DEPARTMENT OF THE NAVY
COMMANDER
NAVAL METEOROLOGY AND OCEANOGRAPHY COMMAND
1100 BALCH BOULEVARD
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NAVMETOCCOMINST 3143.1H
N3
30 Jun 11

NAVMETOCCOM INSTRUCTION 3143.1H

From: Commander, Naval Meteorology and Oceanography Command

Subj: TERMINAL AERODROME FORECAST (TAF) AND THE FM51-XII TAF CODE

Ref: (a) WMO-No 306, FM51-XII, 1995 Edition
(b) National Weather Service Change Notice 08-15
(c) AFMAN 15-124

Encl: (1) Terminal Aerodrome Forecast (TAF) and FM51-XII (TAF) Code Manual

1. Purpose. To promulgate the instructions for development of the Terminal Aerodrome Forecast (TAF) and use of the FM51-XII (TAF) Code per references (a) and (b) to the Naval Meteorology and Oceanography Command and the U. S. Marine Corps METOC community.

2. Cancellation. NAVMETOCCOMINST 3143.1G

3. Background. The TAF is developed by forecasters for individual airfields to specifically support all aviation interests. Pilots, air traffic control personnel, schedulers, etc. read and use the information contained in this forecast to make critical operational decisions. World Meteorological Organization (WMO) Code FM51-XII TAF is the code used universally to express these forecasted weather parameters to the aviation community and to convey that information worldwide.

4. Discussion

a. The TAF provides information about the expected (forecasted) weather conditions for the next 24-hours at the airfield or station control zone as described in the base air operations manual or the local forecaster's handbook. Therefore it is considered a micro scale point forecast and requires precise techniques and terminology. The forecast is disseminated locally, nationally and internationally. Local users rely on this information for making critical mission tasking and base operations decisions. The distant user often finds this data even more critical when determining the likelihood of mission accomplishment and the need for an alternate airfield.

b. It is essential that information contained within the TAF is accurate, complete, and derived by a thorough evaluation of all available environmental data and the local variables that affect the forecast. Moreover, the activity responsible for the aviation weather support must continuously monitor the weather conditions and issue amendments to the TAF when current or anticipated conditions vary from the forecast. This may be accomplished by the individual local office or at a Fleet Weather Center.

c. As of 5 November 2008, the WMO changed their TAF code from a 24hr forecast to 30 hours. While the Naval Meteorology and Oceanography Command and Marine Corps METOC activities have changed their TAF to reflect the required format changes, they maintain issuing 24 hour TAFs vice a 30 hour TAF.

5. Action. The Naval Meteorology and Oceanography Command and Marine Corps METOC activities responsible for aviation support shall develop Standard Operating Procedures detailing the data and evaluation processes used for development of individual TAFs. Supporting activities shall issue the required TAF and use the TAF Code as outlined in enclosure (1) and reference (a). Routine TAFs shall be filed on a six or eight-hour interval as established by the supporting weather agency for each airfield and shall have a valid period of 24 hours. File time of routine TAFs shall be on the hour of valid time. