Writing Instrument. The same type writing instrument will be used throughout each form and for all forms at each location. 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.

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

3.1.4. 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 paragraph does not apply to data which can be obtained by estimation or alternate methods of determination (e.g., sky condition, visibility, present weather, wind, pressure).

3.1.5. 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.

3.1.6. Corrections. Erasure of an entry is authorized only if the data has not been disseminated (either locally or longline). Use the following instructions as a guide in correcting entries. All entries must be legible.

3.1.6.1. Errors in Columns 1 through 13, discovered before dissemination: Erase the erroneous data from all copies of the form and enter the correct data in black. **NOTE:** Where a carbon copy of the form is made, care must be taken to prevent carbon smudges on the duplicate copy. In such cases, it is advisable to insert a piece of paper or cardboard between the carbon and second copy of the form when erasing data from the original.

3.1.6.2. Errors in columns 1 through 13, discovered after either local or longline dissemination. Make corrected entries in red on the original; make corrections in black (pen, pencil, or carbon), if desired, on the duplicate copy of the form. Enter corrections according to the following procedures:

3.1.6.2.1. Draw a line through the erroneous data and enter 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.

3.1.6.2.2. 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.

3.1.6.3. Errors in columns 15 through 90. Make corrections in black according to the following procedures:

3.1.6.3.1. For an error that resulted in erroneous data being disseminated locally or longline, draw a line through the erroneous entry. Enter the correct data 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.

3.1.6.3.2. For other corrections, erase the erroneous entry and enter the correct data. **NOTE:** Where a carbon copy of the form is made, care must be taken to prevent carbon smudges on the duplicate copy. In such cases, it is advisable to insert a piece of paper or cardboard between the carbon and second copy of the form when erasing data from the original.

3.2. Heading Entries. Prepare and use a new AF Form 3803 or AF Form 3813 at 0000 LST each day. Enter heading information and other required data in the blocks provided. On subsequent pages for the same day, only the date and station identification data need be entered. Make entries as indicated in the heading blocks and according to the following instructions:

3.2.1. 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 have 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).

3.2.2. Station Elevation. Enter station elevation to the nearest foot. At stations located at an airfield, station elevation is considered to be 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 to be 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.

3.2.3. 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.

3.2.4. 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 (also, see **chapter 5**).

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

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

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

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

3.3. 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 Form Designator	AF Form 3813 Form Designator	Type of Observation
SA[1]	METAR[1]	Record (METAR)
RS[1]	METAR[1]	Record-Special (METAR)
SP[1]	SPECI[1]	Special (SPECI)
L[1]	LOCAL[1]	LOCAL
L[2]	LOCAL[2]	LOCAL-MISHAP (ACFT MSHP)

NOTES:

1. All observations transmitted longline will use either METAR or SPECI. LOCALs are disseminated locally only.

2. Use of the NTFS prompt LOCAL-MSHAP will automatically include the remark (ACFT MSHP) in column 13 of AF Form 3813.

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

3.5. Wind Entries (Columns 9 Through 11). See **chapter 5** for detailed information concerning wind observing procedures.

3.5.1. Wind Direction (Column 9A). Code and report the mean wind direction (ddd) observed during the 2-minute period (10 minutes overseas) 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. At all locations where recorders are inoperative or not available, a 2-minute average may be used. If a discontinuity occurs during the observation period at units with the AN/FMQ-13, the observer should continue to use backup wind measurements to calculate the 2-minute averages until the data from the AN/FMQ-13 is deemed reliable again.

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

3.5.1.2. Variable Wind Direction (Speeds 6 knots or less). Code and report a variable wind direction when the wind direction varies by 60 degrees or more with an average wind speed of 6 knots or less in the preceding 2 minutes (10 minutes overseas). The column 9A entry shall be the coded entry VRB.

3.5.1.3. Variable Wind Direction (Column 9B). Code 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 (10 minutes overseas). Code in a clockwise direction the extremes of variability $d_nd_nd_nVd_xd_xd_x$ where $d_nd_nd_n$ 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 coded 180V240. The mean wind direction observed during the 2-minute period (10 minutes overseas) before the actual time of observation will be coded and reported in column 9A.

3.5.2. Wind Speed (Column 10). Enter the average wind speed (ff) observed during the 2-minute period (10 minutes overseas) 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. At all locations where recorders are inoperative or not installed, a 2-minute average may be used. If a discontinuity occurs during the observation period at units with the AN/FMQ-13, the observer should continue to use backup wind measurements to calculate the 2-minute averages until the data from the AN/FMQ-13 is deemed reliable again. Enter wind speed to the nearest knot using two digits. Use three digits (fff) when 100 knots or more. Enter “00” when the wind is calm.

3.5.3. Maximum Wind Speed (Gusts) (Column 11). Enter the maximum wind speed (f_mf_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 ($f_mf_mf_m$) when 100 knots or more. Units equipped with the AN/FMQ-13 cannot accurately measure wind speeds exceeding 99 knots. Use alternate methods to evaluate and report these conditions. Follow procedures outlined in paragraph 2.11.1.3. when AN/FMQ-13 wind speeds exceed 99 knots.

3.5.3.1. 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 ESTMD WND will be entered in column 13.

3.5.4. Wind Data Entries. Figure 3.2 illustrates various entries for wind data.

Figure 3.2. 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			Varying between 050 degrees and 110 degrees at 6 knots.
070	07		050V110	Varying between 50 degrees and 110 degrees (with a mean of 070 degrees) at 7 knots.

3.5.5. Primary Wind Equipment Outage . When using a source other than the primary airfield wind sensor display (i.e., inactive runway instrumentation, hand-held anemometer, Beaufort scale, direct-reading dials) to obtain wind data, weather personnel will enter the remark ESTMD WND in column 13 to indicate the winds were obtained from a source other than the primary airfield wind sensor display. The remark will also be used when the primary airfield wind sensor display is believed to be operating below performance standards. A primary airfield wind sensor is a digital wind computer system that continuously samples the wind and has a recorder system. NOTE: An exception to this would be backup equipment calibrated for the active end of the runway.

3.6. Visibility Entries (Column 4). See **chapter 6** for detailed information concerning visibility and RVR observing procedures.

3.6.1. Meters (Column 4A). Code and report the prevailing visibility (VVVV) in meters using four digits 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.

3.6.2. Miles (Column 4B) . Code and report the prevailing visibility (VVVVV) using up to five digits, and the statute mile indicator (SM) at US locations (including Guam, Alaska, and Hawaii). 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 coded as 1 1/2SM.

3.6.3. RVR . Report both local and longline RVR data on AF Form 3803 in column 4C or on AF Form 3813 in columns 4C and 4D. See **chapter 6** for detailed observing and reporting procedures. Determine code values based on an instantaneous, one minute, or ten minute average reading using **table 6.2.** and **table 6.3.** to determine code values based on either a 250 or 500 foot baseline as appropriate. Refer to **figure 6.3.** to determine the code breakdown.

3.6.3.1. RVR--Local (Column 4C). Code and enter in column 4C RVR data from an instantaneous, one minute, or ten minute average readout for local dissemination. The unit of measurement will be the same as that published for your station in the DoD FLIPs. When no RVR minima are published in the DoD FLIPs, report locally in meters if prevailing visibility is locally disseminated in meters; use feet if prevailing visibility is reported locally in statute miles.

3.6.3.2. RVR--Longline (Column 4D). Determine and enter RVR data for longline dissemination on AF Form 3813 using the following procedures. Only RVR data obtained from a system providing a ten minute RVR average readout may be disseminated longline. Units without 10 minute average capability will report RVRNO longline. For units using AF Form 3803, use the column 4C entry and convert to either feet or meters as required for longline dissemination. 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. When no RVR minima are published in the DoD FLIPs, report locally in meters if prevailing visibility is locally disseminated in meters; use feet if prevailing visibility is reported locally in statute miles.

3.7. Present Weather, Obscurations, and Other Weather Phenomena (w'w') (Column 5). See **chapter 7** for detailed information concerning present weather, obscurations, and other weather phenomena observing procedures.

3.7.1. Present Weather, Obscurations, and Other Weather Phenomena Report ing 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 coded 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 coded in the remarks section (column 13).

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, 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.

3.7.2. Code and report, both locally and longline, up to a maximum of three separate present weather, obscuration, and other weather phenomena groups (w'w') using code figures from **figure 7.1.** When no reportable present weather, obscuration, and other weather phenomena w'w' are observed, leave column 5 blank.

3.8. Sky Condition (Column 3) . Code 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 a maximum of six groups. Use figure 8.1 to determine layer-reporting priority. See **chapter 8** for detailed information concerning sky condition observing procedures.

3.8.1. Amount (NsNsNs). Note the amount of sky cover for each layer in eighths (or oktas) attributable to clouds or obscuration layers aloft. Code 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, (see figure 8.3) followed without a space by the height. When there is an indefinite ceiling, code 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.

3.8.1.1. 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, code the amount of sky hidden as FEW, SCT, or BKN followed by a height of 000 in column 5 and place a clarifying remark in column 13. For example, fog obscuring 2/8ths of the sky would be entered in column 5 as FEW000 and clarified in column 13 as FG FEW000.

3.8.2. Height (hshshs). Code and report the height of the layer using reportable values from figure 8.8. 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.

3.8.3. Type (CC). Code 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. Code 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 coded FEW030CB.

3.8.3.1. When only a CB/TCU top (and/or only distant lightning) is observed (CB/TCU cloud base not visible and no other cloud layer, surface-based partial obscuration, or obscuration layer aloft is present), and the CB/TCU top is distant (more than 10 statute miles/16 kilometers from the point(s) of observation), weather personnel may enter SKC in column 3 and a remark such as CB DSNT W OCNL LTGIC in column 13. No Cloud Types ($8/C_LC_MC_H$) entry is required even though a CB/TCU remark is carried even when distance is determinable via radar.

3.8.3.2. When the distance of other cloud layers can be verified as distant (beyond 10 statute miles), SKC may be entered in column 3 and clarifying remarks in column 13 (FEW CU OMTNS DSNT W). No Cloud Types (8/CLCMCH) entry is required even though layer is carried in remarks.

3.9. Temperature (Column 7). Enter the air temperature (T'T') to the nearest whole degree Celsius using two digit values as listed in table 9.1. 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 dewpoint is missing, include the solidus (/) in the longline transmission following the temperature. For example, a temperature of minus 3 degrees Celsius with a missing dewpoint would be coded M03/. See **chapter 9** for detailed information concerning temperature observing procedures.

3.10. Dewpoint Temperature (Column 8). Enter the dewpoint temperature (Td'Td') to the nearest whole degree Celsius using two digit values as listed in table 9.1. When the dewpoint 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 degrees Celsius/M35 degrees Fahrenheit or below), enter the statistical data in parentheses but do not transmit the parentheses longline. When the dewpoint is below zero degrees Celsius, prefix the value with an M to signify minus. For example, a dewpoint of minus 0.2 degrees Celsius would be coded M00. See **chapter 9** for detailed information concerning dewpoint observing procedures.

3.11. Altimeter Setting (Column 12). Code and report the altimeter setting ($AP_HP_HP_HP_H$) 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. ESTMD ALSTG. Additionally, encode a remark such as SLP982 ESTMD ALSTG/SLP when the SLP is estimated as well. See **chapter 10** for detailed information concerning pressure-observing procedures.

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 table 11.1 to determine remarks order of entry and paragraph 3.12.2. to determine additive data order of entry. See **chapter 11** for detailed information concerning remarks and encoding procedures.

3.12.1. Column 13 General Requirements.

3.12.1.1. Contractions. Use the meteorological contractions in this manual, and the Federal Aviation Administration (FAA) Order 7340.1, Contractions manual. When using contractions from FAA Order 7340.1 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 7340.1. Contractions in conflict with definitions in this manual *shall not* be used, i.e., BINOVC, HALF, FEW CU, etc.

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.

3.12.1.3. 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 were detected on radar in the example above, report distance and direction using annotation like CB 22N-11E-16SE in column 13.

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.

3.12.1.5. 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.

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 coded 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.

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

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.

3.12.1.7. Height. Enter height above field elevation for remarks elaborating on coded data in the body of the observation; e.g., ceiling. Enter height above mean sea level for other supplementary remarks; e.g., freezing level.

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 resource protection (normally these are remarks not specifically identified in **table 11.1.**). Remarks significant to the safety of aircraft operations or resource protection will use an order of entry that is the same as the coded data to which the remark most closely relates; e.g., a VIS LWR E remark would have the same order of entry as a sector visibility remark.

3.12.2. Coded Additive Data Column 13 Groups. Code and report in column 13 after the last remark. Do not use a solidus (/) to separate data. Higher headquarters or MAJCOM will determine coding and reporting requirements for overseas units.

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.

3.12.2.1.1. Sea-Level Pressure (SLPppp). Permanent-type CONUS, Alaska, and Hawaii sites will code and report sea-level pressure in each hourly report in the format SLPppp, where SLP is the indicator and ppp is the sea-level pressure in hectopascals. For example, a sea-level pressure of 998.2 hectopascals would be encoded SLP982. When the sea-level pressure is missing or not available enter SLPNO. When estimated values are used, code as SLPppp and add an estimated remark, e.g., SLP982 ESTMD SLP to indicate the sea-level pressure value is estimated (remember to encode the remark as SLP982 ESTMD ALSTG/SLP when the ALSTG is also estimated).

3.12.2.1.1.1. When there is no requirement for a station to record and transmit sea-level pressure, or the capability to determine sea-level pressure does not exist (i.e., non-fixed location), sea-level pressure will be omitted from the observation. The remark SLPNO is not recorded or transmitted under these circumstances.

3.12.2.1.2. Precipitation Amount (6RRRR). Code and report the 3- and 6-hourly precipitation group in the 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 report the amount accumulated in the past six hours in the 6-hourly report.

3.12.2.1.2.1. Code the amount of precipitation in inches using the tens, units, tenths, and hundredths digits of the amount. Omit 6RRRR when no precipitation has occurred in the past 3 hours and/or past 6 hours (as appropriate). See figure 3.3.

3.12.2.1.2.2. When an indeterminable amount of precipitation has occurred during the entire 3- and 6-hour period, code //// for RRRR. When a known amount of precipitation and an indeterminable amount of precipitation have occurred during the 3- and/or 6-hour period, the known amount of precipitation will be reported in the 6RRRR group and the remark ESTMD PCPN will be entered in column 13.

3.12.2.1.2.3. Report the amount accumulated in the period leading up to a 3-hourly observation in the 3-hourly report; and report in the 6-hourly the accumulated total of the previous 3-hourly plus any additional (if any) precipitation falling between the 3-hourly and 6-hourly report. For example, 11.04 inches falling in the first 3 hours plus an additional 1.56 inches falling in the next 3 hour period would be encoded as 61260 in the 6-hourly report.

Figure 3.3. Encoding 3-Hour Precipitation and Encoding 3- + 6-Hour Precipitation.

3-Hour Amount (In Inches)	**Encoded**	**Next 3-Hour Precipitation**	**6-Hour Amount (In Inches)**	**Encoded**
Trace	60000	Trace	Trace	60000
.01	60001	.10	.11	60011
.12	60012	.20	.32	60032
1.23	60123	0	1.23	60123
12.34	61234	.30	12.64	61264
0	Omit group	.40	.40	60040
Indeterminable	6////	.50	Indeterminable	6////

3.12.2.1.3. 24-Hour Precipitation ($7R_{24}R_{24}R_{24}R_{24}$). Code and report the 24-hour precipitation amount in the format $7R_{24}R_{24}R_{24}R_{24}$ where 7 is the group indicator and R24R24R24R24 is the 24-hour precipitation (water equivalent) amount. Include the 24-hour precipitation amount in the 1200 UTC report whenever more than a trace of precipitation (water equivalent) fell in the preceding 24 hours. Code the amount of precipitation using the tens, units, tenths, and hundredths digits of the amount for the 24-hour period. Code 7//// if more than a trace of precipitation (water equivalent) has occurred and the amount cannot be determined. Except where noted below, omit $7R_{24}R_{24}R_{24}R_{24}$ when no precipitation has occurred in the past 24 hours.

3.12.2.1.3.1. At limited duty stations opening between 1200 and 1400 UTC, report in the first METAR following determination of the data. Higher headquarters or MAJCOMs may designate reporting times for limited duty stations outside of the United States.

3.12.2.1.3.2. When the station has been closed over a weekend or holiday, code the first report of the week as the total amount of precipitation (water equivalent) which occurred since the last similar report; i.e., for the preceding 48 hour, 72-hour, etc., period. Insert a supplementary remark following the 7-group consisting of E (estimated), the number of hours, and the contraction HR (hour) e.g., 70054 E96HR.

3.12.2.1.3.3. Figure 3.4 illustrate the coding of this data.

Figure 3.4. Encoding 24-Hour Precipitation.

24-Hour Amount (In Inches)	Encoded
Less than a trace	Omit group
.01	70001
.12	70012
1.23	70123
12.34	71234

3.12.2.1.4. Snow Depth (4/sss). Code and report the total snow depth on the ground in the 0000 and 1200 UTC observations whenever there is .5 inch of snow or more on the ground. Code and report in the 0600 and 1800 UTC observation if there is .5 inch of snow or more on the ground and more than a trace of precipitation (water equivalent) has occurred within the past 6 hours. Higher headquarters or MAJCOMs will designate reporting times for Air Force Weather units outside of the United States. Code the remark 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, code 3 inches as "4/003," code 99 inches as "4/099" and code 219 inches as "4/219." Report this group at all stations transmitting scheduled METAR longline. Omit the group if there is no more than a trace of snow on the ground at the time of observation. See figures 3.5 and 3.6.

3.12.2.1.4.1. At limited duty stations opening between 1200 and 1400 UTC, report in the first METAR following determination of the data.

3.12.2.1.4.2. Do not code or report this group if it consists entirely of small hail (GS) or hail (GR).

Figure 3.5. Encoding 0000/1200 Snowfall.

Snow Depth (In Inches)	Encoded
0	Omit group
Less than .5	Omit group
Equal to .5	4/001
1	4/001
12	4/012
123	4/123

Figure 3.6. Encoding 0600/1800 Snowfall.

Water Equivalent Precipitation in The Last 6 Hours	SnowDepth (In Inches)	Encoded
0	2	Omit group
Trace	2	Omit group
.01 or greater	2	4/002

3.12.2.1.5. Cloud Types ($8/C_LC_MC_H$) and Cloud Amounts ($9/C_LC_MC_H$).

3.12.2.1.5.1. Cloud Types ($8/C_LC_MC_H$). Code and report in hourly reports when clouds are observed. Omit this group when no clouds are present (SKC) or clouds are completely hidden by obscuring phenomena ($VVh_sh_sh_s$) on the surface or aloft. Identify and code the predominant low cloud C_L, middle cloud C_M, and high cloud C_H, using tables 8.3., 8.4., 8.5., and the *Cloud Types for Observers or International Cloud Atlas, Volume II.*

3.12.2.1.5.1.1. Code a 0 for low, middle or high when no cloud is present in that classification.

3.12.2.1.5.1.2. Code a solidus (/) for layers above an overcast.

3.12.2.1.5.2. Cloud Amounts ($9/C_LC_MC_H$). Code and report in each hourly METAR when clouds are observed. Evaluate total coverage by individual level (low, middle, high) and enter the total amount (in eighths) for each level. Weather personnel will attempt to estimate the actual cloud cover at each individual level before determining the $9/C_LC_MC_H$ group (each level will be evaluated for total coverage separate from the other levels).

3.12.2.1.5.2.1. Partial obscurations (surface-based or aloft) will not be considered when determining the total cloud amount. Obscuring phenomena is not considered cloud cover so it is not eligible for $9/C_LC_MC_H$ group consideration. When obscuring phenomena is present, weather personnel will attempt to estimate the total cloud cover (if any) hidden by obscuring phenomena before determining the $9/C_LC_MC_H$ group. For example, during an observation a surface-based partial obscuration is observed to cover 4/8ths of the sky while a low cloud deck at 900 feet is observed to cover 3/8ths of the remaining sky. If the weather person believes the cloud deck at 900 feet actually covers a total of 6/8ths of the sky (3/8ths of cloud cover at 900 feet is hidden by the obscuration), encode the $9/C_LC_MC_H$ group as 9/600.

3.12.2.1.5.2.2. Code a 0 for low, middle, or high when no cloud is present in that classification.

3.12.2.1.5.2.3. Code a solidus (/) for layers above an overcast.

3.12.2.1.5.2.4. When only a trace of total cloud cover is observed at each height level, encode the $9/C_LC_MC_H$ group as 9/111 and enter 1 in column 21.

3.12.2.1.5.2.5. Omit this group when no clouds are present (SKC) or clouds are completely hidden by obscuring phenomena ($VVh_sh_sh_s$) on the surface or aloft.

3.12.2.1.5.2.6. Figure 3.7. illustrates example coding procedures.

Figure 3.7. Examples of Encoded Cloud Groups.

Column 3	Column 5	Column 13 Remarks	Cloud Code Group
BKN000 OVC012	FG	FG BKN000	8/6// 9/8//
SCT025TCU		TCU DSNT W	8/200 9/400
BKN080			8/070 9/050
BKN028CB BKN100 OVC220		CB 12E MOV E	8/963 9/533
SCT007			8/700 9/300
VV002	FG		
FEW003 OVC012	-DZ FG		8/6// 9/8//
SCT003 BKN012			8/600 9/700

3.12.2.1.6. Maximum/Minimum Temperature. Higher headquarters or MAJCOMs will designate units required to code and report these groups.

3.12.2.1.6.1. Maximum Temperature ($1S_nT_xT_xT_x$). Code the maximum temperature observed in the previous 6 hour period and report in the 6-hourly observation. In this group, the 1 identifies the maximum temperature group; the S_n the sign of the temperature, is encoded as 1 if the temperature is below 0 degrees Celsius and 0 if the temperature is 0 degrees Celsius or higher. $T_xT_xT_x$ is the maximum temperature in tenths of degrees Celsius using three digits. For example, a maximum temperature of 30.2 degrees Celsius would be encoded 10302 and a maximum temperature of -4.5 degrees Celsius would be encoded 11045.

3.12.2.1.6.2. Minimum Temperature ($2S_nT_nT_nT_n$). Code the minimum temperature observed in the previous 6 hourly period and report in the 6-hourly observation. In this group, the 2 identifies the minimum temperature group; the S_n the sign of the temperature, is encoded as 1 if the temperature is below 0 degrees Celsius and 0 if the temperature is 0 degrees Celsius or higher. $T_nT_nT_n$ is the minimum temperature in tenths of degrees Celsius using three digits. For example, a minimum temperature of -10.7 degrees Celsius would be encoded 21107 and a minimum temperature of 10.7 degrees Celsius would be encoded 20107.

3.12.2.1.7. Pressure Tendency (5appp). Code and report the 3-hourly pressure tendency group in 3- and 6-hourly reports using the format, 5appp, where 5 is the group indicator, a is the character of pressure change in hectopascals over the last 3 hours, and ppp is the amount of barometric change in tens, units, and tenths digits. For example, a steady increase of 23.4 hectopascals is encoded as 52234. See paragraph 10.2.10. for a detailed explanation of determining pressure tendency.

3.13. Station Pressure (Column 17). Enter station pressure to the nearest 0.005 inch Hg on each 3- and 6-hourly observation (e.g., 29.995). 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.

3.14. Weather Person's Initials (Column 18). Enter the initials of the qualified person responsible for taking the observation.

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).

3.16. Time UTC (Column 41). On the line captioned MID TO (at stations 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 taken at the station. A time entry is not applicable to the MID line. Make all time entries in four figures to the nearest minute UTC. See figure 3.8.

3.17. Time LST (Column 42). If locally desired, enter the time LST equivalent to the time UTC entered in column 41. See the examples in figure 3.8., 3.9., 3.10., and 3.11.

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.

3.19. Precipitation (Column 44). On the MID TO line (at stations 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 stations taking midnight LST observations), enter the amount of precipitation that has occurred between the last 6-hourly observation and the midnight LST observation.

Figure 3.8. Examples of Precipitation and Snow Depth Entries.

Operating Hours 00-24 EST									
Synoptic Data						Summary of the Day			(90) Remarks
Time (UTC) (41)	Time (LST) (42)	NO (43)	PRECIP. (water equiv.) (44)	Snow Fall (45)	Snow Depth (46)	PRECIP. (water equiv.) (68)	Snow Fall (69)	Snow Depth (70)	* HAIL
Mid (LST) to: 0550	Mid to: 0050		.01	0		.76	.9	0	
0550	0050	(1)	.03	0	0				
1148	0648	(2)	0	0	0				
1751	1251	(3)	.01	*T	0				
2347	1847	(4)	.01	.1	T				
Mid (LST)	Mid (LST)		.73	.8	1				

Figure 3.9. Examples of Precipitation and Snow Depth Entries.

Operating Hours 00-24 CST									
Synoptic Data						Summary of the Day			(90) Remarks
Time (UTC) (41)	Time (LST) (42)	NO (43)	PRECIP. (water equiv.) (44)	Snow Fall (45)	Snow Depth (46)	PRECIP. (water equiv.) (68)	Snow Fall (69)	Snow Depth (70)	T--MELTED AS IT FELL E--ESTI-MATED DUE TO MELTING *MAX SNOW DEPTH 1 AT 1648
Mid (LST) to:	Mid to:					.17	E1.2	0	
	0550	(1)	.01	T	0				
1748	1148	(2)	.13	E1.0	*T				
2352	1752	(3)	0	0	T				
0549	2349	(4)	.03	.2	T				
Mid (LST)	Mid (LST)								

Figure 3.10. Examples of Precipitation and Snow Depth Entries.

Operating Hours 03-21 PST									
Synoptic Data						Summary of the Day			(90) Remarks
Time (UTC) (41)	Time (LST) (42)	NO (43)	PRECIP. (water equiv.) (44)	Snow Fall (45)	Snow Depth (46)	PRECIP. (water equiv.) (68)	Snow Fall (69)	Snow Depth (70)	*12HR PCPN E--1:11 RATIO USED
Mid (LST) to:	Mid to:					E.29	E3.2	10	
1147	0347	(1)	*.06	*.7	10				
1751	0951	(2)	E.23	2.5	12				
2350	1550	(3)	0	0	11				
		(4)							
Mid (LST)	Mid (LST)								

Figure 3.11. Examples of Precipitation and Snow Depth Entries.

Operating Hours 08-17 EST									
Synoptic Data						Summary of the Day			(90) Remarks
Time (UTC) (41)	Time (LST) (42)	NO (43)	PRECIP. (water equiv.) (44)	Snow Fall (45)	Snow Depth (46)	PRECIP. (water equiv.) (68)	Snow Fall (69)	Snow Depth (70)	*19HR PCPN COL 70 ENTRY OBSVD AT 1247 E--ESTI-MATED
Mid (LST) to:	Mid to:					E.16	E1.8	1	
1247	0747	(1)	*.01	0	1				
1749	1249	(2)	.15	E1.8	2				
		(3)							
		(4)							
Mid (LST)	Mid (LST)								

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.

3.19.1.1. 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 station (see table 12.2). 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).

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

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. See figure 3.10.

3.19.1.2.2. At stations 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. See figure 3.11.

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 stations that do not operate on weekends or holidays, the column 90 remark might be *72-HR PCPN.

3.20. Snowfall (Column 45). On the MID TO line (at stations 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 stations taking midnight LST observations), enter the amount of precipitation that has occurred between the last 6-hourly observation and the midnight LST observation.

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.

3.20.1.1. 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.

3.20.1.2. 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).

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

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

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 3.20.2.2., make this entry at the time of the current 6-hourly observation.

3.20.2.2. At stations 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.

3.20.2.3. 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 stations that do not operate on weekends, the column 90 remark might be *72-HR PCPN.

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.

3.21.1. 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).

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

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

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 3.21.3.2.).

3.21.3.2. At stations 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.

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

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.

3.24. 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.

3.25. 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 station is equipped with a recording or totaling gauge which indicates 0.005 inch or more. Prefix amounts (except 0 or T) with an E when the total includes an estimated amount.

3.25.1. **Limited Duty Station Procedures.** At limited-duty stations 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.

3.26. 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 station is equipped with a recording or totaling gauge which 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).

3.26.1. Limited Duty Station Procedures . At limited-duty stations 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.

3.27. Snow Depth (Column 70). Enter the depth of frozen precipitation and ice on the ground at 1200 UTC or as directed by higher headquarters or MAJCOM. 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.

3.28. Speed of Peak Wind (Column 71). Enter the highest reliable wind speed (refer to paragraph 2.11.1.1) 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. Annotate doubtful peak wind readings from the AN/FMQ-13 in column 90, e.g., "PK WND 240/65KT AT 1835Z DBTFL."

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.

3.30. 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 speed of the last occurrence on the first line and the speed of the next to last occurrence on the second line.

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 3 OTR TIMES in column 90.

3.32. Remarks, Notes, and Miscellaneous Phenomena (Column 90). Use this column to record information considered significant but not recorded elsewhere and as described in the following paragraphs. Enter time to the nearest minute UTC.

3.32.1. General. Make entries to report.

3.32.1.1. Remarks specified in preceding sections; e.g., wind and precipitation.

3.32.1.2. Occurrence of weather conditions that exceed the meteorological equipment's normal operating range. For example, a gust of 120 knots reported by a AN/FMQ-13 (operating range is 0 to 99 knots).

3.32.1.3. Conditions which affect the accuracy or representativeness of recorded data. For example, the possible effect of construction on instrument readings, ice or snow accumulation on outdoor sensors, etc.

3.32.1.4. Outages, changes in instruments, reasons for change, times of change or outage affecting the accuracy of observations.

3.32.1.5. Reason for omission of mandatory data entries.

3.32.1.6. Time checks of station clock if not indicated elsewhere.

3.32.1.7. Adjustment of equipment clocks; e.g., AN/FMQ-13, NTFS.

3.32.1.8. Operator equipment checks.

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

3.32.1.10. Miscellaneous items; e.g., time notified of an aircraft mishap, time notified of dry runway, etc.

3.32.2. Active Runway and Equipment Changes. Make entries as follows, in the columns provided in column 90, at all locations with weather sensor equipment installed alongside or near a runway.

3.32.2.1. Enter all times in UTC without the time zone designator. The contraction CONT may be entered instead of a time entry on the first page of a new form for a 24-hour duty station (i.e., to indicate no change from the last entry on the preceding day's record). The contraction may also be used on a second or subsequent page for the day at 24-hour and limited-duty stations.

3.32.2.2. On the first page of the form each day, enter the time (or CONT if applicable at a 24-hour station) and the number of the runway in use. If the airfield is closed, enter the runway number:

3.32.2.2.1. Appropriate to the equipment in use at stations with dual instrumentation.

3.32.2.2.2. As soon as it is known at stations with single instrumentation.

3.32.2.3. 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.

3.32.2.4. 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.

3.32.3. Remarks on Instrumentation. Enter remarks on outages, changes in sensors, etc., using the following instructions as a guide:

3.32.3.1. 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, BEGAN USING ML-102.

3.32.3.2. Enter an appropriate remark when equipment is operating properly but indications are considered non-representative for reporting purposes. 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. Enter “FMQ-13 DATA DBTFL, WND SPDS XCD EQPT OPRG RNG” during periods when AN/FMQ-13 recordings exceed 99 knots. Enter “FMQ-13 INOP, WND DATA ESTMD USING XXXX” where XXXX is the alternate wind sensing method used during periods when the AN/FMQ-13 recordings were determined to be erroneous. Determination of wind information, for observations taken during AN/FMQ-13 non-representative periods, will come from backup equipment.

3.32.3.3. Enter a remark for changes in instrumentation which 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.

Figure 3.12. Sample AF Form 3803/3813 (Part-time Hours).

SURFACE WEATHER OBSERVATIONS (METAR/SPECI)	LATITUDE	LONGITUDE	STATION ELEVATION	TIME CONVERSION	MAG to TRUE	DAY (LST)	Month	YEAR	STATION (Not and coord.) & STATE or COUNTRY
	38°58'N	104°49'W	6572 Feet (MSL)	(LST to + 7 Hrs. UTC) - Hrs.	+ 10 Deg. - Deg.	20	MAR	2000	USAFA AFLD. CO

SYNOPTIC DATA					
TIME (UTC) (41)	TIME (LST) (42)	NO. (43)	PRECIP. (water equiv.) (44)	SNOW FALL (45)	SNOW DEPTH (46)
Mid (LST) to:	Mid to:				
1150	0450	(1)	*.62	* 6.2	6
1750	1050	(2)	.12	1.2	3
		(3)			
		(4)			
Mid (LST)	Mid (LST)				

SUMMARY OF THE DAY			
24-HR MAX TEMP (oC) (66)	PRECIP. (water equiv.) (68)	SNOW FALL (69)	SNOW DEPTH (70)
M	E .74	E 7.4	6
24-HR MIN TEMP (oC) (67)	SPEED (knots) (71)	DRCTN (true) (72)	TIME (UTC) (73)
		310	1845
M	29	350	1146

ACTIVE RNWY AND EQUIP CHANGE		(90) REMARKS, NOTES, AND MISCELLANEOUS PHENOMENA (all times UTC)
		TIME CHECK: 1130
TIME (UTC)	RNWY No.	* 17-HR PCPN
1150	34	1:10 RATIO USED
		1425 - DBASI OPERATOR CHECK
		1720 - RWY DRY
		PK WND 340 1130

TYPE (1)	TIME (UTC) (2)	WIND DRCTN (true) (9A)	WIND SPEED (knots) (10)	MAX WIND (knots) (11)	VARIABILITY (true) (9B)	VISIBILITY METERS (4A)	VISIBILITY STATUTE MILES (SM) (4B)	RUNWAY VISUAL RANGE LOCAL (4C)	WEATHER AND OBSTRUCTION TO VISION (5)	SKY CONDITIONS (3)	TEMP (oC) (7)	DEWPOINT (oC) (8)	ALSTG (inches) (12)	STA PRESSURE (inches) (17)	TOTAL SKY (21)	OBS INIT (18)
SA	1155	330	10	28	300V360		1/4	RVRNO	+SN BLSN FG	VV005	M03	M03	2982	23.380	8	DS
(13) RMK VIS W 1/2 PK WND 35029/43 SLP033 ESTMD SLP 8/// 70062 E18HR 4/006 5//// RCRNR FIRST																
SP	1214	350	18	24	320V020		1/2	RVRNO	SN BLSN BR	SCT008 BKN010 OVC033	M03	M03	2983			DS
(13) RMK TWR VIS 1 PSR08																
SP	1225	360	12	18			2 1/2		-SN DRSN BR	SCT012 BKN035 OVC080	M04	M05	2985			DS
(13) RMK VIS 2V3 TWR VIS 3																
SP	1243	360	10	16			5		-SN DRSN BR	BKN035 BKN080 BKN250	M04	M06	2987			DS
(13) RMK																
SA	1255	350	08	15			7		-SN DRSN	BKN035 BKN080 BKN250	M05	M07	2990		7	DS
(13) RMK PK WND 35026/1159 PRESRR SLP113 ESTMD SLP 8/461 9/511 LSR12																
SP	1325	350	11	18			12		DRSN	FEW002 FEW035 SCT080 BKN250	M04	M07	2991			DS
(13) RMK FU FEW002																
SA	1355	330	09				12			FEW000 BKN250	M02	M07	2992		5	DS
(13) RMK FU DSIPTD SLP074 ESTMD SLP 8/461 9/014 PSR14 HFS IR10 8/071 COR 1405																
SA	1455	320	08				12			FEW050 SCT100 SCT200	01	M06	2996	23.400	4	PJ
(13) RMK ROTOR CLD ALQDS ACSL N-E-S SLP090 ESTMD SLP 60012 8/141 9/021 51037 PSR15P WET																
SA	1555	320	10				12			FEW050TCU SCT100 SCT250	02	M04	2998		4	PJ
(13) RMK TCU DSNT NW ACSL N-E-S SLP070 ESTMD SLP 8/241 9/211 WR//																
SA	1655	330	10	16			12			SCT050CB BKN100 BKN250	03	M01	2989		6	PJ
(13) RMK CB DSNT W-NW MOV SE ACSL N SLP049 ESTMD SLP 8/343 9/321 WR//																
SA	1755	330	12				10			SCT050CB BKN100 BKN250	02	00	2999	23.525	7	PJ
(13) RMK CB 5 W AND DSNT N MOV SE SLP049 ESTMD SLP 60012 8/463 9/331 51012																
SP	1835	320	12	18			8		-TSRA	BKN040CB BKN100 BKN250	02	00	2997			PJ
(13) RMK TS OHD-N MOV SE OCNL LTGCACG																
RS	1857	320	17	25	290V350		2		TSRASN	FEW020 BKN035CB BKN090 BKN250	01	M01	2996		7	PJ
(13) RMK TS OHD MOV E FRQ LTGICCG PK WND 31029/46 SLP033 ESTMD SLP 8/511 9/063 WR// LAST																

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Figure 3.13. Sample AF Form 3803/3813 (Full-time Hours).

SURFACE WEATHER OBSERVATIONS (METAR/SPECI)	LATITUDE	LONGITUDE	STATION ELEVATION	TIME CONVERSION	MAG to TRUE	DAY (LST)	Month	YEAR	STATION (Not abbreviated) & STATE or COUNTRY
	30°10'N	79°01'W	+218 Feet (MSL)	(LST to + 5 Hrs. UTC) - Hrs.	+ Deg. - 10 Deg.	23	APR	1999	POPE AFB. NC

SYNOPTIC DATA					
TIME (UTC) (41)	TIME (LST) (42)	NO. (43)	PRECIP. (water equiv.)	SNOW FALL	SNOW DEPTH
Mid (LST) to: 0550	Mid to: 0050		0	0	
0550	0050	(1)	.05	0	0
1150	0650	(2)	0	0	0
1750	1250	(3)	0	0	0
2350	1850	(4)	.89	*T	0
Mid (LST)	Mid (LST)		T	0	0

SUMMARY OF THE DAY			
24-HR MAX TEMP (oC) (66)	PRECIP. (water equiv.) (68)	SNOW FALL (69)	SNOW DEPTH (70)
28	.89	*T	0
24-HR MIN TEMP (oC) (67)	SPEED (knots) (71)	DRCTN (true) (72)	TIME (UTC) (73)
		260	1854
06	53		

ACTIVE RNWY AND EQUIP CHANGE	
TIME (UTC)	RNWY No.
CONT	23

(90) REMARKS, NOTES, AND MISCELLANEOUS PHENOMENA (all times UTC)
TIME CHECK: 0520 / 1320 / 2330
GMQ-32 CONT OUT /05 END (LOGGED OUT ON 20 APR)
RWY DRY AT 0630
FMQ-8 OUT AT 1430 / SLING IN USE
FMQ-8 BACK IN USE AT 1540
28 C AT 1750
RWY DRY AT 0330
* HAIL

TYPE (1)	TIME (UTC) (2)	WIND DRCTN (true) (9A)	WIND SPEED (knots) (10)	MAX WIND (knots) (11)	VARIABILITY (true) (9B)	VISIBILITY METERS (4A)	VISIBILITY STATUTE MILES (SM) (4B)	RUNWAY VISUAL RANGE LOCAL (4C)	WEATHER AND OBSTRUCTION TO VISION (5)	SKY CONDITIONS (3)	TEMP (oC) (7)	DEWPOINT (oC) (8)	ALSTG (inches) (12)	STA PRESSURE (inches) (17)	TOTAL SKY CVR (21)	OBS INIT (18)
SA	0455	230	06				7			FEW050 SCT250	17	13	3006		4	EBS
(13) RMK SLP180 8/408 9/103 WR//																
SA	0555	230	05				7			FEW250	16	13	3007	29.835	2	EBS
(13) RMK SLP183 60005 8/008 9/002 53008 WR//																
SA	0655	220	04				7			FEW050	15	12	3008		1	EBS
(13) RMK SLP185 8/400 9/100																
SA	0755	210	04				7			SKC	14	12	3008		0	EBS
(13) RMK SLP185																
SA	0855	200	03				7			SKC	13	12	3008	29.845	0	EBS
(13) RMK SLP186 51007																
SA	0955	VRB	03				5		BR	SKC	13	12	3008		0	EBS
(13) RMK SLP186																
SA	1055	VRB	04				3		BR	SKC	12	12	3007		0	EBS
(13) RMK VIS S-SW 2 TWR VIS 2 ½ SLP 183																
SA	1155	190	05				5		BR	SKC	14	12	3006	29.825	0	EBS
(13) RMK SLP180 70011 58007																
SA	1255	200	06				6		HZ	SKC	17	13	3005		0	PIB
(13) RMK SLP177																
SA	1355	210	08				7			SKC	20	14	3003		0	PIB
(13) RMK SLP171																
SA	1455	220	10	18			7			FEW030	23	16	3001	29.770	1	PIB
(13) RMK SLP165 8/100 9/100 58019																
SA	1555	230	13	21			7			SCT035	25	17	2999		3	PIB
(13) RMK SLP160 8/200 9/300																
SA	1655	230	15	24			7			SCT035TCU	26	18	2997		4	PIB
(13) RMK TCU S AND DSNT NW SLP154 8/200 9/400																

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Figure 3.13. Continued.

		WIND				VISIBILITY										
TYPE (1)	TIME (UTC) (2)	DRCTN (true) (9A)	SPEED (knots) (10)	MAX WIND (knots) (11)	VARIABILITY (true) (9B)	METERS (4A)	STATUTE MILES (SM) (4B)	RUNWAY VISUAL RANGE LOCAL (4C)	WEATHER AND OBSTRUCTION TO VISION (5)	SKY CONDITIONS (3)	TEMP (°C) (7)	DEWPOINT (°C) (8)	ALSTG (inches) (12)	STA PRESSURE (inches) (17)	TOTAL SKY O/R (21)	OBS INIT (18)
SA	1755	230	16	25			7			SCT035CB BKN280	27	19	2995	29.720	5	PIB
(13)	RMK PK WND 23027/33 CB DSNT SE AND SW-W-NW MOV E SLP145 8/903 9/401 57017															
SP	1835	230	16	23			7		-TSRA	FEW010 BKN035CB OVC280	26	20	2993			PIB
(13)	RMK TS DSNT SW-7 W-DSNT NW MOV E OCNL LTGICCCCG CB DSNT SE MOV E VIS W 2															
RS	1858	260	22	53			½	R23/3200	+TSRAGR SQ	BKN010 OVC035CB	20	19	2996		8	TG
(13)	RMK TS DSNT N-OHD-DSNT SW MOV SE FRQ LTGICCCCG GR ½ PRESRR SLP 146 8/9// 9/8// WR//															
SP	1917	250	18	27			4		-TSRA BR	SCT010 BKN035CB OVC090	21	19	2994			PIB
(13)	RMK TS DSNT NE-2 E-DSNT SW MOV SE OCNL LTGICCCCG PRESFR APRNT WALL CLD SW															
SP	1941								FC							TG
(13)	RMK FUNNEL CLOUD 5 S MOV UNKN															
RS	1958	240	15				5		-SHRA BR	FEW010 BKN035CB BKN090 OVC280	22	19	2992		8	PIB
(13)	RMK FUNNEL CLOUD S DSIPTD OCNL LTGICCC E-SE PK WND 26045/02 CB DSNT NE-SE MOV SE ACC DSNT SE SLP132 8/983 9/323 WR//															
SP	2027	300	16	25	240V310		7			SCT035CB BKN090 BKN280	21	18	2992			TG
(13)	RMK WSHFT 26 FROPA CB DSNT NE-SE MOV SE															
SA	2055	300	17	27			7			FEW090 SCT280	19	16	2994	29.705	3	NC
(13)	RMK PK WND 31028/42 SLP139 60089 8/078 9/012 57005 WR//															
SA	2155	310	16	25			7			FEW280	17	12	2997		1	NC
(13)	RMK PK WND 31026/22 SLP148 8/008 9/001 WR//															
SA	2255	310	15	24			7			SKC	15	08	3000		0	NC
(13)	RMK PK WND 31027/18 SLP158 WR//															
SA	2355	310	16	24			7			SKC	13	05	3003	29.795	0	NC
(13)	RMK SLP168 60089 52030 WR//															
SA	0055	310	17	24			7			FEW050	11	02	3006		2	NC
(13)	RMK PK WND 31026/2358 SLP179 8/500 9/200 WR//															
SA	0155	320	15	23			7		VCSH	BKN055	10	00	3009		5	NC
(13)	RMK SLP191 8/500 9/500 WR//															
SP	0203	320	15	22			7		-SHRA	BKN055	10	M00	3009			NC
(13)	RMK															
SP	0238	320	14	21			7			BKN055	09	M01	3010			NC
(13)	RMK															
SA	0255	320	15	22			7			SCT055	08	M02	3011	29.880	3	NC
(13)	RMK SLP198 60000 8/500 9/300 51029 WR//															
SA	0355	320	13				7			FEW055	06	M03	3013		1	NC
(13)	RMK SLP204 8/500 9/100															

AF FORM 3803 *(REVERSE*

Chapter 4

LOCAL AND LONGLINE DISSEMINATION

4.1. General Information. This chapter outlines requirements and procedures for local and longline dissemination of METAR, SPECI, and LOCAL observations. The instructions apply primarily to observations taken and disseminated for aviation purposes.

4.2. Standard Definitions.

4.2.1. New Tactical Forecast System (NTFS). The primary method of local and longline dissemination of weather observations for US Air Force weather units.

4.2.2. METAR Aviation Weather Code. A code consisting of abbreviations, contractions, plain language, and symbols used to conserve transmission time and provide a uniform means of disseminating aviation weather reports.

4.2.3. Contraction. A word, title, or phrase represented in shortened form. Contractions used in weather reports are given in this manual and FAA Order 7340.1. When using contractions from the FAA order, priority will be given to contractions for NWS, GEN, and ATC, in that order.

4.2.4. Dissemination. Wide distribution of a completed METAR/SPECI to users.

4.2.5. FIBI. A contraction for *filed but impractical to transmit.*

4.2.6. File Time. The time a weather report is made available for transmission.

4.2.7. Local Weather Dissemination System (LWDS). Mode used to transmit or deliver weather information to customers in the local service area of the weather station.

4.2.8. Longline Dissemination. Transmission of weather information by NTFS or other communications media on a regional or national scale.

4.2.9. NIL. A no content indicator meaning a weather report is unavailable at the scheduled time of transmission.

4.3. LWDS Dissemination Priority. Disseminate METAR, SPECI, and LOCAL observations first to the positions which control local air traffic. For further dissemination, establish procedures locally in an order of priority which is consistent with local requirements and scheduled file times for longline transmission. **NOTE:** For an augmented ASOS unit, and to ensure local and longline observation accuracy and consistency, the ASOS may transmit before local dissemination via LWDS. Disseminate as follows:

4.3.1. METAR and SPECI observations: Locally and longline.

4.3.2. LOCAL observations: Locally only.

4.3.3. Corrected observations: Same as original reports.

4.4. Dissemination of Unofficial Weather Reports. Unofficial weather reports will be disseminated locally and longline when weather personnel believe the report is of possible interest to the public and to aviation. Unofficial observations will be appended as a remark on the next METAR or SPECI. When appended to any observation, the unofficial report is considered as additional data and not as SPECI criteria. **NOTE:** Tornadoes, waterspouts, and funnel clouds will be reported in accordance with procedures established in chapters 3 and 7 and may be transmitted as a single element SPECI.

4.4.1. Include the following on unofficial reports.

4.4.1.1. Weather station ICAO and time of SPECI (when sending a single element SPECI).

4.4.1.2. The contraction UNOFFL.

4.4.1.3. Text of report identifying the time phenomena was observed by the source, the source, the phenomena, the location of phenomena in reference to an ICAO, and the direction of movement of the phenomena or movement UNKN. (e.g., AT 1530 CIVIL POLICE REPORTED A TORNADO 15E OF KOFF MOV NE).

4.4.1.4. Example of unofficial reports.

4.4.1.4.1. Single element SPECI: KOFF SPECI 1535 UNOFFL AT 1530 CIVIL POLICE REPORTED A TORNADO 15E OF KOFF MOV NE.

4.4.1.4.2. Last entry in the remarks section of the next METAR or SPECI: UNOFFL AT 1530 CIVIL POLICE REPORTED A TORNADO 15E OF KBLV MOV NE.

4.4.2. Limit unofficial reports transmitted longline to reports from data in sparse areas and reports of severe weather conditions.

4.4.3. When several reports are transmitted as a collective, use the contraction UNOFFL once. Enter it on a separate line following the collective heading.

4.5. Verification of Disseminated Data. Exercise care to avoid disseminating incorrect data. Check all messages before dissemination. Recheck the observation and compare it to the disseminated data, both local and longline, immediately after the dissemination process is completed.

4.6. Corrections to Transmitted Data. Disseminate a correction immediately after detecting an error in a transmitted report. Disseminate correction to the same locations incorrect data were sent. Do not send a correction if superseded by a later report, except in response to a data deficiency bulletin. When transmitting a corrected report:

4.6.1. Locally: Include either a complete observation or the corrected element with appropriate identification.

4.6.2. Longline: Include all of the elements and remarks contained in the original report transmitted in error.

4.6.3. Refer to the actual time of the original observation.

4.7. Local Dissemination : Coordinate local dissemination procedures to include code form, format and content in a locally coordinated document. Use the NTFS as the primary means to distribute locally, when available. When there is an NTFS outage or NTFS is not available, establish and use a backup system as required locally. Review and update (as required) procedures annually. The following instructions will be followed unless specifically documented in a local policy:

4.7.1. Local Dissemination Procedures. Units may exempt local dissemination of observations or specific elements (e.g., RVR, altimeter setting, or remarks) when the airfield is closed, provided procedures are established in coordination with official users of the data NTFS automatically formats observations for local dissemination. Units may modify existing procedures as required. For non-NTFS equipped units, determine and implement LWDS dissemination requirements based on local need.

4.7.1.1. General procedures:

4.7.1.1.1. For non-NTFS locations only, precede reports of tornadic activity and other information as indicated by the situation with the term URGENT.

4.7.1.1.2. Some observed elements are normally given only local dissemination. These include pressure altitude, and density altitude.

4.7.1.1.3. Disseminate missing (e.g., M) for dewpoint temperatures entered in parentheses (statistical data).

4.7.1.1.4. Disseminate wind direction in degrees magnetic using three digits. Disseminate calm winds as CALM.

4.7.1.1.5. Disseminate the altimeter setting in four digits with the decimal, and prefix it with the contraction ALSTG; e.g., ALSTG 29.69, ALSTG E29.87 (estimated ALSTG).

4.7.1.1.6. Identify the observation by station call letters, type of observation, time of observation, and by time of completion of dissemination together with identification of person transmitting the observation.

4.7.1.1.7. For non-operational transmissions on the LWDS, clearly identify all non-operational transmissions as such at both the beginning and the end of the transmission.

4.7.1.1.8. Disseminate remarks and coded data as follows:

4.7.1.1.8.1. Locally disseminate runway condition remarks following all other meteorological information.

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

4.7.1.1.8.3. When required, disseminate pressure altitude (e.g., PA +130) or density altitude (e.g., DA +3680) following the last element of the observation. **EXCEPTION:** Runway condition remarks, when used, will be last.

4.7.2. LWDS Precedence. Disseminate observations as quickly as possible after completion. Disseminate a LOCAL or SPECI on the LWDS before entry on an observational record. If the LWDS is inoperative or not available, the observations will be entered on the observational record (AF Form 3803 or 3813) before local dissemination. Where multi-user interface of the LWDS is possible and in fact can conflict with dissemination of weather products, coordinating agreements will be documented to ensure the precedence of dissemination of specific weather products.

4.7.3. LWDS File Copy. For non-NTFS units, maintain an LWDS hard page copy of all weather products and messages (e.g., observations, forecasts, PIREPs, tests, RAREPs) disseminated on each system(s) in the sequence transmitted. Dispose of LWDS data in accordance with AFI 37-138 instructions.

4.7.4. Voice Dissemination. Maintain instructions outlining priorities and procedures to follow for local dissemination of observations by voice relay; e.g., read back by the person receiving the data.

Also maintain a record (written or recording) of all the following when used to backup the LWDS during outages:

4.7.4.1. Actual time of observation (UTC).

4.7.4.2. Time (in minutes past the hour) the observation was transmitted to the tower and other local aircraft control agencies.

4.7.4.3. Initials of the weather person making the dissemination and the initials of the customer.

4.7.4.4. Altimeter setting LOCALs.

4.7.4.5. Pressure altitude or density altitude (where required).

4.7.4.6. Reasons for delay or non-delivery of an observation.

4.7.5. Backup Local Dissemination Procedures. Use the following procedures as a guide in establishing a backup system for local dissemination during outages in the primary system.

4.7.5.1. When the primary local dissemination system is inoperative in the observing site and the weather station has transmission capability to ATC agencies on the system, relay observations directly to the weather station for local dissemination.

4.7.5.2. When the only means of local communications is voice (such as telephone or hotline), disseminate observations immediately to local ATC agencies (e.g., tower, RAPCON, GCA), then relay the data to other users as established locally.

4.7.5.2.1. Record voice dissemination on a local dissemination log. At a minimum, the dissemination log will include the time of the observation, agencies contacted (listed in the proper order with ATC agencies first), time of dissemination, the initials of the weather person making the dissemination, and the initials of the customer receiving the observation.

4.7.6. Local Dissemination Examples. Examples of locally disseminated observations from weather stations not equipped with NTFS are found in figure 4.1. These examples are for Electrowriter type LWDS. Stations having some other type of LWDS should use this format or one similar to the longline format. These examples do not necessarily reflect local requirements at any specific location (visibility in miles versus meters). These examples show the local requirement to identify fog (FG) and mist (BR) as FG locally.

Figure 4.1. Examples of non-NTFS Local Dissemination Formats.

METAR Observations		
A	**B**	**C**
ETAR METAR 0756 07007 040V100 1300 R09/1220 –RA BR SCT000 SCT008 OVC012 01/M01 ALSTG E29.38 CIG 010V015 VIS N 3200 TWR VIS 1600 BR SCT000 PA +210 WR// 57/DR	RJTY METAR 1058 03010G17 7/8 R36/4000 HZ SCT007 BKN020 OVC070 20/17 ALSTG 30.19 VIS N 2 TWR VIS 1 PA +960 59/RD	KQXX METAR 0958 27004 3/4 R32/P6000FT –RA BR SCT005 OVC020 00/M01 ALSTG E29.92 TWR VIS 2 WR// 58/WS
SPECI Observations		
A	**B**	**C**
ETAR SPECI 0731 25003 1700 R27/1220 BR BKN006 20/15 ALSTG 30.02 TWR VIS 1 ¼ PA +350 32/WM	RJTY SPECI 1614 03005 3/8 R36/2400 –RA FG FEW000 SCT006 BKN016 10/09 ALSTG 29.81 VIS 1/4V3/4 TWR VIS 5/8 FG SCT000 CIG LWR W PA+560 16/DY	URGENT ETIG SPECI 0013 UNOFFICIAL TORNADO 6SW MOV UNKN 2352 13/TT
LOCAL Observations		
A	**B**	**C**
EGUA LOCAL 0750 CALM 1700 R27VR1370(45) BR OVC007 ALSTG 30.03 50/JT	ETIH LOCAL 1637 ALSTG 29.80 37/PS	EGUN LOCAL 1930 23003 8000 HZ SCT037 BKN280 ALSTG 29.89 31/BP

4.8. Longline Dissemination Procedures.

4.8.1. Non-NTFS Longline Coding and Dissemination. Units without NTFS will use format from AF Form 3803. **NOTE:** This includes longline dissemination via the Air Force Weather Information Network (AFWIN) and the Secure Air Force Weather Information Network (SAFWIN). The following rules apply:

4.8.1.1. Disseminate the actual date and time of observation and suffix with a Z; e.g., 010056Z.

4.8.1.2. Disseminate winds in degrees true.

4.8.1.3. Prefix altimeter setting with an A; e.g., A2984. Include the remark ESTMD ALSTG in column 13 when altimeter settings are estimated. Additionally, encode a remark such as ESTMD ALSTG/SLP when the SLP is also estimated.

4.8.1.4. Missing data. When an element does not occur or cannot be determined, the corresponding group and preceding space will be omitted. For example, a missing temperature and dew point would be coded KBLV 011058Z 27010KT 7SM OVC020 A2992 RMK SLP982. Note the complete absence of the missing temperature and dew point groups.

4.8.1.5. Precede all remarks with RMK.

4.8.1.5.1. Send plain language remarks longline (**table 11.1.**). If they are not readily available to the local forecaster, they must be sent both locally and longline.

4.8.1.5.2. Separate plain language remarks and supplementary coded data (e.g., weather modification) from preceding text of remarks by a space. **NOTE:** If there are no remarks, the contraction RMK is not required.

4.8.2. Supplementary Identification of Observations. At limited-duty stations and gunnery ranges, identify the last METAR of the day by adding the term LAST on AF Form 3803 or AF Form 3813 following the last element in the observation text; e.g., TCU SE LAST. (table 11.1. rule 33)

4.8.3. 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 3.1.5.

4.8.4. Reports Filed But not Transmitted. A summary of special requirements pertinent to longline transmission follows:

4.8.4.1. 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). FIBI a METAR only if a later observation containing all elements of a METAR is available for transmission.

4.8.4.2. 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 4.2. illustrates this procedure for CONUS units using statute miles in column 4B (overseas locations would use meters in column 4A).

4.8.5. Communications Failure. Use the telephone (e.g., DSN) or other available means to disseminate a METAR and SPECI to another station with an operational circuit.

4.8.6. Longline Dissemination By Other Stations. A record of longline dissemination by another station will be entered in parentheses in column 13 of AF Form 3803 or 3813. Units will identify which unit transmitted their observation longline and the initials of the individual that received the data; e.g., (by KOFF/DM).

Figure 4.2. 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	012021	23012KT	10SM		BKN025	11/10	A2992	(FIBI)
In this example, light rain began at 16 minutes past the hour and ended 5 minutes later. Both SPECI were FIBI'd because the change between the last transmitted report and the current report do not meet SPECI criteria.								

4.8.7. Longline Dissemination Examples. Figure 4.3 provides the code and figure 4.4 contains examples of longline dissemination of observations for weather stations not equipped with NTFS.

Figure 4.3. Longline Dissemination Code.

United States METAR/SPECI/LOCAL Code
METAR or SPECI CCCC YYGGggZ AUTO or COR dddffG$f_m f_m$KT $d_n d_n d_n$V$d_x d_x d_x$ VVVVVSM R$D_R D_R$/$V_R V_R V_R V_R$FT or R$D_R D_R$ /$V_N V_N V_N V_N$V$V_X V_X V_X V_X$FT w'w' $N_s N_s N_s h_s h_s h_s$ [or VV$h_s h_s h_s$ or SKC] T'T'/T'$_d$T'$_d$A$P_H P_H P_H P_H$ RMK;
Overseas METAR/SPECI/LOCAL Code
METAR or SPECI CCCC YYGGggZ AUTO or COR dddffG$f_m f_m$KT $d_n d_n d_n$V$d_x d_x d_x$ VVVV R$D_R D_R$/$V_R V_R V_R V_R$ R$D_R D_R$/$V_N V_N V_N V_N$V$V_X V_X V_X V_X$ w'w' $N_s N_s N_s h_s h_s h_s$ [or VV$h_s h_s h_s$ or SKC] T'T'/T'$_d$T'$_d$AP_H-$P_H P_H P_H$ RMK;

Figure 4.4. Examples of Longline Dissemination.

METAR Observations
METAR ETAR 010756Z VRB07KT 040V100 1300 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// 9/8// WR//;
METAR RJTY 011058Z COR 02010G17KT 1400 R36/4000 HZ SCT007 BKN020 OVC070 20/17 A3019 RMK VIS N 3200 TWR VIS 1600 SLP015 ESTMD ALSTG/SLP 8/55/ 9/53/ 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 ESTMD ALSTG/SLP 6010/ 70010 4/002 8/5// 9/8// 10010 21002 52010 WR//;
METAR ETIU 011157Z 30003KT 9999 SKC M04/M10 A3003 RMK SLP985 70001 4/002 70002;
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 9/600;
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 9/400 52010;

SPECI Observations (SPECI)
SPECI ETAR 010731Z 25003KT 1700 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 2 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 1 1/2 PK WND 24041/01 PRESFR WR//;

Chapter 5

WIND

5.1. General Information. This chapter outlines the observing procedures for wind data in METAR aviation observations.

5.2. Standard Definitions.

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

5.2.2. Gust. Maximum wind speed observed during the 10-minute observational period with a variation of 10 knots or more between peaks and lulls.

5.2.3. 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.

5.2.4. Light Wind. A term used to indicate that the wind speed is 6 knots or less.

5.2.5. Magnetic Variation. In navigation, at a given place and time, the horizontal angle between the true north and magnetic north measured east or west according to whether magnetic north lies east or west of true north.

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

5.2.7. Squall (SQ). An atmospheric phenomenon characterized by a very large variation of wind speed. It begins suddenly, normally has a duration on the order of minutes, and decreases rather suddenly 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. Code and report the highest wind speed on AF Form 3803/3813 in column 11, and code and report SQ as a present weather group (w'w') in column 5.

5.2.8. Wind. For surface observation purposes, wind is the horizontal motion of the air past a given point. It is measured in terms of velocity, a vector which includes direction and speed.

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

5.2.10. 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.

5.2.11. Wind speed. The rate of movement of the air past a given point.

5.2.12. Variable Wind Direction. A condition in which the wind direction is fluctuating by 60 degrees or more during the period of observation.

5.3. Observing Procedures.

5.3.1. General Requirements for Wind Observations. 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 considered representative.

5.3.1.1. Units of Measure. True wind direction to the nearest 10 degrees is required for form entries and for observational reports disseminated via longline. Magnetic wind directions are reported locally. Wind speeds are reported in nautical miles per hour (knots), to the nearest whole knot. Tables 5.1, 5.2., 5.3., and 5.4. are provided for wind speed conversions.

5.3.1.2. Magnetic Variation. The local magnetic variation must be determined at each observing station to convert wind direction from magnetic to true. Obtain local magnetic variation from the Tactical Piloting Chart or the DoD FLIPs 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 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.

5.3.1.3. Directions for Conversion of Magnetic and True Wind Direction:

5.3.1.3.1. From magnetic to true: Add easterly variation to magnetic direction; subtract westerly variation from magnetic direction.

5.3.1.3.2. From true to magnetic: Add westerly variation to true direction; subtract easterly variation from true direction.

5.3.2. Determination of Wind Direction.

5.3.2.1. Obtain wind direction from a recorder or digital readout, if available. Instrumental values are in reference to magnetic North. These values must be converted to true for observational records and longline dissemination. Obtain a 2-minute (10-minute overseas) average for the period immediately preceding the time of observation.

5.3.2.2. 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 on the basis of 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 ESTMD WND column remark in column 13.

5.3.2.3. When the wind direction is varying 60 degrees or more during the period of observation and the wind speed is greater than 6 knots, determine the range of variability for use in the observation.

5.3.3. Determination of Average Wind speed. Use the following procedures as a guide in observing and reporting the average wind speed:

5.3.3.1. Obtain a 2-minute average (10-minutes overseas) for the period immediately preceding the time of observation.

5.3.3.2. If an instrumental value is not available, use the Beaufort Scale (table 5.5.) as a guide in determining the wind speed. Determine wind speed on the basis of a 2-minute average.

5.3.4. Determination of Wind Character (Gusts). Obtain and report wind character data in conjunction with each observation of average wind speed and direction. Determine this data on the basis of the maximum instantaneous wind speed observed during the 10-minute period before the actual time of observation and as follows:

5.3.4.1. Report character as 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. Note that squalls are reported as present weather.

5.3.4.2. When available, use a recorder or digital readout to determine the occurrence and speed of gusts, squalls, and maximum wind speed. When necessary to use a direct dial indicator, monitor it as closely as practical to observe the highest attained value.

5.3.5. Determination of Peak Wind Data. Determine peak wind data for entry in the remarks of surface observations, and in the summary of the day according to procedures in **chapter 3** and as follows. Requirements for this data are considered mandatory only for stations with an operational wind speed recorder.

5.3.5.1. If the wind speed record is incomplete, it may still be used provided there is no indication that the peak speed occurred during the period of the missing data.

5.3.5.2. If the wind direction record is incomplete, estimate the direction to the nearest 10 degrees for remarks on peak speed and for peak wind of the day.

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

5.3.6. Determination of Wind Shifts. 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. Wind shifts are often associated with the following phenomena:

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

5.3.6.2. Rapid drop or rise in temperature and/or dewpoint.

5.3.6.3. Rapid rise or drop in pressure.

5.3.6.4. Thunderstorm activity, rainshowers, or snowshowers.

5.4. Equipment Operation and Instrumental Evaluation. Operate and use wind measuring equipment according to the appropriate TOs or operating manuals. In addition, refer to **chapter 2** for general equipment operating instructions and for specific procedures applicable to stations with multiple instrumentation.

5.4.1. Exposure for Portable Instruments . When using portable wind measuring instruments, select an unsheltered area which will be most representative of the runway conditions (if applicable) and which will be least affected by local obstructions.

5.4.2. Evaluation of Instrumental Values . Obtain wind direction and speed data by direct reading of instrumental values. Visually determine the appropriate average or extreme according to the required observational period specified.

Table 5.1. Conversion of Knots to Miles Per Hour.

Knots	0	1	2	3	4	5	6	7	8	9
	Miles Per Hour									
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
100	115	116	118	119	120	121	122	123	124	126
110	127	128	129	130	131	132	134	135	136	137
1 KT = 1.15155 mph										

Table 5.2. Conversion of Miles Per Hour to Knots.

Knots	0	1	2	3	4	5	6	7	8	9
	Knots Per Hour									
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
100	87	88	89	89	90	91	92	93	94	95
110	96	96	97	98	99	100	101	102	102	103
1 MPH = 0.868391 KT										

Table 5.3. Conversion of Knots to Meters Per Second.

Knots	0	1	2	3	4	5	6	7	8	9
	Meters Per Second									
0	0	1	1	2	2	3	3	4	4	5
10	5	6	6	7	7	8	8	9	9	10
20	10	11	11	12	12	13	13	14	14	15
30	15	16	17	17	18	18	19	19	20	20
40	21	21	22	22	23	23	24	24	25	25
50	26	26	27	27	28	28	29	29	30	30
60	31	31	32	32	33	34	34	35	35	36
70	36	37	37	38	38	39	39	40	40	41
80	41	42	42	43	43	44	44	45	45	46
90	46	47	47	48	48	49	49	50	50	51
100	52	52	53	53	54	54	55	55	56	56
110	57	57	58	58	59	59	60	60	61	61
1 KT = 0.514791 m/s; 1 m/s = 1.94254 KT										

Table 5.4. Conversion of Knots to Kilometers Per Hour.

Knots	0	1	2	3	4	5	6	7	8	9
	Kilometers Per Hour									
0	0	2	4	6	7	9	11	13	15	17
10	19	20	22	24	26	28	30	32	33	35
20	37	39	41	43	45	46	48	50	52	54
30	56	58	59	61	63	65	67	69	70	72
40	74	76	78	80	82	83	85	87	89	91
50	93	95	96	98	100	102	104	106	108	109
60	111	113	115	117	119	121	122	124	126	128
70	130	132	133	135	137	139	141	143	145	146
80	148	150	152	154	156	158	159	161	163	165
90	167	169	171	172	174	176	178	180	182	184
100	184	187	189	191	193	195	196	198	200	202
110	204	206	208	209	211	213	215	217	219	221
1 KT = 1.85325 km/hr; 1 km/hr = 0.539593 KT										

Table 5.5. Beaufort Scale of Winds.

Beaufort Number	Description	Knots	Specifications for Estimating Wind speed
0	Calm	<1	Calm, smoke rises vertically
1	Light air	1-3	Direction of wind shown by smoke drift but not by wind vanes.
2	Light breeze	4-6	Wind felt on face; leaves rustle; vanes moved by wind.
3	Gentle breeze	7-10	Leaves and small twigs in constant motion; wind extends light flag.
4	Moderate breeze	11-16	Raises dust and loose paper; small branches are moved.
5	Fresh breeze	17-21	Small trees with leaves begin to sway; crested wavelets form on inland waters.
6	Strong breeze	22-27	Large branches in motion; whistling heard in telegraph wires; umbrellas used with difficulty.
7	Near gale	28-33	Whole trees in motion; inconvenience felt when walking against the wind.
8	Gale	34-40	Breaks twigs off trees; generally impedes progress.
9	Strong gale	41-47	Slight structural damage occurs.
10	Storm	48-55	Trees uprooted; considerable structural damage occurs.
11	Violent storm	56-63	Accompanied by widespread damage.
12	Hurricane	64+	Accompanied by widespread damage.

Chapter 6

VISIBILITY AND RUNWAY VISUAL RANGE

6.1. General Information. This chapter contains observing practices and identifies procedures used to determine meteorological visibility. Disseminate prevailing visibility values in either miles or meters longline; disseminate local values as determined by local customers.

6.2. Standard Definitions.

6.2.1. Visibility. Visibility is the horizontal distance determined by human evaluation or instrument measurement. The instrumentally derived visibility value is a sensor value converted to the appropriate reportable visibility. Manual visibility is defined as the greatest distance selected objects can be seen and identified by day, or the greatest distance at which unfocused lights of moderate intensity can be seen and identified at night.

6.2.2. Prevailing Visibility (PV). The greatest visibility equaled or exceeded throughout at least one-half the horizon circle. The visibility does not have to be continuous throughout 180 consecutive degrees; i.e., it may be composed of sectors distributed anywhere around the horizon circle.

6.2.3. Sector Visibility. The visibility in a specified direction representing a 45-degree arc of the horizon circle.

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

6.2.5. Tower Visibility . The prevailing visibility determined from the control tower when the surface visibility is determined from another location such as the weather station. Code and report a tower visibility remark 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.

6.2.6. Variable Prevailing Visibility. Coded and reported whenever the column 4 prevailing visibility value is less than 3 miles (4800 meters) and is rapidly increasing and decreasing by ½ mile (800 meters) or more during the period of observation; e.g., VIS 1800V2600, VIS 1 1/8V1 5/8. The average of all visibility values observed during the period of observation will be coded and reported in column 4A or 4B.

6.3. Observing Procedures.

6.3.1. General Observing Requirements and Practices. Visibility observations are made on the basis of normal vision; i.e., without the aid of optical devices such as binoculars or telescopes. Observations should be representative of conditions at an eye level of approximately 6 feet above the ground (this is an international standard and also forms the basis for defining certain obscurations; e.g., shallow fog). Other requirements necessary to visibility evaluations are outlined below.

6.3.1.1. Units of Measure. Meteorological visibility is reported in statute miles in the United States and meters overseas. See **table 6.1.** for reportable visibility values and statute miles, meters, nautical miles conversion chart.

6.3.1.2. Visibility Markers (Objects). Use suitable objects whenever practical in determining visibility. To help ensure visibility observations are representative, use the following guideline in selecting objects for use as visibility markers:

6.3.1.2.1. The most suitable daytime markers are prominent, 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, ensure the object is located closer to the point of observation than it is to the terrestrial background.

Table 6.1. Reportable Visibility Values/Conversion Chart (Statute Miles, Meters, Nautical Miles).

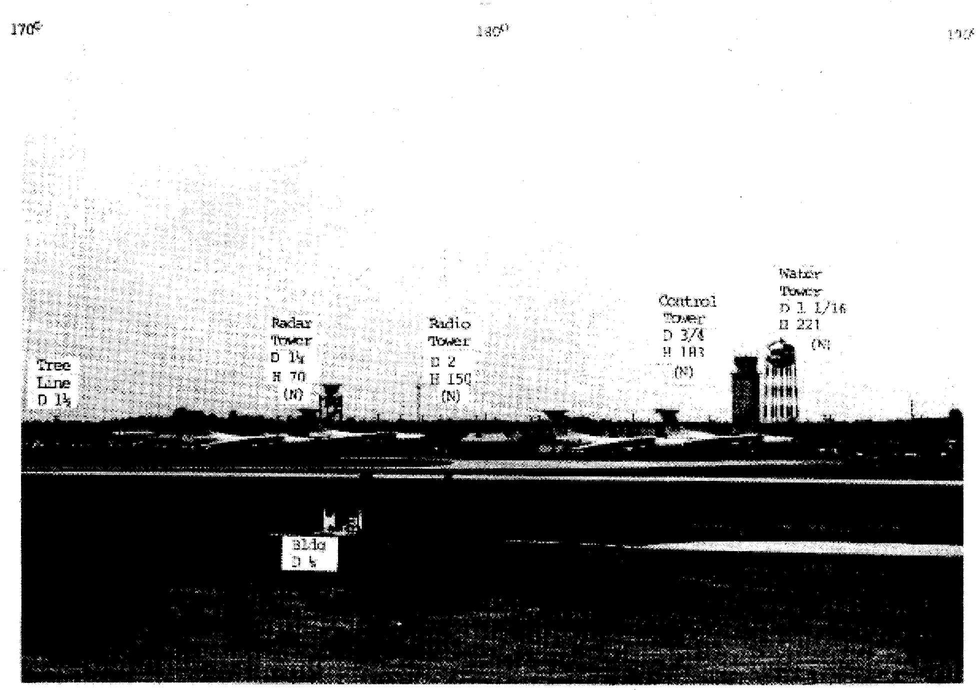
Statute Miles	Meters	Nautical Miles	Statute Miles	Meters	Nautical Miles
0	0000	0.0	---	3400	1.8
1/16	0100	0.05	---	3500	---
1/8	0200	0.1	2 ¼	3600	1.9
3/16	0300	0.15	---	3700	---
¼	0400	0.2	---	3800	---
5/16	0500	0.25	---	3900	---
3/8	0600	0.3	2 ½	4000	2.2
---	0700	0.4	---	4100	---
½	0800	0.45	---	4200	---
---	0900	0.5	---	4300	---
5/8	1000	0.55	2 ¾	4400	2.3
---	1100	0.6	---	4500	2.4
¾	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 ¼	2000	1.1	6	9000	5
---	2100	---	7	9999	6
1 3/8	2200	1.2	8	9999	7
---	2300	---	9	9999	8
1 ½	2400	1.3	10	9999	9
---	2500	---	11	9999	10
1 5/8	2600	1.4	12	9999	11
---	2700	---	13	9999	12
1 ¾	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: Stations reporting visibility locally in nautical miles will disseminate the value 0.05 as LESS THAN 0.1. To convert from statute miles to nautical miles above 25 statute miles, multiply the statute miles by .9 and rounds to the nearest 5 nautical miles.					

6.3.1.2.2. 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.

6.3.1.3. Visibility Charts and Aids. Prepare, post, and maintain current charts, lists, or other positive means of identifying objects selected as visibility markers. Depict or list objects to include a description, distance, and bearing from the point of observation. Also, include a means of identifying objects selected as night-visibility markers. Indicate the height of the object above the ground (if known), especially for those objects which may be useful in determining sky cover height data. Figure 6.1. is an example visibility check point photograph. Use miles, meters, or both as required locally.

Figure 6.1. Example Visibility Check-Point Photograph.



6.3.1.3.1. The representative visibility marker file will allow personnel to easily locate the visibility markers. The visibility marker file will contain high quality photos (color photos preferred), taken on a predominantly cloud and obscuration free day (clear) day, and be representative of the current state of the airfield/site (updated if any significant changes, such as new construction, have taken place at the airfield/site since the last photos were taken).

6.3.1.3.2. If an AOS is required, the AOS visibility marker file will be prepared following guidance provided in 6.3.1.3.1.

6.3.1.4. Control Tower Visibility Aids. ATC regulations require control towers to maintain a visibility checkpoint chart. Upon request, provide whatever assistance is necessary to help prepare a chart of suitable objects for determining tower visibility.

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

6.3.2.1. Point of Observation. Take visibility observations at the observation site from as many positions as necessary to view the entire horizon, or as much of the horizon as practical.

6.3.2.2. Visibility Determination. Use all available markers to determine the greatest visibility in each direction around the horizon circle.

6.3.2.2.1. When the visibility is greater than the distance to the farthest marker, note the sharpness with which the objects stand out and estimate the visibility based on the transparency of the atmosphere.

6.3.2.2.2. 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.

6.3.2.2.3. Sharp outlines in relief, with little or no blurring of color, indicate visibility is much greater than the distance of a reference object. A blurred or indistinct object indicates the visibility may not be much more than the distance to the object.

6.3.2.2.4. If the visibility fluctuates rapidly during the period of observation, determine visibility values at several times during the period; include extremes (highest and lowest).

6.3.2.3. 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.

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

6.3.2.3.2. 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. Figure 6.2. contains examples of this process. In the remarks of the observation, report sector visibility's which differ from the prevailing visibility by a reportable value if they are less than 3 miles (4800 meters) or otherwise considered operationally significant.

Figure 6.2. Determination of Prevailing Visibility.

Four Sectors			**Five Sectors**		
Visibility Miles	**Visibility Meters**	**Approximate Degrees Azimuth**	**Visibility Miles**	**Visibility Meters**	**Approximate Degrees Azimuth**
5	8000	90	5	8000	100
2 ½	4000	90	3	4800	90
2	3200	90	2 ½	4000	60
1 ½	2400	90	2	3200	50
			1 ½	2400	60
Prevailing is 2 ½/4000 meters (half or more of the horizon is 2 1/2/4000 meters)			Prevailing is 3 miles/4800 meters (half or more of the horizon is 3/4800 meters)		

6.3.3. Tower Visibility Observations. ATC regulations require certified control tower personnel to make tower prevailing and sector visibility observations. Using the following guidelines, supplement observations taken at the official observation site with tower visibility data:

6.3.3.1. Reevaluate weather station prevailing or sector visibility upon receipt of a differing control tower value.

6.3.3.2. Use control tower values of prevailing or sector visibility as a guide in determining a weather station value 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 station prevailing visibility to be the same as the control tower level.

6.3.3.3. When the surface and tower prevailing visibility's differ, and either is less than 4 miles (6000 meters), ATC personnel will relay tower visibility reports for inclusion in weather observation remarks.

6.4. Runway Visual Range (RVR). Stations will disseminate RVR locally and longline (units without 10 minute average capability will report RVRNO longline) using the values in the DoD FLIPs for RVR minima. Airfields with a transmissometer and no published RVR minima will code and disseminate RVR using the column labeled *other* in the transmissivity conversion tables.

6.4.1. Definitions.

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

6.4.1.2. 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.

6.4.2. Observing and Reporting Procedures.

6.4.2.1. RVR Requirement. RVR will be reported locally using an instantaneous, one minute, or ten minute average and disseminated longline when the RVR data was obtained from a system providing a ten minute RVR average readout at stations with visibility measuring equipment installed near one or more runways on the airfield.

6.4.2.2. Units of Measure. RVR is reported in either feet or meters as determined locally.

6.4.2.3. Basic Observational Requirements. A knowledge of the following factors is essential to RVR observing and reporting requirements:

6.4.2.3.1. The location of all RVR equipment on the airfield and the relationship of RVR sensors and readouts to the runway approaches.

6.4.2.3.2. The RVR category minima for all RVR runways.

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

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

6.4.2.4. RVR Reporting Conditions. 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.

6.4.2.5. RVR Reporting Requirements. When reporting conditions exist, code and report RVR data in surface weather observations as specified in paragraph 2.8.4., **chapter 3**, and the following requirements:

6.4.2.5.1. Non-Category II RVR Stations. Report touchdown RVR data locally. **NOTE:** Non-category II RVR stations do not use the RVR400 system.

6.4.2.5.2. Category II RVR Stations. Report touchdown RVR data locally. **NOTE:** Category II RVR stations use the RVR400 system. Use the following guidelines:

6.4.2.5.2.1. When advised by an ATC agency of an inoperative digital readout for touchdown RVR, begin reporting touchdown RVR data locally according to observation criteria in **chapter 3** 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.

6.4.2.5.2.2. 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 station for determination of RVR data.

6.4.2.6. Determination of RVR. Obtain instantaneous, one minute, or ten 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 conversion of transmissivity readings when digital data are not available (e.g., unit does not have a ten 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.

6.5. Equipment Operation and Instrumental Evaluation.

6.5.1. General. Operate and use visibility and RVR measuring equipment according to appropriate TOs or operating manuals. Refer to **chapter 2** for general operating instructions.

6.5.1.1. Transmissometer Determined Values. Transmissometer determined values are applicable only to the specified runway near which the instrument is located. Data must not be used during periods in which instrumental values are not considered representative for the associated runway.

6.5.1.2. Transmission Variation. 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.

6.5.2. Equipment Operation Requirements.

6.5.2.1. 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.

6.5.2.2. 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 exist and there is no local requirement to continue operation.

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

6.5.2.3.1. At non-Category II RVR stations, 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).

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

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

6.5.4. Transmissivity Conversion. Convert corrected percentages to equivalent RVR or visibility values. Use tables 6.2 and 6.3, and consider the following factors:

6.5.4.1. 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 values until the evening low intensity lights on or near the airfield complex are clearly visible; use the night values until the morning lights begin to fade.

6.5.4.2. 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.

Table 6.2. RVR (Meters/Feet)—Transmissivity Conversion for 250-Foot Baseline.

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
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 6.3. RVR (Meters/Feet)—Transmissivity Conversion for 500-Foot Baseline.

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
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.

6.6. RVR Code Breakdown. Enter touchdown RVR data using the appropriate format from figure 6.3. Examples of RVR reports are provided in figure 6.4.

6.6.1. RVR Not Available (RVRNO). Indicates touchdown RVR for the in-use runway is not available (i.e., equipment failure) where RVR data are required to be reported for that runway and transmitted longline in place of the locally disseminated RVR value when a unit does not have a ten minute RVR average readout capability.

Figure 6.3. RVR Code Breakdown. Note: US stations append FT to end of reportable value(s).

Reportable Contraction	**Definition**
R	Runway number indicator
D_RD_R/	Runway number. Parallel runways will be distinguished by appending R for right, L for left, and C for center as appropriate. A solidus (/) separates the runway number from the reportable value and is not used with RVRNO.
$V_RV_RV_RV_R$	The touchdown RVR in meters using reportable values in tables 3.2 or 3.3. Use a P to indicate a value greater than the highest reportable increment in both feet and meters, i.e., P6000FT (feet), P1830 (meters) or M to indicate a value below the lowest reportable increment for the line in use for both feet and meters, i.e., 250 foot baseline; 600 feet/180 meters, 500 foot baseline; 1000 feet/ 300 meters.
$V_NV_NV_NV_NVV_XV_XV_XV_X$	Variable RVR shall be coded using $V_NV_NV_NV_N$ as the lowest reportable value, V separates the lowest and highest reportable values, and $V_XV_XV_XV_X$ is the highest reportable value. See tables 3.2 and 3.3 for reportable values.
RVRNO	Entered in place of appropriate $V_RV_RV_R$ values when touchdown RVR data is not available and transmitted longline in place of the locally disseminated RVR value when a unit does not have a ten minute RVR average readout capability.

Figure 6.4. Examples of RVR. (Note: CONUS stations append FT to end of reportable values.)

R27/M0180	Runway 27 touchdown RVR is less than 180 meters
R27/M0600FT	Runway 27 touchdown RVR is less than 600 feet
R09/1000FT	Runway 09 touchdown RVR is 1000 feet
R27/1200FT	Runway 27 touchdown RVR is 1200 feet
R27/1200	Runway 27 touchdown RVR is 1200 meters
R27/ 1000V2000FT	Runway 27 touchdown RVR is varying between 1000 and 2000 feet
R27/0300V0910	Runway 27 touchdown RVR is varying between 300 and 910 meters
RVRNO	Touchdown RVR not available/or no ten minute RVR average readout capability

Chapter 7

WEATHER AND OBSCURATIONS

7.1. General Information. This chapter contains instructions on coding and reporting precipitation and identifying atmospheric phenomena. It includes methods used to measure precipitation amounts and depth and methods of determining precipitation type and intensity. This chapter also contains definitions of present weather parameters and common descriptor/weather phenomena combinations.

7.1.1. Precipitation Evaluation. Code and report precipitation in column 5 only when it is occurring at the point(s) of observation. Precipitation not occurring at the point(s) of observation, but observed to be occurring £ 10 statute miles/16 kilometers of the point(s) of observation (>0 statute miles/>0 meters to £ 10 statute miles/16 kilometers), will be encoded in column 5 as showers in the vicinity (VCSH). For example, if a rainshower is observed 2 statute miles from the point(s) of observation, but no precipitation is actually occurring at the point(s) of observation, the rainshower will be encoded as VCSH in column 5.

7.1.2. Significant Changes. A significant change in precipitation reporting conditions (as specified in **chapter 2** SPECI and LOCAL criteria) involves the occurrence (beginning and ending) of hail, ice pellets, ice pellet shower, freezing rain, and freezing drizzle, to include changes in their intensity (i.e., except hail). Normally, the beginning and ending of other types must also be reported. However, a change from one type to another (e.g., rain changes to snow) and the beginning or ending of one type while another is in progress (e.g., rain changes to rain and snow) need not be reported as a significant change.

7.1.2.1. Snow Increasing Rapidly. Report a snow-increasing-rapidly remark in the next METAR when the snow depth increases by 1 inch or more in the past hour. Code the remark using the format SNINCR_ the inches of snow per hour/the inches of snow on the ground, where SNINCR is the snow-increasing-rapidly remark, inches of snow per hour is the snow depth increase in the past hour, and the inches of snow on the ground is the total depth of snow on the ground at the time of observation. The depth increase in the past hour and the total depth on the ground will be separated by a solidus (/). For example, a snow increase of 2 inches in the past hour with a total snow depth on the ground of 10 inches would be coded as SNINCR 2/10.

7.1.3. Precipitation Character . Determine the type and character of precipitation primarily on the basis of experience, with consideration given to knowledge of the synoptic situation. The classification given most types of precipitation is based primarily on the cloud form (stratiform versus cumuliform) with which it is associated, and indicative of whether or not the precipitation is falling at a fairly continuous or rapid rate. For reporting purposes, only the predominant character is determined for a specific type. For example, if both continuous and showery snow is falling and the showers appear to be predominant, only the showery character is reported. This condition is common to cumulonimbus embedded in nimbostratus and with occluded fronts.

7.1.3.1. Continuous. Intensity changes gradually, if at all. Continuous and intermittent rain, freezing rain, snow, and ice pellets are normally associated with nimbostratus and altostratus, but may also occur with stratocumulus and altocumulus (rarely). Drizzle, freezing drizzle, and snow grains are associated with stratus clouds. Ice crystals are associated with cirriform-type clouds or clear skies (common primarily to polar regions at very low temperatures), and the character of fall is generally continuous.

7.1.3.2. Intermittent. Intensity changes gradually, if at all, but precipitation stops and starts at least once within the hour preceding the observation.

7.1.3.3. Showery. Precipitation changes intensity or starts and stops abruptly. Showers fall exclusively from cumuliform clouds. Rain showers, snow showers, and ice pellet showers are associated with cumuliform-type clouds such as cumulonimbus and towering cumulus. Hail falls exclusively as showers, and snow pellets almost always fall as showers.

7.1.4. Present Weather Order of Entry. When reporting a combination of present weather, obscuration(s), and other weather phenomena, construct w'w' groups using the order of entry presented in figure 7.1.

Figure 7.1. Present Weather Order of Entry.

1. Tornado, Funnel Cloud or Waterspout.
2. Thunderstorm with or without associated precipitation.
3. Weather, obscuration, and other, in order of decreasing predominance; i.e., report the most dominant type first.

7.1.4.1. Order of Entry Examples. The occurrence of a thunderstorm, moderate rainshower, light snowshower, fog, haze, and smoke would be coded TSRASN FG HZ. The code entry for smoke (FU) is not reported because of the three-w'w' group limitation. The occurrence of a funnel cloud, thunderstorm, moderate rainshower, light drizzle, squall, haze, and mist would be coded FC TSRADZ SQ. In this example, the code entries for haze (HZ) and mist (BR) are not reported because of the three-w'w' group limitation.

7.2. Present Weather (w'w') Group Code. Construct w'w' group(s) by considering figure 7.2. columns in sequence; i.e., intensity, followed by descriptor, followed by present weather, obscuration, and/or other weather phenomena. The minimum size of an individual w'w' group is two digits while the maximum size is nine digits, i.e., +TSRAGRDZ.

Figure 7.2. Present Weather (w'w') Group Code.

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
No Symbol – Moderate	**PR** Partial	**RA** Rain	**FG** Fog	**SQ** Squalls
+ Heavy (well-developed in the case of dust/sand whirls, dust devils and tornado/ waterspout	**BC** Patches	**SN** Snow	**FU** Smoke	**FC** Funnel Cloud, (Tornado, Waterspout)
	DR Low Drifting	**SG** Snow Grains	**VA** Volcanic Ash	
	BL Blowing	**IC** Ice Crystals	**DU** Dust	**SS** Sandstorm
	SH Shower(s)	**PL** Ice Pellets	**SA** Sand	**DS** Sandstorm
	TS Thunderstorm	**GR** Hail	**HZ** Haze	
VC In the Vicinity	**FZ** Freezing	**GS** Small Hail and/or Snow Pellets	**PY** Spray	
		UP Unknown Precipitation		

7.2.1. When reporting more than one type of present weather, obscuration, and other weather phenomena at the same time, code and report as separate w'w' groups. Each type of present weather or obscuration is treated as its own w'w' group and when encoded is separated from other w'w' groups (if applicable) by a space (i.e., -SHRA BR HZ).

7.2.2. Base-coded entries on descriptions of hydrometeors and lithometeors found in WMO Manual No. 407, volume 1, *International Cloud Atlas* (manual on the observation of clouds and other meteors). The manual is available through the United States Air Force Combat Climatology Center Library (AFCCC/LD) and can be ordered by your base library.

7.2.3. Intensity and Proximity Qualifier. Code and report light (-), moderate (no symbol), and heavy (+) intensities with all precipitation types except ice crystals (IC) and hail (GR). Code and report funnel clouds as FC and tornadoes and waterspouts as +FC. The proximity qualifier is VC. **NOTE:** A tornado and funnel cloud in the vicinity will be encoded VCFC.

7.2.3.1. Intensity of Precipitation. When more than one form of precipitation is occurring at a time or precipitation is occurring with an obscuration, the intensities determined shall be no greater than that which would be determined if any forms were occurring alone. Each intensity (e.g., light, moderate, or heavy) is defined with respect to the type of precipitation occurring, based either on rate-of-fall for rain and ice pellets or visibility for snow and drizzle. The rate-of-fall criteria are based on time, and do not accurately describe the intensity at the time of observation. For this reason, use tables 7.1, 7.2, and 7.3 as a guide to estimate the intensity at the time of observation. Table 7.4., on the other hand, is based on the visibility at the time of observation and must be used to determine intensity of drizzle or snow, if either is occurring alone. If snow or drizzle are present with other obscuring phenomena, use table 7.4. as a guide to determine the snow intensity and use table 7.5. as a guide to determine the intensity of drizzle on a rate-of-fall basis.

7.2.3.2. Rain and Ice Pellets. Determine the intensity of rain and ice pellets as light, moderate, or heavy from the criteria listed in tables 7.1., 7.2., and 7.3.

Table 7.1. Intensity of Rain or Ice Pellets Based on Rate of Fall.

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

Table 7.2. Estimating Intensity of Rain.

Intensity	Criteria
Light	From 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 7.3. 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 (9999 meters).

7.2.3.3. Snow and Drizzle. Determine the intensity of snow and drizzle as light, moderate, or heavy from the visibility criteria in table 7.4 when snow or drizzle are occurring alone.

7.2.3.4. Use table 7.5. to estimate the intensity of drizzle when it is not occurring alone. In no case should the intensity be higher than that which would be determined using visibility as criteria (see table 7.4.).

Table 7.4. Intensity of Snow or Drizzle Based on Visibility.

Intensity	Criteria
Light	Visibility > ½ mile (800 meters).
Moderate	Visibility > ¼ mile (400 meters) but =< ½ mile (800 meters).
Heavy	Visibility =< ¼ mile (400 meters).

Table 7.5. Estimating Intensity of Drizzle on Rate-of-Fall Basis.

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

7.2.3.5. Do not code light or heavy intensities for the blowing (BL) descriptor when used with; blowing dust (BLDU), blowing sand (BLSA), blowing spray (BLPY) and blowing snow (BLSN). Only moderate or heavy intensity shall be ascribed to sandstorm (SS) and duststorm (DS).

7.2.3.6. Proximity Qualifier. The proximity qualifier is vicinity (VC). VC is used for weather phenomena occurring between 5 statute miles/8000 meters and 10 statute miles/16 kilometers from the point(s) of observation unless stated elsewhere in this manual.

7.2.3.6.1. VC may be encoded in combination with tornadic activity (FC), thunderstorms (TS), showers (SH), fog (FG), blowing snow (BLSN), blowing dust (BLDU), blowing sand (BLSA), well-developed dust/sand whirls (PO), sandstorm (SS), and duststorm (DS). VC will be placed before (no space) the precipitation, obscuration, or other weather phenomena entry (i.e., VCSH, VCPO). Intensity qualifiers will not be encoded with VC.

7.2.4. Descriptor Qualifier (Figure 7.2.). Use descriptors to further amplify weather phenomena when appropriate. A maximum of one descriptor may be used with any w'w' group. Code and report (when applicable) only one descriptor for each of up to the maximum of three present weather, obscuration, and other weather phenomena (w'w') group(s). Mist (BR) will not be used in conjunction with any descriptor.

7.2.4.1. Shallow (MI). Used only in combination with FG to describe shallow fog (MIFG). Do not report an intensity with MI. See paragraph 7.2.8.8. for MIFG reporting and encoding criteria.

7.2.4.2. Partial (PR). Used only in combination with FG to describe partial fog (PRFG). Do not report an intensity with PR. See paragraph 7.2.8.9. for PRFG reporting and encoding criteria.

7.2.4.3. Patches (BC). Used only in combination with FG to describe patchy fog (BCFG). Do not report an intensity with BC. See paragraph 7.2.8.10. for BCFG reporting and encoding criteria.

7.2.4.4. Low Drifting (DR). Use the descriptor DR only with dust (DU), sand (SA), or snow (SN) and report DR only when the DU, SA, or SN is raised by the wind to less than 6 feet (1.8 meters) above the ground. Do not report an intensity with DR.

7.2.4.5. Blowing (BL). Use the descriptor BL only with dust (DU), sand (SA), spray (PY), and snow (SN). Report BL only when the phenomena reported is raised by the wind to 6 feet (1.8 meters) or greater above the ground.

7.2.4.6. Showers(s) (SH). Use the descriptor SH in conjunction with precipitation characterized by the suddenness with which it starts and stops, by the rapid changes of intensity, and usually by rapid changes in the appearance of the sky. Use the descriptor SH only with one or more of the precipitation types of rain (RA), snow (SN), ice pellets (PL), small hail (GS), or large hail (GR). Code and report an intensity for all SH entries except SHGR.

7.2.4.7. Thunderstorm (TS). Use the descriptor TS as a stand-alone w'w' group when there is thunder but no precipitation, or with rain (RA), snow (SN), ice pellets (PL), small hail and/or snow pellets (GS), or hail (GR). For example, a thunderstorm with a heavy rainshower would be coded as +TSRA, where the + indicates a heavy rainshower (+ does not indicate a severe thunderstorm, thunderstorm severity is based on hail size and wind speed). A thunderstorm by definition is a descriptor, and therefore has no intensity. Do not code or report the descriptors TS and SH combined into the same w'w' group.

7.2.4.7.1. For reporting purposes, a thunderstorm is considered to have begun and to be occurring at the station when thunder is first heard. It may also be considered as occurring when hail is falling or lightning is observed at or near the airfield, lightning detection equipment indicates lightning strikes with 5NM and the local noise level is such that resulting thunder cannot be heard. A thunderstorm is considered to have ended 15 minutes after the last occurrence of these criteria.

7.2.4.8. Freezing (FZ). Use the descriptor FZ to further describe freezing fog (FZFG), freezing drizzle (FZDZ) and freezing rain (FZRA). Do not code FZ with showers (SH).

7.2.5. Weather Phenomena (Figure 7.2.). Weather phenomena fall into the following three categories: precipitation, obscuration, and other. Phenomena may be combined with the qualifiers (intensity or proximity and descriptors) as needed to further describe present weather w'w'. Code and report up to three types of precipitation in a single present weather group w'w' with the most dominant (based on intensity) coded first. For example, heavy rain with moderate snow and light drizzle would be coded +RASNDZ.

7.2.5.1. Precipitation. Liquid or solid water particles either falling through or suspended in the atmosphere, blown from the surface by wind, or deposited on exposed objects. The common term applied to any product of the condensation of atmospheric water vapor which is deposited on the earth's surface. Types of precipitation reported in aviation observations are limited to those which originate aloft and fall from clouds (i.e., to exclude such forms as virga, dew, and frost). These types of precipitation are classified according to their liquid, freezing, and frozen form or state, as determined at the point of observation.

7.2.5.2. Precipitation Types. Code and report drizzle as DZ; rain as RA; snow as SN; snow grains as SG; ice crystals as IC; ice pellets as PL; hail as GR, and small hail and/or snow pellets as GS. Automated stations will report precipitation of an unknown type as UP.

7.2.5.2.1. Drizzle (DZ). Fairly uniform precipitation composed exclusively of fine drops (diameter less than 0.02 inch or 0.5 mm) very close together. Drizzle appears to float while following air currents although, unlike fog droplets, it falls to the ground. It usually falls from low stratus clouds and is frequently accompanied by low visibility and fog.

7.2.5.2.2. Rain (RA). Precipitation, either in the form of drops larger than 0.02 inch (0.5 mm), or smaller drops, which in contrast to drizzle, are widely separated.

7.2.5.2.3. Snow (SN). Precipitation of snow crystals, mostly branched in the form of six-pointed stars, many times clustered to form snowflakes.

7.2.5.2.4. Snow Grains (SG). Precipitation of very small, white, opaque particles of ice; the solid equivalent of drizzle. The grains are fairly flat or elongated. Diameters are generally less than .04 inch (1 mm). When the grains hit hard ground, they do not bounce or shatter. They usually fall in very small quantities from stratus clouds (or occasionally from fog).

7.2.5.2.5. Ice Crystals (IC). A fall of unbranched (snow crystals are branched) ice crystals in the form of needles, columns, or plates. They are termed ice prisms in Synoptic observations.

Ice crystals are often so tiny they seem to be suspended in the air. They may fall from a cloud or from clear air. The crystals are visible mainly when they glitter in the sunshine or other bright light (diamond dust), thus producing a luminous pillar or other optical phenomena. This hydrometeor (rarely more than the lightest precipitation), which is frequent in polar regions, occurs only at very low temperatures in stable air masses.

7.2.5.2.6. Ice Pellets (PL). Precipitation of transparent or translucent pellets of ice, which are round or irregular, rarely conical, and 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. Hard grains of ice consisting of frozen raindrops or melted and refrozen snowflakes and pellets of snow encased in a thin layer of ice formed from the freezing, either of droplets intercepted by the pellets, or of water resulting from the partial melting of the pellets.

7.2.5.2.7. Hail (GR) and Small Hail (GS). Precipitation in the form of small balls or other pieces of ice falling separately or frozen together in irregular lumps. Hailstones consist of alternate opaque and clear layers of ice in most cases. Hail is normally associated with thunderstorms and surface temperatures above freezing. GS is defined as hail smaller than 0.2 inches (5 mm) and GR is 0.2 inches (5 mm) or larger.

7.2.5.2.8. Code and report the diameter of the largest hailstone, measured in ¼ inch increments. No column 13 remark is necessary for the size of small hail (GS) or snow pellets (GS) because GS is smaller than 0.2 inches/5 mm in diameter.

7.2.5.2.9. Snow Pellets (GS). Precipitation of white, opaque grains of ice. The grains 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; and, when they fall on hard ground, they bounce and often break up. They generally fall together with snow showers or rain showers when the surface temperature is around 0 degrees Celsius. They may occasionally fall from stratocumulus.

7.2.5.2.10. Unknown Precipitation (UP). The precipitation contraction UP shall be used only by automated equipment.

7.2.6. Obscurations (Table 3.4. Column 4). Any phenomena in the atmosphere, other than precipitation, that reduces the visibility. Obscurations are more or less suspended in the air or lifted from the ground by wind. Code and report each obscuration as a separate w'w' group using up to a maximum of three w'w' groups. Do not combine an obscuration with another phenomena, precipitation or other weather phenomena into the same w'w' group.

7.2.6.1. If an obscuration is present it shall be reported when the surface prevailing visibility is reduced to less than 7 miles (9999 meters), or the obscuration is considered to be operationally significant. The obscurations volcanic ash (VA), low drifting dust (DRDU), low drifting sand (DRSA), low drifting snow (DRSN), shallow fog (MIFG), partial fog (PRFG), and patches of fog (BCFG) shall be carried even if the surface prevailing visibility is not reduced to less than 7 miles (9999 meters). When observed, volcanic ash will always be coded in the body of the report.

7.2.6.2. Obscuration Types.

7.2.6.2.1. Mist (BR). A hydrometer consisting of an aggregate of microscopic and more-or-less hygroscopic water droplets or ice crystals suspended in the atmosphere that reduces horizontal visibility to less than 7 miles (9999 meters) but equal to or greater than 5/8 mile (1000 meters). Water droplets may or may not be freezing upon contact with the exposed objects. **NOTE:** In the French language, the term for mist is brume; hence, the contraction BR for mist.

7.2.6.2.2. Fog (FG). A visible aggregate of minute water particles (droplets) which are based at the Earth's surface, extends vertically, and reduces horizontal visibility to less than 5/8 mile (1000 meters. These water droplets may or may not freeze upon contact with exposed objects. When fog is further described by the descriptors BC, MI, or PR, the prevailing visibility may be equal to or greater than 5/8 mile (1000 meters). Unlike drizzle, FG does not fall to the ground.

7.2.6.2.3. Smoke (FU). A suspension in the air of small particles produced by combustion. A transition to haze may occur when smoke particles have traveled great distances (25 to 100 miles or 40 to 160 kilometers or more) and when the larger particles have settled out and the remaining particles have become widely scattered through the atmosphere. When viewed through smoke, the disk of the sun at sunrise and sunset appears very red. The disk may have an orange tinge when the sun is above the horizon. Evenly distributed smoke from distant sources generally has a light grayish or bluish appearance.

7.2.6.2.4. Volcanic Ash (VA). Fine particles of rock powder blown out of a volcano which may remain suspended in the atmosphere for long periods. The ash is a potential hazard to aircraft operations and may be an obscuration. It will always be carried when present, even if it does not reduce the visibility.

7.2.6.2.5. Dust (DU). Fine particles of earth or other matter raised or suspended in the air by the wind from either at the station or transported by the wind from other locations. Dust gives a tan or gray tinge to distant objects. The sun's disk is pale and colorless or has a yellow tinge through dust.

7.2.6.2.6. Sand (SA). Particles of loose, granular, gritty particles of worn or disintegrated rock picked up from the earth's surface by wind.

7.2.6.2.7. Haze (HZ). A suspension in the air of extremely small, dry particles invisible to the naked eye and sufficiently numerous to give the air an opalescent appearance. This phenomenon resembles a uniform veil over the landscape and subdues all colors. Dark objects viewed through this veil tend to have a bluish tinge while bright objects, such as the sun or distant lights, tend to have a dirty yellow or reddish hue. When haze is present and the sun is well above the horizon, its light may have a peculiar silvery tinge. Haze particles may be composed of a variety of substances; e.g., dust, salt, residue from distant fires or volcanoes, pollen, etc., which generally are well diffused through the atmosphere.

7.2.6.2.8. Spray (PY). An ensemble of water droplets torn by the wind from an extensive body of water, generally from the crests of waves, and carried up into the air in such quantities to reduce the prevailing visibility. Only carried with the descriptor BL (BLPY).

7.2.7. Other Weather Phenomena (**table 7.4.** Column 5). Code and report each other weather phenomena as a separate w'w' group using up to a maximum of three w'w' groups. Do not combine another w'w' group with another precipitation, obscuration or other weather phenomena into the same w'w' group.

7.2.7.1. Well-Developed dust/sand whirls (PO). An ensemble of particles of dust or sand, sometimes accompanied by small litter, raised from the ground in the form of a whirling column of varying height with a small diameter and an approximately vertical axis. Commonly called dust devil and reported regardless of the visibility.

7.2.7.2. Squalls (SQ). A strong wind characterized by a sudden onset in which the wind increases at least 16 knots and is sustained at 22 knots or more for at least one minute. Although a wind event, SQ is reported as a present weather (w'w') event. **NOTE:** A squall cannot be determined by an AFW wind system with no wind trace capability (e.g., AN/FMQ-13).

7.2.7.3. Funnel Cloud (FC). A violent, rotating column of air which does not touch the ground, usually appended to a cumulonimbus cloud. Also called a tuba. A funnel cloud is considered to be occurring at the station when the phenomenon is visible from the point(s) of observation. When reporting FC activity, spell out the appropriate type in remarks.

7.2.7.4. Tornado (+FC). A violent, rotating column of air touching the ground; funnel cloud touching the ground. A tornado nearly always starts as a funnel cloud (FC) and is accompanied by a loud, roaring noise. A tornado is considered to be occurring at the station when the phenomenon is visible from the point(s) of observation. When reporting +FC activity, spell out the appropriate type in remarks.

7.2.7.5. Waterspout (+FC). A violent, rotating column of air that forms over a body of water, such as a bay, gulf, or lake, and touches the water surface; a tornado or funnel cloud that touches a body of water. A waterspout is considered to be occurring at the station when the phenomenon is visible from the point(s) of observation. When reporting +FC activity, spell out the appropriate type in remarks.

7.2.7.6. Sandstorm (SS). Particles of sand ranging in diameter from 0.008 inches to 1 millimeter carried aloft by a strong wind. The sand particles are mostly confined to the lowest ten feet, and rarely rise more than fifty feet above the ground. A sandstorm is reported if the prevailing visibility is reduced to less than 5/8 miles (1000 meters), but not less than 5/16 miles (500 meters). Report a heavy (severe) sandstorm (+SS) if the visibility is reduced to less than 5/16 miles (500 meters).

7.2.7.7. Duststorm (DS). An unusual, frequently severe weather condition characterized by strong winds and dust-filled air over an extensive area. Report a duststorm if the prevailing visibility is reduced to less than 5/8 miles (1000 meters), but not less than 5/16 miles (500 meters). Report a heavy (severe) duststorm (+DS) if the visibility is reduced to less than 5/16 miles (500 meters).

7.2.8. Descriptor/Weather Phenomena Combinations. The following are examples of the most common descriptor/weather phenomena (w'w') combinations.

7.2.8.1. Blowing Snow (BLSN). Snow particles raised and stirred violently by the wind to moderate or greater (6 feet or higher) heights. Prevailing visibility is reduced to less than 7 miles (9999 meters) and the sky may become obscured when the particles are raised to moderate or greater heights. When blowing snow is observed with snow falling from clouds, code and report both phenomena, e.g., SN BLSN. If there is blowing snow and weather personnel cannot determine whether or not snow is also falling, then report only BLSN.

7.2.8.2. Blowing Sand (BLSA). Sand raised and stirred by the wind to moderate or greater (6 feet or higher) heights. Prevailing visibility is reduced to less than 7 miles (9999 meters) and the sky may become obscured when the sand is raised to moderate or greater heights.

7.2.8.3. Blowing Dust (BLDU). Dust raised and stirred by the wind to moderate or greater (6 feet or higher) heights. Prevailing visibility is reduced to less than 7 miles (9999 meters) and the sky may become obscured when the dust is raised to moderate or greater heights.

7.2.8.4. Blowing spray (BLPY). An ensemble of water droplets torn by the wind from an extensive body of water, generally from the crests of waves, and carried up into the air in such quantities to reduce the prevailing visibility to less than 7 miles (9999 meters).

7.2.8.5. Drifting Snow (DRSN). Snow particles raised by the wind to heights less than 6 feet above the ground. Drifting snow alone does not reduce the prevailing visibility to less than 7 miles (9999 meters) at observation level although obscurations below this level may be veiled or hidden by the particles moving nearly horizontal to the ground.

7.2.8.6. Drifting Sand (DRSA). Sand raised by the wind to heights less than 6 feet above the ground. Drifting sand alone does not reduce the prevailing visibility to less than 7 miles (9999 meters) at observation level although obscurations below this level may be veiled or hidden by the particles moving nearly horizontal to the ground.

7.2.8.7. Drifting Dust (DRDU). Dust raised by the wind to heights less than 6 feet above the ground. Drifting dust alone does not reduce the prevailing visibility to less than 7 miles (9999 meters) at observation level although obscurations below this level may be veiled or hidden by the particles moving nearly horizontal to the ground.

7.2.8.8. Shallow Fog (MIFG). A shallow uniform layer of fog that has a vertical extent of less than 6 feet (1.8 meters) and the apparent visibility within the fog is less than 5/8 miles (1000 meters). Code and report MI only with FG and not with mist (BR).

7.2.8.9. Partial Fog (PRFG). A homogeneous but vertically thin layer of fog (FG) that uniformly covers a substantial portion of the station. Partial fog has a vertical extent equal to or greater than 6 feet but less than 20 feet (1.8 to 6 meters), is not patchy, reduces horizontal visibility uniformly in all sectors, but to a lesser extent vertically. Code and report PR only with FG and not with mist (BR).

7.2.8.10. Patches of Fog (BCFG). A patch of fog (FG) that unevenly covers a portion of the station. The visibility (or apparent visibility) within the patch(es) of fog must be less than 5/8 miles (1000 meters), and the prevailing visibility outside the patch(es) of fog must be equal to or greater than 5/8 miles (1000 meters). Patchy fog has a vertical extent of at least 6 feet (1.8 meters), and reduces horizontal visibility unevenly in one or more sectors (e.g., fog bank), but to a lesser extent vertically. Code and report BC only with (FG) and not with mist (BR). BCFG may be coded with a prevailing visibility of 7 miles (9999 meters) or greater. When using BCFG, a sector visibility remark should also be encoded in column 13.

