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Operations and Services
Aviation Weather Services, NWSPD 10-8
TERMINAL AERODROME FORECASTS

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SUMMARY OF REVISIONS: This directive ***s***upersedes NWS Instruction 10-813, *Terminal Aerodrome Forecasts*, dated November 18, 2020. Significant changes are:

- Section 3 - Added link to Aviation Forecast Prep Software (AvnFPS) user guide
- Section 4.2.1 - New section added that defines Digital Aviation Services (DAS) and differentiates Terminal Aerodrome Forecasts (TAF) and the National Digital Forecast Database (NDFD)
- Section 4.2.2 - New section added for AvnFPS verbiage
- Section 4.10 - Clarification of update times for regular scheduled amendments
- Appendix B Section 2.5.1 - Clarified tall tower meaning
- Appendix B Section 2.6 and 2.6.2 - Language added to discourage use of more than two precipitation types
- Appendix B Section 2.6 - New, DAS probabilities
- Appendix B Section 2.8 and Appendix D 2.1 - Updated for aviation chat changes
- Appendix B Section 2.9.4 - Removed 9-hour `PROB30` constraint in the first 9 hours
- Appendix B Section 2.9.4 - Added a `PROB30` example
- Appendix C Table C-1 Section 1.3.1 - Reworded for clarity
- Appendix D Section 2.1 - Additional language adding seasonal TAFs
- Appendix D3 and D4 - Reworded for clarity
- Appendix D Section 4.4 - `NIL` TAF flexibility increased in the event of missing observations

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Allison Allen Date
Director
Analyze, Forecast, and Support Office

Terminal Aerodrome Forecasts

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1 General

This instruction describes Terminal Aerodrome Forecast (TAF) preparation by the National Oceanic and Atmospheric Administration's (NOAA's) National Weather Service (NWS) Weather Forecast Offices (WFOs) and Weather Service Offices (WSOs)[1]. TAFs, also known as Aerodrome Forecasts, are a critical element of NWS aviation weather services because they are a key product in decisions for flight planning and for 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 the requirements of the Federal Aviation Administration (FAA) as the U.S. Aviation Meteorological Authority, 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/WSO Meteorologists-in-Charge (MICs) are responsible for maintaining a consistent and accurate aviation forecast program for their offices. Designated NWS offices prepare TAFs for the sites listed here. The Analyze, Forecast, and Support Office's (AFSO's) Aviation and Space Weather Services Branch (AFS24) at NWS Headquarters (NWSH) updates this list as needed. The Aviation Forecast Preparation System (AvnFPS), located within the Advanced Weather Interactive Processing System (AWIPS), is used to quality control (QC) and monitor TAF locations. See here[2] for the AvnFPS user guide.

[1] Weather Service Office (WSO) Pago Pago issues a TAF like WFOs. For simplicity, WFO and WSO are equivalent in this document.
[2] This website is available to NOAA staff only.

4 Aerodrome Forecast

NWS TAFs consist of the expected meteorological conditions significant to aviation at an airport for a specified time period. For the U.S., this 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 professional judgment to optimize timeliness and representativeness, with an awareness of the potential operational impact of each forecast element. TAFs should remain as concise as possible to describe changes in flight conditions and generally not exceed six (6) "From" (`FM`) groups for most TAF sites and eight (8) `FM` groups for locations with 30-hour TAFs (excluding a temporary (`TEMPO`) group) except when absolutely necessary to describe relevant weather conditions. `FM` groups are described in Section 4.12.

TAFs in the U.S. are prepared, with allowed modifications, following requirements and regulations set by the ICAO in the Standards and Recommended Practices (SARPS) Annex 3 *Meteorological Service for International Air Navigation*, the WMO Technical Regulations No. 49 Volume II — *Meteorological Service for International Air Navigation*; Manual on Codes, International Codes Volume I.1 Part A, Alphanumeric Codes; and the FAA regulations. U.S. modifications are held to a minimum and must be approved by the FAA.

WFOs/WSOs disseminate TAFs in both Traditional Alphanumeric Code (TAC) and ICAO Meteorological Exchange Model (IWXXM) data standards. IWXXM uses machine-readable eXtensible Markup Language (XML) for digital communications.

4.1 Coordination

Forecasters should coordinate across appropriate NWS offices, including the appropriate Center Weather Service Unit (CWSU), the Aviation Weather Center (AWC) (including the National Aviation Meteorologists (NAMs)), and the Alaska Aviation Weather Unit (AAWU) per NWS Instruction (NWSI) NWS1 10-803, Support to Air Traffic Control Facilities to ensure consistency between the TAF and the Impact-based Decision Support Services (IDSS) provided by the CWSU and NAMs. Where applicable, TAFs should also be consistent with the public forecast and other aviation products.

4.2 Composing the TAF

A complete TAF includes 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), non-convective low-level wind shear (LLWS), and any expected significant change(s) to one or more of these elements during the specified time period. This is ordinarily 24 hours; however, there are FAA-specified international airports that require 30-hour TAFs. See Appendix F.

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

- Be aware of operationally significant weather for the airport, including FAA Traffic Flow Management (TFM) weather information requirements.
- Be aware of amendment criteria when formulating the forecast, but do not forecast to satisfy criteria.
- Include more detail in the first 12 hours of the TAF. The latter hours in the TAF may contain less detail but should highlight significant changes that impact the terminal. These

include but are not limited to those used for strategic planning, particularly by the NWS Meteorologists at the FAA Air Traffic Control System Command Center (known colloquially as the Command Center) and airline dispatch operations.

- Offices should ensure the gridded forecast is as consistent as possible with the issued TAF.

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), as defined in Section B.2.6.4. In the U.S., "vicinity" is defined as the area between 5-10 SM from the center of the runway complex of an airport.

The forecaster will maintain awareness of conditions for all pertinent TAF sites, including but not limited to sites with scheduled part-time observations, automated observing sites requiring part-time augmentation, and non-augmented automated observing sites.

4.2.1 Digital Aviation Services (DAS)

For CONUS regions utilizing Digital Aviation Services (DAS), DAS is defined as a graphical depiction of aviation-specific weather elements created using the AWIPS Graphical Forecast Editor (GFE). DAS elements including ceiling/visibility and other grids in National Digital Forecast Database (NDFD) will be populated in GFE using smart tools or other means, with little or no grid editing, and may be used to build a first guess TAF in order to maintain consistency between the forecasts, especially at the routine 00/06/12/18 Coordinated Universal Time (UTC) issuance hours. It is understood that the NDFD database is an hourly representation of the weather, utilizing 2.5 km grid boxes, whereas the TAF is a point forecast that can contain changes represented by the minute, so there may be times additional detail is needed in the TAF.

While NDFD in these regions allows users to build a first guess TAF, forecasters should focus on ensuring their TAF reflects the current and expected conditions over the aerodrome in accordance with Appendix B.

- For the four CONUS regions where DAS is operational, the DAS grids are to be populated and published to NDFD for each routine TAF period (00/06/12/18 UTC). Forecasters are responsible for generating hourly grids through the first 36 hours to ensure completeness of NDFD grid statistics.

- Forecasters may utilize the TAF formatter to create an initial first guess TAF from NDFD. These first guess TAFs should be edited to reflect current conditions, airport-specific timing of impactful elements, and local/airport-specific thresholds as necessary. The TAFs are then sent using AvnFPS.

4.2.2 AvnFPS

The AvnFPS is the interface WFOs use to monitor, edit, and send TAFs. Any TAFs generated using DAS must comply with format guidelines listed above in Section 4.2. After the final TAF product has been sent, the AvnFPS Monitor is used by the forecaster to keep track of weather conditions for all TAF sites and to edit as necessary.

4.3 TAFs for Automated Observing Systems

TAFs for Automated Surface Observing System (ASOS) and Automated Weather Observing

System (AWOS) sites have limitations, and forecasters should take these limitations into consideration when forecasting for these sites. For example, if the forecaster expects clouds above 12,000 feet, zero visibility, and/or ice pellets, the TAF should reflect these conditions even when an automated system reports clear skies (below 12,000 feet) and/or visibility of less than a quarter mile (`M1/4SM`).

For additional information on ASOS/AWOS limitations, please reference NWSI 10-1301, Aviation and Synoptic Observations, Section 5.3. Additionally, forecasters should be familiar with local considerations outlined in the local office Station Duty Manual (SDM).

