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Operations and Services

Aviation Weather Services, NWSPD 10-8

TERMINAL AERODROME FORECASTS

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OPR: W/OS23 (B. McNulty) **Certified by:** W/OS23 (C. Abelman)

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SUMMARY OF REVISIONS: Supersedes NWS Instruction 10-813, *Terminal Aerodrome Forecasts*, and dated November 19, 2007. Changes are necessary out of cycle to accommodate the adoption of the 30-Hour TAF format mandated by ICAO, and introduce a method to issue TAF corrections that conforms to ICAO requirements. Specific changes:

Edited all examples to conform to the 30-Hour TAF format implemented by ICAO on November 5, 2008. The format change consists of adding date and time to the forecast valid periods and change groups.

Added a reference, in paragraph 4.1, to the coordination work files created in NWSI 10-803 for coordination between TAF forecasters and CWSU forecasters.

Added paragraph 4.10: TAF Corrections and also noted in examples the correct ICAO format for corrected TAFs.

//Signed// December 5, 2008
David Caldwell Date
Director, Office of Climate, Water, and Weather Services

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1. General. This instruction describes Terminal Aerodrome Forecast (TAF) preparation by National Weather Service (NWS) Weather Forecast Offices (WFOs). TAFs, also known as Aerodrome Forecasts, are a critical element of NWS aviation weather services because they are a key product in decisions on aircraft movement within the National Airspace System (NAS).

2. Background. TAFs are used by a variety of aviation users, including domestic and international commercial airlines, general aviation (GA), civilian, and military operators. TAFs will be prepared, issued, and distributed on a timely basis to meet requirements of the U.S. Aviation Authority, the Federal Aviation Administration (FAA), and the International Civil Aviation Organization (ICAO) using a code format designed by the World Meteorological Organization (WMO) for both domestic and international use.

3. Responsibility. WFO Meteorologists in Charge (MICs) are ultimately responsible for maintaining a consistent and accurate aviation forecast program. TAFs will be prepared by designated NWS offices for the sites listed in Appendix E. TAF sites are listed alphabetically by region, by WFO within each region, and by TAF sites, indicated by the 4-letter ICAO identifier and the location (city, town, or airport). The Office of Climate, Water, and Weather Services (OCWWS), NWS Headquarters (NWSH) will update Appendix E at least annually.

4. Terminal Aerodrome Forecast. A NWS TAF will consist of the expected meteorological conditions significant to aviation at an airport (terminal) for a specified time period. The U.S. definition of a terminal is the area within five (5) statute miles (SM) of the center of an airport's runway complex. Forecasters will prepare and monitor TAFs using the best professional judgment to optimize timeliness and representativeness, with an awareness of the potential operational impact of each forecast element. Forecasters should also keep in mind the Critical TAF Period; defined as hours 0-6 from the current valid time within the TAF.

TAFs in the U.S. will be prepared in the international standard for TAF code, with U.S. modifications, described in WMO Manual on Codes, WMO No. 306, Volume I.l, Part A, FM 51-X Ext. TAF, Aerodrome Forecast. U.S. modifications will be held to a minimum.

4.1 Guidance and Coordination. Forecasters should use guidance products from the National Centers for Environmental Prediction (NCEP), Aviation Weather Center (AWC), Alaska Aviation Weather Unit (AAWU), Storm Prediction Center (SPC), Tropical Prediction Center (TPC), Central Pacific Hurricane Center (CPHC), and Meteorological Development Laboratory (MDL). Other sources of information useful in preparing TAFs include Pilot Reports (PIREPs), climatology, local effects, locally derived forecast rules, and data obtained through Aircraft Communications, Addressing and Reporting System (ACARS), Meteorological Data Collection and Reporting System (MDCRS), and Tropospheric Airborne Meteorological Data Report (TAMDAR).

Forecasters should coordinate as needed with the servicing Center Weather Service Unit (CWSU) using collaboration files in accordance with NWSI 10-803, *Support to Air Traffic Control Facilities.* Forecasters should coordinate with adjacent NWS offices to prevent inconsistencies between TAFs. TAFs should be synoptically consistent with public and other aviation products. However, since the TAF describes conditions in a very small area relative to public zone forecasts or sections of an aviation area forecast, some small scale differences can occur. The forecaster is the final authority for the forecasts they issue.

4.2 Composing the TAF. A complete TAF will include a forecast of surface wind (speed and direction), surface visibility, weather, obstructions to vision (if any), clouds (or vertical visibility into a surface-based obscuration), Low Level Wind Shear (LLWS), and any expected significant change(s) to one or more of these elements during the specified time period, ordinarily 24 hours.

Beginning November 5, 2008 certain, mostly international, airports require 30 hour TAFs.

Forecasters should keep the following in mind when composing a TAF:

a. Do not provide a great level of detail on operationally insignificant expectations.

b. Be aware of amendment criteria when formulating the forecast, but do not forecast just to satisfy criteria.

c. Severe thunderstorms (TS) are difficult to describe in the significant weather (SIGWX) portion of the TAF. However, a severe TS may be indicated by the forecast winds (greater than or equal to (GTE) 50 knots with TS in significant weather).

d. The Critical TAF Period is the most important time frame for operationally significant weather.

TAFs may also include specified significant meteorological phenomena expected to occur in the airport's vicinity (VC) during any part of the valid period as VC weather codes (VCFG, VCSH, VCTS). In the United States, vicinity is defined as an area between circles (a donut) with radii of 5 and 10 statute miles (SM) from the center of the runway complex of an airport. NOTE: VC has less stringent operational impacts on users than PROB30 groups.

TAFs for Automated Surface Observing System (ASOS) and Automated Weather Observing System (AWOS) sites will contain the element value(s) and the type(s) and intensity of weather and/or obstructions the forecaster expects, regardless of whether the automated system can report or differentiate between those conditions and other, similar conditions. For example, if the forecaster expects clouds above 12,000 feet, zero visibility, ice pellets, or snow showers, the TAF should reflect these conditions. Even when an automated system reports CLR (which indicates clear below 12,000 feet AGL), M1/4SM (which indicates visibility of LT 1/4 SM), or rain or snow when ice pellets or snow showers may be occurring, the TAF will be representative of what is expected to occur.

The forecaster will maintain a watch of weather conditions for all pertinent TAF sites, including sites with scheduled part-time observation, automated observing sites requiring part-time augmentation, and non-augmented automated observing sites. When the WFO forecast team notes an outage of an observation system or missing data, they should contact the FAA facility (usually the FAA tower or contract weather observer) to implement backup procedures to transmit the complete observations.

4.2.1 Tall Tower Airports. Certain airports, generally those with tall towers, report the lower of tower or surface visibility as the prevailing visibility in their observations, with the higher visibility in the remarks section. Forecasters need to monitor these airport observations closely to maintain awareness of the surface visibility.

4.3 Sub-dividing the TAF Valid Time Period. The valid time period of the TAF may be sub-divided into two or more smaller segments of time to describe significant changes to the forecast conditions. The terms used to sub-divide the valid time period are described in Appendix C,

Section 1.2.9. TAFs should be as simple and straightforward as possible. Changes indicated in the forecast should be kept to the minimum number needed to describe operationally significant changes. The following subsections describe factors that impact decisions on sub-dividing the forecast valid period.

4.3.1 Flight Categories. Low Instrument Flight Rules (LIFR), Instrument Flight Rules (IFR), Marginal Visual Flight Rules (MVFR) and Visual Flight Rules (VFR) flight categories define sets of operating procedures, aviator qualifications and aircraft capability requirements. Further, NWS has an additional category: Very Low IFR (VLIFR), with criteria of ceilings less than (LT) 200 feet and/or visibility LT ½ mile. Forecasters should be familiar with these flight categories and understand the impact changes across these categories have on aviation operations.

The flight categories and corresponding ceiling and visibility values are listed below, using the category dividers of Less Than (LT), Less Than or Equal To (LTE), Greater Than (GT), and Greater Than or Equal To (GTE):

FLIGHT CATEGORY	CEILING (feet)		VISIBILITY (statute miles)
VLIFR	LT 200	and/or	LT ½ SM
LIFR	GTE 200 to LT 500	and/or	GTE ½ to LT l SM
IFR	GTE 500 to LT 1,000	and/or	GTE 1 to LT 3 SM
MVFR	GTE 1,000 to LTE 3,000	and/or	GTE 3 to LTE 5 SM
VFR	GT 3,000	and/or	GT 5 SM

4.3.2 Critical Thresholds for Significant Operational Impacts. Other ceiling (CIG) and visibility (VIS) thresholds which have operational impact, i.e., significant safety, capacity, and/or efficiency impact on aviation operations include, but are not limited to:

CIG LT 2,000 ft/VIS LT 3 SM: Alternate destination and increased fuel required for IFR planning. Such conditions may restrict visual approaches which lead to reducing airport arrival rates.

CIG LT 800 ft/VIS LT 2 SM: Non-precision approach airports cannot be used as an IFR flight planning alternate.

CIG LT 600 ft/VIS LT 2 SM: Airport cannot be used by most operators as an IFR flight planning alternate.

CIG LT 200 ft/VIS LT ½ SM: These forecast conditions would preclude dispatch or release to the airport as a destination or alternate for most operators. Operators approved for approach Category II/III could dispatch as a destination airport.

NOTE 1: Category II approach limits are Decision Height (DH) as low as 100 feet, and Visibility or Runway Visual Range (RVR) between 1,200 and 1,800 feet. Category III is subdivided into a, b, and c. Specific DH and RVR requirements will vary at different airports. In general Category IIIa approach limits are DH of 50 feet with an RVR as low as 700 feet. Category IIIb is an instrument approach and landing with a DH lower than 50 feet, or no DH and a RVR less than 700 feet but not less than 150 feet. However, the United States does not use DH

for Category IIIb. Category IIIc is an automated (hands-off) landing by the flight crew and has no minimum DH or RVR. DH is not a ceiling category, but rather the height at which the pilot makes the decision to land. Source: FAA Advisory Circular 120-29A.

NOTE 2: Certain airports may have local critical thresholds. These thresholds will be stated in the local weather support plan created in accordance with NWSI 10-801 (Aviation Weather Warning) for the individual airports. Forecasters should accommodate these thresholds when preparing TAFs.

4.3.3 Other Events Having Significant Operational Impact. Thunderstorms, non-convective LLWS, start or stop of freezing precipitation and ice pellets, moderate or heavy rain, significant snow accumulation, sustained winds greater than 15 knots, wind direction changes of 30 degrees or more with speeds greater than or equal to 12 knots or wind gust spread (the difference between mean wind speed and maximum gusts) greater than or equal to 10 knots all significantly impact aviation operations. In addition, any cloud group, visibility, wind or other sensible weather condition which exceeds an identified threshold results in a notable impact on air traffic flow management, especially at pacing airports.

4.3.4 Length of TAF Change Groups. From (FM) will always be a single time, generally a whole hour. FM may be encoded to the minute if the expected change can be forecast to that degree of accuracy. Temporary (TEMPO) groups will not exceed four (4) hours. Probability (PROB) groups will be six (6) hours or less.

4.4 PROB and TEMPO Groups. PROB and TEMPO are defined as follows:

a. PROB: Probability of occurrence of a thunderstorm or other precipitation event, with associated weather elements as necessary (wind, visibility, and/or sky condition) whose occurrences are directly related to, and contemporaneous with, the thunderstorm or precipitation event. Only PROB30 (30% probability of the specified element occurring) groups will be used in NWS TAFs.

b. TEMPO: Temporary fluctuations in forecast meteorological conditions which are expected to last less than one (1) hour in each instance and, in the aggregate, to cover LT half of the indicated period. Use TEMPO groups for high probability (greater than 50%) expectations only.

Forecasters should remember the lowest meteorological condition contained in a TAF, regardless of any conditional language (e.g., PROB30 or TEMPO), will drive operational decisions. PROB30 and TEMPO should describe short duration forecast weather changes. Therefore, use either group as sparingly as possible.

4.4.1 NWS PROB30 Term Use Restriction. PROB30 groups will not be used in the first nine (9) hours of every TAF valid period, including amendments. TEMPO groups will not be substituted to indicate a low probability event during the restricted time period.

RATIONALE: The TAF is a point forecast, not a zone or area forecast. PROB30 can be confusing, prompting TAF users to request the term not be used in the first nine (9) hours of a

TAF. While the PROB30 group in the TAF should not differ significantly with the zone Probability of Precipitation (PoP), it is not necessarily the same because the PROB30 group usually includes the probability of lower ceilings and restricted visibilities with the precipitation. Further, the TAF can accommodate hourly PoP intervals while the public zone must use PoPs for 6- or 12-hour periods.

Example: A 70% PoP for showers is forecast for a zone in the afternoon. At a TAF site in that zone, a 30% chance of showers is forecast for early afternoon and a 70% chance for late afternoon. The corresponding TAF would not include a PROB30 group in the first nine (9) hours for a 30% PoP, and then may include showers in the prevailing or TEMPO group as the probability increases later in the day.

NOTE: When a PROB30 group is warranted in an amended or delayed TAF, the PROB30 group should become effective on the next whole hour following the end of the nine (9) hour period which begins after the amended or delayed TAF issuance time. The use of intermediate times as beginning times for forecast groups, just for the purpose of including a PROB30 group, is discouraged.

4.5 TAF Amendments. Amendments (AMDs) are an effective method to optimize the quality of the TAF. Forecasters must remember the TAF is designed for the end user. The sooner the forecaster provides an amended TAF to the end user, the better. Unforeseen weather changes can have a rippling effect with delays in the NAS. The decision to amend the TAF relies on the forecaster's assessment of existing conditions and expectations. If conditions change earlier or later than forecast but the TAF shows the expected trend and will soon recover, an amendment may not be needed. Additionally, small fluctuations in the observation should not result in a minor adjustment to the TAF (chasing the observation). However, if improving weather conditions occur sooner than forecast, then an amended TAF is recommended. Further, forecasters should exercise good judgment when using automated observations. Because of their sensitivity, AWOS/ASOS observation data are more likely to fall outside the forecast amendment ranges.

TAF amendments will be issued promptly when:

a. Conditions meeting amendment criteria are imminent or have occurred and those conditions will, in the forecaster’s estimation, persist for 30 minutes or longer, or

b. New guidance/information indicates future conditions are expected to be in a different category than originally forecast, especially during the Critical TAF Period.

Forecasters should use application programs designed to alert them when a TAF does not meet current criteria. Forecasters should issue TAF AMDs for significant forecast changes immediately rather than update at the next regularly scheduled TAF release time, even if that release time is within a half hour after the amendment time.

4.5.1 Amendment Criteria. Amendment criteria values are operationally significant to aircraft and airports. Discrete flight category value changes for VFR, MVFR, IFR and LIFR have significant operational impact (i.e., fuel requirements, alternates) and the TAF must be especially accurate regarding those values. Further, specific airports may have other values which are locally important to operations. Forecasters should be aware of these values when amendments are required and issued.

U.S. TAF Amendment Criteria. The following are recommended amendment thresholds for NWS TAFs.

a. Ceiling. If the ceiling decreases to LTE 3,000 feet, or LT 2,000, 1,000, 600, or 200 feet; or increases to GT 3,000, or GTE 2,000, 1,000, 600, or 200 feet.

b. Visibility. If visibility decreases to LTE 5 SM, or LT 3, 2, 1, or ½ SM; or increases to GTE 7 (if forecast is GTE 3 but LTE 5 SM), or GTE 3, 2, 1, or ½ SM.

c. Weather. If thunderstorms, freezing precipitation or ice pellets occur and are not forecasted, or, if forecasted, do not occur.

d. Wind Direction, Speed and Gusts. Forecast mean refers to the mean wind direction or speed expected for the specified forecast group time period.

(1) Mean wind direction: differs by 30 degrees or more, with an accompanying mean wind speed of GTE 12 knots.

(2) Forecast mean wind speed: actual mean wind speed will differ from forecast group mean speed by GTE 10 knots, and:

(a) The original mean wind speed was GTE 12 knots, or

(b) The newly expected mean wind speed is GTE 12 knots.

(3) Forecast peak gust (or forecast of no gust): GTE 10 knots above observed gust (or above the observed mean wind speed if no gusts are forecast) occur or are expected.

e. Non-Convective LLWS (up to 2,000 feet). Amend the TAF if non-convective LLWS is forecasted and does not occur, or if LLWS occurs and is not forecast.

4.5.1.1 Alternative Amendment Criteria. On approval by Regional Headquarters, each WFO may determine their site specific TAF amendment criteria using Table 1 below. Such TAF amendment criteria for each airport should be established based on input from the majority of operational users of the airport and on operational flight requirements which are provided in the Instrument Approach Procedures (IAPs) for that airport. IAPs for each airport are available via the on-line Terminal Procedures Publication maintained by the FAA at URL:

http://naco.faa.gov

Applying these thresholds may be used as an alternative to the ceiling and visibility amendment criteria above listed above.

Table 1. Site Specific TAF Amendment Criteria for Ceiling and Visibility

Forecast Element/ Occurrence	**TAF Ceiling and Visibility Amendment Criteria**	
• **Ceiling or Visibility observed to decrease to less than, or if below, when both elements increase to equal or exceed** • **See notes for specific details**	**Category**	**Limits**
	A (note 2)	**<200' – 1/2SM**
	B (note 3)	**<600' – 2SM**
	C	**<1,000' – 3SM**
	D	**<3,000' – 5SM**
	E	**See notes 4 and 5**
	F	**See note 6**
	• **NOTES:** **1. Forecast category is determined by the lowest ceiling or visibility value.** **2. Substitute the lowest published airfield minimum for Ceiling/Visibility category A where higher minimums apply.** **3. Substitute category B precision approach minimums at airfields served only by a non-precision approach with 800' and 2SM.** **4. Amendments required for ceiling <2,000' when visibility ≥3SM.** **5. Amendments required for visibility <1SM if a lower airfield minimum visibility exists.** **6. Higher limits locally determined by airfield traffic management requirements.**	

If site-specific amendment criteria are adopted by a WFO, the WFO will include the criteria for each TAF airport in the WFO annual aviation operating plan (as described in NWSPD 10-8, section 2.3b.) and will also provide Regional Headquarters with the criteria.

Also, each WFO may choose to routinely issue TAFs more frequently than every six hours, using either manual or automated means, as a method of keeping the TAF the most representative possible. Coordination with and approval from Regional Headquarters is needed if WFOs choose to implement frequent routine updates.

4.6 Time References. The times in TAFs will be stated in Universal Time Coordinated (UTC). Time references should be as detailed and specific as supporting data and present science allow. The letter Z is appended to the end of the date-time group of forecast origin. The contraction UTC does not appear in either the WMO abbreviated heading or the forecast text.

4.7 Contractions. The only contractions used in NWS TAFs will be those terms defined in this instruction and its appendices, which have been derived from the WMO Codes Manual and

from the ICAO document ICAO Abbreviations and Codes. In a very few cases, plain language English terms may be used. All valid contractions for TAFs are included in Appendix A.

4.8 Dissemination and Format. All scheduled and unscheduled TAFs will be disseminated via communications circuits. The National Weather Service Telecommunications Gateway (NWSTG) assembles all TAFs prepared by NWS offices in the Continental U.S. (CONUS) and Puerto Rico into collectives for domestic and international distribution. TAFs prepared by NWS offices in Alaska and Pacific Regions are transmitted to NWSTG in collectives, i.e., several forecasts per communications header. Individual NWS offices will conform to the directives of their respective region's network (i.e., Advanced Weather Interactive Processing System - AWIPS).

The first line of the text of a TAF product will consist solely of TAF or TAF AMD or TAF COR. The contraction TAF (or TAF AMD or TAF COR) is stated only once in each product or collective, whether it contains one or more TAFs. The next line begins with the ICAO 4-letter location identifier at the left margin. Any subsequent FMYYGGgg group will begin on a new line, indented five spaces. Continuation lines of a forecast group will be indented six spaces.

When a WFO transmits more than one TAF in a collective, each forecast will be started on the line immediately following the previous TAF with the location identifier at the left margin. Each complete TAF will be followed by an end-of-report separator (an equal sign [=]), which denotes the end of a complete TAF for each location. The end-of-report separator will be followed by a return.

The length of a line will not exceed 69 spaces, including typed characters, spaces, returns, and the end-of-report separator.

4.9 Issuance Times. Scheduled TAFs prepared by NWS offices are issued four times a day, every six (6) hours, according to the following schedule:

SCHEDULED ISSUANCE	VALID PERIOD	(30 Hour)	ISSUANCE WINDOW
0000 UTC	0000 to 2400 UTC	(0600 UTC)	2320 to 2340 UTC
0600 UTC	0600 to 0600 UTC	(1200 UTC)	0520 to 0540 UTC
1200 UTC	1200 to 1200 UTC	(1800 UTC)	1120 to 1140 UTC
1800 UTC	1800 to 1800 UTC	(2400 UTC)	1720 to 1740 UTC

Each Office with TAF responsibility is required to issue four scheduled TAFs per day. With Regional approval, WFOs may issue TAFs on a more frequent basis than every six hours as described above. If so, the intermediate TAFs will be issued as amendments (i.e., use the Routinely Amended Header) though they will actually be issued on a scheduled basis. The valid forecast period of any such intermediate TAFs would end at the same time as the previous scheduled (00 UTC, 06 UTC, 12 UTC and 18 UTC) issuance.

4.10 TAF Corrections. Corrections to the TAF should be issued as soon as the forecaster becomes aware of the error. Normally a correction is issued within a half hour of the issuance of the original forecast. Corrections made later than an hour after a TAF or (TAF amendment) was issued should be issued as an amendment; with forecast conditions updated even as the original mistake is corrected.

5. Requests for Preparation of New TAF Service/Changing Existing Part-Time TAF Service. Requests to establish new TAF service should be sent to the appropriate Regional Aviation Meteorologist (RAM) (or equivalent) for evaluation. The Region Headquarters (RH) will evaluate the request based on availability of data and NWS resources to support the newly requested TAF(s). Upon endorsement, the RAM forwards the RH recommendation to OCWWS, NWSH. If OCWWS, NWSH approves the TAF recommendation, then the RH completes a request for change (RC) and forwards it to the Data Review Group Change Management (DRGCM). Upon DRGCM approval of the RC, or concurrent with the RC approval process, the RH will prepare a National Technical Information Notice (TIN) and forward to OCWWS, NWSH for processing and transmission. The TIN will be prepared according to instruction in NWSI 10-1805, *Service Outreach*. The RC will be prepared according to NWSI 10-101 *Change Management Process.*

Part-time TAF service will increase to 24 hours after RH prepares a TIN and forwards it to OCWWS, NWSH for processing and transmission. An RC to expand TAF service to 24 hours is not required because the TAF identifier and communications nodes already exist.

5.1 Observation Requirement to Initiate New TAF Service. The following elements, at a minimum, are required for NWS approval of new TAF locations: wind (speed and direction), visibility, weather and obstructions to vision, sky condition, temperature, dew point, and altimeter setting.

These elements can be obtained from commissioned ASOS or AWOS-III observation sites or manual observer sites with equipment. Augmentation will be provided in accordance with the agency agreements with augmenters (refer to FAA document 7900.5A, Surface Weather Observing - METAR, Chapters 4 and 5).

5.2 Minimum Observations Requirements for Routine TAF Issuance and Continuation. The aviation forecaster must have certain information for the preparation and scheduled issuance of each individual TAF. Although integral to the TAF writing process, the complete observation is not required. Forecasters should use the "total observation concept" to write TAFs with data including nearby observations, radar, satellite, radiosonde, model data, ACARS, MDCRS, TAMDAR, and other sources. When communication problems prevent receiving observations into AWIPS, forecasters should call the ASOS/AWOS to get observation data.

If information sources, such as surface observations, are missing, unreliable, or not complete, forecasters should append AMD NOT SKED to the end of a TAF. The use of AMD NOT SKED indicates the forecaster has enough data, using the total observation concept, to issue a forecast but will not provide updates. This allows airport operations to continue using a valid TAF. Use of the total observation concept, and AMD NOT SKED as needed, is strongly encouraged. No documentation is necessary for the use of AMD NOT SKED.

A NIL TAF should not be issued except in rare situations. In cases where observations have been missing for extended periods of time (i.e., more than one TAF cycle of six hours), and the total observation concept cannot provide sufficient information to construct a TAF then a NIL TAF may be used. Upon issuance of a NIL TAF, the WFO forecast team should provide written documentation on the circumstances leading to the decision to issue a NIL TAF. The

documentation, which may be free form, should cover:

a. Station Location, time of NIL TAF, and expected duration of NIL TAF

b. The condition of the total observation,

c. Which systems or elements were not available,

d. Actions taken to resolve the situation before using NIL TAF,

e. Synoptic or mesoscale events affecting the site, or forecast to do so, and

f. The overall reasoning used to make the NIL TAF decision.

The report should be forwarded to the RAM via the MIC.

NIL TAFs disrupt airline operations, cause inconvenience to the traveling public, forces users to seek weather information from other sources, and should only be used as an "instrument of last resort." Additionally, even if a NIL TAF is issued, airports may continue to operate but do so without a valid forecast available. The use of AMD NOT SKED provides a valid forecast but alerts the user that no amendments will be issued.

The NOAA/NWS General Counsel advised that NWS forecasters are generally protected from liability when issuing TAFs employing the total observation concept:

> **NWS forecasters employ their discretion in issuing forecasts, including utilizing the "total observation concept" for writing and issuing TAFs. In the performance of their jobs, where NWS forecasters utilize their discretion, they are covered under the discretionary function exemption of the Federal Tort Claims Act, 28 U.S.C. §§ 2671 *et seq.***

5.2.1 Sites With Scheduled Part-Time Observations. For TAFs with LT 24-hour observational coverage, the TAF will be valid to the end of the routine scheduled forecast period even if observations cease prior to that time. The time observations are scheduled to end and/or resume will be indicated by expanding the AMD NOT SKED statement. Expanded statements will include the observation ending time (AFT Y1Y1HHmm, e.g., AFT 120200), the scheduled observation resumption time (TIL Y1Y1HHmm, e.g., TIL 171200Z) or the period of observation unavailability (Y1Y1HH/YeYehh, e.g., 2502/2512). TIL should be used only when the beginning of the scheduled TAF valid period coincides with the time of the last observation or when observations are scheduled to resume prior to the next scheduled issuance time. When used, these remarks will immediately follow the last forecast group. If a routine TAF issuance is scheduled to be made after observations have ceased, but before they resume, the remark AMD NOT SKED will immediately follow the valid period group of the scheduled issuance. After sufficient data using the total observation concept has been received, the AMD NOT SKED remark should be removed.

Examples:

TAF AMD
KRWF 150202Z 1502/1524 {TAF text}
AMD NOT SKED 1505/1518=

TAF AMD
KPSP 190230Z 1903/1924 {TAF text}
AMD NOT SKED=

5.2.2 Automated Observing Sites Requiring Part-Time Augmentation. Each NWS office with TAF responsibility will maintain the latest copy of FAA document 7900.5X, (*Surface Weather Observing – METAR*), where "X" is the current version. Chapter Four (4) of this document is entitled "General Procedures at Automated Weather Stations" and Chapter Five (5) is entitled "Augmentation at Automated Weather Stations".

TAFs for AWOS-III sites which have part-time augmentation will be prepared using the procedures for part-time manual observation sites detailed in the previous section, with one exception. This exception is the remark used when the automated system is unattended. Specifically, the time an augmented automated system is scheduled to go into unattended operation and/or the time augmentation resumes will be included in a remark unique to automated observing sites: AMD LTD TO CLD VIS AND WIND (AFT YYHHmm, or TIL YYhhmm, or YYHH/YYhh), where YY is the date, HHmm is the time, in hours and minutes, of the last augmented observation and hhmm is the time, in hours and minutes, the second complete observation is expected to be received. This remark, which does not preclude amendments for other forecast elements, will be appended to the last scheduled TAF issued prior to the last augmented observation. It will also be appended to all subsequent amendments until augmentation resumes.

The AMD LTD TO (elements specified) remark is a flag for users and differs from the AMD NOT SKED AFT Z remark for part-time manual observation sites. AMD LTD TO (elements specified) means users should expect amendments only for those elements and the times specified. The AMD LTD TO (elements specified) remark may also be used without any specified times upon coordination with the region headquarters. In this form the remark flags that certain elements may not be amended at the AWOS-III site. The remark should be by itself as a separate last line of text in the TAF so the forecast user does not overlook it.

Example:

TAF AMD
KCOE 150202Z 1502/1524 text
AMD LTD TO CLD VIS AND WIND 1505/1518=

The amended forecast indicates that amendments will only be issued for wind, visibility and clouds, between 0500Z and 1800Z.

Example:

TAF
KTVL 160520Z 1606/1706 text

AMD LTD TO CLD VIS AND WIND=

The forecast indicates that amendments are only issued for wind, visibility, and clouds. Other elements are included, as noted in the next paragraph, when the forecast is updated for changes in wind, visibility, or clouds.

An amendment will include forecasts for all appropriate TAF elements, even those not reported when the automated site is not augmented. If unreported elements are judged crucial to the representativeness of a TAF and cannot be adequately determined (e.g., fog versus moderate snow), TAF amendments should be suspended (i.e., issue an amended TAF stating "AMD NOT SKED").

AWOS-III systems with part-time augmentation, which the forecaster suspects are providing unreliable information when not augmented, should be reported for maintenance and treated the same as part-time manual observation sites. In such cases, the AMD NOT SKED AFT YYaaZ remark will be used.

5.2.3 Non-augmented Automated Observing Sites. TAF amendments issued for a non-augmented ASOS site may be suspended in the event the forecaster is notified of, or strongly suspects, an outage or unrepresentative data. Forecasters may also consider suspension of TAF amendments when an element the forecaster judges to be critical is missing from the observation and cannot be obtained using the total observation concept. The term AMD NOT SKED will be appended, on a separate line and indented five spaces, to the end of an amendment to the existing TAF when appropriate.

6. Terminating TAF Service. If a TAF site experiences a drastic, permanent reduction in aviation services, the MIC may evaluate whether TAF service should continue for that site. If the MIC believes the TAF service should be terminated, they will forward a recommendation with justification through their RAM and RH to OCWWS, NWSH. The Aviation Services Branch (ASB) of OCWWS, NWSH will coordinate TAF termination with the FAA, and also with other interested agencies as needed. ASB will coordinate a TIN and RC as the final step in terminating TAF service.

7. Records Retention. Records of disseminated TAFs, including amendments, corrections, and delayed issuances, will be maintained in accordance with NWSI 10-2003, *Records Retention*.

8. Verification of TAFs. Feedback is an important piece in any process because it tells the process owner how well the process is doing, and also tells them whether their goals are being met. In aviation forecasting, the goal is to continually improve forecast service by identifying forecasting weaknesses and developing methods to strengthen those weaknesses. NWS uses Stats-on-Demand as the primary program for performing verification on TAFs and WFOs will verify their respective TAFs in this manner. Forecast and verification results tracked using the Stats-on-Demand verification program should never be used against forecasters.

Appendix A
Contractions Used in NWS TAFs

NOTE: Some of the expressions (short words, in common English for which there are no ICAO contractions) are completely spelled out, e.g., AND, WIND.

AAx	Code used in the WMO abbreviated heading to indicate an amended TAF, where x is the letter A through X (see Appendix D, Section 1.1). NOTE: AAx is not used in the forecast text.
AFT	After
AMD	Amended TAF. Used in the forecast text only. AMD is not used in the WMO abbreviated heading.
BC	Patches
BKN	Broken cloud layer (5 to 7 oktas cloud amount). Clouds may be transparent or opaque. Lowest broken layer is implied to be the ceiling.
BL	Blowing
BR	Mist
CB	Cumulonimbus cloud
CCCC	Generic WMO format code group for a four-letter location identifier. Four-letter location identifiers for specific airports are listed in ICAO document 7910, Location Identifiers.
CCx	Code used in the WMO abbreviated heading to indicate a corrected forecast, where x is the letter A through X (see Appendix D, Section 1.3). CCx is not used in the forecast text.
CLD	Cloud
DR	Low drifting
DS	Dust storm
DU	Dust
DZ	Drizzle
FC	Funnel cloud
FEW	Few clouds (GT 0 oktas to 2 oktas cloud amount)

FG	Fog
FMYYGGgg	From the date (YY) and time (UTC) indicated by GGgg. Generic WMO format code group, indicating a significant and rapid (in LT one hour) change to a new set of prevailing conditions. GG is in whole hours, gg is in minutes. See Appendix C, Section 1.2.9.1.
FU	Smoke
FZ	Freezing
G (Gust)	Defined as rapid fluctuations in wind speed with a variation of 10 knots or more between peaks and lulls within a 10 minute time period.
GR	Hail (largest hailstone diameter GTE 1/4 inch)
GS	Small hail and/or snow pellets (largest hailstone diameter LT 1/4 inch)
GT	Greater than
GTE	Greater than or equal to
HZ	Haze
IC	Ice crystals
KT	Knots
LT	Less than
LTE	Less than or equal to
LTD	Limited
MI	Shallow
NSW	No Significant Weather. An indication that significant weather conditions, as expressed by WMO Code Table 4678, are forecast to end. See Appendix C, Section 1.2.6.
OVC	Overcast cloud layer [eight (8) oktas cloud amount]
P6SM	Visibility forecast GT six (6) statute miles
PL	Ice pellets
PO	Well-developed dust/sand whirls

PR	Partial
PROBC2C2	Forecaster's assessment of the probability of occurrence of a thunderstorm (and associated precipitation) or precipitation event, along with associated weather elements (wind, visibility, and/or sky condition) whose occurrences are directly related to, and contemporaneous with, the thunderstorm or precipitation event. C2C2 refer to the probability of the event. Only PROB30 is allowed. See Appendix C, Section 1.2.9.4.
PY	Spray
RA	Rain
RRx	Code used in the WMO abbreviated heading to indicate a delayed TAF, where "x" is the letter A through X (Appendix D, Section 1.2). RRx is not used in the TAF text.
SA	Sand
SCT	Scattered cloud layer [three (3) to four (4) oktas cloud amount]
SG	Snow grains
SH	Shower
SKC	Sky clear. No clouds; zero oktas cloud amount. The contraction CLR is not used in the TAF.
SKED	Scheduled
SM	Statute miles
SN	Snow
SQ	Squall
SS	Sandstorm
TAF	Terminal Aerodrome Forecast code format. The international standard for the TAF code, FM 51-X Ext. TAF, is included in WMO Manual on Codes, WMO No. 306, Volume I.1, Part A.
TEMPO	Temporarily. Indicator of temporary fluctuations to forecast meteorological conditions which are expected to last LT 1 hour in each instance and, in the aggregate, to cover LT half of the indicated period. The period of time covered by a TEMPO group will not exceed four (4) hours. See Appendix C, Section 1.2.9.3.

TS	Thunderstorm
VA	Volcanic ash
VC	Vicinity - it has two definitions: NWS: A donut-shaped area encompassed between circles with radii of 5 and 10 SM, respectively, from the center of the runway complex of an airport. VC will only be used in the initial time period or in FM groups, all of which forecast prevailing conditions, and will only be used in combination with fog (FG), shower(s) (SH), and thunderstorm(s) (TS). WMO: (An area encompassed) within eight (8) kilometers [five (5) statute miles] of the aerodrome but not at the aerodrome (Words in parentheses inferred. See Note 1 under WMO Regulation 15.8.10).
VIS	Visibility
VRB	Variable wind direction. Wind direction is considered variable when it is impossible to forecast a mean wind direction due to its expected variability, e.g., for very light winds [LTE six (6) knots] or during convective activity.
VV	Vertical Visibility
Z	Indicator letter (an abbreviated symbol for Coordinated Universal Time - UTC) appended to the date-time of forecast origin group.

Appendix B –
TAF Code Format, Terminology, and Significant Weather Matrices

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1. Generic International TAF Code Format. The NWS forecaster must be familiar with the International TAF Code Format shown below.

TAF or TAF AMD or TAF COR

CCCC	YYGGggZ	YlYlGlGl/Y2Y2G2G2	dddffGfmfmKT
[Location identifier]	[Date/time of forecast origin]	[Valid period]	[Wind forecast]

VVVV or CAVOK	w'w' or NSW	NsNsNshshshs, Vvh,h,h, or SKC (NSC)
[Visibility forecast]	[Significant weather forecast]	[Cloud and obscuration forecast]

6IcchlhlhltL	5BhBhBhBtL	TTFTF / GFGFZ	QNHPIPIPIPIINS
[Icing forecast]	[Turbulence forecast]	[Temperature forecast]	[Lowest altimeter setting]

TTYYGGgg or TTTTT Y1Y1GG/YeYeGeGe	PROBC2C2 Y1Y1GG/YeYeGeGe
[Forecast change indicators]	[Probability forecast]

2. International Terminology and Forecast Groups Not Used in NWS TAFs.

   a. CAVOK: Ceiling and Visibility OK.

   b. NSC: No Significant Clouds.

   c. BECMG: Becoming.

   d. PROBC2C2 Y1Y1GG/YeYeGeGe in combination with TEMPO.

   e. Optional Groups: 6I (Icing), 5B (Turbulence), TT (Temperature), and QNH (Altimeter). There is no agreement which requires NWS WFOs to use these groups in NWS TAFs.

3. Significant Weather: WMO Code Table 4678 (next page).

The w'w' groups will be constructed by considering columns 1 to 5 from the following table in sequence. For example, heavy rain shower(s) are coded as +SHRA.

Intensity or Proximity$_1$	Descriptor$_2$	Precipitation$_3$	Obscuration$_4$	Other$_5$
- Light	**MI** Shallow	**DZ** Drizzle	**BR** Mist	**PO** Well-developed dust/sand swirls
Moderate (no qualifier)	**BC** Patches	**RA** Rain	**FG** Fog	
	PR Partial (covering part of the aerodrome)	**SN** Snow	**FU** Smoke	**SQ** Squalls
+ Heavy (or well developed, in the case of funnel clouds)		**SG** Snow Grains	**VA** Volcanic Ash	**FC$_5$** (Funnel Cloud(s) (tornado or waterspout))
	DR Low Drifting	**IC** Ice Crystals	**DU** Widespread Dust	
	BL Blowing	**PL** Ice Pellets	**SA** Sand	**SS** Sandstorm
VC$_1$ In the vicinity	**SH** Shower(s)	**GR$_2$** Hail	**HZ** Haze	**DS** Duststorm
	TS Thunderstorm	**GS$_3$** Small hail and/or snow pellets	**PY** Spray	
	FZ Freezing	**UP$_4$** Unknown Precipitation in automated observations		

Footnotes for Code Table 4678 above

1. The NWS definition of VC applied to the terminal forecast is: A donut-shaped area encompassed between circles with radii of 5 and 10 statute miles, respectively, from the center of the airport's runway complex.

2. Diameter of largest hailstone GTE 1/4"

3. Diameter of hailstones LT 1/4"

4. UP will not be used in NWS-prepared terminal forecasts

5. Tornadic activity, including tornadoes, waterspouts, and funnel clouds, should not be included in TAFs because the probability of occurrence at a specific site is very small.

4. Significant Weather Phenomena Matrix for NWS-issued TAFs.

WEATHER PHENOMENA	**QUALIFIER**												
	Intensity or Proximity					**Descriptor[1]**							
Precipitation		Light	Moderate	Heavy	Vicinity	Shallow	Partial	Patches	Low Drifting[3]	Blowing	Showers	T-storm[4]	Freezing
		-		+	VC[2]	MI	PR	BC	DR	BL	SH	TS	FZ
Drizzle	DZ	-DZ	DZ	+DZ	-	-	-	-	-	-	-	-	FZDZ
Rain	RA	-RA	RA	+RA	-	-	-	-	-	-	SHRA	TSRA	FZRA
Snow	SN	-SN	SN	+SN	-	-	-	-	DRSN	BLSN	SHSN	TSSN	-
Snow Grains	SG	-SG	SG	+SG	-	-	-	-	-	-	-	-	-
Ice Crystals[5]	IC	-	IC	-	-	-	-	-	-	-	-	-	-
Ice Pellets	PL	-PL	PL	+PL	-	-	-	-	-	-	SHPL	TSPL	-
Hail[5,6]	GR	-	GR	-	-	-	-	-	-	-	SHGR	TSGR	-
Small Hail[5,7]	GS	-	GS	-	-	-	-	-	-	-	SHGS	TSGS	-
Thunderstorms, Showers, Freezing, and their intensity or proximity													
TS	TS	-	TS	-	VCTS[8]	-	-	-	-	-	-	-	-
TSRA		-TRSA	TSRA	+TSRA	-	-	-	-	-	-	-	-	-
TSSN		-TSSN	TSSN	+TSSN	-	-	-	-	-	-	-	-	-
TSPL		-TSPL	TSPL	+TSPL	-	-	-	-	-	-	-	-	-
TSGS		-	TSGS	-	-	-	-	-	-	-	-	-	-
TSGR		-	TSGR	-	-	-	-	-	-	-	-	-	-
SH	SH	-	-	-	VCSH[9]	-	-	-	-	-	-	-	-
SHRA		-SHRA	SHRA	+SHRA	-	-	-	-	-	-	-	-	-
SHSN		-SHSN	SHSN	+SHSN	-	-	-	-	-	-	-	-	-
SHPL		-SHPL	SHPL	+SHPL	-	-	-	-	-	-	-	-	-
SHGR		-	SHGR	-	-	-	-	-	-	-	-	-	-
SHGS		-	SHGS	-	-	-	-	-	-	-	-	-	-
FZDZ		-FZDZ	FZDZ	+FZDZ	-	-	-	-	-	-	-	-	-
FZRA		-FZRA	FZRA	+FZRA	-	-	-	-	-	-	-	-	-
FZSG		-	FZSG	-	-	-	-	-	-	-	-	-	-
Obscurations													
Mist	BR	-	BR[10]	-	-	-	-	-	-	-	-	-	-
Fog	FG	-	FG[11]	-	VCFG[12]	MIFG[13]	PRFG[14]	BCFG[15]	-	-	-	-	FZFG[16]
Smoke	FU	-	FU	-	-	-	-	-	-	-	-	-	-
Volcanic Ash	VA	-	VA[17]	-	-	-	-	-	-	-	-	-	-
Widespread Dust	DU	-	DU	-	-	-	-	-	DRDU	BLDU	-	-	-
Sand	SA	-	SA	-	-	-	-	-	DRSA	BLSA	-	-	-
Haze	HZ	-	HZ	-	-	-	-	-	-	-	-	-	-
Spray	PY	-	PY	-	-	-	-	-	-	BLPY	-	-	-
Blowing Phenomena													
Snow[18]	BLSN	-	BLSN	-	-	-	-	-	-	BLSN	-	-	-
Sand	BLSA	-	BLSA	-	-	-	-	-	-	BLSA	-	-	-
Duststorm	BLDU	-	BLDU	-	-	-	-	-	-	BLDU	-	-	-
Other													
Sand/Dust Whirls	PO	-	PO	-	-	-	-	-	-	-	-	-	-
Squalls[19]	SQ	-	SQ	-	-	-	-	-	-	-	-	-	-
Funnel Cloud[20]	FC	-	FC	-	-	-	-	-	-	-	-	-	-
Tornado / Waterspout[21]	+FC	-	-	+FC	-	-	-	-	-	-	-	-	-
Sandstorm	SS	-	SS	+SS	-	-	-	-	-	-	-	-	-
Duststorm	DS	-	DS	+DS	-	-	-	-	-	-	-	-	-

Footnotes for Weather Phenomena Matrix for NWS TAFs

1. Only one descriptor will be used for each weather phenomena group, e.g., BCFG.

2. In NWS TAFs, vicinity (VC) is defined as a donut-shaped area 5SM to 10SM from the center of the runway complex of an airport. In NWS TAFs, vicinity will be combined only with fog (VCFG), showers (VCSH), or thunderstorms (VCTS), and only when forecasting prevailing conditions (i.e., initial time period, or FM groups).

3. Raised by wind to LT six (6) feet above the ground.

4. TS may be forecast by itself if no precipitation is associated with the thunderstorm.

5. No intensity is ever given to hail (GR/GS [snow pellets]) or ice crystals (IC).

6. Largest forecast hailstone has a diameter of GTE 1/4 inch.

7. Forecast hailstone diameter is LT 1/4 inch.

8. VCTS is a valid combination for all airports for which NWS offices prepare TAFs. [In the METAR code, VCTS is only reported by automated stations connected to FAA ALDARS].

9. In NWS TAFs, VCSH will be used to forecast showers 5-10SM from the center of the airport. [In the METAR code, VCSH will be used to report any type of precipitation not at point of observation, but within 10SM.] The type and intensity of showers in the vicinity will not be specified, i.e., +VCSHRA is not allowed.

10. BR will only be used when the visibility is forecast to be GT 1/2SM, but LTE 6SM.

11. For FG to be forecast with any qualifiers, visibility will be LTE 1/2SM.

12. VCFG may be used to forecast fog at any visibility value between 0 and 6SM in the vicinity (5-10SM) of the airport.

13. For MIFG to be forecast, the visibility at 6 feet above ground level will be GT 1/2SM and the apparent visibility in the fog layer will be expected to be LTE 1/2SM.

14. PRFG indicates that a substantial part of the airport is forecast to be covered by fog (visibility LTE 1/2SM) while the remainder of the airport is expected to be clear of fog.

15. BCFG indicates that patches of fog (visibility LTE 1/2SM) are forecast to

randomly cover the airport.

16. FZFG is fog (visibility LTE 1/2SM) consisting predominately of water droplets at temperatures LTE 0C, whether or not the fog is expected to deposit rime ice.

17. Volcanic Ash (VA) is always included in the forecast when expected. Visibility is not a factor.

18. SN BLSN indicates a combination of snow falling from clouds and blowing snow.

19. SQ (squall) is a sudden increase in wind speed of GTE 16 knots, the speed rising to 22 knots or more and lasting for GTE one minute.

20. Generally, Funnel Clouds should not be forecast in TAFs.

21. Generally, Tornadoes and Waterspouts should not be forecast in TAFs.

22. SS is forecast if visibility is GT 1/4SM and LTE 1/2SM. Forecast +SS if visibility is expected to be LTE 1/4SM.

23. DS is forecast if visibility is GT 1/4SM and LTE 1/2SM. Forecast +DS if visibility is expected to be LTE 1/4SM.

No more than three significant weather groups will be used to forecast weather phenomena at or near the airport. If more than one significant weather phenomena is expected in the forecast, separate weather groups will be included. If more than one form of precipitation is forecast, the appropriate contractions will be combined in a single group with the predominant type of precipitation included first. One exception to this is in Appendix C, Section 1.2.6. In such a single precipitation group, the intensity will refer to the total precipitation and be used with one or no intensity qualifier, as appropriate.

Appendix C
TAF Code Elements

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1. Terminal Forecast Coding. Each group of the TAF code used in NWS TAFs is described in the following sections. Each section includes partial or complete examples of one or more TAFs to clarify descriptions in the text.

1.1 Bulletin Headings. TAF bulletins begin with a WMO heading where the four letter ICAO identifier is the issuing office. For example:

FTUS42 KMFL 141100 AAx
TAFFLL
TAF (AMD) or (COR)
KFLL 141123Z 1412/1512 etc…

FT	TAF whose valid period exceeds 12 hours
US	Denotes CONUS airport location
42	CONUS group location (usually by geographical area)
KMFL	Issuing WFO
141100	First 2 digits are issuance date; the last four are cardinal hour prior to forecast valid hour, required to meet international requirements for scheduled TAFs.
AAx	Used to identify a non-scheduled TAF (corrections, delayed TAFs, amendments, etc.). If not used, simply omit (as in regularly scheduled TAFs). The indicators used are AAx for TAF amendments, RRx for delayed routine TAFs, and CCx for corrections of previously transmitted TAFs. The x is the letter A through X, used sequentially which indicate the subsequent use of the heading. For example, the

first correction would be CCA, the second CCB, etc.

TAFFLL First three (3) letters identify a TAF, the last three are the site the TAF is for (this line is deleted when the gateway collects TAFs after transmission for disbursement as a group).

TAF (AMD/COR) Identifies TAF as the product (AMD indicates an amendment/COR indicates correction)

KFLL ICAO identifier of the TAF site

141123Z Time of preparation

1412/1512 Valid time of new TAF

ICAO location identifiers in the CONUS begin with the letter K, those in the North Pacific (Hawaii, Alaska, and Guam) begin with a P, those in the Caribbean (Puerto Rico, Virgin Islands, etc.) begin with a T, and those in the South Pacific begin with an N.

1.2 Forecast Text. The first line of text in a TAF consists of the contraction TAF or TAF AMD or TAF COR. This indicates if the product is scheduled or amended, respectively. This information appears only once, on a separate line at the beginning of the product, regardless of how many TAFs it contains. Delayed TAFs are not identified in the text; that information is included at the end of the first line on the WMO header.

The format of text in a NWS TAF is comprised of code groups shown below. Each term and group is described in Sections 1.2.1 through 1.2.9 below and in the same sequence as they are required to appear in each forecast group.

GENERIC FORMAT OF THE FORECAST TEXT OF A NWS-PREPARED TAF

{TAF or TAF AMD or TAF COR}
CCCC YYGGggZ YlY1G1G1/Y2Y2G2G2 dddffGfmfmKT VVVV w'w' (NSW) VVhshshs (SKC)
WShwshwshws/dddftKT TTGGgg
FMY1Y1GGGeGe TEMPO Y1Y1GG/YeYeGeGe PROB30Y1Y1GG/YeYeGeGe

1.2.1 Location Identifier (CCCC). After the line containing either TAF or TAF AMD or TAF COR, each TAF will begin with its four-letter ICAO location identifier. ICAO Document 7910 contains a complete list of all identifiers.

For NWS WFOs which transmit TAFs in a bulletin (collective), the TAF order should be decided by the respective RH and remain unchanged as much as possible. Newly added airports should generally be placed at the end of the bulletin. Location identifiers remaining after an identifier has been deleted from the bulletin should occupy the same relative order as before the deletion.

1.2.2 Date/Time of Forecast Origin Group. The date/time of forecast origin group (YYGGggZ) follows the terminal's location identifier. It contains the day of the month in two (2) digits (YY) and time in four (4) digits (GGgg in hours and minutes) the forecast is completed and ready for transmission, with a Z appended to denote UTC. This time is entered by the forecaster. Section 4.9 of this instruction contains a table of issuance time windows for scheduled TAFs.

1.2.3 Valid Period and Routine Issuances. The TAF valid period (Y1Y1G1G1/Y2Y2G2G2) is the next group. Scheduled 24-hour TAFs are issued four (4) times per day, at 0000, 0600, 1200, and 1800Z. The first two digits (Y1Y1) are the day of the month for the start of the TAF. The next two digits (G1G1) are the starting hour. Y2Y2 is the day of the month for the end of the TAF, and the last two digits (G2G2) are the ending hour of the valid period. A forecast period that begins at midnight UTC will be annotated as 00. If the end time of a valid period is at midnight UTC, it is annotated as 24. For example, a 00Z TAF issued on the 9th of the month would have a valid period of 0900/0924.

A TAF issued at one of the 32 airports designated to have a 30-hour valid period will also be formatted Y1Y1G1G1/Y2Y2G2G2. For example, a 00Z TAF issued on the 11th of the month for 30 hours would have a valid period of 1100/1206.

1.2.4. Wind Group. The initial time period and any subsequent FM groups will begin with a mean surface wind forecast (dddffGfmfmKT) for that period. Wind forecasts will be expressed as the mean three-digit direction (ddd - relative to true north) rounded to the nearest ten degrees and the mean wind speed in knots (ff) for the time period. If wind gusts are forecast (gusts are defined as rapid fluctuations in wind speeds with a variation of 10 knots or more between peaks and lulls), they are indicated immediately after the mean wind speed by the letter G, followed by the peak gust speed expected. KT is appended to the end of the wind forecast group. Any wind speed of 100 knots or more will be encoded in three digits. Encode calm winds as 00000KT.

The prevailing wind direction will be forecast for any speed greater than or equal to seven (7) knots. The forecast wind direction will be encoded as VRBffKT when forecasting a prevailing surface wind direction is not possible due to its expected variability (variations in wind direction GTE 30 degrees). Two conditions where this can occur are very light winds and convective activity. Variable wind direction for very light winds must have a wind speed of one (1) through six (6) knots inclusive. For convective activity, the wind group may be encoded as VRBffGfmfmKT, where Gfmfm is the maximum expected wind gusts. VRB will not be used in the non-convective LLWS group (refer to Section 1.2.8).

The forecaster should strive to forecast a mean wind direction with low wind speeds if weather is expected to, or has already impacted the TAF site. Wind direction forecasts, even at low speeds, can be critical if the runway(s) are contaminated by ice, snow, or water, creating tighter tailwind and crosswind aircraft tolerances. There are no amendment criteria for low wind speed conditions (see Section 4.5.1).

When forecasting variable wind direction, there is no requirement to specify direction variability limits in remarks.

Squalls are forecast in the wind group as gusts (G), but must be identified in the significant weather group with the code SQ (Appendix B, Section 4, Footnote 19).

EXAMPLES:

TAF
KPIT 231732Z 2318/2418 23010KT 4SM -SHRA BKN030

FM232200 28020G35KT P6SM OVC020
FM232300 30015KT P6SM SCT060
TEMPO 2401/2404 BKN060
FM240500 30004KT P6SM SCT080=

This example above demonstrates rapid changes in wind associated with a frontal passage. Also note the correct format for gusts.

TAF
KCSG 060537Z 0606/0706 VRB03KT etc.

This example above shows the correct format and use of variable wind direction with light winds at the beginning of the valid period (0600 UTC).

TAF
KGRB 241732Z 2418/2518 11006KT 4SM -SHRA BKN030
FM242300 22006KT 3SM -SHRA OVC030 PROB30 2504/2506 VRB20G35KT
1SM +TSRA BKN015CB=

This example above shows the correct format and use of variable wind direction because of convective activity in the immediate area. Forecasting wind direction with convective activity is difficult; therefore this is the only time you should consider using VRB with significant wind speeds.

TAF
KROW 021726Z 0218/0318 30008KT 5SM HZ BKN030 PROB30 0304/0306
27020G45KT 1SM TSRA OVC012CB etc.=

This example above depicts using high winds in an organized event.

TAF
KAMA 171130Z 1712/1812 00000KT etc.=

This example above shows the correct format for calm winds.

TAF
PASN 010530Z 0106/0206 080100G140KT etc.=

This example above shows the correct format of wind speed of 100 knots or more (the wind is from 80 degrees at 100 knots gusting to 140 knots).

TAF
KORD 161725Z 1618/1718 27020G35KT P6SM TS FEW020CB
TEMPO 1618/1619 29040G55KT SQ
FM161930 30015G25KT P6SM etc.=

This example shows the correct format for squalls.

1.2.5 Visibility Group. The initial time period and any subsequent FM groups will include a visibility forecast (VVVV) in statute miles. The valid values for visibility forecasts in NWS TAFs are shown below. Visibility will be forecast rounded down to the next lowest reported value. The contraction SM is appended to the end of the visibility forecast group.

VALID VISIBILITY FORECAST VALUES

STATUTE MILES(SM)	METERS
0	0
1/4	0400
1/2	0800
3/4	1,200
1	1,600
1½	2,400
2	3,200
3	4,800
4	6,000 (1)
5	8,000
6	9,000 (2)
P6SM	9,999 (3)

NOTE: For visibility reduced to LT 5/8 SM strictly because of fog, the code is FG. For visibility GTE 5/8 SM, the code is BR.

1. Rounded down from 6,400 meters

2. Rounded down from 9,600 meters

3. GT 6 statute miles (10 kilometers or more)

When the prevailing visibility is forecast to be less than or equal to six (6) SM, one or more significant weather groups (see Section 1.2.6) will be included. However, drifting dust (DRDU), drifting sand (DRSA), drifting snow (DRSN), shallow fog (MIFG), partial fog (PRFG), and patchy fog (BCFG) may be forecast with prevailing visibility greater than or equal to seven (7) statute miles.

When a whole number and a fraction are used to forecast visibility, a space will always be included between them (e.g., 1 1/2SM). Visibility greater than six (6) statute miles will be encoded as P6SM.

Prevailing visibility as described by Federal Meteorological Handbook No. 1 (FMH-l), will be used if the visibility is not expected to be the same in different directions.

When VA is forecast in the significant weather group, visibility will be included in the forecast, even if it is unrestricted (P6SM). For example, an expected reduction of visibility to 10 statute miles by volcanic ash will be encoded in the forecast as P6SM VA.

1.2.6 Significant Weather Group. The significant weather group (w'w') consists of the

appropriate qualifier(s) and weather phenomenon contraction(s) (shown in Appendix B, Section 3 and described in FMH-1) or NSW, and Section 4 of the same appendix shows all possible valid combinations of weather phenomena codes and should be used to encode w'w'.

If the initial forecast period and subsequent FM groups do not contain an explicit significant weather group, the significant weather group will be omitted. Do not use NSW in the initial forecast time period or FM groups.

The weather phenomenon code UP (unknown precipitation) will not be used in NWS TAFs. It is reserved for use in automated surface observations.

Tornadic activity (tornadoes, waterspouts, and funnel clouds), should not be forecast in terminal forecasts because the probability of occurrence at a specific site is extremely small.

One or more significant weather group(s) is (are) required when the visibility is forecast to be 6SM or less (see Section 1.2.5). With the exception of VA, DRDU, DRSA, DRSN, MIFG, PRFG, and BCFG, obstructions to vision are only forecast when the prevailing visibility is less than 7 statute miles or, in the judgment of the forecaster, is considered operationally significant.

VA will always be forecast when expected. When VA is included in the significant weather group, visibility will be included in the forecast as well, even if the visibility is unrestricted (P6SM).

NSW will be used in place of w'w' only in a TEMPO group (Section 1.2.9.2) to indicate when significant weather (including in the vicinity - VC, Section 1.2.6.1) included in a previous sub-divided group is expected to end.

After NSW is used in a significant weather group, any subsequent significant weather groups will either be omitted or selected from the phenomena listed in Appendix B, Section 4. <u>No two consecutive TEMPO groups will contain NSW as the significant weather group.</u>

NOTE: P6SM NSW will be used together in a TEMPO group when the significant weather is forecast to end and the visibility is forecast to be greater than 6 statute miles after, regardless of visibility before the TEMPO event.

Forecasters will use their judgment when determining how many weather phenomena groups are included. NWS forecasters may include up to three separate w'w' groups if necessary to accurately describe the expected conditions.

When more than one type of significant weather is forecast in the same forecast time period, the order will be:

1. Thunderstorms with/without associated precipitation.

2. Significant weather in order of decreasing dominance is based on intensity, i.e., the most intense type is reported first (see precipitation exception below).

3. Left-to-right in Appendix B, Section 3 (columns 1 through 5).

Forecaster judgment will be used to resolve situations not addressed by these guidelines. Non-precipitation significant weather elements are encoded after any precipitation, in their own group, separated by a space (e.g., -SHSN BLSN BR). The same is true for encoding w'w' groups: first, the appropriate qualifier for intensity or proximity, then the appropriate contraction for the descriptor, and finally the contraction for the observed weather phenomenon or combinations thereof, all without any spaces.

Multiple precipitation elements are encoded in a single group (e.g., -TSRASN). If more than one type of precipitation is forecast, up to three appropriate precipitation contractions can be combined in a single group (with no spaces) with the predominant type of precipitation being first. In this single group, the intensity will refer to the total precipitation and be used with either one or no intensity qualifier, as appropriate. The intensity qualifiers (light, moderate, and heavy) refer to the intensity of the precipitation and not to the intensity of any thunderstorms associated with the precipitation.

Exception for encoding multiple precipitation types: When more than one type of precipitation is forecast in a time period, any precipitation type associated with a descriptor (e.g., FZRA) must be encoded first in the precipitation group, regardless of the predominance or intensity of the other precipitation types. Descriptors will not be encoded with the second or third precipitation type in the group. The intensity is associated with the first precipitation type of a multiple precipitation type group.

For example, a forecast of heavy snow and light freezing rain is properly coded as -FZRASN, even though the intensity of the snow is greater than the freezing rain. This is why the descriptor (FZ) and the intensity is associated with this precipitation type must be encoded first. In this example, since heavy snow is forecast, it would have to be inferred by a visibility forecast of less than 1/4SM.

A qualifier (if relevant) will precede (with no space) the phenomena (including descriptor) to which it applies. There are two categories of qualifiers (see Appendix B, Section 3): intensity/proximity or descriptor. Except for VCSH and VCTS, which are used to forecast showers or thunderstorms between radii of 5 and 10 statute miles from the center of the runway complex, only one intensity or proximity qualifier and descriptor will be used for each weather phenomena group. The intensity qualifiers are light (-), moderate (no qualifier), and heavy (+).

Intensity will be coded with precipitation types, except ice crystals and hail, including those associated with thunderstorms and those of a showery nature (SH). No intensity will be ascribed to blowing dust (BLDU), blowing sand (BLSA), or blowing snow (BLSN). Only moderate or heavy intensity will be ascribed to sandstorm (SS) and dust storm (DS). Refer to FMH-l for criteria in determining intensity associated with these weather elements. Some intensity criteria are also described in the footnotes of Appendix B, Section 4.

The only way to depict severe thunderstorms in the TAF is to forecast surface winds of 50 knots or more. No significant weather contraction for 3/4 inch hail exists, so the wind criteria is the only means of informing the user of the possibility of severe thunderstorms.

If a significant weather code group has been used and conditions are forecast to change, the significant weather entry in the next TEMPO group (Section 1.2.9.2) should be a different code group or NSW. If the significant weather group does not differ in subsequent TEMPO groups, no change to the significant weather group is necessary and the current significant weather group will apply.

EXAMPLES (combinations of one precipitation and one non-precipitation weather phenomena):

-DZ FG	Light drizzle and fog (obstruction which reduces visibility to LT 5/8 SM)
RA BR	Moderate rain and mist (obstruction which reduces visibility to LT 7 SM but GTE 5/8 SM)
-SHRA FG	Light rain showers and fog (visibility LT 5/8 statute miles)
+SN FG	Heavy snow and fog

EXAMPLES (showing combinations of more than one type of precipitation:

-RASN FG HZ	Light rain and snow (light rain predominant), fog and haze
TSSNRA	Thunderstorm with moderate snow and rain (moderate snow predominant)
FZRASNPL	Moderate freezing rain, snow, and ice pellets (freezing rain mentioned first due to the descriptor, followed by other precipitation types in order of predominance)
SHSNPL	Moderate snow showers and ice pellets

EXAMPLE TAF:

TAF
KFAR 091739Z 0918/1018 21030G60KT 1/4SM +TSRAGR BKN050CB...

Winds southwest at 30 knots, with gusts to 60 knots. Visibility 1/4 SM, thunderstorm (severe because of 60KT gusts) with heavy rain and hail. NOTE: the + qualifier is associated with the precipitation (RA) and not the thunderstorm. Broken cumulonimbus (CB) clouds (ceiling) at 5,000 feet.

In the following cases the TS descriptor is treated differently than other descriptors:

1) When dry thunderstorms are forecast, TS may be encoded as the sole significant weather phenomenon; and 2) When forecasting thunderstorms with freezing precipitation (FZRA or FZDZ), include the TS descriptor first, followed by the intensity and weather phenomena.

See the following example:

EXAMPLE:

TAF
KMCI 252335Z 2600/2624 31015KT 1 1/2SM TS -FZRA BKN010CB...

Winds northwesterly at 15 knots. Visibility 1 1/2 SM, thunder with light freezing rain, broken CB clouds (ceiling) at 1,000 feet.

When a TS is included in the significant weather group (even in vicinity - VCTS), the cloud group (NsNsNshshshs) will include a forecast cloud type of CB. See the following example for encoding VCTS:

TAF
KMCI 252335Z 2600/2624 31015KT 1 1/2SM -FZRA VCTS BKN010CB...

Winds northwesterly at 15 knots. Visibility 1 1/2 SM and light freezing rain, broken CB clouds (ceiling) at 1,000 feet, TS in the vicinity.

A visibility threshold must be met before a forecast for fog (FG) may be included in the TAF. When forecasting a fog-restricted visibility from 5/8SM to 6SM, the phenomena will be coded as BR (mist). When forecasting a fog-restricted visibility that is LT 5/8SM, use code FG. Never encode weather obstruction as mist (BR) when the forecast visibility is GT 6 statute miles (P6SM).

The following fog-related terms will only be used as described below:

Freezing Fog (FZFG):	Any fog (visibility LT 5/8 SM) consisting predominantly of water droplets at temperatures LTE 32°F/0°C, whether or not rime ice is expected to be deposited. FZBR is not a valid significant weather combination and will not be used in TAFs.
Shallow Fog (MIFG):	The visibility at 6 feet above ground level is GTE 5/8 SM and the apparent visibility in the fog layer is LT 5/8 SM.
Patchy Fog (BCFG):	Fog patches covering part of the airport. The apparent visibility in the fog patch or bank is LT 5/8 SM, with the foggy patches extending to at least 6 feet above ground level.
Partial Fog (PRFG):	A substantial part of the airport is expected to be covered by fog while the remainder is expected to be clear of fog (e.g., a fog bank).

NOTE: MIFG, PRFG and BCFG may be forecast with prevailing visibility of P6SM.

EXAMPLES:

TAF
KLWS 020530Z 0206/0306 27010KT 1/2SM FG VV008

FM021100 27010KT 3SM BR BKN010...

This example shows the proper use of FG and BR. When significant weather is not expected in a FM group, the significant weather group is omitted.

TAF
KBIL 211140Z 2112/2212 04005KT 1SM -RA BR OVC008
FM211700 34008KT 3SM -RA BKN050 etc.=

Change is expected at 1700Z. NOTE: The light rain is repeated in the FM211700 group to indicate that light rain remains in the forecast. The mist is omitted from the FM211700 group, which indicates it is forecast to end at 1700Z.

TAF
KMPV 021130Z 0212/0312 04006KT 3SM -DZ OVC008
FM021800 36010KT P6SM SCT025...

Improvement at 1800Z to winds from 360 degrees at 10 knots, visibility GT 6SM (unrestricted), no significant weather.

1.2.6.1 Vicinity. In the United States, vicinity (VC) is defined as a donut-shaped area between 5 and 10SM from the center of the airport's runway complex. The FAA requires TAFs to include certain meteorological phenomena which may directly affect flight operations to and from the airport. Therefore, NWS TAFs should include prevailing condition forecasts of fog, showers and thunderstorms in the airport's vicinity (GTE 50% probability and expected to occur for more than ½ of the sub-divided forecast time period) in the significant weather section of the TAF. Prevailing conditions are forecast in the initial time period and FM groups. Significant weather in the vicinity will not be included in TEMPO or PROB groups.

The following significant weather phenomena are valid for use in prevailing portions of NWS TAFs in combination with VC:

Phenomenon	Coded as**
Fog*	VCFG
Shower(s)	VCSH
Thunderstorm	VCTS

*Always coded as VCFG regardless of visibility in the obstruction, and without qualification as to intensity or type (frozen or liquid)

**The VC group, if used, should be the last entry in any w'w' group.

1.2.7 Cloud and Vertical Obscuration Groups. The initial forecast period and any subsequent FM groups will include a cloud group (NsNsNshshshs) used as appropriate to indicate the cumulative amount (NsNsNs) of all cloud layers in ascending order and height (hshshs) or to indicate a clear sky (SKC) and an obscuration if appropriate to indicate vertical visibility (VVhshshs) into a surface-based obstructing medium.

All cloud layers and obscurations will be considered opaque, defined as when more than 50% of the sky is hidden by the clouds at any layer.

1.2.7.1 Cloud Group. The cloud group (NsNsNshshshs) will be used to forecast cloud amount as follows:

SKY COVER CONTRACTION	SKY COVERAGE
SKC	0 oktas
FEW	1 to 2 oktas
SCT	3 to 4 oktas
BKN	5 to 7 oktas
OVC	8 oktas

When zero (0) oktas of sky coverage is forecast, the cloud group will be replaced by SKC. The contraction CLR, which is used in the METAR code, will not be used in TAFs. TAFs for sites with ASOS/AWOS will contain the cloud amount and/or obscurations which the forecaster expects, not what is expected to be reported by an ASOS/AWOS.

Height of cloud (hshshs) will be forecast in hundreds of feet AGL at the following resolution:

RANGE OF HEIGHT VALUES	REPORTABLE INCREMENT
LT 3,000	To nearest 100
GTE 3,000 but LT 5,000	To nearest 500
GTE 5,000	To nearest 1,000

In general, the number of cloud layers in each sub-divided time period should not exceed three. However, NWS forecasters should use their judgment to determine how many cloud groups accurately describe the meteorological conditions at that time in the TAF.

Additionally, scattered cloud layers will not be forecast at a higher level than broken or overcast cloud layers, and broken cloud layers will not be forecast at a higher level than overcast layers. Using the principle of at/below, the lowest level at which the cumulative cloud cover equals 5/8 or more of the celestial dome is understood to be the forecast ceiling. For example, VV008, BKN008 or OVC008 all indicate an 800 foot ceiling.

1.2.7.2 Vertical Obscuration Group. The vertical obscuration group (VVhshshs) is used to forecast, in hundreds of feet AGL, the vertical visibility (VV) into a surface-based total obscuration. VVhshshs is this ceiling at the height indicated in the forecast. TAFs will not include forecasts of partial obscurations (i.e., FEW000, SCT000, or BKN000).

EXAMPLE:

TAF
KCPR 110537Z 1106/1206 24015KT P6SM SKC
FM110820 24015KT 1SM BR VV008...

Note that the wind in the FM group is the same as in the initial forecast period, but is

repeated since all elements are required to be included in a FM group.

1.2.7.3 Cloud Type. The only cloud type included in the TAF is CB. CB follows cloud or obscuration height (hshshs) without a space. Whenever TS are included in w'w', even if TS are only forecast in the vicinity (VCTS), CB must be included in NsNsNshshshs or VVhshshs. There may be situations where nearly identical NsNsNshshshs or VVhshshs appear in consecutive time periods, with the only change being the addition or elimination of CB in the forecast cloud type. CB may be included in NsNsNshshshs or VVhshshs without mentioning thunderstorm in w'w'. Using a CB in the TAF without TS in the w'w' implies either thunderstorms beyond the vicinity of the airport, or, in the forecaster's judgment, thunderstorms are possible but it is uncertain whether or when they may occur at the airport or affect flight operations in the vicinity of the airport. Whenever CB is used without w'w' an explanation should be included in the aviation portion of the Area Forecast Discussion (AFD). The AFD explanation should include the reason why CB was used in the TAF without TS in the w'w'.

EXAMPLES:

TAF
KORD 110537Z 1106/1206 06008KT P6SM FEW050 SCT100
FM111115 11010KT 2SM -RA OVC012...

Note the initial forecast period (beginning at 0600Z) does not contain w'w'. When significant weather is not expected in the initial period of an FM group, w'w' is omitted.

TAF
KDAY 221730Z 2218/2318 19010G25KT P6SM BKN040
FM222230 26025G45KT 1/2SM TSSN OVC010CB...

Significant change at 2230Z to wind from 260 degrees at 25 knots gusting to 45 knots, visibility ½ SM in a thunderstorm with moderate snow, overcast clouds (ceiling) at 1,000 feet, including CB.

TAF
KSYR 230532Z 2306/2406 29012KT 1/2SM SHSN FZFG OVC003
TEMPO 2306/2309 29014G28KT 1/4SM +TSSNPL BLSN VV004CB
FM231400 36011KT P6SM FEW008 BKN025
FM232300 VRB03KT P6SM SKC...

NOTE: The + qualifier is associated with precipitation (SN) and ice pellets (PL) and not the thunderstorm (TS). Significant change at 1400Z to wind from 360 degrees at 11 knots, visibility GT 6 SM (unrestricted), few clouds at 800 feet and broken clouds at 2,500 feet. Change at 2300Z to variable wind direction (light winds), wind speed 3 knots, and clear skies.

1.2.8 Non-Convective LLWS Group. Wind Shear (WS) is defined in NOAA Technical Memorandum NWS FCST-23, as "...a change in horizontal wind speed and/or direction, and/or vertical speed with distance, measured in a horizontal and/or vertical direction." Wind shear is a vector difference, composed of wind direction and wind speed, between two wind velocities. A

sufficient difference in wind speed, wind direction, or both, can severely impact airplanes, especially within 2,000 feet AGL because of limited vertical airspace for recovery. The following, emphasizing the importance of wind shear, is taken from ICAO Circular 186-AN/122:

"Wind shear cannot be calculated by simple scalar subtraction of the wind speeds, except in the specific case where the directions of the two winds concerned are exactly the same or are exact reciprocals...The scalar shear (i.e., direct subtraction of wind speeds taking no account of their directions) is always less than or equal to the vector shear and thus for most cases underestimates the actual shear magnitude." Forecasters may use NOAA Technical Memorandum NWS FCST-23 as a reference for non-convective LLWS forecasting. The procedures described below are based on that study.

Forecasts of LLWS in the TAF will refer only to non-convective LLWS from the surface up to and including 2,000 feet AGL (LLWS is always assumed to be present in convective activity). It will be included in TAFs on an as-needed basis to focus the aircrew's attention on LLWS problems which currently exist or are expected. Non-convective LLWS may be associated with the following: frontal passage, inversion, low-level jet, lee side mountain effect, sea breeze front, Santa Ana winds, etc.

A non-convective LLWS forecast will be included in the initial time period or a FM group in a TAF whenever:

a. One or more PIREPs are received of non-convective LLWS within 2,000 feet of the surface, at or in the vicinity of the TAF airport, causing an indicated air speed loss or gain of 20 knots or more, and the forecaster determines the report(s) reflect a valid non-convective LLWS event rather than mechanical turbulence, or

b. When, in the forecaster's judgment, non-convective vertical WS of 10 knots or more per 100 feet in a layer more than 200 feet thick are expected or reliably reported within 2,000 feet of the surface at, or in the vicinity of, the airport.

If meteorological conditions are such that non-convective LLWS of intensities similar to those described above are expected and/or could be inferred from less detailed PIREPs or other sources, the forecaster should include a WS group in either the initial time period, or a FM group of the TAF.

When LLWS conditions are expected, the non-convective LLWS code WS will be included in the TAF as the last group (after cloud forecast). Once in the TAF, the WS group remains the prevailing condition until the next FM change group, or the end of the TAF valid period if there are no subsequent FM groups. Forecasts of non-convective LLWS will not be included in TEMPO (see Section 1.2.9.2) or PROB (see Section 1.2.9.3) groups.

The format of the non-convective low-level wind shear group is WShwshwshws/dddffKT, where:

WS	Indicator for non-convective LLWS
hwshwshws	Height of the top of the WS layer in hundreds of feet AGL
ddd	True direction in ten degree increments at the indicated height (see Note

	below)
ff	Speed in knots of the forecast wind at the indicated height
KT	Unit indicator for wind

NOTE: VRB will not be used for direction in the non-convective LLWS forecast group.

EXAMPLE:

TAF
KPUB 181122Z 1812/1912 13012KT 5SM -RA SCT010 OVC035 WS020/27055KT
FM181400 32010KT P6SM FEW008 BKN045

In this forecast, the wind shear is a prevailing condition from 1200Z until the beginning of the next FM group. The same is true for the following example, except it's prevailing from 0600Z until the beginning of the next FM group.

TAF
KDFW 220539Z 2206/2306 21010KT 3SM BR SCT030 WS015/29065KT
FM221100 24015KT 1SM TSRA BR OVC010CB
FM221830...

In both examples above, the indicator "WS" is followed by a three-digit number which is the top of the wind shear layer (KPUB - 020, KDFW - 015). LLWS is forecast to be present from the surface to this level. After the solidus (/), the five digit wind group is the wind direction and speed at the top of the wind shear layer. It is not a value for the amount of shear.

Other possible tools for detecting or observing non-convective LLWS in the short-term are data from ACARS, MDCRS, TAMDAR, the Velocity Azimuth Display (VAD) wind profiles from the WSR-88D, data from wind profilers (if available), and data from FAA's Terminal Doppler Weather Radars (if available). The utility of these data sets depends on the elevation and proximity of the sensors to the airport for which TAFs are written. Mountain top WSR-88D radars will not be useful for detecting non-convective LLWS (below 2,000 feet AGL).

1.2.9 Forecast Change Indicator Groups. Forecast change indicator groups (FMYYGGgg and TEMPO YYGG/YeYeGeGe) are contractions which will be used to sub-divide the forecast period (24 or 30-hours for scheduled TAFs; less for amended or delayed forecasts) according to significant changes in the weather.

To sub-divide the TAF forecast period, forecasters should use FM groups (see Section 1.2.9.1) instead of TEMPO and PROB30 to the extent possible. The FM group is a more definitive and precise forecast and, therefore, more valuable to the user. TEMPO and PROB30 groups should be used sparingly in NWS TAFs.

A FM (FMYYGGfgg) forecast group (see Section 1.2.9.1) indicates a change at a specific point in time in hours and minutes (GGgg), and includes a complete set of forecast elements representing prevailing conditions beginning at the indicated time.

To keep the forecast intent clear and unambiguous to the aviation user, forecast groups, both initial and change groups, should be as concise as possible, highlighting significant changes which will affect aviation operations. Overlapping of sub-divided forecast valid periods will be avoided. Further, forecasters must be aware conditions described in TEMPO and PROB30 groups have just as much effect on those decisions as the prevailing conditions.

For example, a forecast of TEMPO YY05/YeYe07 3SM RA BR OVC015 would require the pilot to file an IFR alternate and carry additional fuel. A forecast of TEMPO YY23/YeYe02 2SM -FZDZ BR VV005 would, in most cases prevent an airport from being used as an IFR alternate. A more extreme case would be this forecast: PROB30 YY19/YeYe23 1/4SM TSRA OVC005CB. The visibility of ¼ SM could, in some circumstances, prevent the airport from being a destination by an air carrier.

The following forecast change indicators will be used when a change in any or all of the elements forecast is expected:

1.2.9.1 FMYYGGgg. The FM (voiced as "from") change indicator group (FMYYGGgg) will be used to indicate when prevailing conditions are expected to change significantly over a period of less than one hour. In these instances, the forecast will be sub-divided into time periods using the contraction FM followed, without a space, by four digits indicating the time (in hours and minutes in UTC) the change is expected to occur. While the use of a four-digit time in whole hours (e.g., 2100) is acceptable, if a forecaster can predict changes and/or events with higher resolution, then more precise timing of the change to the minute should be indicated. All forecast elements following FMYYGGgg will relate to the period of time from the indicated time (GGgg) to the end of the valid period of the terminal forecast, or to the next FMYYGGgg if the terminal forecast valid period is divided into additional periods.

The FM group will be followed by a complete description of the weather (i.e., self-contained) and all forecast conditions given before the FMYYGGgg group are superseded by those following the group. All elements of the TAF (surface wind, visibility, significant weather, clouds, obscurations, and when expected, non-convective LLWS) will be included in each FM group, regardless if they are forecast to change or not. The only exception to this involves significant weather. If no significant weather is expected in the FM time period group, then significant weather is omitted. For example, if forecast cloud and visibility changes warrant a new FM group but the wind does not, the new FM group will include a wind forecast, even if it is the same as the most recently forecast wind.

One or more FM groups may be included depending on the prevailing weather conditions expected. In the interest of clarity, each FM group will start on a new line of forecast text, indented five spaces.

EXAMPLES:

TAF
KDSM 022336Z 0300/0324 20015KT P6SM BKN015
FM030230 29020G35KT 1SM +SHRA OVC005
TEMPO 0303/0304 30030G45KT 3/4SM -SHSN
FM030500 31010G20KT P6SM SCT025...

Note that significant weather is omitted from the initial forecast period, beginning at 0000 Z, since none was expected.

TAF
KAPN 312330Z 0100/0124 13008KT P6SM SCT030
FM010320 31010KT 3SM -SHSN BKN015
FM010500 31010KT 1/4SM +SHSN VV007...

Note the wind in the FM010500 group is the same as the previous FM group, but is repeated since all elements are required to be included in a FM group.

1.2.9.2 TEMPO YYGG/YeYeGeGe. The TEMPO change-indicator group (TEMPO YYGG/YeYeGeGe) will be used to indicate temporary fluctuations to forecast meteorological conditions which are expected to:

a. Have a high percentage (greater than 50 %) probability of occurrence and,
b. Last for one hour or less in each instance and,
c. In the aggregate, to cover less than half of the period YYGG to YeYeGeGe.

Temporary changes described by TEMPO groups occur during a period of time defined by a two-digit beginning and two-digit ending time, both in whole hours (GMT or Zulu). If the TEMPO condition is expected to last more than one (1) hour, a FMYYGGgg group should be used to forecast conditions different from those forecast prior to GG. If the TEMPO condition is expected to last more than half the time period indicated (YYGG/YeYeGeGe), then the TEMPO condition is considered predominant and should instead be entered in the initial forecast period, or following a FM group. TEMPO groups will not exceed four hours.

Each TEMPO group will be placed on a new line in the TAF, indented six (6) spaces from the left margin. The TEMPO identifier will be followed by a description of all the elements in which a temporary change is forecast. A previously forecast element which has no change during the TEMPO period is understood to remain the same. Only those weather elements forecast to temporarily change are required to be included in the TEMPO group. However, when a significant reduction in visibility is forecast in a TEMPO group, the significant weather causing the deterioration will also be included. If a significant change is expected in the cloud forecast, all cloud layers, including any significant layer not expected to change will be given.

Consecutive TEMPO groups will not be used during the initial forecast period or following any subsequent FM group(s).

TEMPO groups will not include forecasts of either significant weather in the vicinity (VC) or non-convective LLWS.

EXAMPLES:

TAF
KDDC 221130Z 2212/2312 29010G25KT P6SM SCT025
TEMPO 2215/2217 30025G35KT 1 1/2SM SHRA BKN010...

TAF
KSEA 091125Z 0912/1012 19008KT P6SM SCT010 BKN020 OVC090
TEMPO 0912/0915 -RA SCT010 BKN015 OVC040...

Note the TEMPO 0912/0915 group. All three cloud layers are included though the lowest layer is not forecast to change from the initial time period.

TAF
KBOI 091735Z 0918/1018 24007KT P6SM SCT025 BKN040
TEMPO 0918/0922 -SHSN BKN025 BKN040...

1.2.9.3 PROB30 YYGG/YeYeGeGe. The PROB30 group (PROB30 YYGG/YeYeGeGe) will only be used by NWS WFOs to forecast a low probability of occurrence (30 percent chance) of a thunderstorm or precipitation event and its associated weather and obscuration elements (wind, visibility and/or sky condition) when occurrence of those elements are directly related to the thunderstorm or precipitation event.

PROB30 is followed by a space, then eight digits (YYGG/YeYeGeGe) stating the beginning and ending time (in hours) of the expected condition. PROB30 is the only PROB group used in NWS TAFs.

The PROB30 group will be located within the same line of the prevailing condition group, continuing on the line below if necessary.

If the thunderstorm or precipitation event probability is expected to equal or exceed 50%, the event should be considered a predominant feature and should be entered in the initial forecast period or following a FM or TEMPO group of the TAF.

The PROB30 group will not be used within in the first nine (9) hours of the TAF valid period. Only one PROB30 group will be used in the initial forecast period and in any subsequent FM group.

The decision to use PROB30 in a TAF should be based on the fact the TAF is limited to a 5SM radius from the center of the respective airfield complex. This is a significantly smaller area than the zone covered by the corresponding public forecast. The 6- or 12-hour area probability of precipitation (PoP) guidance and the forecaster's hourly expectations of actual occurrence at a TAF site can vary over relatively short periods of time but should be synoptically consistent with the public forecast.

PROB30 groups will not include forecasts of significant weather in the vicinity (VC) or non-convective LLWS.

The PROB30 group will not be used by NWS offices as a direct modifier of TEMPO. Similarly, TEMPO groups may not be used by NWS offices as a direct modifier of the PROB30 group e.g., TEMPO PROB30 YY23/YeYe24.

Appendix D
Unscheduled TAFs.

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1. Unscheduled TAFs. Unscheduled TAFs are issued on an as-needed basis as amended, delayed, or corrected messages. They contain the same elements and use the same format as scheduled issuances. The only differences are the date and time of forecast origin (YYGGgg) and beginning valid times (for amended and delayed forecasts only). The entire text of each individual TAF which has not yet expired, not just the amended, corrected, or delayed portion, will be transmitted.

Amended, delayed, and corrected forecasts will include the appropriate BBB group in the WMO abbreviated heading. Amended (AAx), delayed (RRx), and corrected (CCx) forecasts are counted (lettered) independently. For example, the first correction to a scheduled forecast would be CCA. If that same corrected forecast needed to be amended, the amendment would be AAA, indicating it is the first amendment of the scheduled TAF, etc. The following table demonstrates the procedures for multiple combinations of corrected, amended and delayed TAFs:

TIME (UTC)	FORECAST ISSUED	BBB INDICATOR
0615	First delayed terminal forecast	RRA
0714	First amendment to terminal forecast	AAA
1042	Second amendment to terminal forecast	AAB
1045	First correction to terminal forecast	CCA

1.1 Amended TAFs. NWS offices that prepare TAFs will keep the current weather and forecasts under continuous review to ensure that necessary TAF amendments are issued promptly. TAFs should be amended whenever they become, in the forecaster's judgment, unrepresentative of existing or expected conditions, particularly regarding those elements and events detailed in Appendix C. Forecasters should strive to amend TAFs prior to the occurrence of changes that meet these criteria. Amendments will be issued promptly whenever conditions meeting one or more of the criteria occur, and in the forecaster's judgment, will persist at least 30 minutes. At a minimum, forecasters will use the criteria in Section 4.5.1 to determine if an amendment is required. The amendment criterion applies to manual and automated observing sites. Amendments will be issued when expected or observed conditions: 1) meet amendment criteria for the specified forecast elements, 2) and are expected to persist. Forecasters may amend any portion of a TAF for an unattended part-time site when there is sufficient information to determine that a criterion has been met or the forecast for that element has become unrepresentative of actual conditions.

An amended TAF should be considered in situations where a TEMPO group has been used and the forecaster determines (1) the actual probability of occurrence is, and will remain, less than

50%; (2) the occurring TEMPO conditions will account for one half or more of the forecast group's valid period; or (3) the TEMPO conditions last for more than one (1) hour.

An amended TAF will be identified in the WMO abbreviated heading by the contraction AAx following the date/time group, where x is the letter A through X, as described in Section 1. For example, AAA would indicate the first amendment of a particular scheduled terminal forecast, AAB, the second amendment of the same scheduled forecast, etc. An amended forecast will also be identified by TAF AMD (in place of TAF) on the first line of the forecast text. The date/time group in the WMO abbreviated heading of an amended terminal forecast will be the whole hour of issuance.

The amended TAF will cover all of the remaining valid period of the original scheduled forecast. Expired portions of the amended forecast or references to weather occurring before the issuance time will be omitted from the amendment.

In an amended forecast, the date and time of the forecast origin group (YYGGggZ) will reflect the time the amended forecast was prepared. In the forecast valid period group (Y1Y1G1G1/Y2Y2G2G2), the first four digits (Y1Y1G1G1) will reflect the UTC date and time of the beginning of the valid period of the amended TAF. With an issuance time (YYGGggZ) of H+00 to H+29, use the current hour (based on UTC) to denote the beginning valid time; for H+30 to H+59, use the next hour (based on UTC). In either case the forecast will be valid from the time of forecast origin (YYGGgg) to the valid period ending time of the original scheduled terminal forecast.

PROB groups are not allowed in the first nine (9) hours of an amended TAF.

Example of amended TAF:

Original	Amended
FTAK31 PAFC 030500	FTAK31 PAFC 030500 AAA
TAF	TAF AMD
PAEN 030540Z 0306/0406...	PAEN 031012Z 0310/0406...

The scheduled forecast was sent, and 4 ½ hours later, the forecaster prepared the first amendment to that forecast (indicated by AAA), at 1012Z on the 3rd day of the month. The amended TAF shows the time of the original scheduled TAF in the WMO abbreviated header (0500Z).

1.2 Delayed TAFs. Delayed TAFs will be issued as soon as possible after correction of the problem (electrical, mechanical or other) that caused the delay.

A delayed TAF will be identified in the WMO abbreviated heading by the contraction RRx following the date/time group, where x is the letter A through X, as described in Section 1. For example, RRA would indicate the first delayed issuance of a particular scheduled TAF. Only offices issuing TAFs in collectives would need to issue a second (or greater) delayed TAF. No contraction in the TAF text indicates a TAF is delayed; the contraction RRx only appears in the WMO abbreviated heading line.

The delayed TAF is valid from the UTC date/time of actual forecast origin (YYGGggZ) until the

end of the previously scheduled TAF valid period. The date and time of actual forecast origin is determined by the UTC date/time of issue of the delayed TAF. With an issuance time of H+00 to H+29, use the current hour (based on UTC) to denote the beginning valid time; for H+30 to H+59, use the next hour (based on UTC). The TAF will be valid from the time of forecast origin to the end of the valid period of the original scheduled TAF.

Example of delayed TAF:
Delayed
FTPA31 PHFO 030500 RRA
TAF
PHMK 031012Z 0310/0406...

The forecaster prepared the first delayed TAF (indicated by RRA) at 1012Z on the 3rd day of the month (as shown in the date/time of forecast origin in the text of the TAF). The delayed terminal shows the time of the original scheduled forecast in the WMO abbreviated header (0500 UTC).

1.3 Corrected TAFs. Corrected TAFs will be issued as soon as possible after discovery of an error (typographical or other mistake). A corrected TAF will be identified in the WMO abbreviated heading by the contraction CCx, which follows the date/time group (x is the letter A through X, as described in Section 1). CCA would indicate the first correction of a scheduled TAF, CCB the second correction of the same TAF, etc. There is no contraction in the forecast text to indicate a TAF is corrected; the contraction CCx only appears in the WMO abbreviated heading.

The date/time group in the WMO abbreviated heading of a corrected TAF will be the same as that of the original TAF unless the date/time group in the WMO abbreviated header contained the error. Refer to the example below.

Example of corrected TAF:

Original	Corrected
FTAK31 PAFG 030500	FTAK31 PAFG 030500 CCA
TAF	TAF COR
PAOM 030540Z 0306/0406...	PAOM 030551Z 0306/0406...

The scheduled TAF was sent and 11 minutes later, the forecaster discovered an error and prepared the first corrected TAF (indicated by CCA), at 0551Z on the 3rd day of the month (typed in by the forecaster). The corrected TAF shows the time of the original scheduled TAF in the WMO abbreviated header (0500Z).

1.3.1 Correcting Amended or Delayed Forecasts. If an amended or delayed TAF contains an error, it should be corrected following the same procedures described in Section 1. An example of a corrected amendment is shown below:

Example of corrected amendment:

Amendment (containing an error):
FTUS43 KTOP 271100 AAA

TAF AMD
KMHK 271522Z 2715/2812 VRB03KT P6SM SCT012
TEMPO 2715/2717 BKN012
FM271700 11000KT P6SM SCT035
FM280100 10003KT P6SM SKC

Corrected amendment:
FTUS43 KTOP 271100 CCA
TAF COR
KMHK 271602Z 2715/2812 VRB03KT P6SM SCT012
TEMPO 2715/2717 BKN012
FM271700 11005KT P6SM SCT035
FM280100 10003KT P6SM SKC

The amended TAF was prepared on the 27th day of the month at 1522Z (date/time of forecast origin in the forecast text of the amended TAF), and valid from 1500Z on the 27th until 1200Z the next day (the 28th). The amendment contains an error in the FM1700 group: winds incorrectly encoded as 110 degrees at 00 knots. The forecaster notices the error, and prepares the first correction (CCA) of the TAF at 1602Z (date/time of forecast origin in the forecast text of the corrected TAF). Note the following in the corrected amendment: 1) the CCA replaces the AAA in the WMO abbreviated heading which appeared in the first amendment; 2) the first line of the forecast text becomes TAF COR; 3) the TAF valid period in the forecast text is the same as the original amendment (1500Z-1200Z); 4) the error in the FM1700 group has been corrected.