7.2.8.11. Freezing Fog (FZFG). A suspension of numerous minute water droplets in the air, (or ice crystals) with temperatures at and below 0 degrees Celsius, based at the Earth’s surface that has a vertical extent equal to or greater than 6 feet (1.8 meters). FZFG reduces prevailing visibility to less than 5/8 mile (1000 meters) and, unlike drizzle, does not fall to the ground. The water droplets may freeze upon contact with exposed objects to form a coating of rime or glaze ice. Freezing can occur even though the air temperature is slightly above freezing because the water droplets are supercooled or because the temperatures of certain objects (i.e., metal surfaces, cold ground) may be below 0 degrees Celsius. Also called Ice Fog.

7.2.8.12. Freezing Drizzle (FZDZ). Drizzle which freezes upon contact with the ground, with objects in flight, or with objects on the ground. Produces glaze (clear) ice.

7.2.8.13. Freezing Rain (FZRA). Rain that freezes on contact with the ground, with objects in flight, or with objects on the ground. Produces glaze (clear) ice.

Chapter 8

SKY CONDITION

8.1. General Information. The instructions in this chapter establish the requirements and methods used in observing the appearance of the sky. The *WMO International Cloud Atlas*, Volume II, and *Cloud Types for Observers* (available through the United States Air Force Combat Climatological Center Library [AFCCC/DOL]) contain detailed instructions and photographs for identifying the various cloud forms.

8.2. Standard Definitions.

8.2.1. 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.

8.2.2. 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.

8.2.3. 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.

8.2.4. 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.

8.2.5. Obscuring Phenomena. Any collection of aerosol particles aloft or in contact with the earth's surface dense enough to be discernible to the weather personnel (e.g., haze, fog, smoke). The term is also applicable to precipitation (e.g., rain, snow, drizzle) when it obscures part or all of the sky.

8.2.5.1. Code obscurations (surface-based or aloft) in the format w'w' $N_sN_sN_sh_sh_sh_s$ where w'w' is the weather phenomena causing the obscuration at the surface or aloft, $N_sN_sN_s$ 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. Code surface-based obscurations with a height of 000. For example, a surface-based partial obscuration of fog hiding $1/8^{th}$ of the sky should be coded in column 3 as FEW000 and the remark in column 13 would be FG FEW000. An $1/8^{th}$ layer of smoke at 800 feet would be coded in column 3 as FEW008 and the remark in column 13 would be FU FEW008.

8.2.6. 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, surface-based obscuring phenomena 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. Refer to figure 8.1., which lists the priority for reporting layers.

8.2.7. 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.

8.2.8. 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 is applicable for the evaluation of both total sky cover as well as the determination of the ceiling layer. See examples in figure 8.2.

Figure 8.1. 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

Figure 8.2. Examples of Sky Cover Summation.

Sky Cover Layers	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	
8/8 altostratus at 9,000 feet	8/8	FEW005 FEW020 BKN030CB OVC090	
2/8 smoke at 500 feet	2/8	FEW005	FU FEW005
indefinite ceiling obscured by snow	8/8	FEW005 VV010	FU FEW005
vertical visibility at 1,000 feet			
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

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

8.2.10. Ceiling. The height above the earth's surface ascribed to the lowest non surface-based layer that is reported as broken or overcast or the vertical visibility into a surface-based obscuration that totally hides the sky (indefinite ceiling).

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

8.2.12. 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.

8.2.12.1. Sky Cover Amounts.

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

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

8.2.13. 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:

8.2.13.1. Clear. A term used to describe the absence of clouds or obscuring phenomena. Entered on the form and transmitted as SKC.

8.2.13.2. 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. Entered on the form and transmitted as FEW.

8.2.13.3. Scattered. A summation sky cover of 3/8ths through 4/8ths. Entered on the form and transmitted as SCT.

8.2.13.4. 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. Entered on the form and transmitted as BKN.

8.2.13.5. Overcast. A summation sky cover of 8/8ths. Entered on the form and transmitted as OVC.

8.2.13.6. Obscured. A sky cover of 8/8ths. A condition in which surface-based obscuring phenomena (e.g., fog, rain, snow) are hiding 8/8ths of the sky. The terms *obscuration* and *indefinite ceiling* may also be used in relation to this sky condition. Entered on the form and transmitted as $VVh_sh_sh_s$.

8.2.13.7. Figure 8.3. shows the contractions, contraction meaning, and the corresponding amounts for each contraction.

8.2.13.8. 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 entered on the form as FEW000 and clarified in remarks as FG FEW000.

Figure 8.3. Contractions for Sky Cover.

Reportable Contraction	Meaning	Summation Amount of Layer
SKC (or CLR[1])	Clear	0
FEW[2]	Few	1/8 – 2/8
SCT	Scattered	3/8 – 4/8
BKN	Broken	5/8 – 7/8
OVC	Overcast	8/8
VV	Vertical Visibility (Obscured)	8/8

1. Fully automated stations will use the abbreviation CLR when no layers at or below 12,000 feet are detected. Manual stations use the abbreviation SKC when no layers are reported.

2. Any cloud layer amount less than 1/8 reported as FEW.

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

8.2.15. Variable Ceiling. 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 figure 8.4.

8.2.15.1. Variable Ceiling Height. When a ceiling height below 3,000 feet is varying during the period of observation, code and report a variable ceiling height in the format, CIG $h_nh_nh_nVh_xh_xh_x$, where CIG is the remark identifier, $h_nh_nh_n$ is the lowest ceiling height evaluated, V denotes variability between two values, and $h_xh_xh_x$ is the highest ceiling height evaluated. Leave a blank space following the remark identifier CIG; and no spaces between the letter V and the lowest/highest ceiling values. For example, CIG 005V010 would indicate a ceiling varying between 500 and 1,000 feet. The average of all ceiling height values observed during the period of observation will be coded and reported in column 3.

8.2.15.2. Height Variation Criteria for Variable Ceiling. The variation requirement will be based on the lowest ceiling height reported in column 13. For example, CIG 009V012 requires a variability of >=200 feet (based on 009), while CIG 018V022 requires a variability of >=400 feet (based on 018).

Figure 8.4. Height Variation Criteria for Variable Ceiling.

Ceiling (feet)	Variation (feet)
<1,000	>=200
>1,000 to <2,000	>=400
>2,000 to <3,000	>=500

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

8.2.16.1. Report a variable sky condition if the sky cover below 3,000 feet varies by one or more reportable values (FEW, SCT, BKN, OVC) during the period of observation. Code the variable sky condition as a column 13 remark in the format, $N_sN_sN_s(h_sh_sh_s)$ V $N_sN_sN_s$, where N_sN-

$_sN_s(h_sh_sh_s)$ and $N_sN_sN_s$ identifies the two sky conditions (FEW, SCT, BKN, OVC) and V denotes the variability between the two ranges. If there are several layers with the same sky condition amount, code only layer height $(h_sh_sh_s)$ of the variable layer. For example, a cloud layer at 1,400 feet varying between broken and overcast would be coded BKN014 V OVC.

Figure 8.5. Examples of Sky Condition and Variable Ceiling Remark Entries.

Column 3	**Column 13**
OVC008	CIG 007V009
SCT002 OVC010	CIG 009V012
SCT000 OVC012	FG SCT000 CIG 010V014
BKN025 OVC040	CIG 022V028

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

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

8.2.17.2. The height corresponding to the upper limit of a ceilometer reading, the top of a ceiling light projector beam, or the height at which a balloon completely disappears into the obscuring phenomena.

8.2.17.3. The maximum vertical height above the surface from which a pilot can discern the ground.

8.3. Observing Procedures.

8.3.1. Sky Condition Evaluation. Sky condition observations require an evaluation of atmospheric phenomena which prevent an uninterrupted view of the celestial dome. Evaluate the type, amount, direction of movement, and height of bases of layers, and the affect of surface-based obscuring phenomena on vertical visibility.

8.3.1.1. Evaluation of Multiple Layers. A series of observations will often show the existence of upper layers above a lower layer. Through lower layers it may be possible to observe higher layers. Differences in the direction of cloud movement are often a valuable aid in observing and differentiating between layers, particularly when the presence of haze, smoke, etc., make depth perception difficult. Use ceilometer and ceiling light readings as guides in determining the presence of multiple layers at night.

8.3.1.2. Interconnection of Layers. When clouds formed by the horizontal extension of swelling cumulus or cumulonimbus are attached to a parent cloud, they are 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 is regarded as a single layer at a height corresponding to that of the base of the parent cloud.

8.3.2. Sky Cover Classification.

8.3.2.1. Determining Layer Sky Cover Amounts**.** Estimate the amount of sky cover of each individual layer of cloud cover or obscuring phenomena. Use the following methods as a guide:

8.3.2.1.1. 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 procedure can be done by estimating the amount of clear sky. Subtract this amount from 8/8ths to obtain an estimate of layer coverage.

8.3.2.1.2. During darkness, consider the sky to be clear if the stars are plainly visible and no cloud or obscuring phenomena is observed. When the stars are dimmed, the dimming is evidence of the presence of cloud or obscuring phenomena and will be of assistance in determining the amount and opacity of the layer.

8.3.2.1.3. The amount of a low layer may often be estimated with the aid of the ceiling light projector beam or ceilometer display. The proportion of time the layer is observed crossing the projector beam (or detector) gives some indication of the amount. Reflection (sky glow) from a city or other lights may also be useful in estimating the amount of low cloud layers.

8.3.2.1.4. Advancing or Receding Layers. 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 8.1.** 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. Figure 8.6 provides an example.

Figure 8.6. Determining Actual Sky Cover.

Forward edge	78 degrees	3/8
Rear edge	53 degrees	2/8
Difference (actual sky cover)		1/8

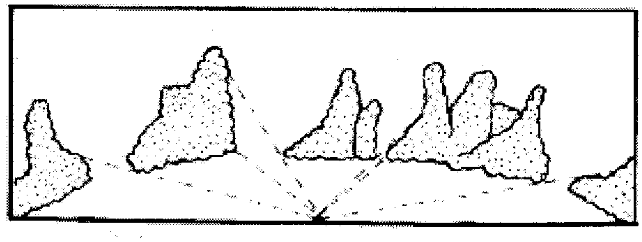
8.3.2.1.5. Continuous Layer Surrounding the Station. To estimate the amount of a continuous layer surrounding the station and extending to the horizon, determine the angular elevation of the edge of the layer and convert it to a sky cover amount using **table 8.1.** This method is most useful in determining the amount of sky hidden for a partly obscured condition.

Table 8.1. Sky Cover Evaluation.

Angle of Advancing or Receding Layer Edge	Eighths of Sky Cover	Angular Elevation of Layer Surrounding the Station
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

8.3.2.1.6. 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 8.7. for an illustration of this effect). Estimate the layer sky cover on the basis of the amount of sky actually covered (i.e., to include both the base and sides of the cloud or obscuration).

Figure 8.7. Illustration of Packing Affect.



8.3.2.2. Evaluation of Sky Cover Amounts. Evaluate sky cover amounts as follows, beginning with the lowest layer and proceeding in ascending order of height.

8.3.2.2.1. 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.

8.3.2.2.2. 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 which are visible through lower clouds.

8.3.3. Determination of Layer Heights. Determine height data in feet above surface (field elevation) to the nearest reportable value as specified in figure 8.8. for each layer aloft and for the vertical visibility into an indefinite ceiling. The preferred methods for evaluation of layer height, or vertical visibility into a surface-based indefinite ceiling, is the use of, a ceilometer operating within its operational range, or the known height of unobscured portions of abrupt, isolated objects within 1 1/2 miles (2400 meters) of a runway. Alternative methods include:

Figure 8.8. Reportable Sky Cover Height Values.

Range of Height Values (feet)	Reportable Increment (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

8.3.3.1. Tactical Laser Range Finder or Tactical Cloud Height Indicator.

8.3.3.2. Aircraft report. Convert height reported above mean sea level to height above ground level. Do not use pilot reported height data in the observation if, in the judgment of weather personnel, it is not representative of conditions over the airfield.

8.3.3.3. Convective cloud height (**table 8.2.**).

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

8.3.3.5. Ceiling light.

8.3.3.6. Ascension rate of a ceiling balloon.

8.3.3.7. Laser Beam Ceilometer (LBC) values that exceed the maximum operating range of 12,000 feet or rotating beam ceilometer (RBC) values that equal or exceed 10 times the baseline used or the penetration of the light beam is in excess of normal for the particular height and type of layer present.

8.3.3.8. The apparent size of cloud elements, rolls, or features visible in the layer. Large rolls or elements greater than five degrees wide (three fingers is about 5 degrees when at arms length) usually indicate the layer is relatively low while 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.

8.3.3.9. Reflection of city or other lights at night. During darkness, lights may be reflected off the base of a layer which could assist in estimating the layers height. For example, through experience and reliable measurements, a unit may have noted cloud layers over a city to the west are noticeably illuminated when the base is 5,000 feet or lower. However, the same unit may have also noted a layer must be at 1,000 feet or lower for any appreciable illumination from a small town to the northeast of the station.

8.3.3.10. Persistence of height previously classified, weather personnel experience, and visual estimates when other guides are not available or are considered unreliable.

Table 8.2. Convective Cloud Heights.

TT - TdTd Degrees Celsius	**Estimated Cumulus Height (feet)**	**TT - TdTd Degrees Celsius**	**Estimated Cumulus Height (feet)**
0.5	200	1.0	400
1.5	600	2.0	800
2.5	1,000	3.0	1,200
3.5	1,400	4.0	1,600
4.5	1,800	5.0	2,000
5.5	2,200	6.0	2,400
6.5	2,600	7.0	2,800
7.5	3,000	8.0	3,200
8.5	3,400	9.0	3,600
9.5	3,800	10.0	4,000
10.5	4,200	11.0	4,400
11.5	4,600	12.0	4,800
12.5	5,000		

NOTES:

1. This table is not suitable for use at stations situated in mountainous or hilly terrain, and it should be used only when clouds are formed by active surface convection in the vicinity of the station. Use with caution when the surface temperature is below freezing due to the difficulties inherent in the accurate determination of the dewpoint at low temperatures.

2. The temperature factor in the table is based on the difference between air and dewpoint temperatures. Reportable height values between those in the table may be obtained by means of interpolation using the difference to the nearest tenth of a degree. Examples:

	A	**B**
Air Temperature	23	27.4
Dewpoint Temperature	16	17.1
Difference	7	10.3
Estimated Height	2,800	4,200

8.3.4. Determination of Cloud Movement. Requirements for reporting the direction of movement of clouds are generally limited to towering cumulus and cumulonimbus. Determine direction of movement to the eight points of the compass (i.e., N, NE, E, SE, etc.) towards which the layer is moving with respect to true north.

8.3.4.1. In most cases, movement can best be estimated by observing the cloud motion past a stationary object (vertical pole, the side of a building, etc.) of known orientation.

8.3.4.2. When clouds are moving slowly, the direction of motion can be determined with reasonable accuracy by taking several observations a few minutes apart, and by noting the relative position of cloud elements with respect to the previous observations. Additionally, direction of movement for thunderstorms can be based on radar or movement of lightning strikes on lightning detection equipment.

8.3.5. Determination of Type of Cloud (Order of Priority, Cloud Present, and Cloud Code Figure). Identify and code the predominant low cloud C_L, middle cloud C_M, and high cloud C_H, in the Cloud Types group ($8/C_LC_MC_H$) using **table 8.3.**, **table 8.4.**, and **table 8.5.** Additionally, refer to the WMO International Cloud Atlas-Volumes I and II, the WMO Abridged International Cloud Atlas, or agency observing aids for cloud identification and precipitation categorization.

8.4. Cloud Height Measuring Equipment Operations and Instrument Evaluation.

8.4.1. General. Operate and use cloud height measuring equipment according to appropriate technical orders (TO) or operating manuals. In addition, refer to **chapter 2** for specific procedures applicable to stations with multiple instrumentation. Supplement instrumental evaluations with visual observations.

8.4.2. Period of Ceilometer Operation. As a minimum, the RBC or LBC must be in operation during periods in which clouds (within the height determination capability of the equipment), fog, or mist are present or forecast to be present within 3 hours.

Table 8.3. Coding of CL Clouds.

Order of Priority	CL Cloud Present	CL Description	CL Code Figure
1st	A. Cumulonimbus present, with or without other CL clouds:	1. The upper part of at least one of the CB clouds present is clearly fibrous or striated. By convention, code figure 9 is used for CBMAM and those cases in which radar, lightning, thunder, or hail indicates the presence of a CB but the top is hidden by other clouds.	9
		2. The upper part of none of the CB clouds present is clearly fibrous, striated, or in the form of an anvil.	3
2nd	B. No Cumulonimbus present:	1. SC formed by the spreading out of CU is present.	4
3rd		2. Code figure 4 is not applicable, and CU and SC (not formed by the spreading out of CU) with bases at different levels are present.	8
		3. Code figures 4 and 8 are not applicable, and TCU or CU of moderate or strong vertical extent are present.	2
4th	C. No Cumulonimbus present, and CL code figures 4, 8, and 2 are not applicable.	1. Predominant type of low cloud is CU with little vertical extent and seemingly flattened, or ragged CU other than of bad weather, or both.	1
		2. Predominant type of low cloud is SC other than that formed by the spreading or flattening of CU.	5
		3. Predominant type of low cloud is ST in a relatively continuous layer, or ragged shreds (other than of bad weather), or both.	6
		4. Predominate type of low cloud is STFRA of bad weather or CUFRA of bad weather, or both (pannus); usually below AS or NS.	7

NORMAL CL HEIGHT RANGE	POLAR REGIONS	TEMPERATE REGIONS	TROPICAL REGIONS
	Surface-6,500 ft Surface-1,981 m	Surface-6,500 ft Surface-1,981 m	Surface-6,500 ft Surface-1,981 m

Table 8.4. Coding of CM Clouds.

Order of Priority	CM Cloud Present	CM Description	CM Code Figure
1st	A. Altocumulus present (with or without AS or NS):	1. AC of a chaotic sky is present (generally at several levels), with or without AS or NS.	9
		2. Code figure 9 is not applicable; and, AC with sproutings in the form of turrets or battlements or AC having the appearance of small cumuliform tufts is present, with or without AS or NS. Altocumulus Castellanus (ACC).	8
2nd	B. Altocumulus present (with AS or NS):	1. Code figures 9 and 8 are not applicable; and, AS or NS is present together with AC.	7
3rd	C. Altocumulus present (without AS or NS):	1. Preceding code figures are not applicable; and, AC present is formed by the spreading or flattening of CU and CB.	6
		2. Preceding code figures are not applicable; and, AC present is progressively invading the sky.	5
		3. Preceding code figures are not applicable; and, AC present is in the form of semitransparent patches (often almond-shaped, fish-shaped or lenticular), continuously changing in appearance and occurring at one or more levels. Altocumulus Standing Lenticular (ACSL).	4
		4. Preceding code figures are not applicable; and, AC is present at two or more levels, not progressively invading the sky.	7
3rd	C. Altocumulus present (without AS or NS):	5. Preceding code figures are not applicable; and, predominantly opaque AC is present at one level, not progressively invading the sky.	7
		6. Preceding code figures are not applicable; and, predominantly semitransparent or transparent AC is present at one level, not progressively invading the sky.	3
4th	D. No Altocumulus present:	1. NS or predominant opaque AS is present.	2
		2. No NS, and AS present is predominantly semitransparent or transparent.	1

NORMAL CM HEIGHT RANGE	POLAR REGIONS	TEMPERATE REGIONS	TROPICAL REGIONS
	6,500-13,000 ft 1,981-3,962 m	6,500-23,000 ft 1,981-7,010 m	6,500-25,000 ft 1,981-7,620 m

Table 8.5. Coding of CH Clouds.

Order of Priority	CH Cloud Present	CH Description	CH Code Figure
1st	A. Cirrocumulus (alone or predominant):	1. CC is present alone, or CC amount is predominant when compared with combined sky cover of any CI and CS present.	9
2nd	B. Cirrostratus (with or without CI or CC and code figure 9 is not applicable):	1. CS covers the entire sky (10/10 or 8/8 sky cover).	7
		2. CS does not cover the whole sky and is not invading the celestial dome.	8
		3. CS (or CS and CI) is progressively invading the sky and the continuous veil extends more than 45 degrees above the local horizon but does not cover the whole sky.	6
		4. CS (or CS and CI) is progressively invading the sky and the continuous veil extends 45 degrees or less above the local horizon.	5
3rd	C. Cirrus (code figure 9 not applicable and no CS present):	1. CI (hooks, filaments or strands) progressively invading the sky and generally growing denser.	4
		2. Code figure 4 is not applicable; and, dense CI present (often if the form of an anvil) originated from cumulonimbus.	3
		3. Code figures 4 and 3 are not applicable; and, CI present is predominantly dense patches or with sproutings in the form of small tufts or battlements.	2
		4. Code figures 4, 3 and 2 are not applicable; and, CI present is predominantly in the form of thin filaments, strands or hooks (not progressively invading the sky. CI present alone resulting from condensation trails (CONTRAILS).	1

NORMAL CH HEIGHT RANGE	POLAR REGIONS	TEMPERATE REGIONS	TROPICAL REGIONS
	10,000-25,000 ft	16,500-45,000 ft	20,000-60,000 ft
	3,048-7,620 m	5,029-13,716 m	6,096-18,288 m

8.4.3. Balloon Height Evaluation. Stations not equipped with a ceilometer or ceiling light, should maintain the capability to obtain height data using balloon height equipment. If a more accurate method is not available, begin using ceiling or pilot balloons to obtain sky cover height data whenever:

8.4.3.1. The ceiling is known to be at or below the minimum height for VFR operations in the airfield traffic area.

8.4.3.2. The ceiling height is known to be 2,000 feet or less, and the presence of nimbostratus or other stratiform cloud layer make estimation difficult.

8.4.4. Release Procedures. Release at a frequency consistent with evident changes in height which have occurred since the last determination was made, particularly in relation to SPECI and LOCAL criteria. **NOTE:** Approval must be obtained from the ATC agency before each balloon release.

8.4.4.1. The following instructions summarize the steps involved in obtaining balloon height estimates:

8.4.4.1.1. Choose the appropriate color of balloon. Red balloons are usually preferable with thin clouds, and blue or black balloons should be used under other conditions.

8.4.4.1.2. Watch the balloon continuously, and determine with a stop watch (or any watch having a second hand) the length of time that elapses between release of the balloon and entry into the base of the layer. Consider the point of entry as midway between the time the balloon first begins to fade and the time of complete disappearance for layers aloft. Use the point at which the balloon disappeared as a guide in estimating the vertical visibility of an indefinite ceiling condition.

8.4.4.1.3. Use **table 8.6.** (or a locally prepared table) to determine the height above the point of observation corresponding to the nearest 5 seconds of elapsed ascent time.

Table 8.6. Balloon Ascension Rates.

Time in Minutes and Seconds	**10-gram spherical**		**30-gram PIBAL**	
	Day		**Day**	**Night**
	Nozzle Lift 40-gram Hydrogen (Notes 1,2)	Nozzle Lift 45-gram Helium or 43-gram Helium (Notes 1,3)	Nozzle Lift 125-gram Hydrogen or 139-gram Helium (Notes 1,4)	Nozzle Lift 170-gram Hydrogen or 192-gram Helium (Notes 4,5)
0:10	80	80	120	
0:20	170	170	240	
0:30	250	250	350	
0:40	330	330	470	
0:50	400	420	590	
1:00	480	500	710	
1:10	540	580	820	
1:20	610	650	930	
1:30	670	730	1,030	
1:40	730	810	1,140	
1:50	790	880	1,250	
2:00	850	960	1,360	
2:30	1,030	1,190	1,680	
3:00	1,210	1,420	2,010	
3:30	1,390	1,650	2,320	
4:00	1,570	1,880	2,630	
4:30	1,750	2,090	2,940	
5:00	1,930	2,300	3,250	
5:30	2,110	2,510	3,540	
6:00	2,290	2,930	3,840	
6:30	2,470	2,930	4,130	
7:00	2,650	3,140	4,430	
7:30	2,830	3,350	4,720	
8:00	3,010	3,560	5,020	

NOTES:

1. The daytime table for 10- and 30-gram balloons may be used at night when the ML-608 lighting unit is used and attached before inflation.

2. Add 180 feet for each additional 1/2 minute after 8 minutes.

3. Add 210 feet for each additional 1/2 minute after 8 minutes.

4. Add 295 feet for each additional 1/2 minute after 8 minutes.

5. Attach lighting unit after inflation.

8.4.4.1.4. Algebraically add to the tabular value the difference between the height of the observation site and field elevation, and round off the result to the nearest reportable height increment. **NOTE:** This step is not applicable to locally prepared tables in which the tabular values have been corrected for the difference in elevation.

8.4.4.1.5. The relative accuracy of height data obtained by balloon may be adversely affected by conditions such as those indicated below; therefore, data must be used with caution.

8.4.4.1.6. The balloon rate of ascent is significantly reduced by rain and when a light is attached.

8.4.4.1.7. Strong winds with poor horizontal visibility may result in too low an indication of height. The large horizontal movement of the balloon in flight and the reduced visibility may make it appear the balloon entered the cloud before it actually did so.

8.4.4.1.8. Entry into an unrepresentative portion of the cloud base or through a break in the layer may result in inaccurate height evaluations. If time allows in such cases, another balloon should be released in an attempt to hit the cloud base.

Chapter 9

TEMPERATURE AND DEWPOINT

9.1. General Information. This chapter contains observing procedures for temperature and humidity data in aviation observations. The procedures are based on those applicable to national and international practices. When practical, equivalent metric units are included with the conventional US units.

9.2. Standard Definitions.

9.2.1. 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 9.1.** for a Fahrenheit to Celsius temperature conversion chart.

9.2.2. Dewpoint Temperature. The temperature to which a given parcel of air must be cooled at constant pressure and constant water vapor content for saturation to occur.

9.2.3. Dry-Bulb Temperature. The ambient temperature registered by the dry-bulb thermometer of a psychrometer. It is identical with the temperature of the air and may be used in that sense.

9.2.4. Hygrothermometer. An instrumental system for obtaining dewpoint and ambient air temperatures from dial indication or recorder traces and the use of remote sensors as thermometers. The ambient air temperature dial indicator is usually equipped with pointers for determining maximum and minimum temperature extremes.

9.2.5. Psychrometer. An instrument used for measuring the water vapor content of the air. It can consist of two ordinary glass thermometers or be a hand-held sensing device.

9.2.5.1. When using the glass mercury thermometer psychrometer, the bulb of the wet-bulb thermometer is covered with a clean muslin wick, which is saturated with water before an observation. When the bulbs are properly ventilated, they indicate the wet- and dry-bulb temperatures of the atmosphere.

9.2.5.2. When using the hand-held sensing device, the temperature and dewpoint readings are shown in a display area.

9.2.6. Psychrometric Calculator. A circular slide rule used to compute dewpoint and relative humidity from known values of wet- and dry-bulb temperatures and the normal station atmospheric pressure. Instructions for the use of this calculator are printed on it.

9.2.7. Psychrometric Tables . Tables prepared from a psychrometric formula and used to obtain dewpoint and relative humidity from known values of wet- and dry-bulb temperatures.

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

9.2.9. Sling Psychrometer. A device for determining psychrometric data consisting of two matched thermometers mounted on a common back. The wet bulb is covered with a muslin wick saturated with water before an observation. Ventilation is achieved by whirling the thermometers with a handle and a swivel link until the lowest wet-bulb temperature has been obtained.

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

9.2.11. Wet-Bulb Temperature. The temperature an air parcel would have if cooled adiabatically to saturation at constant pressure by evaporation of water into it. 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.

9.3. Observing Procedures.

9.3.1. General Requirements . 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. Dewpoint and relative humidity are calculated with respect to water at all temperatures.

Table 9.1. 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) = ^oC. For example:

For 131.0^{o}F: 5/9(131-32) = 5 X 11 = 55^{o}C

For –48.5^{o}F: 5/9(-48.5-32) = 5/9 X –80.5 = -402.5/9 = -44.7 or –45^{o}C

9.3.1.1. 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.

9.3.1.1.1. To the nearest 0.1 degree when used in computations.

9.3.1.1.2. To the nearest whole degree for use in aviation observations.

9.3.1.2. Observation Periods. As a minimum, air and dewpoint 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 **chapter 3**.

9.3.2. Determination of Air and Dewpoint Temperatures. When an automatic sensing system (e.g., AN/FMQ-8) is available and functioning within operational limits, obtain air and dewpoint temperatures by direct reading of the respective indicators. Otherwise, obtain the data from a psychrometer and psychrometric calculator or from the psychrometer (TH-550) in the Manual Observing System (MOS) kit. Obtain data from instruments according to procedures in paragraph 9.4. Obtain data from instruments used in the following priority:

9.3.2.1. Dry Bulb:

9.3.2.1.1. Hygrothermometer (FMQ-8, TMQ-20), if the temperature is warmer than -46^{o}C.

9.3.2.1.2. When a hygrothermometer is not available, use a psychrometer, equipped with a mercury thermometer, if the temperature is warmer than -37^{o}C.

9.3.2.1.3. Psychrometer (TH-550). When a mercury psychrometer is not available, use the TH-550 if the temperature is warmer than –1^{o}C.

9.3.2.1.4. Psychrometer (spirit). When a mercury psychrometer is not available, use a spirit thermometer, if the temperature is –37^{o}C (-35^{o}F) or colder. The spirit thermometer used will have a range of either –46^{o}C to 38^{o}C (-50^{o}F to 100^{o}F), or –62^{o}C to 43^{o}C (-80^{o}F to 110^{o}F).

9.3.2.1.5. From the meniscus of a spirit column of an exposed minimum thermometer.

9.3.2.2. Wet-Bulb Values (When Needed To Compute Dewpoint):

9.3.2.2.1. Psychrometer if the dry-bulb temperature is warmer than -37^{o}C.

9.3.2.2.2. Dry-bulb reading of the psychrometer if the dry-bulb temperature is -37^{o}C or colder.

9.3.2.3. Dewpoint Temperature. Obtain dewpoint temperatures from:

9.3.2.3.1. A hygrothermometer (FMQ-8, TMQ-11, TMQ-20), if the dry-bulb temperature is warmer than -37^{o}C.

9.3.2.3.2. Dry-bulb and wet-bulb temperatures using a mercury thermometer psychrometer if a hygrothermometer is not available and the temperature is warmer than -37^{o}C.

9.3.2.3.3. The TH-550 psychrometer if the dry-bulb temperature is warmer than –1^{o}C.

9.3.2.3.4. The dry-bulb temperature if the dry-bulb temperature is –37^{o}C or colder.

9.3.3. Dewpoint Equal to or Exceeding Air Temperature. Provided the system in use is functioning within operational limits, obtain dewpoint temperature using the following procedures when it equals or exceeds the dry-bulb temperature:

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

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

9.3.4. Statistical Dew Point Temperature. At dry-bulb temperature of -37^{o}C (-35^{o}F) and colder, assume the dewpoint, with respect to ice, is the same as the dry-bulb temperature.

9.3.5. Determination of 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.

9.3.6. Determination of 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:

9.3.6.1. Instrumental. Determine the maximum and minimum temperature extremes of the day from digital readout or temperature recording equipment.

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

9.3.6.3. Hourly Temperature Record. If maximum or minimum thermometers are not available, use the air temperature entries from column 7 of the AF Form 3803.

9.4. Equipment Operation and Instrumental Evaluation.

9.4.1. General. Operate and use temperature measuring instruments according to appropriate TOs or operating manuals and supplementary instructions in the following paragraphs.

9.4.2. Use of Automatic Sensing Equipment . Obtain air and dewpoint temperature values by direct reading using appropriate instructions.

9.4.3. Use of Psychrometers. Obtain air and dewpoint temperature values by following the instructions below, appropriate manuals or TO procedures.

9.4.3.1. 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.

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

9.4.3.3. The wick on the wet-bulb thermometer must be kept clean to obtain accurate readings. Change the wick as often as necessary to ensure a clean wick is used.

9.4.3.4. The wick must be moistened prior to ventilation of the psychrometer and according to the procedures and conditions described below:

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

9.4.3.4.2. Whenever practical in areas where the temperature is high and the relative humidity is low, pre-cooled water should be used. Moisten the wick thoroughly several minutes prior to 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.

9.4.3.4.3. At dry-bulb temperatures of 37^{o}F (3^{o}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 be dissipated 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^{o}F (O^{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.

9.4.3.5. Preparation of the dry bulb. When appropriate, take the following actions prior to ventilating the psychrometer:

9.4.3.5.1. When dew or frost is expected, check the dry-bulb thermometer 10 to 15 minutes prior to 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.

9.4.3.5.2. The dry-bulb temperature must be obtained prior to 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.

9.4.3.6. 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:

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

9.4.3.6.2. 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^{o}F or less of each other. Then ventilate the instrument at 5-second interval reading the indication after each ventilation.

9.4.3.6.3. When two consecutive readings show no further decrease, the wet-bulb temperature has been reached. Read this temperature to the nearest 0.1^{o}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.

9.4.4. Use of the Psychrometric Calculator. Use the pressure scale (colored ring) on the calculator based on the current station pressure.

9.4.4.1. Depression of the Wet Bulb. Determine the wet-bulb depression to compute the dewpoint temperature. Algebraically subtract the wet-bulb temperature from the dry-bulb temperature. Figure 9.1 provides an example.

Figure 9.1. Determine Wet-Bulb Depression.

	A	B	C
Dry-bulb temperature	40.6	1.2	-3.4
Wet-bulb temperature	32.1	-0.7	-4.7
Wet-bulb depression	8.5	1.9	1.3

9.4.4.2. Using the Calculator. Instructions for the use of the calculator are printed on the disks.

9.4.4.3. Psychrometric Tables. For psychrometric data outside the range of calculators or nomogram, use Smithsonian *Meteorological Tables* 99, 100, 101, and 102.

Chapter 10

PRESSURE

10.1. 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.

10.2. Standard Definitions.

10.2.1. Altimeter Setting (QNH). The pressure datum in millibars or inches of mercury set on the altimeter subscale.

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

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

10.2.4. Density Altitude (DA). An atmospheric density expressed in terms of the altitude which corresponds with that density in the standard atmosphere.

10.2.5. 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.

10.2.6. 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.

10.2.7. Pressure-Altitude (PA). An atmospheric pressure expressed in terms of altitude which corresponds to that pressure in the standard atmosphere. It is the indicated altitude of a pressure altimeter at an altimeter setting of 29.92 inches of Hg (1013.2 hectopascals [hPa]) and is therefore the indicated altitude above the 29.92 inches Hg (1013.2 hPas) constant pressure surface.

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

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

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

10.2.10.1. Pressure tendency and amount of change are computed automatically by NTFS equipment. To determine pressure tendency and amount of change manually, use the following procedures:

10.2.10.2. Pressure Tendency (a). Using **table 10.1.**, first determine which primary requirement is correct by reviewing the station pressure readings from the 3-hourly period being evaluated. Next, select the description which best describes the pressure change over the last 3 hours. When determining the description, disregard minor inconsistencies in the pattern. When the pattern shows characteristics of two descriptions, use the pattern that occurred last. Use a barograph to determine the description when possible. For stations without a barograph, the station pressure recorded in column 17 of the AF Form 3803/3813 will be used normally. Finally, select the code figure that corresponds to the description selected. If the pressure tendency can not be determined, omit the 5appp group and record the reason it is omitted in column 90.

10.2.10.3. Amount of Pressure Change (ppp). Determine the net 3-hour amount of change using the station pressures recorded in column 17 of the AF Form 3803/3813. In a series of three station pressure readings, subtract the third reading from the first reading to obtain the net change to the nearest 0.005 inches Hg (the +/- sign is not significant to determining net change and will be disregarded). If no observation was taken three hours earlier (first observation in the series of three is missing), use a barograph (if available) to obtain the net change. Select the code figure that corresponds to the net change using **table 10.2.** If the amount of change can not be determined, omit the 5appp group and records the reason it is omitted in column 90.

Table 10.1. 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, 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

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

10.2.11.1. QNH. This term designates the altimeter setting. At times the pilot may request this value in hPas. When such a request is received, the current altimeter setting in inches will be converted to hPas using **table 10.3.** and rounded down to the nearest whole hPa; e.g., QNH = 29.41 inches = 995.9 hPas = 995 hPas.

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

10.2.11.3. QNE. This term designates pressure altitude.

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

10.2.12. 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.

10.2.13. 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 station and the properties of the hypothetical atmosphere are related to conditions observed at the station.

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

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

10.2.16. Station Pressure. The atmospheric pressure at the assigned Hp.

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

Table 10.2. 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.											

10.3. Observing Procedures.

10.3.1. 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 station 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.

10.3.1.1. Units of Measure. In the United States and at military stations overseas, data are 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 hPas for all pressure data (one hPa = one millibar). When required for international aviation purposes, provide pressure data in whole hPas (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.

10.3.1.2. 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.

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

10.3.1.2.2. Any non-tactical barometer (see paragraph 10.2.6.)

10.3.1.2.3. Barometer (ML-102 or FA-185260 Aneroid barometer).

10.3.1.2.4. Altimeter Setting Indicator (ASI).

10.3.1.2.5. Tactical Digital Barometer/Altimeter (Manual Observing System (MOS) kit).

10.3.1.2.6. Tactical Digital Barometer (TMQ-34).

10.3.1.2.7. Tactical Aneroid Barometer (AFWA-approved).

10.3.1.2.8. Aircraft altimeter.

NOTE: All permanent locations providing direct observing support to flying operations will have a DBASI as the primary pressure instrument, and all DBASI locations will have a dedicated backup pressure measuring device. Exceptions to this policy will be approved by and documented by higher headquarters or MAJCOM.

10.3.1.3. Estimated Pressure Values. Although all pressure data are instrumentally derived, values must be classified as estimated under certain conditions. The following summarize general conditions under which the station pressure, and all other pressure data computed using it, are normally classified as estimated.

10.3.1.3.1. Any correction factor is based on an approximation.

10.3.1.3.2. The station DBASI has not been calibrated within the past 180 days.

10.3.1.3.3. 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.

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

10.3.1.3.5. The aneroid pressure observation is made during periods of gusty or high surface winds, in the range of 25 knots (13 m/s) 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.

10.3.1.3.6. 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.

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

10.3.1.3.8. The instrument is considered to be a *tactical* barometer.

10.3.2. 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:

10.3.2.1. Obtain a pressure reading from the appropriate instrument.

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

10.3.2.3. When necessary, convert the corrected pressure reading from hPas to inches of mercury (to the nearest 0.005 inch Hg).

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

10.3.3.1. 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 hPas for international aviation purposes.

10.3.3.2. 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.

10.3.3.3. 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 10.3.3.2. 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:

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

10.3.3.3.2. 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.

10.3.3.3.3. At locations where an operational ASI is installed in the control tower, the requirement in paragraph 10.3.3.2 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 10.3.3.2.

10.3.4. Determination of Pressure Altitude and Density Altitude. Compute PA and DA on the basis of a current station pressure value and the method of determination applicable to the station (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.

10.3.5. Determination of Sea-Level Pressure. Compute sea-level pressure (QFF) on the basis of 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.

10.3.6. Determination of Significant Pressure Changes. When pressure is falling or rising rapidly at the time an observation is being taken, report the condition in the remarks of the observation. These conditions are most noticeable on the barogram and may also be evidenced by a significant decrease or increase in altimeter settings. At stations using a barograph, report pressure unsteady in the remarks of the observation when this condition exists at the time an observation is being taken. Note that these conditions may be considered operationally significant and included with an altimeter setting LOCAL or other observation disseminated to ATC personnel.

10.4. Standardization and Comparison Procedures. The station barometry program is established and managed according to this manual. The instructions in this section are generally limited to those procedures required by weather personnel in performing routine comparisons as a part of the station barometry 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, restandardize the aneroid; next, reset and standardize; then, lastly, turn in the aneroid to supply (and order a replacement).

10.4.1. Standardization of Non-tactical Aneroid Barometers. Non-tactical aneroid barometers collocated with a DBASI will be standardized with the station DBASI. Locations with a non-tactical ML-102 or FA-185260 but without a DBASI will coordinate with their supporting maintenance office to have a DBASI brought to their location annually to certify the ML-102 or FA-185260.

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

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

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

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

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

10.4.1.1.5. When a verified difference between station pressure from the DBASI and the corrected reading of the aneroid barometer (column 14 of AF Form 3801, **Aneroid Barometer Standardization/Comparison**) is more than .010 inch Hg (0.30 hPa).

10.4.1.1.6. When any of the instruments have been subjected to a serious disturbance or shock or other condition or treatment which 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.

10.4.1.2. Standardization Procedures. All non-tactical aneroid barometers will be set to a zero correction against the DBASI they are compared against. This is a one-time reset; subsequent resets to zero correction will only be accomplished when the AF Form 3801, column 15, tolerance is exceeded. 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:

10.4.1.2.1. Make 10 comparisons of the aneroid with the DBASI and make appropriate entries in columns 1 through 9 of AF Form 3801. 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.

10.4.1.2.1.1. The correction entered in column 9 of the current comparison should not differ from the preceding column 9 entry by more than .010 inch Hg (0.30 hPa). If the difference exceeds this tolerance, immediately verify (preferably by another qualified individual) by making a second comparison. If the first of these two comparisons appears to be erroneous, circle or otherwise mark the column 9 entry to ensure it is disregarded in all subsequent evaluations. If the second of the two comparisons verifies the accuracy of the first, circle or otherwise mark the column 9 entry for the second comparison and use the first as the official comparison in the series.

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

10.4.1.2.2. Upon completion of the last of the 10 comparisons, compute the mean of the corrections (entries in column 9; i.e., algebraically add the entries and divide by 10). Make appropriate entries in columns 10 through 15 on the line containing the 10th or last comparison. To determine the column 14 entry, apply the newly determined column 12 entry to the observed aneroid reading (column 4). The column 15 entry is the difference between the column 8 and column 14 entries.

10.4.1.2.3. Check the reliability of the instrument by verifying that the difference entered in column 15 does not exceed .010 inch Hg (0.30 hPa). If the difference exceeds this tolerance, immediately verify it by making a second comparison, preferably by another qualified individual.

10.4.1.2.3.1. If the column 15 difference does not exceed the accepted tolerance after the second comparison, consider the instrument reliable based on the second comparison and mark column 9 of the first comparison (by circling or other means) to ensure it is omitted from sums and means.

10.4.1.2.3.2. If the verified differences (column 15) after both of the comparisons exceed the accepted tolerance, restart the entire standardization series of 10 comparisons.

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

10.4.1.2.3.4. If the instrument is considered reliable, establish the column 12 mean, to the nearest .005 inch Hg (0.1 hPa), as the posted correction to be applied to observed aneroid readings.

10.4.2. Standardization of Tactical Barometers. Tactical barometers (regardless of their nomenclature or description) will be qualified for operational use through a series of comparisons compatible with operations in a tactical environment. Initially, in garrison, set the tactical barometer to read atmospheric pressure at the height of the station 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 according to the following procedures:

10.4.2.1. Barometers in Storage. Compare these instruments against the station standard in conjunction with station training programs or at least once quarterly, before deployment (when possible), and upon return from a deployment. Make a series of at least four comparisons, not less than 15 minutes apart, against the station standard. Record these comparisons on a separate AF Form 3801 for each tactical barometer. Establish a mean correction from the comparisons. 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, use the mean correction as the posted correction to be applied to the aneroid until a new mean correction is determined (See figure 10.1.).

10.4.2.2. Barometers at Locations With No Station Standard. Compare each tactical barometer against any available calibrated pressure instrument; e.g., an aircraft altimeter; a nearby NWS/FAA ASI or mercurial or aneroid barometer, following procedures in paragraphs 10.4.1.2.1 and 10.4.1.2.2.

10.4.2.3. Deployed Barometers. Conduct a daily barometer comparison against the most reliable calibrated pressure device available (a second deployed barometer or an aircraft altimeter). Record these comparisons on AF Form 3801 (see figure 10.2.). 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, and await until return to garrison to reset the barometer. Do not use any pressure-measuring instrument with known or suspected erroneous indications.

10.4.3. Conditions for Delaying Aneroid Comparisons. The following guidelines summarize special limitations which weather personnel must consider in making routine barometer comparisons:

10.4.3.1. At stations 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 10.3.6) 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.

10.4.3.2. 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 (13 m/s) or greater.

10.4.3.3. 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.

10.4.4. Altimeter Setting Indicator. At stations 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.

10.4.5. DBASI Calibration. Calibration of the DBASI is required every 180 days and accomplished by the base TMDEL personnel. Normally the only requirements for weather station personnel in securing calibration of the DBASI are to:

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

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

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

10.5. Equipment Operation and Instrumental Evaluation.

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

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

10.5.3. 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 has procedures on reading each instrument.

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

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

10.5.4.2. If at all 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.

10.5.4.3. 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 10.5.5. for procedures.

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

10.5.4.5. 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 handbook for the instrument being used to determine if a correction is required.

10.5.5. 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 (see figure 10.3.).

Figure 10.1. Example of a Tactical Barometer Comparison.

ANEROID BAROMETER STANDARDIZATION/COMPARISON
(Modified Meteorological Form 1-13 for use at AF Weather Stations) (See detailed instructions for preparation on reverse side)

STATION NAME/LOCATION FORT SOMEWHERE, AN		ELEVATION *(HP)* 384'		ALTERNATE OBSERVING ELEVATION *(Hz) (MSL)* ----------	
DBASI	SERIAL NO. 120	ELEVATION *(Hz) (MSL)* 429'	LAST CALIBRATION DATE 15 Mar 92	DATE DUE CALIBRATION 11 Sep 92	REMOVAL CORRECTION
ANEROID BAROMETER	SERIAL NO. 4626	ELEVATION *(Hz) (MSL)* 427'	LAST QUALIFICATION DATE 19 Apr 92	DATE DUE QUALIFICATION 19 Jul 92	BWS ---- / AOS +.043

COMPARISON NO.	YEAR 20 / MONTH AND DAY	TIME	DATA FROM ANEROID BAROMETER: OBSERVED PRESSURE		STATION PRESSURE	ALSTG	COMPARISON NO. / STATION PRESSURE READING	CORRECTIONS	SUM OF CORRECTIONS	COMP NOS. SUMMED	MEAN	REMARKS	CORRECTED ANEROID READING	DIF
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
---------------	Initial		Comparison		------------	Taylor	Reset	to	Station	Pressure				-----
1	19 Apr	0805	29.81		29.853		29.859	+.006						
2	19 Apr	0830	29.81		29.853		29.867	+.014						
3	19 Apr	0900	29.82		29.863		29.876	+.013						-
4	19 Apr	0930	29.83		29.873		29.882	+.009	+.042	1-4	+.010	COR = +.01		
-----------------	13 Jul		Deployed	to	Exercise	Site	- No	Time to	Compare	with	DBASI	Prior to	Deployment	
-----------------	10 Aug		Returned		From		Deployment	-	Begin	Comparison	Series			
5	11 Aug	1020	29.86		29.903		29.984	+.031						
6	11 Aug	1045	29.87		29.913		29.943	+.030						
7	11 Aug	1115	29.88		29.923		29.955	+.032						
8	11 Aug	1133	29.90		29.943		29.976	+.033	+.126	5-8	+.031	Reset Mean	Cor To High	
-----------------	Taylor	Reset	- Begin		Comparison									
9	11 Aug	1445	29.93		29.973		29.976	+.003						
10	11 Aug	1510	29.94		29.983		29.988	+.005						
11	11 Aug	1530	29.94		29.983		29.988	+.005						
12	11 Aug	1600	29.95		29.993		29.997	+.004	+.017	9-12	+.004	COR = +/- 0		

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NOTE: Value includes removal correction only. Use removal correction to nearest .001 inch to increase accuracy of comparisons.

Figure 10.2. Example of Deployed Tactical Barometer Comparisons.

ANEROID BAROMETER STANDARDIZATION/COMPARISON

(Modified Meteorological Form 1-13 for use at AF Weather Stations) (See detailed instructions for preparation on reverse side)

STATION NAME /LOCATION	ELEVATION *(HP)*			ALTERNATE OBSERVING ELEVATION *(Hz) (MSL)*
FIELD SITE	793'			----------
DBASI	SERIAL NO. -----	ELEVATION *(Hz) (MSL)* -----	LAST CALIBRATION DATE -----	DATE DUE CALIBRATION -----	REMOVAL CORRECTION
ANEROID BAROMETER	SERIAL NO. 4626	ELEVATION *(Hz) (MSL)* 859'	LAST QUALIFICATION DATE 19 Apr 92	DATE DUE QUALIFICATION 18 Jul 92	BWS ---- / AOS +.07

COMPARISON NO.	YEAR 20 MONTH AND DAY	TIME	DATA FROM ANEROID BAROMETER: OBSERVED PRESSURE		STATION PRESSURE	ALSTG	COMPARISON NO. STATION PRESSURE READING	CORRECTIONS	SUM OF CORRECTIONS	COMP NOS. SUMMED	MEAN	REMARKS	CORRECTED ANEROID READING	DIF
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	16 Jul	1753	29.72		29.79	30.65	30.68	+.03				COR = +.01 (Initial Cor) + .07 = +.08		
2	17 Jul	1328	29.73		29.80	30.66	30.71	+.05						
3	18 Jul	1035	29.75		29.82	30.69	30.72	+.03						
4	19 Jul	1410	29.74		29.81	30.68	30.65	-.03	+.08	1-4	+.020	COR = +.02 + .07 = +.09		
5	20 Jul	0925	29.71		29.78	30.64	30.66	+.02						
6	21 Jul	1128	29.62		29.69	30.55	30.50	-.05						
7	22 Jul	1230	29.54		29.61	30.47	30.46	-.01						
8	23 Jul	1650	29.51		29.58	30.44	30.41	-.03	-.07	5-8	-.018	COR = -.02 + .07 = +.05		
9	25 Jul	0240	29.56		29.63	30.49	30.49	+/-0						
10	26 Jul	1748	29.64		29.71	30.57	30.56	-.01						
11	28 Jul	2112	29.74		29.81	30.67	30.69	-.02						
12	29 Jul	1425	29.80		29.87	30.74	30.73	-.01	-.04	9-12	-.010	COR = -.01 + .07 = +.06		

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NOTES:

1. Read Taylor to nearest .01 Hg.
2. Value indicates removal correction (column 4 value +.07).
3. ALSTG based on column 6 value and station elevation.
4. ALSTG obtained from calibrated instrument, usually an aircraft altimeter.
5. Rounds column 12 value to nearest .01 inch when adding removal correction, if any.
6. Posted correction is column 12 mean added to removal correction, to nearest .01 inch.

Figure 10.3. Example of ML-102 and FA-185260 (Pennwalt) Standardization.

ANEROID BAROMETER STANDARDIZATION/COMPARISON
(Modified Meteorological Form 1-13 for use at AF Weather Stations) (See detailed instructions for preparation on reverse side)

STATION NAME /LOCATION SCOTTSVILLE AFB, AW		ELEVATION *(HP)* 463'		ALTERNATE OBSERVING ELEVATION *(Hz) (MSL)* 481'	
DBASI	SERIAL NO. 33	ELEVATION *(Hz) (MSL)* 498'	LAST CALIBRATION DATE 18 May 92	DATE DUE CALIBRATION 18 Nov 92	REMOVAL CORRECTION
ANEROID BAROMETER	SERIAL NO. 103	ELEVATION *(Hz) (MSL)* 498'	LAST QUALIFICATION DATE 22 May 92	DATE DUE QUALIFICATION 20 Aug 92	BWS 0 / AOS + .017 Hg + .6 hPa

COMPARI-SON NO.	YEAR 20 / MONTH AND DAY	TIME	DATA FROM ANEROID BAROMETER: OBSERVED PRESSURE		STATION PRESSURE	ALSTG	COMPARI-SON NO. STATION PRESSURE READING	CORREC-TIONS	SUM OF CORREC-TIONS	COMP NOS. SUMMED	MEAN	REMARKS	CORRECTED ANEROID READING	DIF
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
--------------	DBASI		Installed		Begin	Standard	ization -	Aneroid	Reset	to	Station	Pressure	---------------------	-----
1	22 May	0915	997.6				997.7	+.1						
2	22 May	0940	997.7				997.9	+.2						
3	22 May	1000	997.8				997.9	+.1						
4	22 May	1015	997.9				998.1	+.2						
5	22 May	1040	998.1				998.2	+.1						
6	22 May	1058	998.1				998.1	+/-.0						
7	22 May	1117	998.1				998.5	+.4				Disregard – Bad Data		
7a	22 May	1128	998.3				998.5	+.2						
8	22 May	1147	998.5				998.6	+.1						
9	22 May	1220	998.7				998.8	+.1						
10	22 May	1245	998.9				998.9	+/-.0	+1.1	1-10	+.11	COR = +.1	999.01	.11

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NOTES:

1. This example depicts the standardization of an aneroid backup to a station DBASI. Both are located at the weather observing site.
2. Apply the alternate observing site (AOS) removal correction to the aneroid when it is in use at the AOS. Apply an instrument correction if applicable. AOS removal correction computation: (498' – 481') x .001 = +.017 Hg (+.6 hPa). The correction is positive because the aneroid is lowered when moved to the AOS. The correction used at the AOS is .1 + .6 = .7 hPa (instrument correction + removal correction).

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

10.5.5.2. Multiply the elevation difference (10.5.5.1) 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.

10.5.6. Barograph. Use of the barograph is optional; however, when in use, the following procedures will be followed:

10.5.6.1. Adjustments:

10.5.6.1.1. Pressure Adjustment. Make adjustments for pressure at the time of a 3- or 6-hourly observation. To adjust the position of the pen, turn the knurled pressure-adjusting knob at the top of the cylindrical pressure-element housing until the pen is at the correct station pressure. Tap the case or chassis lightly to overcome any sticking in the linkage mechanism before checking the adjustment of the pen.

10.5.6.1.2. Time Adjustment. Make adjustments for time at the time of a 3- or 6-hourly observation. Adjust the barograph for time (when in error by one chart division or more) by turning the cylinder counterclockwise until all slack motion in the drive mechanism is removed. If the pen position does not bear the proper relationship to the time-ordinate lines after the slack has been removed, continue to turn the cylinder counterclockwise with sufficient force to override the friction drive until the timing error is eliminated.

10.5.6.1.3. Chart Scale Adjustment. Monitor the barograph during routine operation to ascertain that the clock is running and the ink is flowing properly, and note the position of the pen on the chart. Whenever it appears that the pen will pass off the printed divisions of the chart, set the pen up or down equivalent to 1 full inch of pressure by means of the adjusting screw, and renumber the pressure lines, if applicable.

10.5.6.2. Charts. Barograph charts may be changed at the discretion of the local unit. Enter the beginning date and time at the start of each separate trace on the chart. Change charts at a 3- or 6-hourly observation time to ensure the pressure tendency record is not interrupted. Follow instructions in the appropriate TO for replacing charts and winding the clock.

10.5.7. 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.

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

10.5.8.1. 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. Figure 10.4. provides examples of this process

Figure 10.4. Determine Altimeter Setting.

	A	**B**	**C**	**C**
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

10.5.8.2. 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. Figure 10.5. provides examples of this process

Figure 10.5. Determine Pressure Altitude.

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

Table 10.3. Conversion of Altimeter Setting From Inches of Mercury to Hectopascals.

Inches of Mercury	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 hPas, rounded down to 986 hPas.

Chapter 11

REMARKS

11.1. General Information. This chapter contains the order of entry table for column 13 remarks and the definitions and coding instructions for column 13 remarks that are not explained elsewhere in this manual.

11.2. Column 13 Order of Entry. Order of entry for local and longline transmis sion of column 13 remarks will be as listed in Table 11.1.

Table 11.1. Column 13 Remarks and Order of Entry.

	When Condition Observed is a	Then Enter in Remarks Section
1	Volcanic eruption (plain language)	The following information, if known; name of volcano, latitude and longitude, date/time, size description, approximate height and direction of movement of the ash cloud and any other pertinent data, e.g., MT AUGUSTINE VOLCANO 70SW ERUPTED 231505 LARGE ASH CLOUD EXTENDING TO APRX 30000 FEET MOVING NE
2	Funnel cloud, tornado or waterspout in progress (Note)	Description, time of beginning, distance (if known), direction from station, and direction of movement (if known); e.g., TORNADO 15NE MOV N, FUNNEL CLOUD 4S MOV UNKN. If the distance is unknown, but believed to be more than 10 statute miles/16 kilometers from the point(s) of observation, use the contraction DSNT in place of the numeric distance indicator; e.g., TORNADO DSNT E MOV SE.
3	Tornado, funnel cloud, or waterspout having ended or disappeared (Note)	Description, time of ending, or beginning and ending, and direction of movement (if known); e.g., TORNADO MOV N, FUNNEL CLOUD NW DSIPTD.
4	Thunderstorm begins or is in progress (Note 1)	Thunderstorm (TS), distance from station (if known), direction from station, and direction of movement (if known); e.g., TS OHD MOV NE, TS 14NW MOV SE. If the distance is unknown, but believed to be more than 10 statute miles/16 kilometers from the point(s) of observation, use the contraction DSNT in place of the numeric distance indicator; e.g., TS DSNT N MOV S.
5	Thunderstorm ends (Note 1)	Thunderstorm (TS), direction of movement or description; e.g., TS MOV SE, TS DSIPTD.

	When Condition Observed is a	Then Enter in Remarks Section
6	Lightning activity	Frequency (FRQ, OCNL, or CONS), type, and direction from station; e.g., OCNL LTGCCCG N, FRQ LTGCAIC SW-NW. Direction may be omitted if the same as TS or CB/CBMAM remark.
7	Hailstone size (GR) (Note 1)	The remark GR followed by the diameter size of the largest hailstone, coded in ¼ inch increments. For example, GR 1 ¾ would indicate the largest hailstone was 1 ¾ inches in diameter.
8	Surface prevailing visibility less than 3 miles (4800 meters) and is rapidly increasing and decreasing (variable visibility) by at least ½ mile (800 meters) or more during the period of observation.	VIS, followed by extremes of variability (lowest, V, and highest); e.g., VIS 1/4V1, VIS 0400V1600.
9	Variable ceiling height below 3,000 feet	CIG followed by extremes of variability (lowest, V, and highest). For example, CIG 005V010 would indicate a ceiling varying between 500 and 1,000 feet.
10	Variable sky condition below 3,000 feet	The sky condition and height of the first variable layer, a V to denote, variability, and the second variable layer. For example, a cloud layer at 1,400 feet varying between broken and overcast would be coded BKN014 V OVC. Another example would include CIG LWR W.
11	Sector visibility (visibility in a specified direction representing a 45-degree arc of the horizon circle) shall be reported when it differs from the prevailing visibility by one or more reportable values and either the prevailing or sector visibility is less than 3 miles (4800 meters).	VIS followed by the sector visibility; e.g., VIS SW 1, VIS SW 1600.
12	Weather observing site or tower prevailing visibility is less than 4 miles (6000 meters) and the tower prevailing visibility differs from the weather observing site prevailing visibility by a reportable value.	TWR and a visibility value; e.g., TWR VIS 2, TWR VIS 3200.

	When Condition Observed is a	Then Enter in Remarks Section
13	Peak wind speed greater than or equal to 25 knots since the last 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 (average) or 10 (maximum/overseas) minute observation period prior to the METAR (the peak wind speed will already be in the body of the METAR). If the peak wind speed occurred more than once during the hour, encode the latest occurrence first. Prior occurrences of the peak wind within the hour will be encoded after the first occurrence.	On the next METAR the direction, the peak wind speed since the last METAR, and the time of occurrence. Encode only the minutes if the time of occurrence can be inferred from the report time (peak wind of 45 knots from 280 degrees that occurred at 15 minutes past the hour would be coded PK WND 28045/15. Encode the hour and minutes if the time of occurrence can not be inferred from the report time (peak wind of 45 knots from 280 degrees that occurred at 58 minutes past the hour (METAR already transmitted) would be coded PK WND 28045/1858. Multiple occurrence example: PK WND 24042/43 25042/19.
14	Wind direction changes by 45 degrees or more in less than 15 minutes with sustained winds of 10 knots or more throughout the wind shift.	WSHFT and time of beginning; followed by FROPA if reasonably certain the shift was the result of a frontal passage; e.g., WSHFT 30, WSHFT 23 FROPA. If the initial entry is not transmitted longline, enter the remark in the next observation which is transmitted longline.
15	Estimated winds	The remark ESTMD WND, to indicate the winds were obtained from a source other than primary airfield wind sensor display.
16	Surface-based partial obscuration	The weather phenomena (w'w') obscuration causing the surface-based obscuration, the sky condition code for amount of coverage ($N_sN_sN_sh_sh_sh_s$), and a height of 000 to denote the phenomena is surface-based. For example, widespread dust hiding 3 to 4 eighths of the sky would be coded DU SCT000.
17	Layered obscuration aloft	The weather phenomena (w'w') aloft causing the layer, the sky condition code for amount of coverage, and the height of the obscuring phenomenon aloft. For example, a 2,000 foot layer composed of 5 to 6 eighths of smoke (carried as sky condition BKN020 in column 3) would be code FU BKN020.
18	Cumulonimbus or cumulonimbus mammatus (CB/CBMAM) for which no thunderstorm is being reported.	The cloud type (CB/CBMAM), distance (if known), location, and movement (if known); e.g., CB 12W MOV E, CBMAM OVD STNRY. If the distance is unknown, but believed to be more than 10 statute miles/16 kilometers from the point(s) of observation, use the contraction DSNT in place of the numeric distance indicator; e.g., CB DSNT N MOV S.

	When Condition Observed is a	Then Enter in Remarks Section
19	Towering cumulus (TCU)	The cloud type (TCU), distance (if known), and direction from the station; e.g., TCU 18SE. If the distance is unknown, but believed to be more than 10 statute miles/16 kilometers from the point(s) of observation, use the contraction DSNT in place of the numeric distance indicator; e.g., TCU DSNT S.
20	Altocumulus castellanus (ACC)	The cloud type (ACC) and direction from the station; e.g., ACC SE.
21	Standing lenticular (SCSL, ACSL, CCSL) or rotor clouds	The cloud type (SCSL, ACSL, CCSL, ROTOR), and direction from the station; e.g., ACSL W. An apparent rotor cloud north through east through southeast would be coded APRNT ROTOR CLD DSNT N-E-SE.
22	Precipitation falling from clouds that evaporates before reaching the ground (VIRGA).	VIRGA followed by the direction of occurrence from the station; e.g., VIRGA SW.
23	Pressure 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	PRESRR or PRESFR as appropriate.
24	Snow increasing rapidly. Reported in the next METAR when the snow depth increases by 1 inch or more in the past hour.	The remark SNINCR, the inches of snow per hour, and the inches of snow on the ground. For example, a snow increase of 2 inches in the past hour with a total snow depth on the ground of 10 inches would be coded as SNINCR 2/10.
25	Condensation trails	The remark CONTRAILS to indicate condensation trails are observed.
26	Aurora observed in the past hour	AURBO in the next METAR (to include each subsequent METARs throughout period of occurrence).
27	Significant atmospheric phenomena not reported elsewhere	The appropriate remark in order of significance; i.e., AEROB, unofficial weather reports, etc.
28	Sea level pressure or estimated sea level pressure; estimated altimeter	On all METAR SLPppp where SLP is the indicator and ppp is the sea level pressure in hectopascals. For example, a sea level pressure of 998.2 hectopascals would be encoded SLP982. When missing, or not available enter SLPNO. When estimated values are used, code as SLPppp and add an estimated remark, e.g., SLP982 ESTMD SLP. An estimated altimeter would be encoded ESTMD ALSTG. When both are estimated encode ESTMD ALSTG/SLP. In a SPECI, only the altimeter setting is estimated; e.g., ESTMD ALSTG.

	When Condition Observed is a	Then Enter in Remarks Section
29	Code additive data group(s)	As appropriate in hourly, 3-hourly, and 6-hourly METAR in the following order of entry: 6RRRR $7R_{24}R_{24}R_{24}R_{24}$ 4/sss $8/C_LC_MC_H$ $9/C_LC_MC_H$ $1S_nT_xT_xT_x$ $2S_nT_nT_nT_n$ 5appp. See paragraph 3.12.3 for coding instructions.
30	Runway condition (pertaining to one or dual parallel runways), state of ground, weather modification, wind speed difference between dual parallel runways, or rawinsonde data remark.	A remark to indicate the 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.
31	Aircraft mishap remark	The remark ACFT MSHP but do not transmit local or longline.
32	Type of automated station (report from an ASOS)	On all METAR and SPECI indicating the report is generated from an automated system. Automated stations without a present weather discriminator will enter AO1, while automated stations with a present weather discriminator will enter AO2.
33	First, last, or correction to an observation	FIRST, LAST, or COR 1010 as appropriate.
NOTE: If 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 ¾. These B and/or E times are entered for longline transmission only.		

11.3. Definitions and Coding Instructions for Remarks Not Explained Elsewhere.

11.3.1. Lightning (LTG). Lightning is a luminous manifestation accompanying a sudden electrical discharge which takes place from or inside a cloud or, less often, from high structures on the ground, or from mountains. Lightning can be observed visually or by using sensors to detect the electrical discharge. Code and report observed frequency, type, and location of lightning. There is no need to report the lightning's location if the parent thunderstorms location is reported.

11.3.1.1. When lightning is observed, determine for each storm center the frequency (occasional, frequent, continuous), type (e.g., in-cloud, cloud-to-cloud, etc.), and the location with respect to the station. See figure 11.1.

Figure 11.1. Type and Frequency of Lightning.

Type of Lightning		
Type	**Contraction**	**Definition**
In-cloud	IC	Lightning which takes place within the CB.
Cloud to ground	CG	Lightning occurring between cloud and ground.
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	From 1 to 6 flashes/minute.
Continuous	CONS	More than 6 flashes/minute.

11.3.2. Condensation Trails (CONTRAILS). Engine exhaust condensation trails form in the wake of aircraft when the water vapor in the exhaust gas mixes and saturates sufficiently cold and humid air. Condensation trails may be non-persistent or persistent. Non-persistent condensation trails will dissipate shortly after the aircraft has passed through the area. Persistent contrails can exist for several hours (especially when cirrus or cirrostratus are already present). Persistent condensation trails may even eventually become impossible to distinguish from the existing clouds. Non-persistent and persistent condensation trails are encoded in column 13 using the remark CONTRAILS.

11.3.2.1. Higher headquarters or MAJCOMs will designate units required to code and report the contrail remark.

11.3.2.2. When only non-persistent or persistent condensation trails are observed (no other high clouds are present), they will be coded and reported in the cloud types group ($8/C_LC_MC_H$) as C_H code figure 1 (see **table 8.5.**).

11.3.2.3. The amount of condensation trails present will be factored into the CH entry of the cloud amounts group ($9/C_LC_MC_H$).

11.3.3. Aurora (AURBO). An aurora is a luminous phenomenon which appears in the high atmosphere in the form of arcs, bands, draperies, or curtains. This phenomenon is usually white but may have other colors. The lower edges of the arcs or curtains are usually well defined while the upper edges are not. Polar auroras are due to electrically charged particles, ejected from the sun, acting on the rarified gases of the higher atmosphere. The particles are channeled by the earth's magnetic field, so auroras are mainly observed near the magnetic poles.

11.3.4. Runway Condition. Enter runway surface condition (RSC) and average runway condition reading (RCR) as determined and reported by the airfield manager or operations officer.

Figure 11.2. Examples of Column 13 RSC Usage.

Reported Condition	**Code**
Base Operations Closed	RCRNR (RCR No Report)
Ice on Runway	IR
Loose Snow on Runway	LSR
Packed Snow on Runway	PSR
Slush on Runway	SLR
Wet Runway	WR

11.3.4.1. RCR. A two-digit number (an average decelerometer reading) from 02 to 25. A decelerometer reading of 02 represents the lowest (worst traction) braking action reported while a decelerometer reading of 25 represents the highest (best traction) braking action reported. Append RCR to the encoded RSC; e.g., IR08 for ice covering runway. Code as // when the runway is wet or slush covered or when no decelerometer reading is available and ice or snow is on the runway. When base operations is closed or RCR data is not available and the runway is not completely dry, transmit RCRNR. Resume transmission of actual runway condition data when base operations opens and reports a new runway condition. When runway condition (ice, snow, slush) is reported in patches, append P to the RCR. Append SANDED to indicate that the runways have been treated with sand or other friction-enhancing materials. Append P WET or P DRY when RSC is patchy but the rest the of runway is wet or dry.

11.3.4.2. International Civil Aviation Organization (ICAO) Braking Action Remarks. Units at airfields not equipped with decelerometers (e.g., Army airfields and Air National Guard bases) are authorized to transmit ICAO braking action remarks (such as BA GOOD, BA NIL) when requested by base or post officials. If officials at these airfields request that runway conditions (RSC and RCR) be transmitted, substitute solidus for RCR and append the ICAO braking action remark provided by the base or post operations; e.g., PSR// SANDED BA MEDIUM. Units should ensure the provision, receipt, and transmission of runway condition data is coordinated with local customers and specified in a local weather support document.

Figure 11.3. Examples of Column 13 RCR Usage.

Reported Condition	Description of Code
IR//	Ice on runway, no decelerometer reading available.
LSR08P DRY	Loose snow on runway, decelerometer reading 08, patchy, rest of runway dry.
PSR12 HFS IR08	Packed snow on runway, decelerometer reading 12 on touchdown portion. The rollout portion is a high friction surface HFS with ice on runway, decelerometer reading 08.
PSR15	Packed snow on runway, decelerometer reading 15.
RCRNR	Base operations closed, and conditions for reporting RCR are suspected.
WR//	Wet runway.

11.3.4.3. Multiple-Runway Surfaces. When the runway surface consists of two materials with significantly different friction characteristics such as concrete and a porous friction surface, base operations provides two RSC or RCR reports for transmission. Two RSC or RCR reports are provided only when there is a significant difference.

11.3.4.4. Transmission of Runway Condition Data. Transmit runway condition reports as follows:

11.3.4.4.1. Longline. Upon receipt, either transmit the initial or amended runway condition report as a full element SPECI or append to a METAR. After initial transmission, include the runway condition remark in each subsequent METAR until amended or canceled by the airfield manager or until base operation closes.

11.3.4.4.2. Local Dissemination. RSC and RCR reports will be disseminated by weather personnel using NTFS or a local weather dissemination system (LWDS) unless base operations operates the LWDS. In either case, a local agreement will ensure that:

11.3.4.4.2.1. Weather data has first priority for transmission on LWDS.

11.3.4.4.2.2. Runway condition entries are separate from weather entries when transmission is by base operations personnel.

11.3.4.4.2.3. Base operations maintains a record of runway condition data reported for longline and local dissemination.

11.3.4.4.2.4. Base operations reports runway condition data to those agencies that need data and do not have a drop on the local dissemination system.

11.3.4.4.2.5. Base operations disseminates runway condition data during local dissemination outages.

11.3.5. State of Ground/State of Water. Report the state of ground or state of water if required by higher headquarters.

11.3.6. Weather Modification. Weather modification is any attempt at changing or dispersing one or more of the natural meteorological phenomena occurring in the atmosphere.

11.3.6.1. Append a report of dispersal activities to the first METAR or SPECI observation following receipt of information that such activities have begun or are scheduled to begin within 2 hours. For information received several hours in advance of scheduled or planned activities, hold the report and append it to a METAR or SPECI observation no more than 2 hours preceding the time the operation will begin.

11.3.6.2. Enter remarks on weather dispersal activities according to the following procedures:

11.3.6.2.1. Identify the phenomenon to which the dispersal effort is directed. Use appropriate abbreviations or contractions currently authorized for use in aviation observations; e.g., FG DSPRL, ST DSPRL, etc.

11.3.6.2.2. In the first report, include the time UTC the activity began or is expected to begin; e.g., FG DSPRL B45, ST DSPRL SKEDD B1300, FG DSPRL BUNK (when the activity has started but actual time is unknown).

11.3.6.2.3. In each subsequent METAR during the activity, include an appropriate remark such as FG DSPRL CONTG.

11.3.6.2.4. In the concluding report for a weather dispersal activity, indicate the time UTC that the operation ceased or is scheduled to cease; e.g., FG DSPRL E37, ST DSPRL SKEDD E1417. Append the remark to the first METAR following notification that dispersal activity has stopped or, the METAR preceding the scheduled time for ending the activity. If the dispersal operator provides a sound, scientific estimate of the time the dispersal agent may cease to influence terminal weather, this time may be reported instead of the time of ending (or scheduled ending) of dispersal operations; e.g., ST DSPRL EFF SKEDD E1702.

Chapter 12

PRECIPITATION MEASUREMENT

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

12.2. Equipment Operation and Instrumental Evaluation.

12.2.1. General. At permanent-type stations, precipitation measurements 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.

12.2.2. 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.

12.2.3. 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 **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:

12.2.3.1. Measurement of Liquid Precipitation. Determine the amount of liquid precipitation amounts by measuring the collection in the rain gauge. If only liquid precipitation has occurred during the period, the rain gauge will normally be emptied only after the 6-hourly measurement.

12.2.3.1.1. 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.

12.2.3.1.2. 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.

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

12.2.3.1.4. Pour the liquid from the overflow container (if any) into the measuring tube and measure the amount as in paragraph 12.2.3.1.1.

12.2.3.1.5. 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.

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

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

12.2.3.2. 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 on the basis of the collection in the overflow container.

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

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

12.2.3.2.3. 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 (i.e., the water equivalent of the frozen/freezing precipitation).

12.2.3.2.4. 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.

12.2.3.3. 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 station 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:

12.2.3.3.1. 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.

12.2.3.3.2. Melt the collection to obtain the water content; i.e., as explained in 12.2.3.2.2. and 12.2.3.2.3. Classify the amount as estimated if it is not considered representative of the actual snowfall.

12.3. Precipitation Measurement Procedures.

12.3.1. General. The measurement of precipitation is expressed in terms of vertical depth of water (or water equivalent in the case of solid forms) which 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 which 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.

12.3.2. Unit of Measurement. The basic unit of measurement is the inch. Higher headquarters or MAJCOMs may require stations to report in millimeters (mm) for liquid precipitation (or water equivalent) and centimeters (cm) for frozen precipitation and snow depth. Table 12.1. provides guidance for converting values from inches to millimeters.

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

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

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

12.3.3. 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; i.e., to meet local or other support requirements.

12.3.4. 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.

12.3.4.1. 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.

12.3.4.2. 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, light-weight 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 ½ inch thick.

12.3.4.3. In using the area, start measurements along the edge nearest the station 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.

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

Table 12.1. 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
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, multiply the inches column by 10 and read direct from table; e.g., 4.6 inches equals 11.7 centimeters.

12.3.5. 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:

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

12.3.5.2. 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 an estimation when precipitation during the period consisted entirely of solid forms.

12.3.5.3. To estimate water equivalent of solid forms of precipitation, first obtain a measurement of the snowfall. Convert the actual depth to its water equivalent on the basis of a 1:10 ratio (or other ratio if known to be representative for the station 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.

12.3.5.3.1. The following table may be used to help determine the water equivalent of new snowfall. Table 12.2 will not be used to determine the water equivalency of old snowfall because packing and melting/freezing will have a substantial effect on the density of the snow pack are not accounted for in this table.

Table 12.2. 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
.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 34^{o}F (1^{o}C) 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.

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

12.3.6.1. 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 which 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.

12.3.6.1.1. 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.

12.3.6.1.2. When melting or settling occurred between measurements, estimate the depth of new snow which 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.

12.3.6.2. 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.

12.3.6.3. When an accurate water equivalent of frozen precipitation has been obtained, the snowfall amount may be estimated on the basis of a 1:10 ratio (or other ratio if known to be representative for the station or the snowfall); i.e., as an alternative to procedures in 12.3.6.1. 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.

12.3.7. 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.

12.3.7.1. 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.

12.3.7.1.1. 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.

12.3.7.1.2. 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.

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

12.3.7.2. Estimates of total depth may be obtained using snow stakes at stations 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.

Chapter 13

MISCELLANEOUS TERMS AND OBSERVATIONS

13.1. General Information . This chapter contains definitions for miscellaneous terms and instructions for miscellaneous observations unique to individual weather observing units.

13.2. Definitions of Miscellaneous Terms.

13.2.1. Freeze. The condition of the lower atmosphere when the temperature of surface objects is 0 degrees Celsius or lower. A freeze may occur with or without frost.

13.2.2. Dew. A deposit of water drops on objects at or near the ground, produced by condensation of water vapor from the surrounding clear air.

13.2.3. White Dew. A deposit of white, frozen dew drops. White dew forms as liquid dew, then freezes.

13.2.4. Glaze (Clear Ice). A coating of ice, generally clear and smooth, but with some air pockets. It is formed on exposed objects at temperatures below or slightly above 0 degrees Celsius by the freezing of super-cooled drizzle or rain drops. Glaze is denser, harder, and more transparent than either rime or hoar frost. In aviation observations, glaze is reported as freezing rain or freezing drizzle.

13.2.5. Hoar Frost. A deposit of ice having a crystalline appearance, generally assuming the form of scales, needles, or fans. Hoar frost is formed when water vapor is deposited on surfaces whose temperatures are at or below freezing (in contrast with dew which is formed before freezing is induced).

13.2.6. Rime. A deposit of ice, produced by fog at temperatures below 0 degrees Celsius. It is composed of grains separated by air, some times adorned with crystalline branches.

13.2.7. Meteors. A phenomenon, other than cloud, observed in the atmosphere or on the surface, consisting of precipitation, a suspension or a deposit of liquid water, frozen water, or other particulate matter, or an optical or electrical manifestation. Meteors are classified into four groups: Electrometeors, hydrometeors, lithometeors, and photometeors.

13.2.7.1. Electrometeors. A visible or audible manifestation of atmospheric electricity.

13.2.7.2. Hydrometeors. A meteor consisting of liquid or solid water particles either falling through or suspended in the atmosphere, blown from the surface by the wind, or deposited on exposed objects.

13.2.7.3. Lithometeors. A meteor consisting of a visible concentration of mostly solid, non-aqueous (dry) particles. The particles are more or less suspended in the air or lifted from the grounds by the wind.

13.2.7.4. Photometeors. A luminous phenomenon produced by the reflection, refraction, diffraction, or interference of light from the sun or moon. The most common photometeors are:

13.2.7.4.1. Corona. One or more sequences of small, colored rings centered on the sun or moon. A corona is usually smaller than a halo. All the spectral colors may be visible with red on the outside, although the inner colors may not be visible. Sometimes the colors are repeated irregularly causing iridescence.

13.2.7.4.2. Fog Bow. A primary rainbow consisting of a white band which appears on a screen of fog. It is usually fringed with red on the outside and blue on the inside.

13.2.7.4.3. Halo Phenomena. A group of phenomena in the form of rings, arcs, pillars, or bright spots produced by the reflection or refraction of sunlight or moonlight by ice crystals suspended in the atmosphere (cirriform clouds, ice fog, etc.). Halo phenomena include the following:

13.2.7.4.3.1. Small Halo. A luminous ring of 22 degree radius with the luminary at its center; i.e., the angle formed between the line of sight from the observation point to the luminary and from the observation point to the ring. This halo usually has a faint red ring on the inside and, rarely, a violet fringe on the outside. This is the most frequent halo.

13.2.7.4.3.2. Large Halo. A luminous ring of 46 degrees radius. It is less bright and less common than the small halo. May have a red inner ring progressing to a blue outer ring.

13.2.7.4.4. Rainbow. A group of concentric arcs produced on a screen of falling precipitation by light from the sun or moon. The primary bow usually includes violet on the inside and red on the outside. The secondary bow is not as bright, with red on the inside and violet on the outside.

13.3. Automated Surface Observing Systems Operation.

13.3.1. General . Automated surface observing systems certified by the USAF for operational use can be operated in an unaugmented mode at USAF and US Army controlled airfields to provide the official METAR, SPECI, and LOCAL observations **except** under the conditions specified in paragraph 13.3.2. In the unaugmented mode, automated surface observing systems will provide observations as specified by chapters 2 and 4, as it 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.

13.3.1.1. 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, thereby designating it as a Class E Airspace controlled to the ground, 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.

13.3.2. Augmenting Automated Surface Observing Systems .

13.3.2.1. Automated surface observing system augmentation by a certified weather technician is **mandatory** at USAF and US Army controlled airfields with combat weather teams assigned when any of the following criteria are met:

13.3.2.1.1. ATC tower located on the airfield is open to support military flight operations.

13.3.2.1.2. A severe weather watch or warning is issued for the airfield IAW AFI 10-229.

13.3.2.1.3. Volcanic ash is observed from the airfield.

13.3.2.2. During automated surface observing system augmentation, the certified weather technician will check the observation for representativeness, quality control check all weather elements, and check for weather elements listed in figure 13.1 at intervals not to exceed **20 minutes** since the last observation. He/she will change or add elements in the body of the observation or in remarks, as applicable, prior to local/longline dissemination. **NOTE:** The requirement to augment specific elements in figure 13.1 may change as future automated surface observing sensors/algorithms are added.

Figure 13.1. Automated Surface Observing Systems Augmented Weather Elements.

Weather Elements.	Body/Remarks
Volcanic Eruptions	Remarks
Tornadoes, Funnel Clouds, Waterspouts	Remarks
Thunderstorm (augment with location remarks)	Remarks
Lightning (augment with location remarks)	Remarks
Visibility Increments of 1/8, 1/16 and 0 (if required)	Body
Hail	Body/Remarks
Ice Crystals (Snow Grains, Ice Pellets, Snow Pellets)	Body
Drizzle, Freezing Drizzle versus Freezing Rain	Body
Volcanic Ash	Body
Variable Sky Condition	Remarks
Sector Visibility	Remarks
Tower Visibility	Remarks
Local and/or Longline RVR (at required locations)	Body
Widespread Blowing Obstructions (Sand, Dust, Spray)	Body/Remarks
Smoke	Body/Remarks
Significant Cloud Types (i.e., CB/CBMAM, TCU, ACC, SCSL, ACSL, CCSL)	Remarks
Cloud Layers Above 12,000 feet	Body
Virga	Remarks
Snow Fall (accumulation rate) and Snow Depth (6-hourly)	Remarks
Hourly Snow Increasing Rapidly	Remarks
Water Equivalent of Snow on the Ground	Remarks
Liquid Equivalent of Frozen Precipitation (See Note)	Remarks
Observed Significant Weather Not at the Station remarks	Remarks
Any operationally significant remarks as deemed appropriate by the weather technician.	Body/Remarks
NOTE: This may require augmentation depending on the precipitation event and automated surface observing system equipment limitations.	

13.3.2.2.1. If available, weather personnel will use accurate, reliable alternative data sources (e.g., TACMET) to report missing, clearly erroneous, or temporarily unrepresentative elements. In the event of a total automated surface observing system equipment failure, they will manually record and disseminate all METAR/SPECI reports.

13.3.2.3. Operational units requiring additional weather observing support are responsible to ensure appropriate observing arrangements are negotiated and documented between all parties.

13.3.2.4. MAJCOMs will update Flight Information Publication (FLIP) references IAW AFI 11-201, *Flight Information Publications*, to specify those USAF and US Army controlled airfields with an unaugmented automated surface observing system capability.