4.4 Format

The format of the TAF follows ICAO standards as outlined in Appendix B. The length of a line will not exceed 69 characters, including typed spaces, returns, and the end-of-report separator.

4.5 Contractions

The only contractions used in NWS TAFs are those defined in this instruction and its appendices, which are derived from the WMO Codes Manual and the ICAO document *ICAO Abbreviations and Codes*[3]. All valid contractions for TAFs are included in Appendix A.

4.6 TAF Corrections

Corrections to the TAF should be issued as soon as the forecaster becomes aware of the error, with forecast conditions updated as the original mistake is corrected. Corrections can be for typos, incorrect times, formatting errors, etc.

4.7 TAF Amendments (AMDs)

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, known as "chasing the observation." However, an amended TAF is necessary if improving weather conditions occur sooner than forecast.

TAF amendments are issued promptly when:

a. Conditions meeting amendment criteria are expected or have occurred, and those conditions will, in the forecaster's estimation, persist, or

b. New guidance or information indicates future conditions are expected to be in a different category than originally forecasted, especially in the 1- to 6-hour period.

Forecasters should maintain a weather watch and amend forecasts before weather conditions meet amendment criteria. Additionally, forecasters should issue `TAF AMD`s for significant forecast changes immediately rather than waiting for the next regularly scheduled TAF release time, even if that release time is close to an upcoming or previous routine or amended TAF issuance.

[3] ICAO documents are available online for purchase through the ICAO Store and therefore cannot be linked publicly. NWS staff have internal access to this documentation.

4.8 TAF Issuance

WFOs transmit more than one TAF in the 00/06/12/18 UTC issuance; each forecast is started on the line immediately following the previous TAF with the location identifier at the left margin. Each complete TAF is 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 is followed by a carriage return.

4.9 Time References

The times in TAFs are stated in UTC. Time references should be as detailed and specific as supporting data and present science allow and do not need to begin at the top of an hour. The letter **"Z"** is appended to the end of the date-time issuance group as an abbreviation for Zulu, which represents UTC. The contraction UTC does not appear in the WMO abbreviated heading or the forecast text.

4.10 Issuance Times

Scheduled TAFs are typically issued four times daily, every six hours. Some WFOs have routine amendments issued three (3) hours after the initial issuance. Issuance times should typically be in the following windows.

Scheduled Issuance	Valid Period	End Time for 30 Hour	Issuance Window*
0000 UTC	0000 to 0000 UTC	0600 UTC	2320 to 2340 UTC
0300 UTC (AMD)	0300 to 0000 UTC	0600 UTC	0240 to 0300 UTC
0600 UTC	0600 to 0600 UTC	1200 UTC	0520 to 0540 UTC
0900 UTC (AMD)	0900 to 0600 UTC	1200 UTC	0840 to 0900 UTC
1200 UTC	1200 to 1200 UTC	1800 UTC	1120 to 1140 UTC
1500 UTC (AMD)	1500 to 1200 UTC	1800 UTC	1440 to 1500 UTC
1800 UTC	1800 to 1800 UTC	0000 UTC	1720 to 1740 UTC
2100 UTC (AMD)	2100 to 1800 UTC	0000 UTC	2040 to 2100 UTC

*The Amendment time window can be altered via a local agreement.

The issuance of a new TAF cancels any previous TAF for the same time and location. For example, a forecast issued at 1720 UTC is valid immediately despite the validity period in the TAF starting at 1800 UTC. For a routine TAF, the forecast may still be amended prior to the top of the hour (e.g., an 18Z TAF may be amended between 1720-1759 UTC).

4.11 Update Frequency

A WFO may choose to issue TAFs more frequently than every six hours to keep the TAF as representative as possible. For example, the FAA Core 30 airports receive regularly scheduled amendments at three-hour intervals using the suggested amendment times in the table above. These intermediate TAFs are issued as amendments using the TAF AMD header. Offices not issuing for these core airports may issue more frequently scheduled updates after coordinating the change with the appropriate NWS regional headquarters.

4.12 Length of TAF Change Groups

To forecast a change in weather conditions starting at a particular time, the FM contraction is used.

It is always a single time to the nearest minute if the expected change can be forecast to that degree of accuracy. TEMPO groups do not exceed four hours. Probability (PROB) groups are six hours or less. More information on Change Groups can be found in Appendix B.

4.13 Sites with Scheduled Part-Time Observations

For TAFs with less than 24-hour observational coverage, the TAFs are valid to the end of the routinely scheduled forecast period, even when observations end prior to that time. The time observations are scheduled to end or resume is indicated using the phrase Amendment Not Scheduled (AMD NOT SKED); see Appendix D4.

Expanded statements include:

a. Observation ending time (AFT Y_1Y_1HHmm, e.g., AFT 120200),

b. Scheduled observation resumption time (TIL Y_1Y_1HHmm, e.g., TIL 171200) or

c. Period of observation unavailability ($Y_1Y_1H_1H_1/Y_eY_eH_eH_e$, e.g., 2502/2512).

TIL is only used 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 immediately follow the last forecast group. If a routine TAF issuance is scheduled after observations have ceased. Before they resume, the remark AMD NOT SKED immediately follows the last FM line of the scheduled issuance.

After sufficient data using the total observation concept has been received, the AMD NOT SKED remark is removed.

Examples:

```
TAF AMD
KRWF 150202Z 1502/1600
{TAF text}
AMD NOT SKED 1505/1518=

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

5 NWS Forecaster Liability

NOAA's Office of General Counsel, Weather, Satellite and Research Section has advised that NWS forecasters are generally protected from liability when utilizing professional discretion:

> *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.*

6 Records Retention

TAFs, including amendments, corrections, and delayed issuances, are considered federal records and will be maintained in accordance with NWSI 10-2003, Records Retention, NOAA Records Schedules, and other federal requirements.

7 Quality Assurance of TAFs

Performance reports to the office staff and stakeholders (e.g., airport managers, individual airlines) are encouraged to verify how the office supports the NWS mission. The goal of aviation forecasting is to continually improve forecast services by identifying weaknesses and developing methods to strengthen or eliminate those weaknesses.

The NWS uses Stats-on-Demand as the primary program for performing verification of TAFs. The Aviation Focal Points (AFPs) may view individual stats for their forecasters with their MIC's approval. Forecast and verification results tracked using the Stats-on-Demand verification program will never be used against forecasters. See NWS1 10-1601, Section 6.1.3, for more information.

Appendix A – Contractions Used in NWS TAFs

AA*x*	Code used in the WMO abbreviated heading to indicate an amended TAF, where *x* is the letter A through X (see Appendix C, Section 1.1). NOTE: AA*x* 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 (5-7 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	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*.
CC*x*	Code used in the WMO abbreviated heading to indicate a corrected forecast, where *x* is the letter A through X (see Appendix C, Section 3). CC*x* 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 [greater than zero (0) oktas to two (2) oktas cloud amount]
FG	Fog
FM	From the date (*DD*) and time (UTC) indicated by *GGgg*. Generic WMO format code group, indicating a significant and rapid (in less than one hour) change to a new set of prevailing conditions. *GG* is in whole hours, *gg* is in minutes. See Appendix B, Section 2.9.
FU	Smoke
FZ	Freezing
G	Wind gust. Defined as rapid fluctuations in wind speed with a variation of 10 kts or more between peaks and lulls within 10 minutes.
GR	Hail
GS	Snow pellets
HZ	Haze
IC	Ice crystals
KT	Knots
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 B, Section 2.6.
OVC	Overcast cloud layer [eight (8) oktas cloud amount]
P6SM	Visibility forecast > 6 SM
PL	Ice pellets
PO	Well-developed dust/sand whirls
PR	Partial
PROB*C_2C_2*	Probability of occurrence of a thunderstorm (and associated precipitation) or precipitation event, along with associated weather elements (wind, visibility, and/or sky condition) directly related to the thunderstorm or precipitation event. *C_2C_2* refers to the probability of the event. Only PROB30 is allowed. See Appendix B, Section 2.9.4.
PY	Spray
RA	Rain
RR*x*	Code used in the WMO abbreviated heading to indicate a delayed TAF, where *x* is the letter A

	through X (Appendix C, Section 2). RR*x* is not used in the TAF text.
SA	Sand
SCT	Scattered cloud layer [three (3) to four (4) oktas cloud amount]
SH	Showers
SKED	Scheduled
SM	Statute miles
SN	Snow
SQ	Squall
SS	Sandstorm
TAF	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 conditions expected to last < 1 hour in each instance and, in the aggregate, to cover less than half of the indicated period. The period of time covered by a TEMPO group should be the minimum necessary, not to exceed four (4) hours. See Appendix B, Section 2.9.2.
TIL	Until
TS	Thunderstorm
VA	Volcanic Ash
VC	Vicinity 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 (km) [5 SM] of the aerodrome but not at the aerodrome (Words in parentheses inferred. See Note 1 under WMO Regulation 15.8.10). Only used in METARs/SPECIs.
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. For very light winds ≤ 6 kts or during convective activity.
VV	Vertical Visibility
Z	Indicator letter (an abbreviated symbol for Coordinated Universal Time – UTC) appended to the date-time of issuance group.

Appendix B – TAF Code Elements

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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.

B1 Bulletin Headings

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

```
[FT|LT]US42 KMFL 141100 AAx
TAFFLL
TAF (AMD|COR)
KFLL 141123Z 1412/1512 etc…
```

FT or **LT** TAF whose valid period exceeds 12 hours. FT designates a Traditional Alphanumeric Code (TAC) product; LT designates the message in ICAO Meteorological Exchange Model (IWXXM) format.

US Denotes United States airport locations.

42	The Continental U.S. (CONUS) group location (usually by geographical area).
KMFL	Issuing WFO.
141100	First two digits are the issuance date; the last four indicate the cardinal hour prior to the forecast valid hour, required to meet international requirements for scheduled TAFs.
AA*x*	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 AA*x* for TAF amendments, RR*x* for delayed routine TAFs, and CC*x* for corrections of previously transmitted TAFs. The *x* is the letter A through X, used sequentially, which indicates the subsequent use of the heading. For example, the first correction would be CCA, the second CCB, etc.
TAFFLL	First three letters identify a TAF, and the last three are the site the TAF is for (this line is deleted during dissemination for disbursement as a group).
TAF	Identifies TAF as the product.
TAF AMD	TAF AMD indicates an amendment.
TAF COR	TAF COR indicates a correction.
KFLL	ICAO identifier of the TAF site*.
141123Z	Time of issuance.
1412/1512	Valid time of new TAF.

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

B2 Forecast Text

The first line of text in a TAF consists of the contraction TAF, TAF AMD, or TAF COR. This indicates if the product is scheduled, amended, or corrected. 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 text format in an NWS TAF consists of code groups shown below. Each term and group is described in Sections B2.1 through B2.9 below and in the same sequence as they are required to appear in each forecast group.

Generic format of the forecast text of an NWS-prepared TAF:

TAF|**TAF AMD**|**TAF COR**
*CCCC YYGGgg***Z** $Y_LY_1G_1G_1/Y_2Y_2G_2G_2$ *ddd*ff**G**f_mf_m**KT** *VVVV* $w'w'$ (**NSW**) **VV**$h_sh_sh_s$ (**SKC**)
WS$h_{ws}h_{ws}h_{ws}$**/***ddd*ff**KT**
FM$Y_1Y_1GGG_eG_e$
TEMPO $Y_1Y_1GG/Y_eY_eG_eG_e$|**PROB30** $Y_1Y_1GG/Y_eY_eG_eG_e$

B2.1 Location Identifier (*CCCC*)

After the line containing either TAF, TAF AMD, or TAF COR, each TAF will begin with its four-letter ICAO location identifier per ICAO Document 7910.

B2.2 Issuance Date/Time Group (*YYGGggZ*)

The issuance date/time group 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.

B2.3 Valid Period and Routine Issuances ($Y_1Y_1G_1G_1/Y_2Y_2G_2G_2$)

If the TAF is not `NIL`, the valid period is the next group. The first two digits (Y_1Y_1) are the day of the month for the start of the TAF. The next two digits (G_1G_1) are the starting hour. Y_2Y_2 is the day of the month for the end of the TAF, and the last two digits (G_2G_2) are the ending hour of the valid period. A forecast period that begins at midnight UTC will be annotated as `00`. If the valid period's end time is 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 airports designated with a 30-hour valid period will also be formatted $Y_1Y_1G_1G_1/Y_2Y_2G_2G_2$. For example, a 00Z TAF issued on the 11th of the month for 30 hours would have a valid period of `1100/1206`.

B2.4 Wind Group (*dddff*Gf_mf_mKT)

The initial time period and any subsequent `FM` groups will begin with a mean surface wind forecast for that period. Wind forecasts are 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.

B2.4.1 Wind Gusts (G)

If wind gusts, defined as rapid fluctuations in wind speeds with a variation of 10 kts or more between peaks and lulls, are forecast. In that case, 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 kts or more will be encoded in three digits. Encode calm winds as `00000KT`.

B2.4.2 Wind Direction (*ddd*)

The prevailing wind direction will be forecast for any speed greater than or equal to 7 kts. However, the forecaster should strive to forecast a mean wind direction with low wind speeds, especially if the weather is expected to, or has already, impacted the TAF site. Wind direction forecasts can be critical even at low speeds if the runway(s) is contaminated by ice, snow, or water, creating tighter tailwind and crosswind aircraft tolerances. Additionally, the local tower and/or TRACON can use wind direction forecasts to determine runway configurations. Since there are no amendment criteria for low wind speed conditions, forecasters should use their discretion and knowledge of local customer needs to determine if an amendment is necessary.

B2.4.3 Variable Wind (VRB*ff*KT)

The forecast wind direction will be encoded when forecasting a prevailing surface wind direction is impossible due to its expected variability (variations in wind direction ≥ 30 degrees).

Meteorologists should avoid using VRB and provide the best forecast direction possible. This enables users to use the wind group for planning purposes. If necessary, two conditions where this can occur are very light winds and convective activity. Variable wind direction for very light winds should have a wind speed between 1-6 kts. For convective activity, the wind group may be encoded as VRBffGf_mf_mKT, where Gf_mf_m is the maximum expected wind gust. VRB is not used in the non-convective LLWS group (refer to Section B2.8).

B2.4.4 Squalls (SQ)

Squalls are forecasted in the wind group as gusts (G) but should be identified in the significant weather group with the code SQ (see Appendix E, Section 4, Footnote 17).

Examples:

```
TAF
KPIT 231732Z 2318/2418 23010KT 4SM -SHRA BKN030
     FM232200 28020G35KT P6SM OVC020
     FM232330 30015KT P6SM SCT060
     FM240500 30004KT P6SM SCT080=
```

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

```
TAF
KCSG 060537Z 0606/0706 VRB03KT...
```

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

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

```
TAF
KAMA 171130Z 1712/1812 00000KT...
```

This example above shows the correct format for calm winds.

```
TAF
PASN 010530Z 0106/0206 080100G140KT...
```

This example above shows the correct format of wind speed of 100 kts or more with the wind from 80 degrees at 100 kts gusting to 140 kts.

```
TAF
KORD 161725Z 1618/1718 27020G35KT P6SM TS FEW020CB
      TEMPO 1618/1619 29040G56KT SQ
```

```
FM161930 30015G25KT P6SM...
```

This example shows the correct format for squalls.

B2.5 Visibility Group (VVVV)

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

Visibility Forecast Values in Statute Miles (SM)	
0	1/4
1/2	3/4
1	1 1/2
2	3
4	5
6	P6SM

When the prevailing visibility is forecast to be less than or equal to 6 SM, one or more significant weather groups (see Section B2.6) will be included. However, drifting dust (DRDU), drifting sand (DRSA), drifting snow (DRSN), shallow fog (MIFG), partial fog (PRFG), patchy fog (BCFG), and light precipitation may be forecast with prevailing visibility > 6 SM (P6SM) if, in the judgment of the forecaster, the phenomenon is operationally significant. When a whole number and a fraction are used to forecast visibility, a space will always be included between them (e.g., 1 ½ SM). Visibility > 6 SM will be encoded as P6SM.

As described by Federal Meteorological Handbook No. 1 (FMH-l), prevailing visibility will be used if the visibility is expected to be different in different directions. When volcanic ash (VA) is forecast in the significant weather group, visibility will be included in the forecast, even if it is unrestricted (> 6 SM or P6SM). For example, an expected reduction of visibility to 10 SM by volcanic ash will be encoded in the forecast as P6SM VA.

B2.5.1 Tower and Surface Visibility

Tower visibilities and, more so, visibility from taller towers (well over 200 feet) will, at times, report different visibilities from that of surface visibility. This can be due to effects of differing location, slantwise visibility, tower in clouds, or other.

NWS TAFs, by definition, reflect the prevailing surface visibility at all times, regardless of tower visibility.

When tower visibility is lower, it becomes the prevailing visibility in the METAR and is denoted by the surface visibility remark "SFC VIS X" in the remarks. In such cases, the TAF should reflect the value of the surface visibility remark.

Forecasters need to closely monitor these airport observations to maintain awareness of the surface visibility.

B2.6 Significant Weather Group (*w'w'*)

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

Forecaster judgment is used when determining how many weather phenomena groups are included. If necessary, NWS forecasters may include up to three separate *w'w'* groups to describe the expected conditions accurately. Note: More than two precipitation types should be reserved for instances where confidence EXCEEDS 95% that three or more weather types will be observed for more than 15 minutes, due to impacts to airline partners when this is used. Forecaster judgment is used to resolve situations not addressed by these guidelines.

The following guidance should be used for this group:

- 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.
- Tornadic activity, including tornadoes, waterspouts, and funnel clouds, should only be included in TAFs when necessary. Although the probability of occurrence at a specific site is low, it is possible.
- One or more significant weather group(s) is (are) required when the visibility is forecast to be ≤ 6 SM (see Section B2.5).
- DRDU, DRSA, DRSN, MIFG, PRFG, and BCFG obstructions to vision are only forecast when the prevailing visibility is or, in the forecaster's judgment, is considered operationally significant.
- VA is always forecast when expected. When VA is included in the significant weather group, visibility is also included in the forecast, even if the visibility is unrestricted (P6SM).
- NSW is used in place of *w'w'* in a TEMPO group (Section B2.9.3) to indicate when significant weather included in a previously subdivided group is expected to end. This includes vicinity.
- 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 Section B4.
- No two consecutive TEMPO groups can contain NSW as the significant weather group.

- P6SM NSW is used together in a TEMPO group when the significant weather is forecast to end and the visibility is forecast to be > 6 SM after, regardless of visibility before the TEMPO event.

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

    - Thunderstorms with/without associated precipitation.
    - Significant weather in order of decreasing dominance based on intensity.
    - In Appendix E, Section 3 (columns 1 through 5), left to right.

- 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).
- Up to three appropriate precipitation contractions can be combined in a single group (with no spaces), with the predominant type of precipitation being first. Be aware that this combination can ground flights in some high-traffic corridors, so use it judiciously.
- In this single group, the intensity will refer to the total precipitation and be used with either one or no intensity qualifier.
    - The intensity qualifiers (light, moderate, and heavy) refer to the intensity of the precipitation, not the intensity of any thunderstorms associated with the precipitation.

B2.6.1 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) is encoded first in the precipitation group, regardless of the predominance or intensity of the other precipitation types. Descriptors are not to be encoded with the group's second or third precipitation type. 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, although the intensity of the snow is greater than the freezing rain. This is why the descriptor (FZ) and the intensity associated with this precipitation type should be encoded first. In this example, since heavy snow is forecast, it would have to be inferred by a visibility forecast of less than ¼ SM.

B2.6.2 Qualifiers

A qualifier precedes (with no space) the phenomena, including the descriptor to which it applies. There are two categories of qualifiers (see Appendix E, Section 3): intensity/proximity or descriptor. Except for VCSH and VCTS, only one intensity or proximity qualifier and descriptor is used for each weather phenomena group. The intensity qualifiers are light (-), moderate (no qualifier), and heavy (+).

- Refer to Section 8.4.1 of FMH-l for criteria for determining intensity associated with these weather elements. Intensity is coded with precipitation types using the following guidance:
- Ice crystals and hail do not have an intensity qualifier.

- No intensity is ascribed to:
  - Blowing dust (BLDU)
  - Blowing sand (BLSA)
  - Blowing snow (BLSN)
  - Thunderstorms (TS)

- Only moderate or heavy intensity will be ascribed to sandstorms (SS) and dust storms (DS).

If a significant weather code group is used and conditions are forecasted to change, the significant weather entry in the next TEMPO group (Section B2.9.3) should be a different code group or NSW. If the significant weather group is similar 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 phenomenon):

-DZ FG	Light drizzle and fog (obstruction reducing visibility to < ⅝ SM)
RA BR	Moderate rain and mist (obstruction reducing visibility to < 7 SM but ≥ 5/8 SM)
-SHRA FG	Light rain showers and fog (visibility < ⅝ SM)
+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 was 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...

Wind from the southwest at 30 kts, with gusts to 60 kts. Visibility is one-quarter statute miles, with thunderstorms 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 ft.

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

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:

TAF
KMCI 252335Z 2600/2700 31015KT 1 1/2SM TS -FZRA BKN010CB...

Wind from the northwest at 15 kts. Visibility of one and one-half statute miles, thunder with light freezing rain, broken CB clouds (ceiling) at 1,000 ft.

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

TAF
KMCI 252335Z 2600/2700 31015KT 1 1/2SM -FZRA VCTS BKN010CB...

Wind from the northwest at 15 kts. Visibility one and one-half statute miles, light freezing rain, broken CB clouds (ceiling) at 1,000 ft, TS in the vicinity.

B2.6.3 Visibility as Significant Weather

When forecasting fog-restricted visibility from ⅝-6 SM, the phenomena is coded as BR (mist). When forecasting a fog-restricted visibility that is < ⅝ SM, use code FG. Never encode weather obstruction as mist (BR) when the forecast visibility is > 6 SM or P6SM.

The following fog-related terms are used as described below:

Freezing Fog (FZFG) Any fog (visibility < ⅝ SM) consisting predominantly of water droplets at temperatures ≤ 32 ºF/0 ºC, whether or not rime ice is expected to be deposited. FZBR is not a valid significant weather combination and is not used in the TAF.

Shallow Fog (MIFG) The visibility at 6 ft above ground level is ≥ ⅝ SM and the apparent visibility in the fog layer is < ⅝ SM.

Patchy Fog (BCFG) Fog patches covering part of the airport. The apparent visibility in the fog patch or bank is < ⅝ SM, with the foggy patches extending to at least 6 ft 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...
```

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

```
TAF
KBIL 211140Z 2112/2212 04005KT 1SM -RA BR OVC008
     FM211715 34008KT 3SM -RA BKN050...
```

Change is expected at 1715Z. NOTE: The light rain is repeated in the FM211715 group to indicate that light rain remains in the forecast. The mist is omitted from the FM211715 group, which indicates it is forecast to end at 1715Z.

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

Conditions improve at 1800Z to wind from 360 degrees at 10 kts, visibility > 6 SM (unrestricted), and no significant weather.

B2.6.4 Vicinity (VC)

In the U.S., vicinity is defined explicitly as a donut-shaped area between 5SM and 10SM from the center of the airport's runway complex. NWS TAFs include prevailing condition forecasts of fog, showers, and thunderstorms in the airport's vicinity (≥ 50% probability and expected to occur for more than one-half of the sub-divided forecast time period) in the significant weather section of the TAF. VC should not be used during times of low forecaster confidence or probability; forecasters should instead use PROB30 in these cases (as described below in Section B2.9.4). Prevailing conditions are forecast in the initial time period and FM groups. Significant weather in the vicinity is not 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.

B2.7 Cloud and Vertical Obscuration Groups ($N_sN_sN_sh_sh_sh_s$/VV$h_sh_sh_s$)

The initial forecast period and any subsequent FM groups include a cloud group to indicate the cumulative amount ($N_sN_sN_s$) of all cloud layers in ascending order and height ($h_sh_sh_s$) or to indicate a clear sky (SKC) and an obscuration, if appropriate to indicate vertical visibility into a surface-based obstructing medium.

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

B2.7.1 Cloud Group ($N_sN_sN_sh_sh_sh_s$)

The cloud group forecasts cloud amounts for the airport terminal area.

Sky Cover Contraction ($N_sN_sN_s$)	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 is forecast, the cloud group is replaced by SKC. The contraction CLR, used in the METAR code, is not used in TAFs.

The height of cloud ($h_sh_sh_s$) is forecast in hundreds of feet Above Ground Level (AGL) at the following resolution:

Range of Height Values (ft)	Reportable Increment (ft)
< 3,000	To nearest 100
≥ 3,000 but < 5,000	To nearest 500
≥ 5,000	To nearest 1,000

In general, the number of cloud layers in each subdivided time period should not exceed three.

Additionally, scattered cloud layers are not forecast higher than broken or overcast cloud layers. Broken cloud layers are not forecasted at a higher level than overcast layers. Using the principle of at/below, the lowest level at which the cumulative cloud cover equals ⅝ or more of the celestial dome is understood to be the forecast ceiling. For example, VV008, BKN008, or OVC008 all indicate an 800 ft ceiling.

B2.7.2 Vertical Obscuration Group (VV$h_sh_sh_s$)

The vertical obscuration group is used to forecast, in hundreds of feet AGL, the vertical visibility (VV) into a surface-based total obscuration. VV$h_sh_sh_s$ is an indefinite ceiling and not an exact ceiling in the forecast. The TAF does not include forecasts of partial obscurations (e.g., 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 must be included in the FM group.

B2.7.3 Cloud Type

The only cloud type included in the TAF is CB. CB follows cloud or obscuration height ($h_s h_s h_s$) without a space. Whenever TS is included in $w'w'$, even if TS is only forecast in the vicinity (VCTS), CB should be included in $N_s N_s N_s h_s h_s h_s$ or VV$h_s h_s h_s$. CB may not be used alone, as it can confuse the users and cause difficulty in air traffic planning.

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 kts gusting to 45 kts, visibility one-half statute miles in a thunderstorm with moderate snow, overcast clouds (ceiling) at 1,000 ft, including CB.

```
TAF
KSYR 230532Z 2306/2406 29012KT 1/2SM SHSN FZFG OVC003
      TEMPO 2306/2309 29014G28KT 1/4SM +TSSNPL BLSN VV004CB
     FM231445 36011KT P6SM FEW008 BKN025
FM232300 VRB03KT P6SM SKC...
```

Significant change at 1445Z to wind from 360 degrees at 11 kts, visibility greater than 6 statute miles (unrestricted), few clouds at 800 ft and broken clouds at 2,500 ft. Significant change at 2300Z to variable wind direction (light winds), wind speed 3 kts, and clear skies.

B2.8 Non-Convective Low-Level Wind Shear Group (WS$h_{ws}h_{ws}h_{ws}$/$ddd ff$KT).

Forecasts of Non-Convective LLWS in the TAF refer only to non-convective LLWS from the surface up to 2,000 ft AGL. LLWS is always assumed to be present in convective activity. It is included in the TAF on an as-needed basis to focus on LLWS problems that currently exist or are expected. Non-convective LLWS may be associated with the following phenomena (list not exhaustive): frontal passage, inversion, low-level jet, lee-side mountain effect, sea breeze front, Santa Ana/Chinook/Föhn winds, etc. Mentioning LLWS whenever conditions are present or possible is highly encouraged as it provides the TAF user with valuable information.

Wind shear is a vector difference, composed of wind direction and wind speed, between two wind velocities. Per the ICAO Doc 9817 AN/449 - *Manual On Low-level Wind Shear*, "Low-level wind shear, in the broadest sense, encompasses a family of air motions in the lower levels of the atmosphere, ranging from small-scale eddies and gustiness that may affect aircraft as turbulence, to the large-scale flow of one air mass layer past an adjacent layer" (ICAO, 2005)[4].

A sufficient difference in wind speed, wind direction, or both can severely impact aircraft, especially within 2,000 ft AGL, because of limited vertical airspace for recovery. The following taken from ICAO Doc 9817 AN/449 emphasizes the importance of wind shear:

> *It would be difficult to overemphasize that wind shear is a vector, and hence the speed and direction of the two winds concerned must be considered. Wind shear cannot be calculated by simple scalar subtraction of the wind speeds, except in the specific case where the direction of the two winds are the same.*

In situations where gusty surface winds are expected or occurring, forecasters should consider the low-level directional shear to determine whether LLWS or mechanical turbulence is expected or occurring. In a nearly unidirectional low-level environment, a well-mixed boundary layer provides gusty winds at the surface, typically resulting in mechanical turbulence instead of LLWS. If strong low-level directional shear exists, especially if a critical layer is present, forecasters should use the vector difference guidance described above to determine if LLWS should be included in the TAF.

The TAF should identify the lowest layer where the wind shear is at least +/- 30 kts within 2,000 ft AGL. For example, if LLWS of 30 kts at 500 ft is expected and LLWS of 50 kts at 2,000 ft, the LLWS at 500 ft should be chosen as there is a greater risk of recovery to aircraft. However, some locations could have conditions where users need more specialized criteria. In these cases, the office should work with users to determine the appropriate minimum wind shear threshold and consider that when writing the TAF. Once this threshold is determined, a WFO should work with its respective Regional Aviation Meteorologist (RAM) for approval. LLWS criteria for each TAF site will be included in the Categorical Amendment Criteria (CAC) spreadsheet. Offices should routinely monitor this criterion to ensure it remains correct. See Appendix C Section 1.3.1 and the additional background and information per the spreadsheet above on the CAC process.

An example showing how the height of the WS should be encoded is in this example, WS018/27055KT, thus inferring that the top of the LLWS layer is at 1,800 ft AGL. If LLWS is not in the TAF, but reports, such as PIREPs, are received indicating non-convective LLWS within 2,000 ft of the surface causing ≥ 30 kts of an indicated air speed loss or gain to be reported by an aircraft, the forecast should be amended to include LLWS. If a location uses a specialized criteria, then that criteria is used. When LLWS conditions are expected, the non-convective LLWS code WS is 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. Forecasts of non-convective LLWS are not included in `TEMPO` or

[4]International Civil Aviation Organization (ICAO). (2005). *Manual on Low-level Wind Shear, First Edition*. Doc 9817 AN/449.

PROB groups.

The format of the non-convective low-level wind shear group is WS$h_{ws}h_{ws}h_{ws}$/*dddff*KT, where:

WS	Indicator for non-convective LLWS.
$h_{ws}h_{ws}h_{ws}$	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** is not 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 prevails from 0600Z until the beginning of the next FM group at 1100Z.

```
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 (020 at KPUB; 015 at KDFW). 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. In cases where multiple layers of LLWS exist, the lowest layer in elevation should be included in the TAF, as users have consistently identified this as the most dangerous type of LLWS. For example, if 30 kts of LLWS are present at 1,000 ft, and 60 kts at 2,000 ft, the 1,000 ft layer should be included in the TAF.

LLWS is difficult to define as it is a vector term and is used to describe an impact on pilots with different aircraft types and capabilities. As we are ultimately looking to communicate an impact, both WFOs and CWSUs should monitor PIREPs as appropriate and coordinate, on whether LLWS should be added based on available reports and their forecast expertise.

B2.9 Forecast Change Indicator Groups (FM*YYGGgg* and TEMPO *YYGG/$Y_eY_eG_eG_e$*)

Forecast change indicator groups, FM*YYGGgg* and TEMPO *YYGG/$Y_eY_eG_eG_e$*, are contractions which are used to subdivide the forecast period (24 or 30 hours for scheduled TAFs; less for amended or delayed forecasts) according to significant changes in the weather. Forecasters should remember the lowest meteorological condition contained in a TAF, regardless of any conditional language, including those forecasted in the PROB or TEMPO groups drive user

operational decisions. PROB30 and TEMPO should describe short duration forecast weather changes and should be used as sparingly as possible.

B2.9.1 Special Thunderstorm Consistency Guidance

When the TFM Convective Forecast (TCF) forecasts thunderstorms with at least medium coverage at an FAA Core Airport, consider thunderstorms in the TAF as prevailing conditions or TEMPO.

B2.9.2 FROM Change Group Indicator (FM*YYGGgg*)

The FM change indicator group (FM*YYGGgg*) is used to indicate when prevailing conditions are expected to change significantly over a period of less than one hour. In these instances, the forecast is subdivided 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, a forecaster should make every effort to forecast changes with higher temporal resolution. All forecast elements following FM*YYGGgg* 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 FM*YYGGgg* if the terminal forecast valid period is divided into additional periods.

The FM group is followed by a complete description of the weather, and all forecast conditions given before the FM*YYGGgg* 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) are included in each FM group, regardless of whether they are forecast to change. 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, suppose forecast cloud and visibility changes warrant a new FM group but the wind does not. In that case, the new FM group will include a wind forecast, even if it is the same as the most recently forecast wind.

Instances, when a forecaster should consider including a new FM group, include but are not limited to:

- The start and/or end of LLWS.
- A 30-degree wind direction change with wind speeds ≥ 12 kts and/or wind crossing critical threshold (e.g., results in crosswinds/runway change).
- The start and/or end of hail, freezing precipitation, and/or ice pellets.
- Conditions cross Categorical Amendment Criteria (CAC) Thresholds.
- When a thunderstorm begins or ends.

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

Examples:

```
TAF
KDSM 022336Z 0300/0400 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 0000Z, since none was expected.

```
TAF
KAPN 312330Z 0100/0200 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.

B2.9.3 TEMPO Change Indicator (TEMPO *YYGG/$Y_eY_eG_eG_e$*)

The TEMPO change indicator group (TEMPO *YYGG/$Y_eY_eG_eG_e$*) is used to indicate temporary fluctuations to forecast meteorological conditions, which are expected to:

a. Have a high percentage (greater than 50%) probability of occurrence;

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 *$Y_eY_eG_eG_e$*.

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 UTC. If the TEMPO condition is expected to last more than one (1) hour, a FM*YYGGgg* 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/$Y_eY_eG_eG_e$*), then the TEMPO condition is considered predominant and should instead be entered in the initial forecast period or following a FM group. TEMPO groups do not exceed four hours.

The TEMPO group is placed on a new line in the TAF, indented six (6) spaces from the left margin. The TEMPO identifier is followed by a description of all the elements in which a temporary change is forecast. A previously forecast element that 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 is also included. If a significant change is expected in the cloud forecast, all cloud layers are given, including any significant layer not expected to change.

Consecutive TEMPO groups are not used during the initial forecast period or following any subsequent FM group(s). TEMPO groups do not include forecasts of 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…
```

B2.9.4 Probability Groups (PROB30 *YYGG/$Y_eY_eG_eG_e$*)

The PROB30 groups (PROB30 *YYGG/$Y_eY_eG_eG_e$*) are used to forecast a 30% chance, respectively, of occurrence 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 groups do not exceed 6 hours. Only one PROB30 group is used in any subsequent FM group.

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

The PROB30 groups are located within the same line as the prevailing condition group, continuing on the line below if necessary.

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

The PROB30 groups are not used by NWS offices as a direct modifier of TEMPO. Similarly, NWS offices do not use TEMPO groups as a direct modifier of the PROB30 groups (e.g., TEMPO PROB30 *YY*23/Y_eY_e24).

Example:

```
TAF
KSEA 091125Z 0912/1012 19008KT P6SM SCT02 OVC090
      PROB30 0915/0919 1SM +TSRA BR OVC007CB
```

Appendix C — Unscheduled TAFs

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C1 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 issuance (*YYGGgg*) and beginning valid times (for amended and delayed forecasts only). The entire text of each TAF that has yet to expire, not just the amended, corrected, or delayed portion, is transmitted.

Amended, delayed, and corrected forecasts 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**

C1.1 Amended TAFs

Amendments (AMD) are an effective method to optimize the quality of the TAF. Forecasters should 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 (i.e., chasing the observation). However, an amended TAF is recommended if improving weather conditions occur sooner than forecast. Further, forecasters should exercise good judgment when using automated observations. Because of their sensitivity, AWOS/ASOS observation data are likelier to fall outside the forecast amendment ranges.

TAF amendments are issued promptly when:

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

b. New guidance/information indicates future conditions are expected to be in a different category than initially forecast, especially in a 1- to 6-hour period.

Forecasters use AvnFPS to notify 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 of the amendment time.

C1.2 Amendment Coding

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

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

In an amended forecast, the date and time group (*YYGGggZ*) reflects when the amended forecast was issued. In the forecast valid period group ($Y_1Y_1G_1G_1/Y_2Y_2G_2G_2$), the first four digits ($Y_1Y_1G_1G_1$) 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 is valid from the time of issuance (*YYGGgg*) to the valid period ending time of the original scheduled terminal forecast.

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 four and a half 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 (0500).

C1.3 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 (e.g., fuel requirements and alternates), and the TAF should be especially accurate regarding those values. Further, specific airports may have other locally important values to operations. Forecasters should be aware of these values when amendments are required and issued.

C1.3.1 Categorical Amendment Criteria (CAC)

WFOs utilize CAC for ceiling and visibility thresholds. CAC Thresholds are updated on a 28-day cycle consistent with the FAA's Terminal Procedure Publications (TPP). NWSH/AFS24 reviews published FAA approach plates every 28 days, updates the Master List of CAC thresholds, and shares this with Aviation Focal Points (AFP) via the AFP listserv on the Virtual Lab (VLAB). WFOs are responsible for reviewing the Master List and keeping the CAC thresholds they use for their TAF sites up to date. WFOs should review the FAA approach plates to verify the accuracy of the Master List and report inaccuracies to their RAM and NWSH/AFS24. See Table C1 for specific CAC categories.

Table C1. Categorical Amendment Criteria

<table>
<tr><td>Forecast Element/
Occurrence</td><td colspan="2">TAF Ceiling and Visibility
Amendment Criteria</td></tr>
<tr><td rowspan="2">a. Ceiling and/or visibility is observed to increase/decrease from a threshold. The lowest ceiling or visibility value determines the forecast category.
b. When ceiling and visibility increase to equal or exceeds a threshold.
c. See notes for specific details.</td><td>Threshold
A (note 1)
B (note 2)
C
D
E
F</td><td>Default Limits
200 ft; 1/2SM
600 ft; 2SM
1,000 ft; 3SM
3,000 ft; 5SM
2,000 ft; ≥ 3SM
Note 3</td></tr>
<tr><td colspan="2">NOTES:
1. Or the lowest published airfield minimum, where higher minimums apply.
2. Or higher thresholds as determined by specific airport requirements.
3. Other Conditions Defined by Local Air Traffic Managers or Airport Requirements.</td></tr>
</table>

C1.3.2 Additional U.S. TAF Amendment Criteria

The following are recommended amendment thresholds for NWS TAFs in addition to the CAC thresholds. Offices may develop more restrictive criteria as defined by Local Air Traffic Managers or Airport Requirements.

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

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

(1) Forecast mean wind speed differs by ≥ 10 kts, while original or newly expected mean wind speed is ≥ 12 kts.

(2) Forecast wind gust (or forecast of no gust): differs from observed wind gust by ≥ 10 kts (or above the observed mean wind speed if no gusts are forecast).

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

C2 Delayed TAFs

A delayed TAF is when a TAF is not issued on time due to unavoidable circumstances (e.g., electrical, mechanical, etc.). Delayed TAFs are issued as soon as possible after the circumstances that caused the delay have been remedied.

The delayed TAF is identified in the WMO abbreviated heading by the contraction RR*x* following the date/time group, where *x* is the letter A through X, as described in Section C1. For example, RRA indicates the first delayed issuance of a scheduled TAF. Only offices issuing TAFs in collectives need to issue a second (or greater) delayed TAF. No contraction in the TAF text indicates a TAF is delayed; the contraction RR*x* only appears in the WMO abbreviated heading line.

The delayed TAF is valid from the UTC date/time of issuance (*YYGGgg*Z) until the end of the previously scheduled TAF valid period. 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 is valid from the time of issuance to the end of the valid period of the original scheduled TAF.

Example of delayed TAF:

Original	Delayed
FTPA31 PHFO 030500	**FTPA31 PHFO 030500 RRA**
TAF	**TAF RTD**
PHMK 030540Z 0306/0406...	**PHMK 030555Z 0306/0406**...

The forecaster prepared the first delayed TAF (indicated by RRA) at 0555Z on the 3rd day of the month (as shown in the date/time of issuance in the text of the TAF). The delayed terminal shows the time of the originally scheduled forecast in the WMO abbreviated header (0500).

C3 Corrected TAFs

Corrected TAFs are issued as soon as possible after discovering an error (typographical or other mistake). A corrected TAF is 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 C1). 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 corrected TAF; the contraction CCx only appears in the WMO abbreviated heading.

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

Example of corrected TAF:

Original	Corrected
FTAK31 PAFG 030500 **TAF** **PAOM 030540Z 0306/0406**...	**FTAK31 PAFG 030500 CCA** **TAF COR** **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 (0500).

C3.1 Correcting Amended or Delayed Forecasts

If an amended or delayed TAF contains an error, it should be corrected following the procedures described in Section C1. 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 issuance 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 FM271700 group: winds are incorrectly encoded as 110 degrees at 0 kts. The forecaster notices the error and prepares the TAF's first correction (CCA) at 1602Z (date/time of issuance 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 (2715/2812); 4) the error in the FM271700 group has been corrected.

Appendix D — New TAF Service, Part time TAF service, Observation Requirements, and Terminating TAF Service

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D1 Requests for Preparation of New TAF Service/Changing Existing Part-Time TAF Service

WFOs requested to start a new TAF should work with local union representatives, local WFO management, and the appropriate RAM or equivalent for evaluation. The requestor should provide documentation regarding the need for a new TAF (e.g., letterhead requests from the Airport Manager, City or Chamber, Customer, or State Aeronautics Board). This way, the WFO and Region can better evaluate the request based on the availability of data and NWS resources to support the new TAF(s) if approved. Upon endorsement, the RAM should forward the recommendation to AFS24.

After review, if AFS24 approves the TAF recommendation, the RAM 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 RAM prepares a Service Change Notice (SCN) and forwards it to AFS24 for processing and public transmission. The SCN is prepared according to NWSI 10-1805, *National and Regional Public Information Statements and Service Change Notices*. The RC is prepared according to NWSI 10-102, *Products and Services Change Management*.

If a part-time TAF (less than 24/7 service) increases to 24 hours, the appropriate RAM or equivalent prepares a SCN and forwards it to AFS24 for processing and transmission. A RC to expand TAF service to 24 hours is not needed because the TAF identifier and communications nodes already exist.

D2 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, sky condition, temperature, dew point, and altimeter setting. Weather and obstructions to vision are desired to initiate new TAF requests but not

required. A new TAF location may still be approved, with National and Regional Headquarters coordination, if the above elements are unavailable and the need for the site has been determined to be appropriate and necessary.

These elements can be obtained from commissioned ASOS or AWOS-III observation sites or manual observer sites with equipment. Augmentation is provided per the agency agreements with augmenters (refer to FAA document 7900.5 series, *Surface Weather Observing — METAR*.)

NWS offices, with regional approval, have the authority to suspend TAF service if there are long term changes to the ASOS or AWOS status (such as communication outages or airport construction). Offices experiencing these long-term status changes at TAF sites should contact their Regional Headquarters for guidance. A SCN should be coordinated with NWSH to document and alert users to the suspension of the TAF service.

D2.1 Temporary TAFs for Special Events or Changes in Seasonal Traffic or Operations

Offices may start temporary TAFs for large events or seasonal traffic, where air traffic may increase exponentially at an airport with no TAF. These temporary TAFs should be coordinated with not only the appropriate Regional Headquarters but also the appropriate CWSU. A SCN should be prepared and coordinated with NWSH and include a beginning and ending date for these services unless a SCN and RC were already accomplished a previous year for what's known as a "start and stop" TAF. These TAFs may be issued with just a Public Information Statement (PNS). See Appendix D1 and Appendix D2 for additional information on observational requirements and the approval process.

D2.2 Temporary TAFs in Support of Natural Disasters

Temporary TAFs are created to support emergency relief efforts. No observation is required for the location. Instead, the office can use the "total observation concept" to support emergency operations when needed. A SCN should be prepared providing a set beginning and ending date for these services in the SCN and RC. See Appendix D1 and Appendix D2.

D3 Minimum Observations Requirements for Routine TAF Issuance and Continuation

The aviation forecaster should have specific information for the preparation and issuance of each TAF. Although integral to the TAF writing process, a complete observation is not required. Complete observations include wind, visibility, weather, sky, temperature/dewpoint, etc. Forecasters should use the "total observation concept" to write TAFs with data, including using nearby observations, radar, satellite, radiosonde, model data, ACARS, MDCRS, webcams, and other credible sources to prepare the TAF.

D4 TAFs with Incomplete or Missing Observations

When NWS offices are unable to receive timely observations needed for TAF production, forecasters should first attempt to dial directly into the appropriate ASOS/AWOS site(s) to attempt to obtain the observational data needed to keep a valid TAF in effect. Additionally, forecasters are encouraged to follow NWSI 10-1301 Surface Observing, section 2.3 to report any observational outages.

In the event the forecaster is not able to obtain current observations directly from the ASOS/AWOS needed, the following should be considered:

D4.1 AMD NOT SKED

In events where the observations are missing or incomplete, forecasters should rely on the "total observation concept" mentioned in Appendix D3. When this occurs, forecasters should use AMD NOT SKED, in the TAF. This indicates the forecaster has enough data to issue a TAF but will not provide amendments. This allows airport operations to continue using a valid TAF but not to expect updates between standard issuance times. The "total observation concept" and AMD NOT SKED is strongly encouraged and should be used as an alternative to a NIL TAF as much as possible. No documentation is necessary for the use of AMD NOT SKED.

D4.2 Automated Observing Sites Requiring Part-Time Augmentation

Each NWS office with TAF responsibility should maintain the latest copy of FAA document 7900.5 series, Surface Weather Observing – METAR. 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 with part-time augmentation are prepared using the procedures for part-time manual observation sites detailed in the previous section, with one exception: the remark used when the automated system is unattended. The time an augmented automated station is scheduled to go into unattended operation and/or the time augmentation resumes is included in a remark unique to automated observing sites: AMD LTD TO (elements specified) (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, is appended to the last scheduled TAF issued prior to the last augmented observation. It is also 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 specified times upon coordination with the regional headquarters. In this form, the remark flags that certain elements may not be amended at the AWOS-III site. The remark should be a separate last line of text in the TAF so the user does not overlook it.

Example:

```
TAF AMD
KCOE 150202Z 1502/1600 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. As noted in the next paragraph, other elements are included when the forecast is updated for changes in wind, visibility, or clouds.

An amendment includes 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 is used. See NWSI 10-1301, Surface Observing for reporting procedures.

D4.3 Non-augmented Automated Observing Sites

TAF amendments issued for a non-augmented ASOS site may be suspended if 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` is appended, on a separate line, and five spaces are indented to the end of an amendment to the existing TAF when appropriate.

D4.4 `NIL` TAF

A `NIL` TAF should not be issued except in rare situations. In cases where observations are missing for extended periods (i.e., more than one TAF cycle of six hours) and the total observation concept cannot provide sufficient information to construct a TAF, a `NIL` TAF may be used. A `NIL` TAF disrupts airline operations, inconveniences the traveling public, forces users to seek weather information from other sources, and should only be used as a last resort.

Upon issuance of a `NIL` TAF, the WFO forecast team will provide written documentation on the circumstances leading to the decision to issue a `NIL` TAF. The documentation should include:

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.

This documentation will be forwarded to the appropriate Regional Operations Center (ROC) as soon as possible, and the local MIC and RAM will be copied for awareness. Following regional guidelines, the ROC Duty Officer will determine if it is appropriate to forward to the NWS

Operations Center (NWSOC) for senior leadership awareness. Depending on the circumstances and location of the NIL TAF, the ROC should consider alerting the NWSOC via approved chat or telephone to meet any reporting or briefing deadlines for senior leadership.

In some cases, WFOs may need to frequently NIL TAFs at specific airports, such as remote airports operating part-time. In these special cases, WFOs may be allowed to NIL without additional documentation after prior coordination with and approval from the local MIC and RAM.

D5 Terminating TAF Service

If a TAF site experiences a drastic, permanent reduction in civilian aviation services, the local WFO management will coordinate with the appropriate RAM (or equivalent) on whether TAF service should continue for that site. If the WFO MIC believes the TAF service should be terminated, the WFO MIC forwards a recommendation with justification through the RAM and RH to NWSH. AFS24 coordinates TAF termination with the FAA and other interested agencies as appropriate AFS24 coordinates a PNS and RC as the final step in terminating TAF service.

Appendix E — TAF Code Format, Terminology, and Significant Weather Matrices

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E1 Generic International TAF Code Format

The NWS forecaster should know the International TAF Code Format below.

Line 1

TAF or **TAF AMD** or **TAF COR**

Line 2

CCCC	*YYGGgg***Z**	$Y_1Y_1G_1G_1/Y_2Y_2G_2G_2$ or **NIL**
[Location identifier]	[Date/time of issuance]	[Valid period]

Forecast elements beginning after a valid period in Line 2

*dddff***G***f_mf_m***KT**	*VVVV* or **CAVOK**	*w'w'* or **NSW**	$N_sN_sN_sh_sh_sh_s$, **VV***$h_sh_sh_s$*, or **SKC** (**NSC**)
[Wind forecast]	[Visibility forecast]	[Significant weather forecast]	[Cloud and obscuration forecast]

6*$I_{cc}h_Lh_Lh_Lt_L$*	**5***$B_{cc}B_hB_hB_ht_L$*	**T***T_FT_F/G_FG_F***Z**	**QNH***$P_IP_IP_IP_I$***INS**
[Icing forecast]	[Turbulence forecast]	[Temperature forecast]	[Lowest altimeter setting forecast]

TTYYGGgg or *TTTTT* $Y_1Y_1GG/Y_eY_eG_eG_e$ **PROB***C_2C_2* $Y_1Y_1GG/Y_eY_eG_eG_e$
[Forecast change indicators] [Probability forecast]

E2 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. **PROB***C_2C_2* $Y_1Y_1GG/Y_eY_eG_eG_e$ in combination with TEMPO

e. Optional Groups: **6***I* (Icing), **5***B* (Turbulence), **T***T* (Temperature), and **QNH** (Altimeter). There is no requirement for NWS WFOs to use these groups in NWS TAFs.

E3 Significant Weather: WMO Code Table 4678

The *w'w'* groups are constructed by considering the columns of the following table in sequence from left to right. For example, heavy rain shower(s) are coded as +SHRA.

Qualifier		Weather Phenomena		
Intensity or Proximity	Descriptor	Precipitation	Obscuration	Other
- Light Moderate (no qualifier) + Heavy (well developed in the case of dust/sand whirls (dust devils) and funnel clouds) VC[1] In the vicinity	MI Shallow BC Patches PR Partial (covering part of the aerodrome) DR Low drifting BL Blowing SH Shower(s) TS Thunderstorm FZ Freezing (supercooled)	DZ Drizzle RA Rain SN Snow SG Snow grains PL Ice pellets GR Hail GS Snow pellets UP[2] Unknown precipitation in automated observations	BR Mist FG Fog FU Smoke VA Volcanic ash DU Widespread dust SA Sand HZ Haze	PO Well-developed dust/sand whirls (dust devils) SQ Squalls FC[3] Funnel cloud(s) (tornado or waterspout) SS Sandstorm DS Dust storm

Footnotes for WMO 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. UP is not used in NWS-prepared terminal forecasts.

3. Tornadic activity, including tornadoes, waterspouts, and funnel clouds, should only be included in TAFs when absolutely necessary. Although the probability of occurrence at a specific site is low, it is possible.

E4 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]	GR		GR								SHGR	TSGR	
Snow pellets[5]	GS		GS								SHGS	TSGS	
Thunderstorms, Showers, Freezing, and their intensity or proximity													
TS	TS		TS		VCTS[6]								
TSRA		-TSRA	TSRA	+TSRA									
TSSN		-TSSN	TSSN	+TSSN									
TSPL		-TSPL	TSPL	+TSPL									
TSGS			TSGS										
TSGR			TSGR										
SH	SH				VCSH[7]								
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[8]		BR										
Fog	FG[9]		FG		VCFG[10]	MIFG[11]	PRFG[12]	BCFG[13]					FZFG[14]
Smoke	FU		FU										
Volcanic ash	VA[15]		VA										
Widespread dust	DU		DU						DRDU	BLDU			
Sand	SA		SA						DRSA	BLSA			
Haze	HZ		HZ										
Spray	PY		PY							BLPY			
Blowing Phenomena													
Snow[16]	BLSN		BLSN							BLSN			
Sand	BLSA		BLSA							BLSA			
Dust storm	BLDU		BLDU							BLDU			
Other													
Sand/Dust Whirls	PO		PO										
Squalls[17]	SQ		SQ										
Funnel cloud[18]	FC		FC										
Tornado/ Waterspout[19]	+FC			+FC									
Sandstorm[20]	SS		SS	+SS									
Dust storm[21]	DS		DS	+DS									

Footnotes for Weather Phenomena Matrix for NWS TAFs:

1. For each weather phenomena group, only one descriptor is used, e.g., BCFG.
2. In NWS TAFs, vicinity (VC) is defined as a donut-shaped area 5-10 SM from the center of the runway complex of an airport. In NWS TAFs, the vicinity is 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 the wind to < 6 ft 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), snow pellets (GS), or ice crystals (IC).
6. VCTS is a valid combination for all airports with TAFs. [In the METAR code, VCTS is only reported by automated stations connected to the FAA Automated Lightning Detection And Reporting System (ALDARS)].
7. VCSH is used to forecast showers 5-10 SM from the center of the airport. The type and intensity of showers in the vicinity are not specified, i.e., +VCSHRA is not allowed.
8. BR is only used when the visibility is forecast to be > ½ SM but ≤ 6 SM.
9. For FG to be forecast with any qualifiers, visibility is ≤ ½ SM.
10. VCFG may be used to forecast fog at any visibility value between 0 SM and 6 SM in the vicinity (5-10 SM) of the airport.
11. For MIFG to be forecast, the visibility at 6 ft above ground level is > ½ SM, and the apparent visibility in the fog layer is expected to be ≤ ½ SM.
12. PRFG indicates that a substantial part of the airport is forecast to be covered by fog (visibility ≤ ½ SM), while the remainder of the airport is expected to be clear of fog.
13. BCFG indicates that patches of fog (visibility ≤ ½ SM) are forecast to cover the airport randomly.
14. FZFG is fog (visibility ≤ ½ SM) consisting predominantly of water droplets at temperatures ≤ 0°C, whether or not the fog is expected to deposit rime ice.
15. Volcanic Ash (VA) is always in the forecast when expected. Visibility is not a factor.
16. SN BLSN indicates a combination of snow falling from clouds and blowing snow.
17. Squall (SQ) is a sudden increase in wind speed of ≥ 16 kts, the speed rising to 22 kts or more and lasting for at least one minute.
18. Generally, Funnel Clouds should not be forecast.
19. Tornadoes and Waterspouts should rarely be forecast.
20. SS is forecast if visibility is > ¼ SM and ≤ ½ SM. Forecast +SS if visibility is expected to be ≤ ¼ SM.
21. DS is forecast if visibility is > ¼ SM and ≤ ½ SM. Forecast +DS if visibility is expected to be ≤ ¼ SM.
22. No more than three significant weather groups are used to forecast weather phenomena at

or near the airport. If more than one significant weather phenomenon is expected in the forecast, separate weather groups are included. If more than one form of precipitation is forecasted, the appropriate contractions are combined in a single group, with the predominant type of precipitation included first. One exception to this is in Appendix B, Section 2.6.1. 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 F — 30 Hour TAF Locations

KAUS Austin – Bergstrom Intl, TX
KATL Atlanta - Hartsfield Intl, GA
KBDL Bradley Intl, CT
KBOS Logan Intl, MA
KBWI Baltimore/Washington Intl Thurgood Marshall, MD
KBZN Bozeman Yellowstone Intl, MT
KCLE Cleveland Hopkins Intl, OH
KCLT Charlotte Douglas Intl, NC
KCVG Cincinnati/Northern Ky Itnl, OH
KDCA Ronald Reagan Washington National, VA
KDEN Denver Intl, CO
KDFW Dallas/Fort Worth, Intl TX
KDTW Detroit, MI
KEWR Newark Liberty Intl, NJ
KFLL Fort Lauderdale/Hollywood Intl, FL
KIAD Washington Dulles Intl, VA
KIAH Houston – George Bush Intl, TX
KIND Indianapolis Intl, IN
KJFK John F. Kennedy Intl, NY
KLAS Harry Reid Intl, NV
KLAX Los Angeles Intl, CA
KLGA LaGuardia, NY
KMCO Orlando Intl, FL
KMDW Chicago Midway, IL
KMEM Memphis Intl, TN
KMIA Miami Intl, FL
KMKE General Mitchell Intl, WI
KMSP Minneapolis-St. Paul Intl, MN
KMSY New Orleans Intl, LA
KOAK Oakland Intl, CA
KONT Ontario Intl, CA
KORD Chicago-O'Hare Intl, IL
KPHL Philadelphia Intl, PA
KPHX Phoenix Sky Harbor Intl, AZ
KPIT Pittsburgh Intl, PA
KSAN San Diego Intl, CA
KSDF Louisville Intl, KY
KSEA Seattle-Tacoma Intl, WA
KSFO San Francisco Intl, CA
KSLC Salt Lake City Intl, UT
KSTL Lambert-St. Louis Intl, MO
KSWF Stewart Intl, NY
KSAT San Antonio Intl, TX
KTPA Tampa Intl, FL
KTEB Teterboro, NJ
PANC Ted Stevens Anchorage Intl, AK
PAFA Fairbanks Intl, AK
PGUM Guam Intl, US Territory
PHNL Honolulu Intl, HI