Appendix E
NWS TAF Locations by Responsible WFO

WFO	TAF Code	Location
Alaska		
AFC		Anchorage AK
	PAAQ	Palmer Municipal Airport
	PABE	Bethel Airport
	PACD	Cold Bay Airport
	PACV	Merle K. (Mudhole) Smith Airport
	PADL	Dillingham Airport
	PADQ	Kodiak Airport
	PADU	Unalaska Airport
	PAEN	Kenai Municipal Airport
	PAGK	Gulkana Airport
	PAHO	Homer Airport
	PAIL	Iliamna Airport
	PAKN	King Salmon Airport
	PAMC	McGrath Airport
	PANC	Anchorage International Airport
	PASN	St. Paul Island Airport
	PATK	Talkeetna Airport
	PAVD	Valdez Airport
AFG		Fairbanks AK
	PABR	Wiley Post - Will Rogers Memorial Airport
	PABT	Bettles Airport
	PAFA	Fairbanks International Airport
	PAGA	Edward G. Pitka Sr. Airport
	PAOM	Nome Airport
	PAOR	Northway Airport
	PAOT	Ralph Wien Memorial Airport
	PAQT	Nuiqsut Airport
	PASC	Deadhorse Airport
	PATA	Ralph M. Calhoun Memorial Airport
	PAUN	Unalakleet Airport
AJK		Juneau AK
	PAGS	Gustavus Airport
	PAGY	Skagway Airport
	PAJN	Juneau International Airport
	PAKT	Ketchikan International Airport
	PAPG	Petersburg James A. Johnson Airport
	PASI	Sitka Rocky Gutierrez Airport
	PAWG	Wrangell Airport
	PAYA	Yakutat Airport
Central		
ABR		Aberdeen SD
	KABR	Aberdeen Regional Airport
	KATY	Watertown Municipal Airport
	KMBG	Mobridge Municipal Airport
	KPIR	Pierre Regional Airport

APX North Central Lower Michigan MI

KAPN	Alpena County Regional Airport
KPLN	Pellston Regional Airport of Emmet County
KTVC	Cherry Capital Airport

ARX Lacrosse WI

KLSE	La Crosse Municipal Airport
KRST	Rochester International Airport

BIS Bismarck ND

KBIS	Bismarck Municipal Airport
KDIK	Dickinson Municipal Airport
KISN	Sloulin Field International Airport
KJMS	Jamestown Municipal Airport
KMOT	Minot International Airport

BOU Boulder CO

KAPA	Centennial Airport
KBJC	Jeffco Airport
KDEN	Denver International Airport

CYS Cheyenne WY

KBFF	William B. Heilig Field
KCDR	Chadron Municipal Airport
KCYS	Cheyenne Regional Airport/Jerry Olsen Field
KLAR	Laramie Regional Airport
KRWL	Rawlins Municipal Airport
KSNY	Sidney Municipal Airport

DDC Dodge City KS

KDDC	Dodge City Regional Airport
KGCK	Garden City Regional Airport
KHYS	Hays Regional Airport

DLH Duluth MN

KBRD	Brainerd - Crow Wing County Regional Airport
KDLH	Duluth International Airport
KHIB	Chisholm - Hibbing Airport
KHYR	Sawyer County Airport
KINL	International Falls Airport

DMX Des Moines IA

KALO	Waterloo Municipal Airport
KFOD	Fort Dodge Regional Airport
KDSM	Des Moines International Airport
KMCW	Mason City Municipal Airport
KOTM	Ottumwa Industrial Airport

DTX Detroit MI

KDET	Coleman A. Young Municipal Airport
KDTW	Detroit Metropolitan - Wayne County Airport
KFNT	Bishop International Airport
KMBS	MBS International Airport
KPTK	Pontiac – Oakland County International Airport

DVN Quad Cities IA

KBRL	Burlington Regional Airport

KCID	The Eastern Iowa Airport
KDBQ	Dubuque Regional Airport
KMLI	Quad City International Airport

EAX Kansas City MO

KMCI	Kansas City International Airport
KMKC	Charles B. Wheeler Downtown Airport
KSTJ	Rosecrans Memorial Airport

FGF Eastern N. Dakota ND

KBJI	Bemidji - Beltrami County Airport
KDVL	Devils Lake Municipal Airport
KFAR	Hector International Airport
KGFK	Grand Forks International Airport
KTVF	Thief River Falls Regional Airport

FSD Sioux Falls SD

KFSD	Joe Foss Field
KHON	Huron Regional Airport
KSUX	Sioux Gateway Airport

GID Hastings NE

KGRI	Central Nebraska Regional Airport

GJT Grand Junction CO

KASE	Aspen - Pitkin County Airport (Sardy Field)
KEGE	Eagle County Regional Airport
KGJT	Walker Field
KGUC	Gunnison County Airport (Issued NIL four times daily)
KHDN	Yampa Valley Airport (Issued NIL four times daily)
KMTJ	Montrose Regional Airport
KRIL	Garfield County Regional Airport
KVEL	Vernal Airport

GLD Goodland KS

KGLD	Goodland Municipal Airport (Renner Field)
KMCK	Mc Cook Municipal Airport

GRB Green Bay WI

KAUW	Wausau Downtown Airport
KCWA	Central Wisconsin Airport
KGRB	Austin Straubel International Airport
KOSH	Wittman Regional Airport (Only issued for annual Oshkosh air show)
KRHI	Rhinelander-Oneida County Airport

GRR Grand Rapids MI

KAZO	Kalamazoo - Battle Creek International Airport
KBTL	W K Kellogg Airport (Battle Creek MI)
KGRR	Gerald R. Ford International Airport
KJXN	Jackson County - Reynolds Field Airport
KLAN	Capital City Airport
KMKG	Muskegon County Airport

ICT Wichita KS

KCNU	Chanute Martin Johnson Airport
KHUT	Hutchinson Municipal Airport
KICT	Wichita Mid-Continent Airport
KRSL	Russell Municipal Airport

	KSLN	Salina Municipal Airport
ILX		Central Illinois IL
	KBMI	Central Illinois Regional Airport at Bloomington-Normal
	KCMI	Univ. of Illinois - Willard Airport
	KDEC	Decatur Airport
	KPIA	Greater Peoria Regional Airport
	KSPI	Abraham Lincoln Capital Airport
IND		Indianapolis IN
	KBMG	Monroe County/Airport
	KHUF	**T**erre Haute International - Hulman Field
	KIND	Indianapolis International Airport
	KLAF	Purdue Univ. Airport
IWX		Northern Indiana IN
	KFWA	Fort Wayne International Airport
	KSBN	Michiana Regional Transportation Center Airport
JKL		Jackson KY
	KJKL	Julien Carroll Airport
	KLOZ	London - Corbin Airport (Magee Field)
	KSME	Somerset-Pulaski County-J.T. Wilson Field
LBF		North Platte NE
	KLBF	North Platte Regional Airport - Lee Bird Field Airport
	KVTN	Miller Field Airport
LMK		Louisville KY
	KBWG	Bowling Green - Warren County Regional Airport
	KLEX	Blue Grass Airport
	KSDF	Louisville International - Standiford Field Airport
LOT		Chicago IL
	KDPA	Dupage Airport
	KGYY	Gary/Chicago Airport
	KMDW	Chicago Midway Airport
	KORD	Chicago O'Hare International Airport
	KRFD	Greater Rockford Airport
LSX		St. Louis MO
	KCOU	Columbia Regional Airport
	KSTL	Lambert - St Louis International Airport
	KSUS	Spirit of St Louis Airport
	KUIN	Quincy Municipal Airport (Baldwin Field)
MKX		Milwaukee WI
	KMKE	General Mitchell International Airport
	KMSN	Dane County Regional Airport (Truax Field)
MPX		Minneapolis MN
	KAXN	Chandler Field
	KEAU	Chippewa Valley Regional Airport
	KMSP	Minneapolis-St. Paul International./World-Chamberlain/Airport
	KRNH	New Richmond Regional Airport
	KRWF	Redwood Falls Municipal Airport
	KSTC	St. Cloud Regional Airport

MQT Marquette MI

KCMX	Houghton County Memorial Airport
KSAW	Sawyer International Airport

OAX Omaha NE

KLNK	Lincoln Municipal Airport
KOFK	Karl Stefan Memorial Airport
KOMA	Eppley Airfield

PAH Paducah KY

KCGI	Cape Girardeau Regional Airport
KEVV	Evansville Regional Airport
KOWB	Owensboro-Daviess County Airport
KPAH	Barkley Regional Airport

PUB Pueblo CO

KALS	San Luis Valley Regional - Bergman Airport
KCOS	City of Colorado Springs Municipal Airport
KPUB	Pueblo Memorial Airport

RIW Riverton WY

KBPI	Big Piney Airport
KCOD	Yellowstone Regional Airport
KCPR	Natrona County International Airport
KJAC	Jackson Hole Airport
KLND	Hunt Field
KPNA	Ralph Wenz Field - Pinedale
KRIW	Riverton Regional Airport
KRKS	Rock Springs - Sweetwater County Airport
KWRL	Worland Municipal Airport

SGF Springfield MO

KJLN	Joplin Regional Airport
KSGF	Springfield - Branson Regional Airport

TOP Topeka KS

KFOE	Forbes Field
KMHK	Manhattan Regional Airport
KTOP	Philip Billard Municipal Airport

UNR Rapid City SD

KGCC	Gillette - Campbell County Airport
KRAP	Rapid City Regional Airport

Eastern

AKQ Wakefield VA

KECG	Elizabeth City CGAS/Municipal Airport
KORF	Norfolk International Airport
KPHF	Newport News - Williamsburg International Airport
KRIC	Richmond International Airport
KSBY	Salisbury - Ocean City - Wicomico Regional Airport

ALY Albany NY

KALB	Albany International Airport

KGFL	Floyd Bennett Memorial Airport
KPOU	Dutchess County Airport

BGM Binghamton NY

KAVP	Wilkes-Barre - Scranton International Airport
KBGM	Binghamton Regional/Edwin A Link Field Airport
KELM	Elmira - Corning Regional Airport
KITH	Ithaca Tompkins Regional Airport
KRME	Griffiss Airpark - Rome
KSYR	Syracuse Hancock International Airport

BOX Taunton MA

KACK	Nantucket Memorial Airport
KBAF	Barnes Municipal Airport
KBDL	Bradley International Airport
KBOS	General Edward Lawrence Logan International Airport
KHYA	Barnstable Municipal - Boardman - Polando Airport
KMHT	Manchester Airport
KORH	Worcester Regional Airport
KPVD	Theodore Francis Green State Airport

BTV Burlington VT

KBTV	Burlington International Airport
KMPV	Edward F. Knapp State Airport
KMSS	Massena International Airport (Richards Field)
KPBG	Plattsburgh International Airport
KRUT	Rutland State Airport
KSLK	Adirondack Regional Airport

BUF Buffalo NY

KART	Watertown International Airport
KBUF	Buffalo Niagara International Airport
KIAG	Niagara Falls International Airport
KJHW	Chautauqua County - Jamestown Airport
KROC	Greater Rochester International Airport

CAE Columbia SC

KAGS	Bush Field
KCAE	Columbia Metropolitan Airport
KCUB	Columbia Owens Downtown Airport
KDNL	Daniel Field Airport
KOGB	Orangeburg Municipal Airport

CAR Caribou ME

KBGR	Bangor International Airport
KBHB	Hancock County - Bar Harbor Airport
KCAR	Caribou Municipal Airport
KHUL	Houlton International Airport
KPQI	Northern Maine Regional Airport at Presque Isle

CHS Charleston SC

KCHS	Charleston AFB/International Airport
KSAV	Savannah International Airport

CLE Cleveland OH

KCAK	Akron - Canton Regional Airport
KCLE	Cleveland - Hopkins International Airport
KERI	Erie International Airport
KFDY	Findlay Airport
KMFD	Mansfield Lahm Municipal Airport

KTOL	Toledo Express Airport
KYNG	Youngstown - Warren Regional Airport

CTP State College PA

KAOO	Altoona - Blair County Airport
KBFD	Bradford Regional Airport
KIPT	Williamsport Regional Airport
KJST	John Murtha Johnstown - Cambria County Airport
KMDT	Harrisburg International Airport
KUNV	University Park Airport

GSP Greenville-Spartanburg SC

KAND	Anderson County Airport
KAVL	Asheville Regional Airport
KCLT	Charlotte/Douglas International Airport
KGMU	Greenville Downtown Airport
KGSP	Greenville-Spartanburg International Airport
KHKY	Hickory Regional Airport

GYX Gray ME

KAUG	Augusta State Airport
KCON	Concord Municipal Airport
KLEB	Lebanon Municipal Airport
KPSM	Pease International Tradeport
KPWM	Portland International Jetport

ILM Wilmington NC

KCRE	Grand Strand Airport
KFLO	Florence Regional Airport
KILM	Wilmington International Airport
KLBT	Lumberton Municipal Airport
KMYR	Myrtle Beach International Airport

ILN Wilmington OH

KCMH	Port Columbus International Airport
KCVG	Cincinnati - Northern Kentucky International Airport
KDAY	James M. Cox Dayton International Airport
KLCK	Rickenbaker International Airport
KLUK	Cincinnati Municipal Airport (Lunken Field)
KILN	Airborne Airpark

LWX Sterling VA

KBWI	Baltimore - Washington International/Thurgood Marshall Airport
KCHO	Charlottesville - Albemarle Airport
KDCA	Ronald Reagan/Washington National Airport
KIAD	Washington Dulles International Airport
KMRB	Eastern WV Regional/Shepherd Airport
KMTN	Martin State Airport

MHX Newport-Morehead City NC

KEWN	Craven County Regional Airport
KISO	Kinston Regional Jetport
KOAJ	Albert J Ellis Airport
KPGV	Pitt-Greenville Airport

OKX Upton NY

KBDR	Igor I. Sikorsky Memorial Airport
KEWR	Newark Liberty International Airport
KGON	Groton New London Airport
KHPN	Westchester County Airport

KISP	Long Island MacArthur Airport
KJFK	John F. Kennedy International Airport
KLGA	LaGuardia Airport
KSWF	Stewart International Airport
KTEB	Teterboro Airport

PBZ Pittsburgh PA

KAGC	Allegheny County Airport
KBVI	Beaver County Airport
KDUJ	Du Bois - Jefferson County Airport
KFKL	Venango Regional Airport
KHLG	Wheeling Ohio County Airport
KLBE	Arnold Palmer Regional County Airport
KMGW	Morgantown Municipal/Walter L. Bill Hart Field Airport
KPIT	Pittsburgh International Airport
KZZV	Zanesville Municipal Airport

PHI Mount Holly NJ

KABE	Lehigh Valley International Airport
KACY	Atlantic City International Airport
KILG	New Castle County Airport
KMIV	Millville Municipal Airport
KPHL	Philadelphia International Airport
KPNE	Northeast Philadelphia Airport
KRDG	Reading Regional Airport (Carl A. Spaatz Field)
KTTN	Trenton-Mercer County Airport

RAH Raleigh NC

KFAY	Fayetteville Regional/Grannis Field Airport
KGSO	Piedmont Triad International Airport
KINT	Smith Reynolds Airport
KRDU	Raleigh - Durham International Airport
KRWI	Rocky Mount - Wilson Regional Airport