13.3.3. Transmitted automated surface observing system observations will use column 13 to identify the type of equipment used (see figure 13.2), and whether or not it is augmented. The use of the contraction AUTO in the heading of the observation signifies that the observation is fully automated with no human augmentation. **NOTE:** For an augmented unit: To ensure local and longline observation accuracy and consistency, the automated surface observing system may transmit before local dissemination via LWDS.

Figure 13.2. Types of Automated Surface Observing Stations.

Column 13 Identifier	Definition
AO1	Automated station without precipitation discriminator
AO2	Automated station with precipitation discriminator

13.3.4. General Capabilities. The Automated Surface Observing System (ASOS) provides a fully automated weather observation. However, certain ASOS components and algorithms have the following limitations:

13.3.4.1. Sky Condition. The sky condition represents the most recent 30 minutes of 30-second sample data; the last 10 minutes of data are processed twice (double weighted) to be more responsive to the latest changes in sky condition. The sensor outputs range from surface to 12,000 feet (limitation of LBC). It assumes all clouds or obscuring phenomena are opaque. Ceiling is based on all layers detected and reported as either CLR, FEW, SCT, BKN, OVC or VV (indefinite ceiling) and reports a maximum of three layers. ASOS does not evaluate for variable sky cover. Variable ceiling height is reported when the ceiling varies 200 feet or more when the ceiling is 1,000 feet or less, 400 feet or more when the ceiling is between 1,100 and 2,000 feet, and 500 feet or more when the ceiling is greater than 2,000 but less than 3,000 feet.

13.3.4.2. Prevailing Visibility. First, ASOS calculates a 1-minute average visibility every minute and stores the value for 10 minutes. Second, ASOS computes a running 10-minute harmonic mean once a minute from the stored data to provide the latest visibility. Sector visibility is not reported and tower visibility is only reported at designated augmented stations. Variable visibility is reported when visibility varies by 1/2 mile (800 meters) or more and the average is less than 3 miles (4800 meters). Reportable values are: <1/4, 1/4, 1/2, 3/4, 1, 1 1/4, 1 1/2, 1 3/4, 2, 2 1/2, 3, 3 1/2, 4, 5, 7, and 10 statute miles. See table 6.1 for metric conversion. **NOTE:** A harmonic mean is used in the final computation rather than an arithmetic mean because it is more responsive to rapidly decreasing visibility conditions and will generally yield a lower value than the arithmetic value.

13.3.4.3. Weather and Obscurations. Neither will be reported by an AO1 location. Locations with AO2 will report rain (RA), snow (SN), and unknown precipitation (UP) for cases when there is precipitation but the sensor cannot determine if it is rain or snow. They will also report fog and haze.

13.3.4.4. Sea-Level Pressure. Same as manual.

13.3.4.5. Temperature and Dew Point. Same as manual.

13.3.4.6. Wind Direction and Speed. Same as manual.

13.3.4.7. Wind Character. Same as manual.

13.3.4.8. Altimeter Setting. Same as manual.

13.3.4.9. Remarks. The ASOS puts automatic remarks for variable ceiling, visibility, and wind direction, precipitation amounts, and peak wind. Remarks added by weather personnel during ASOS augmentation are coded and reported in accordance with **table 13.1.**

Table 13.1. ASOS METAR Observation.

METAR KABC 1217155Z AUTO 21016G24KT 180V240 1SM R11/P6000FT –RA FG BKN015 OVC025 06/05 A2990 RMK AO2 PK WND 20032/25 WSHFT 1715 VIS 3/4V1 ½ ¾ RWY11 RAB07 CIG 013V017 CIG017 RWY11 PRESFR SLP125 P003 60009 T00640054 10066 21012 58033 TSNO $		
Coded Entry	**Code Definition**	**Description of Code Definition**
METAR	TYPE OF REPORT	METAR: Hourly (scheduled) report; SPECI: special (unscheduled report.
KABC	STATION IDENTIFIER	Four alphanumeric characters; ICAO location identifier.
121755Z	DATE/TIME	All dates and times in UTC using a 24-hour clock; two-digit date and four-digit time always appended with Z to indicate UTC.
AUTO	REPORT MODIFIER	Fully automated report, no human intervention. **NOTE**: This modifier is removed during ASOS augmentation when weather personnel sign on.
21016G24KT	WIND DIRECTION AND SPEED	Direction in tens of degrees from true north (first three digits); next two digits: speed in whole knots; as needed Gusts (character) followed by maximum observed speed; always appended with KT to indicate knots; 00000KT for calm; if direction varies by 60 degrees or more, a variable wind direction group is reported.
1SM	VISIBILITY	Prevailing visibility in statute miles and fractions (space between whole miles and fractions); always appended with SM in the United States and Guam to indicate statute miles; values <1/4 reported as M1/4.
R11/P6000FT	RUNWAY VISUAL RANGE	Location dependent: 10-minute RVR value in hundreds of feet; reported if prevailing visibility is =< one mile or RVR =< 6000 feet; always appended with FT in the United States to indicate feet; value prefixed with M or P to indicate value is lower or higher than the reportable RVR value.
-RA FG	WEATHER PHENOMENA	TS (thunderstorm); FZRA (intensity, freezing rain); RA: liquid precipitation that does not freeze; SN: frozen precipitation other than hail; UP: precipitation of unknown type; intensity prefixed: light (-), moderate (no sign), heavy (+); FG: fog; FZFG: freezing fog (temperature below 0 degrees Celsius); BR: mist; HZ: haze; SQ: squall; maximum of three groups reported; augmented by weather personnel: FC (tornadic activity); GR (hail); GS (small hail; <1/4 inch); and VA (volcanic ash).
BKN015 OVC025	SKY CONDITION	Cloud amount and height: CLR (no clouds detected below 12,000 feet); FEW (few); SCT (scattered); BKN (broken); OVC (overcast); followed by 3-digit height in hundreds of feet; or vertical visibility (VV) followed by height for indefinite ceiling.
06/05	TEMPERATURE/DEW-POINT	Each is reported in whole degrees Celsius using two digits; values are separated by a solidus; sub-zero values are prefixed with an M (minus).
A2990	ALTIMETER	Altimeter always preferred with an A indicating inches of mercury; reported using four digits: tens, units, tenths, and hundredths.
RMK	REMARKS INDICATOR	Indicates remarks will follow.
Remarks are reported using the following order of entry. NOTE: A blank Coded Entry block indicates the remark was not used in the above example.		

METAR KABC 1217155Z AUTO 21016G24KT 180V240 1SM R11/P6000FT –RA FG BKN015 OVC025 06/05 A2990 RMK AO2 PK WND 20032/25 WSHFT 1715 VIS 3/4V1 ½ ¾ RWY11 RAB07 CIG 013V017 CIG017 RWY11 PRESFR SLP125 P003 60009 T00640054 10066 21012 58033 TSNO $		
Coded Entry	**Code Definition**	**Description of Code Definition**
	VOLCANIC ERUPTIONS	Plain language. Used only in augmented reports. The following information, if known; name of volcano, latitude and longitude, date/time, size description, approximate height and direction of movement of the ash cloud and any other pertinent data, e.g., MT AUGUSTINE VOLCANO 70SW ERUPTED 231505 LARGE ASH CLOUD EXTENDING TO APRX 30000 FEET MOVING NE.
	TORNADIC ACTIVITY	Used only in augmented reports. Augmented report should include TORNADO, FUNNEL CLOUD, or WATERSPOUT, time begin/end, location, movement, e.g., TORNADO B25 N MOV E.
AO2	TYPE OF AUTOMATED STATION	Indicates an automated station with precipitation discriminator. AO1 indicates an automated station without precipitation discriminator.
PK WND 20032/25	PEAK WIND	PK WND dddff(f)/(hh)mm; direction in tens of degrees, speed in whole knots, and time.
WSHFT 1715	WIND SHIFT	WSHFT (hh)mm
TWR VIS	TOWER OR SURFACE VISIBILITY	TWR VIS vvvvv: visibility reported by tower personnel; SFC VIS vvvvv: visibility reported by ASOS.
VIS ¾V1 ½	VARIABLE PREVAILING VISIBILITY	VIS vvvvvVvvvvv; reported if prevailing visibility is <3 miles and variable.
	SECTOR VISIBILITY	Plain language. Code sector visibility in the format, VIS_[DIR]_vvvvv, 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, using the appropriate set of values in Table 6.1 (see paragraph 6.2.3.). For example, a visibility of 2 1/2 statute miles in the northeastern octant would be coded "VIS NE 2 ½."
VIS ¾ RWY11	VISIBILITY AT SECOND LOCATION	VIS vvvvv (LOC); reported if different than the reported prevailing visibility in body of report.
	LIGHTNING	(FREQ) LTG (LOC); when detected, the frequency and location is reported, e.g., FRQ LTG NE.
RAB07	BEGINNING AND ENDING OF PRECIPITATION AND THUNDERSTORMS	w'w'B(hh)mmmE(bb)mm; TSB(hh)mmE(hh)mm.
	THUNDERSTORM LOCATION	Plain language. Coded in the format, TS_LOC_(MOV_DIR), where TS identifies the thunderstorm activity, LOC is the location of the thunderstorm(s) from the station, and MOV_DIR is the movement with direction, if known. For example, a thunderstorm southeast of the station and moving toward the northeast would be coded "TS SE MOV NE."
	HAILSTONE SIZE (GR SIZE)	Plain language. Coded in the format, GR_[size], where GR is the remark identifier and [size] is the diameter of the largest hailstone. Code hailstone size in 1/4 inch increments (see paragraphs 7.2.5.2.7. and 7.2.5.2.8.). For example, "GR 1 3/4" would indicate that the largest hailstones were 1 3/4 inches in diameter. If GS is coded in the body of the report, no hailstone size remark is required.
	VIRGA	Plain language. Augmented; precipitation not reaching the ground, e.g., VIRGA.

METAR KABC 1217155Z AUTO 21016G24KT 180V240 1SM R11/P6000FT –RA FG BKN015 OVC025 06/05 A2990 RMK AO2 PK WND 20032/25 WSHFT 1715 VIS 3/4V1 ½ ¾ RWY11 RAB07 CIG 013V017 CIG017 RWY11 PRESFR SLP125 P003 60009 T00640054 10066 21012 58033 TSNO $		
Coded Entry	**Code Definition**	**Description of Code Definition**
CIG 013V017	VARIABLE CEILING HEIGHT	CIG hhhVhhh; reported if ceiling in body of report is < 3,000 feet an variable.
	OBSCURATION	Plain language. Code obscurations (surface-based or aloft) in the format, w'w'_[NsNsNs]hshshs, where w'w' is the weather causing the obscuration at the surface or aloft, NsNsNs is the applicable sky cover amount of the obscuration aloft (FEW, SCT, BKN, OVC) or at the surface (FEW, SCT, BKN), and hshshs is the applicable height (see paragraph 8.2.5.1.). Code surface-based obscurations with a height of "000". Insert a space separating the weather causing the obscuration and the sky cover amount; with no space between the sky cover amount and the height. For example, fog hiding 3-4 oktas of the sky would be coded "FG SCT000"; a broken layer at 2,000 feet composed of smoke would be coded "FU BKN020."
	VARIABLE SKY CONDITION	Plain language. Code variable sky condition remarks in the format, NsNsNs(hshshs)_V_NsNsNs, where NsNsNs(hshshs) and NsNsNs identifies the two operationally significant sky conditions and V denotes the variability between the two ranges (see paragraph 8.2.16.). If there are several layers with the same sky condition amount, the layer height (hshshs) of the variable layer shall be coded. For example, a cloud layer at 1,400 feet that is varying between broken and overcast would be coded "BKN014 V OVC."
	SIGNIFICANT CLOUD TYPES (CB/CBMAM, TCU, ACC, SCSL, ACSL, CCSL)	Plain language. See Table 11.1. Column 13 Remarks and Order of Entry.
CIG 017 RWY 11	CEILING HEIGHT AT SECOND LOCATION	CIG hhh (LOC); Ceiling height reported if secondary ceilometer site is different from the ceiling height in the body of the report.
PRESFR	PRESSURE RISING OR FALLING RAPIDLY	PRESRR or PRESFR; pressure rising or falling rapidly at time of observation.
SLP125	SEA-LEVEL PRESSURE	SLPppp; tens, units, and tenths of SLP in hPa.
	AIRCRAFT MISHAP	Plain language. If a report is taken to document weather conditions when notified of an aircraft mishap, code the remark ACFT MSHP in the report but do not transmit local or longline. Indicate the act of non-transmission by enclosing the remark in parentheses in the record, i.e., "(ACFT MSHP)."
	SNOW INCREASING RAPIDLY	The remark SNINCR, the inches of snow per hour, and the inches of snow on the ground. For example, a snow increase of 2 inches in the past hour with a total snow depth on the ground of 10 inches would be coded as SNINCR 2/10.
	OTHER SIGNIFICANT INFORMATION	Plain language. Units may add to a report other information significant to their operations, such as information on fog dispersal operations, runway conditions, "FIRST" or "LAST" report from station, etc.
P0003	HOURLY PRECIPITATION AMOUNT	Prrrr; in .01 inches since last METAR; a trace is P0000.

METAR KABC 1217155Z AUTO 21016G24KT 180V240 1SM R11/P6000FT –RA FG BKN015 OVC025 06/05 A2990 RMK AO2 PK WND 20032/25 WSHFT 1715 VIS 3/4V1 ½ ¾ RWY11 RAB07 CIG 013V017 CIG017 RWY11 PRESFR SLP125 P003 60009 T00640054 10066 21012 58033 TSNO $		
Coded Entry	**Code Definition**	**Description of Code Definition**
60009	3- and 6-HOURLY PRECIPITATION AMOUNT	6RRRR; precipitation amount in .01 inches for past 6 hours reported in 00, 06, 12, and 18 UTC observations and for the past 3 hours in 03, 09, 15, and 21 UTC observations, a trace is 60000.
	24-HOURLY PRECIPITATION AMOUNT	$7R_{24}R_{24}R_{24}R_{24}$: precipitation amount in .01 inches for past 24 hours reported in 12 UTC observations, e.g., 70015.
	CLOUD TYPES	See paragraph 3.12.2.1.5.
T00640054	HOURLY TEMPERATURE AND DEWPOINT	T_sTTT_sTTT; tenths of degrees Celsius; s: 1 if temperature below 0 degrees and 0 if temperature is 0 degrees or higher.
10066	6-HOUR MAXIMUM TEMPERATURE	$1s_nT_xT_xT_x$ tenth of degree Celsius; 00, 06, 12, 18 UTC; s_n: 1 if temperature below 0 degrees and 0 if temperature is 0 degrees or higher.
21012	6-HOUR MINIMUM TEMPERATURE	$2s_nT_nT_nT_n$: tenth of degree Celsius; 00, 06, 12, 18 UTC; s_n: 1 if temperature below 0 degrees and 0 if temperature is 0 degrees or higher.
	24-HOUR MAXIMUM and MINIMUM TEMPERATURE	$4s_nT_xT_xT_xs_nT_nT_nT_n$: tenth of degree Celsius; reported at midnight local standard time; 1 if temperature below 0 degrees and 0 if temperature is 0 degrees or higher, e.g., 400461006.
58033	PRESSURE TENDENCY	5appp; the character (a) and change in pressure (ppp; tenths of hPa) the past 3 hours.
TSNO	SENSOR STATUS INDICATORS	RVRNO: RVR missing; PWINO: precipitation identifier information not available; PNO: precipitation amount not available; FZRANO: freezing rain information not available; TSNO: thunderstorm information not available; VISNO (LOC); visibility a secondary location not available, e.g., VISNO RWY06; CHINO (LOC): (cloud-height-indicator) sky condition at secondary location not available, e.g., CHINO RWY06.
	MAINTENANCE INDICATOR	Maintenance needed on the system.
NOTE: If an element or phenomena is missing, or cannot be observed, the corresponding group and spaces are omitted (body and/or remarks) from that particular report, except for Sea-Level Pressure (SLPppp). SLPNO shall be reported in a METAR when the SLP is missing or not available.		

13.4. Tactical Weather Station Operations. Mobile capabilities and tactical observing operations are inherent to US Air Force weather support of the US Air Force and US Army missions. Tactical observing support is conducted according to operations plans and other pertinent directives. Observing standards and practices in this manual will be used, to the maximum extent possible when establishing and managing tactical observing stations.

13.4.1. Tactical Meteorological Observing System Modification (TAC MET-Mod). TACMET-Mod can provide a remote semi-automated to automated surface meteorological observation capability for use by Air Force weather forces. TACMET-Mod software can produce an automated METAR observation per Federal Meteorological Handbook (FMH) #1.

13.4.2. Remote Miniature Weather Station (RMWS). RMWS is an expendable automated observation sensor suite, used primarily in data sparse or data-denied areas. Due to the nature of the system and non-attended areas the system will be located, information received should be considered estimated and will be annotated as such (E for estimated). Table 13.2 depicts an example of a RWMS site and its relayed data.

Table 13.2. RWMS Site Example.

Current Schedule:
Report: 1 hour
Temperature/Pressure/Humidity (TPH): 1 hour
Wind: 1 hour
Visibility: 1 hour
Position: 1 hour
Bite: 1 hour

TPH Data:						
DTG	T1	T2	T3	P1	P2	RH
(GMT)	(F)	(F)	(F)	(mb)	(mb)	(%)
20/11/13 04:39:16	66	66	66	1017.9	1018.0	86

WIND Data:				
DTG	Average	Maximum	Direction	Variability
(GMT)	(kts)	(kts)	(deg)	(deg)
20/11/13 04:57:41	1	3	353	119

Visibility Data:	
DTG	Meteorological Optical Range (MOR)
(GMT)	(km)
20/11/13 04:40:57	20.00

Position Data:					
(DTG)	Direction	Azimuth	Tilt	Latitude	Longitude
(GMT)	(deg)	(deg)	(deg)		
20/11/13 04:45:23	65	172	4	38.3540	-77.5480

Bite Data:										
DTG	V1	V2	V3	V4	V5	Wind	Tilt	Bar	Sns	Bat
(GMT)	(Built in Test Data, Volts)									
20/11/13 04:48:05	9.1	10.1	4.8	8.4	10.0	10.3	4.9	13.6	4.9	14.8

NOTES:

1. Pressure is not currently corrected for altitude.

2. The wind data reported is generated from a 2 ½ minute collection period. Average equals the average wind speed in the 2 ½ minute interval. Maximum wind speed is generated in the 2 ½ minute interval. Direction is the average direction of wind relative to magnetic north. Variability is the maximum wind divergence about the wind direction during the 2 ½ minute interval.

3. The maximum value for MOR is 20 kilometers.

4. The position data reports orientation of the weather pod and may include the derived latitude and longitude. Direction refers to the direction the weather pod is pointing relative to magnetic north. Azimuth is the direction of tilt from vertical of the weather pod relative to the front of the pod. Tilt is the tilt of the pod from vertical. Latitude is the decimal reading of the RWMS. Longitude is the decimal reading of the RWMS.

5. The BITE data contains data collected from test equipment internal to the RWMS. This data is useful when troubleshooting the system or when trying to determine the state of health. This data can be ignored for most users.

13.5. Earthquake Observations. The National Earthquake Information Center of the US Geological Survey (USGS/NEIC) requires information in addition to that available from its network of seismograph stations. The information is necessary to properly describe the event for dissemination of advisories relative to the occurrence.

13.5.1. Reporting Stations. Each active US Air Force weather unit with an observing or forecasting function located in the CONUS, Alaska, and Hawaii will establish procedures to obtain applicable data and report earthquake occurrences. This requirement includes the Alaskan Radar System (formerly called Aircraft Control and Warning System) sites where the functions are performed by contract weather observers. If more than one weather unit is located on a base, the unit with the longest operating hours is responsible for preparing and submitting the report. At joint use bases, coordinate with the other agency to determine who will submit the report and establish procedures for consolidated reports. Earthquake reports are required for only those detected during the unit's hours of operation.

13.5.2. Reporting Procedures. Immediately following an earthquake, send a message to the Tinker Automatic Digital Weather Switch (ADWS) via the Automated Weather Network (AWN). Reports will consist of a brief description of the event using the format in **attachment 2** as a guide. As a follow-up to the message report, complete the United States Geological Survey (USGS) Form 9-3013, Earthquake Report Form, and mail it within 3 working days to the USGS/NEIC address printed on the form. Additionally, reports can be electronically submitted through the National Earthquake Information Center home page (URL: http://earthquake.usgs.gov).

13.5.3. Requests for Forms . Send requests for forms to:

US Geological Survey

National Earthquake Information Center

Box 25046

Mail Stop 966

Attn: Carl Stover

Denver Federal Center

Denver CO 80225-0046

13.6. Radioactive Fallout Collection Observations . These observations are made in support of the US Department of Energy.

13.6.1. Reporting Stations. The Lajes AB weather unit is tasked to participate in the program:

13.6.2. Reporting Procedures. Submit reports according to the instructions provided. Units are authorized direct correspondence on matters concerning operational instructions, equipment, and supplies. Forward all correspondence, collection tubes, and other required data to:

Environmental Measurements Laboratory

US Department of Energy

201 Varick Street

New York, New York 10014

13.7. Tidal Gauge Monitoring. NOAA requires tide gauge information in support of the Tsunami Warning System. Equipment and expendables are provided by NOAA.

13.7.1. Reporting Station . Eareckson AFS AK is tasked to provide support.

13.7.2. Reporting Procedures. Reporting procedures are provided by higher headquarters or MAJCOMs.

13.8. Forms Prescribed:

AF Form 3801, **Aneroid Barometer Standardization/Comparison**

AF Form 3803, **Surface Weather Observations (METAR/SPECI)**

AF Form 3813, **Federal Meteorological Surface Weather Observations (METAR/SPECI).**

MARVIN R. ESMOND, Lt General, USAF
DCS/Air and 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 36-2201, *Developing, Managing, and Conducting Training*

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*

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

ADWS—Automatic Digital Weather Switch

AFCCC—Air Force Combat Climatology Center

AFW—Air Force Weather

AFWA—Air Force Weather Agency

AFWIN—Air Force Weather Information Network

ALP—Airport Location Point

ALSTG—Altimeter Setting

AO1—Automated Station Without Precipitation Discriminator

AO2—Automated Station With Precipitation Discriminator

AOS—Alternate Observing Site

APRNT—Apparent

APRX—Approximately

ASOS—Automated Surface Observing Systems

ATC—Air Traffic Control

AUTO—Automated Report

B—Began

BC—Patches

BKN—Broken

BL—Blowing

BR—Mist

BWS—Base Weather Station

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

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 After A Break In Coverage At Manual Station

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 Sensor Not Available

G—Gust

GEN—General Type Contraction

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

KT—Knots

L—Left (With Reference To Runway Designation)

LAST—Last Observation Before A Break In Coverage At A Manual Station

LBC—Laser-Beam Ceilometer

LST—Local Standard Time

LTG—Lightning

LWDS—Local Weather Dissemination System

LWR—Lower

M—Minus, Less Than

MACOM—Major Army Command

MAJCOM—Major Command

METAR—Aviation Routine Weather Report

MI—Shallow

MOV—Moved/Moving/Movement

MT—Mountains

N—North

N/A—Not Applicable

NE—Northeast

NIL—Transmitted When Report Not Ready On Time

NOSPECI—No SPECI Reports Are Taken At The Station

NTFS—New Tactical Forecast System

NW—Northwest

NWS—National Weather Service

OCNL—Occasional

OVC—Overcast

OHD—Overhead

P—Greater Than

PCPN—Precipitation

PK WIND—Peak Wind

PL—Ice Pellets

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

PWS—Post Weather Station

PY—Spray

R—Right (With Reference To Runway Designation)

RA—Rain

RBC—Rotating Beam Ceilometer

RCR—Runway Condition Reading

RCRNO—Runway Condition Reading Not Available

RMK—Remark

RSC—Runway Surface Condition

RVR—Runway Visual Range

RVRNO—RVR System Not Available/No Ten Minute RVR Average Readout Capability

RWY—Runway

S—South

SA—Sand

SAFWIN—Secure Air Force Weather Information Network

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—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

UTO—Universal Time Observed

V—Variable

VA—Volcanic Ash

VC—In The Vicinity

VFR—Visual Flight Rules

VIS—Visibility

VISNO—Visibility At Secondary Location Not Available

VRB—Variable

VV—Vertical Visibility

W—West

WMO—World Meteorological Organization

WND—Wind

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 environmental/weather data and Notices to Airmen (NOTAMs). It consists of: two overseas Automatic Digital Weather Switches (ADWSs) which are linked to AFWA via high-speed communications circuits through a hub ADWS at Tinker AFB OK and the CFEP at Offutt AFB NE; three overseas Weather Intercept Concentrator Units, and their supporting circuits; and the circuitry and interfaces interconnecting the ADWSs with other DoD, federal, and foreign meteorological and aviation facilities.

Automated Weather Network Management Center—The joint 38 EIW, AFWA and US Navy office located at Tinker AFB OK. Responsible for overall management of the AWN, including resource allocation and reconfiguration, planning and implementing circuit upgrade actions and maintenance of the Message Distribution Library (MDL).

Automatic Digital Weather Switch—A joint communications/weather operation that performs the communications switching and editing function of the AWN. The AWN is comprised of three ADWSs. The central hub is at Tinker AFB OK and the two overseas hubs are at Hickam AFB HI and RAF Croughton UK.

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

Bulletin Heading—A combination of letters and numbers that describe the contents of a bulletin, including the data type, geographical location, ICAO identifier of the originator and a date-time group.

Distant from the station—Used to report present weather phenomena more than 10 statute miles/16 kilometers from the point(s) of observation.

Dedicated Circuit—A circuit devoted solely for the use of one customer.

Dissemination Circuit—A circuit used to send weather data from one point to another or to several customers on that circuit.

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.

ICAO Identifier—A specifically authorized 4-letter identifier assigned to a location and documented in ICAO Document 7910.ICAO (used by NTFS): An ICAO identifier with a fifth character appended which designates a specific NTFS functional area (reference NTFS 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 Station—A weather station that provides less than 24-hour a day forecast service.

Nondecodable—Data transmitted with no set code format that does not require identification by AWN software decoders. These products are identified and distributed within the AWN by bulletin heading.

Notice to Airmen—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. Also called NOTAM.

New Tactical Forecast System—An integrated automated system designed to provide weather and air traffic control products to support the missions of base weather stations, weather support units, air traffic control agencies, and command posts of the DoD.

NTFS Product Driver System—A system at AFWA which builds and formats NTFS graphic products.

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 crew member.

Precedence (AWN)—A designation indicating the urgency of a message. Messages within the AWN are assigned a precedence to determine the order of importance in the distribution process. AWN precedences are assigned by number (2 through 5). 2=IMMEDIATE, 3=PRIORITY, 4&5=Two levels of ROUTINE precedence.

Precedence Prosign—Addressed messages (including ARQs) are assigned a precedence prosign: OO-Immediate, PP-Priority and RR-Routine. The precedence prosign indicates the urgency of the message and, in the case of addressed messages, the required time limits for the reply (when applicable).

Request for Service—The document required to add, delete or change communications terminal equipment or circuits.

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.

Service Message—A short non-meteorological message authorized for transmission on weather circuits for the purpose of discussing matters relating to weather products or service.

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.

Squall—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 one minute.

Vicinity—Used to report present weather phenomena 5 statute miles/8000 meters to 10 statute miles/16 kilometers from the point(s) of observation.

Weather Communications Center—The communications unit at Offutt AFB NE responsible for routing graphics products and selected alphanumeric products from AFWA, NMC and FNOC, to NTFS, the AWN, and other users.

Attachment 2

EARTHQUAKE MESSAGE FORMAT

1. Bulletin Heading: SEXX XXXX

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.

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.