RLX Charleston WV

KBKW	Raleigh County Memorial Airport
KCKB	Clarksburg/Harrison/Marion Regional Airport
KCRW	Yeager Airport
KEKN	Elkins - Randolph County Airport (Jennings Randolph Field)
KHTS	Tri-State Airport (Milton J. Ferguson Field)
KPKB	Mid-Ohio Valley Regional Airport

RNK Blacksburg VA

KBLF	Mercer County Airport
KDAN	Danville Regional Airport
KLWB	Greenbrier Valley Airport
KLYH	Lynchburg Regional/Preston Glenn Airport
KROA	Roanoke Regional Airport (Woodrum Field)

Pacific

HFO Honolulu HI

NSTU	Pago Pago International Airport
PHJH	Kapalua Airport
PHJR	Kalaeloa Airport (John Rodgers Field)
PHKO	Kona International at Keahole Airport
PHLI	Lihue Airport
PHMK	Molokai Airport
PHNL	Honolulu International Airport
PHNY	Lanai Airport
PHOG	Kahului Airport

PHTO	Hilo International Airport
PMDY	Henderson Field

PGUM — Guam, Island of Guam

PGRO	Rota International Airport
PGSN	Saipan International Airport
PGUM	Guam International Airport
PGWT	West Tinian Airport
PTKK	Chuuk International Airport
PTPN	Pohnpei International Airport
PTRO	Babelthuap/Koror Airport
PTYA	Yap International Airport
PKMJ	Marshall Islands International Airport
PKWA	Bucholz AAF
PTSA	Kosrae Airport

Southern

ABQ — Albuquerque NM

KABQ	Albuquerque International Sunport Airport
KFMN	Four Corners Regional Airport
KGUP	Gallup Municipal Airport
KLVS	Las Vegas Municipal Airport
KROW	Roswell Industrial Air Center Airport
KSAF	Santa Fe Municipal Airport
KTCC	Tucumcari Municipal Airport

AMA — Amarillo TX

KAMA	Amarillo International Airport
KDHT	Dalhart Municipal Airport
KGUY	Guymon Airport

BMX — Birmingham AL

KANB	Anniston Metropolitan Airport
KBHM	Birmingham International Airport
KEET	Shelby County Airport
KMGM	Montgomery Regional Airport (Dannelly Field)
KTCL	Tuscaloosa Municipal Airport
KTOI	Troy Municipal Airport

BRO — Brownsville TX

KBRO	Brownsville - South Padre Island International Airport
KHRL	Rio Grande Valley International Airport
KMFE	McAllen - Miller International Airport

CRP — Corpus Christi TX

KALI	Alice International Airport
KCRP	Corpus Christi International Airport
KLRD	Laredo International Airport
KVCT	Victoria Regional Airport

EPZ — El Paso TX

KDMN	Deming Municipal Airport
KELP	El Paso International Airport
KLRU	Las Cruces International Airport
KTCS	Truth Or Consequences Municipal Airport

EWX — Austin/San Antonio TX

KAUS	Austin - Bergstrom International Airport
KDRT	Del Rio International Airport
KHYI	San Marcos Municipal Airport
KSAT	San Antonio International Airport
KSSF	Stinson Municipal Airport

KEY — Key West FL

KEYW	Key West International Airport
KMTH	The Florida Keys Marathon Airport

FFC — Peachtree City GA

KAHN	Athens - Ben Epps Airport
KATL	The William B. Hartsfield Atlanta International Airport
KCSG	Columbus Metropolitan Airport
KFTY	Fulton County Airport (Brown Field)
KMCN	Middle Georgia Regional Airport
KRYY	Cobb County Airport - McCollum Field

FWD — Fort Worth TX

KACT	Waco Regional Airport
KAFW	Fort Worth Alliance Airport
KDAL	Dallas Love Field
KDFW	Dallas - Fort Worth International Airport
KFTW	Fort Worth Meacham International Airport

HGX — Houston TX

KCLL	Easterwood Field
KCXO	Lone Star Executive Airport
KGLS	Scholes Field
KHOU	William P. Hobby Airport
KIAH	George Bush Intercontinental Airport
KLBX	Angleton/Lake Jackson - Brazoria County Airport
KSGR	Sugarland Regional Airport
KUTS	Hunstville Municipal Airport

HUN — Huntsville AL

KHSV	Huntsville International Airport (Carl T. Jones Field)
KMSL	Northwest Alabama Regional Airport

JAN — Jackson MS

KGLH	Mid Delta Regional Airport
KGTR	Golden Triangle Airport
KGWO	Greenwood - Leflore Airport
KHBG	Bobby L. Chain Municipal Airport
KJAN	Jackson International Airport
KMEI	Key Field

JAX — Jacksonville FL

KCRG	Craig Municipal Airport
KGNV	Gainesville Regional Airport
KJAX	Jacksonville International Airport
KSSI	Malcolm McKinnon Airport

LCH — Lake Charles LA

KAEX	Alexandria International Airport
KARA	New Iberia/Acadiana Regional Airport
KBPT	Southeast Texas Regional Airport
KLCH	Lake Charles Regional Airport
KLFT	Lafayette Regional Airport

LIX		New Orleans LA
	KBTR	Baton Rouge Metropolitan Airport (Ryan Field)
	KGPT	Gulfport - Biloxi Regional Airport
	KMCB	McComb - Pike County - John E Lewis Airport
	KMSY	New Orleans International Airport (Moisant Field)
LUB		Lubbock TX
	KCDS	Childress Municipal Airport
	KLBB	Lubbock International Airport
LZK		Little Rock AR
	KBPK	Ozark Regional Airport
	KHOT	Memorial Field
	KHRO	Boone County Airport
	KLIT	Adams Field
	KLLQ	Monticello Municipal Airport – Ellis Field
	KPBF	Grider Field
MAF		Midland/Odessa TX
	KCNM	Cavern City Air Terminal
	KFST	Fort Stockton Airport
	KHOB	Lea County - Hobbs Airport
	KINK	Winkler County Airport
	KMAF	Midland International Airport
MEG		Memphis TN
	KJBR	Jonesboro Municipal Airport
	KMEM	Memphis International Airport
	KMKL	McKellar - Sipes Regional Airport
	KTUP	Tupelo Regional Airport
MFL		Miami FL
	KAPF	Naples Municipal Airport
	KFLL	Fort Lauderdale - Hollywood International Airport
	KFXE	Fort Lauderdale Executive Airport
	KMIA	Miami International Airport
	KOPF	Opa-Locka Executive
	KPBI	Palm Beach International Airport
	KTMB	Kendall- Executive Airport
MLB		Melbourne FL
	KDAB	Daytona Beach International Airport
	KISM	Kissimmee Gateway Airport
	KLEE	Leesburg Regional Airport
	KMCO	Orlando International Airport
	KMLB	Melbourne International Airport
	KSFB	Orlando Sanford Airport
	KVRB	Vero Beach Municipal Airport
MOB		Mobile AL
	KMOB	Mobile Regional Airport
	KPNS	Pensacola Regional Airport
MRX		Knoxville/Tri-Cities TN
	KCHA	Lovell Field
	KTRI	Tri-Cities Regional TN/VA Airport
	KTYS	McGhee Tyson Airport

OHX Nashville TN

KBNA	Nashville International Airport
KCSV	Crossville Memorial Airport (Whitson Field)

OUN Norman OK

KCSM	Clinton-Sherman Regional Airport
KGAG	Gage Airport
KHBR	Hobart Municipal Airport
KLAW	Lawton-Fort Sill Regional Airport
KOKC	Will Rogers World Airport
KOUN	Norman Regional Airport
KPNC	Ponca City Municipal Airport
KSPS	Sheppard AFB/Wichita Falls Municipal Airport
KWWR	West Woodward Airport

SHV Shreveport LA

KELD	South Arkansas Regional at Goodwin Field Airport
KGGG	Gregg County Airport
KLFK	Angelina County Airport
KMLU	Monroe Regional Airport
KSHV	Shreveport Regional Airport
KTXK	Texarkana Regional Airport (Webb Field)
KTYR	Tyler Pounds Field

SJT San Angelo TX

KABI	Abilene Regional Airport
KBBD	Brady Curtis Field Airport
KJCT	Junction Kimble County Airport
KSJT	Mathis Field
KSOA	Sonora Municipal Airport

SJU San Juan PR

TIST	Cyril E. King Airport
TISX	Henry E. Rohlsen Airport
TJBQ	Rafael Hernandez Airport
TJMZ	Eugenio Maria de Hostos Airport
TJPS	Mercedita Airport
TJSJ	Luis Munoz Marin International Airport
TKPK	Golden Rock Airport
TNCM	Princess Juliana Airport

TAE Tallahassee FL

KABY	Southwest Georgia Regional Airport
KDHN	Dothan Airport
KPFN	Panama City - Bay County International Airport
KTLH	Tallahassee Regional Airport
KVLD	Valdosta Regional Airport

TBW Tampa Bay FL

KFMY	Page Field (Ft. Myers)
KPIE	St. Petersburg/Clearwater International Airport
KRSW	Southwest Florida International Airport
KSRQ	Sarasota - Bradenton International Airport
KTPA	Tampa International Airport

TSA Tulsa

KFSM	Fort Smith Regional Airport
KFYV	Drake Field

KMLC	McAlester Regional Airport
KRVS	Richard Lloyd Jones Jr. Airport
KTUL	Tulsa International Airport
KXNA	Northwest Arkansas Regional Airport

Western

BOI Boise ID

KBKE	Baker City Municipal Airport
KBNO	Burns Municipal Airport
KBOI	Boise Air Terminal (Gowen Field)
KMYL	McCall Airport
KTWF	Magic Valley Regional Airport (Joslin Field)

BYZ Billings MT

KBIL	Billings Logan International Airport
KLVM	Mission Field
KMLS	Frank Wiley Field
KSHR	Sheridan County Airport

EKA Eureka CA

KACV	Arcata Airport
KCEC	Jack McNamara Field
KUKI	Ukiah Municipal Airport

FGZ Flagstaff AZ

KFLG	Flagstaff Pulliam Airport
KGCN	Grand Canyon National Park Airport
KINW	Winslow - Lindbergh Regional Airport
KPGA	Page Municipal Airport
KPRC	Ernest A. Love Field

GGW Glasgow MT

KGDV	Dawson Community Airport
KGGW	Wokal Field/Glasgow International Airport
KOLF	L. M. Clayton Airport
KSDY	Sidney - Richland Municipal Airport

HNX San Joaquin CA

KBFL	Meadows Field Airport
KFAT	Fresno Yosemite International Airport
KMCE	Merced Municipal Airport (MacReady Field)
KMER	Castle Airport
KVIS	**Visalia Airport**

LKN Elko NV

KEKO	Elko Municipal Airport (J.C. Harris Field)
KELY	Ely Airport (Yelland Field)
KTPH	Tonopah Airport
KWMC	Winnemucca Municipal Airport

LOX Oxnard CA

KBUR	Burbank - Bob Hope Airport
KLAX	Los Angeles International Airport
KLGB	Long Beach Airport (Daugherty Field)
KOXR	Oxnard Airport
KPMD	Palmdale Production Flight/Test Installation AF Plant 42 Plant
KPRB	Paso Robles Municipal Airport

	KSBA	Santa Barbara Municipal Airport
	KSBP	San Luis Obispo County - McChesney Airport
	KSMX	Santa Maria Public Airport/Capt G. Allan Hancock Field
	KVNY	Van Nuys Airport
	KWJF	General William J. Fox Airfield

MFR Medford OR

	KLMT	Klamath Falls International Airport
	KMFR	Rogue Valley International - Medford Airport
	KOTH	North Bend Municipal Airport

MSO Missoula MT

	KBTM	Bert Mooney Airport
	KGPI	Glacier Park International Airport
	KMSO	Missoula International Airport
	KSMN	Lemhi County Airport

MTR Monterey CA

	KMRY	Monterey Peninsula Airport
	KOAK	Metropolitan Oakland International Airport
	KSFO	San Francisco International Airport
	KSJC	Norman Y. Mineta San Jose International Airport
	KSNS	Salinas Municipal Airport
	KSTS	Sonoma County Airport

OTX Spokane WA

	KCOE	Coeur D'Alene Air Terminal
	KEAT	Pangborn Memorial Airport
	KGEG	Spokane International Airport
	KLWS	Lewiston - Nez Perce County Airport
	KMWH	Grant County International Airport
	KSFF	Felts Field

PDT Pendleton OR

	KALW	Walla Walla Regional Airport
	KDLS	Columbia Gorge Regional/The Dalles Municipal Airport
	KPDT	Eastern Oregon Regional at Pendleton Airport
	KPSC	Tri-Cities Airport
	KRDM	Redmond Airport (Roberts Field)
	KYKM	Yakima Air Terminal (McAllister Field)

PIH Pocatello ID

	KBYI	Burley Municipal Airport
	KIDA	Idaho Falls Regional Airport
	KPIH	Pocatello Regional Airport
	KSUN	Friedman Memorial Airport

PQR Portland OR

	KAST	Astoria Regional Airport
	KEUG	Mahlon Sweet Field
	KHIO	Portland - Hillsboro Airport
	KONP	Newport Airport
	KPDX	Portland International Airport
	KSLE	McNary Field
	KTTD	Portland - Troutdale Airport

PSR Phoenix AZ

	KBLH	Blythe Airport
	KIPL	Imperial County Airport

KIWA	Williams Gateway Airport
KPHX	Phoenix Sky Harbor International Airport
KYUM	Yuma MCAS/International Airport

REV — Reno NV

KLOL	Derby Field
KRNO	Reno - Tahoe International Airport
KTRK	Truckee - Tahoe Airport
KTVL	Lake Tahoe Airport

SEW — Seattle WA

KBFI	King County International Airport (Boeing Field)
KBLI	Bellingham International Airport
KCLM	William R. Fairchild International Airport
KHQM	Bowerman Airport
KOLM	Olympia Airport
KPAE	Snohomish County Airport (Paine Field)
KSEA	Seattle - Tacoma International Airport

SGX — San Diego CA

KCRQ	McClellan - Palomar Airport
KONT	Ontario International Airport
KPSP	Palm Springs International Airport
KSAN	San Diego International Airport (Lindbergh Field)
KSNA	John Wayne Airport - Orange County Airport
KTRM	Jacqueline Cochran Regional Airport Palm Springs (Thermal Airport)

SLC — Salt Lake City UT

KBCE	Bryce Canyon Airport
KCDC	Cedar City Regional Airport
KENV	Wendover Airport
KEVW	Evanston-Uinta County Airport
KLGU	Logan - Cache Airport
KOGD	Ogden - Hinckley Airport
KPVU	Provo Municipal Airport
KSGU	St. George Municipal Airport
KSLC	Salt Lake City International Airport

STO — Sacramento CA

KMHR	Sacramento Mather Airport
KRBL	Red Bluff Municipal Airport
KRDD	Redding Municipal Airport
KSAC	Sacramento Executive Airport
KSCK	Stockton Metropolitan Airport
KSMF	Sacramento International Airport

TFX — Great Falls MT

KBZN	Gallatin Field
KCTB	Cut Bank Municipal Airport
KGTF	Great Falls International Airport
KHLN	Helena Regional Airport
KHVR	Havre City - County Airport
KLWT	Lewistown Municipal Airport

TWC — Tucson AZ

KDUG	Bisbee Douglas International Airport
KOLS	Nogales International Airport
KTUS	Tucson International Airport

VEF — Las Vegas NV

KBIH	Bishop Airport
KDAG	Barstow - Daggett Airport
KDRA	Desert Rock Airport
KEED	Needles Airport
KLAS	McCarran International Airport
KVGT	North Las Vegas Airport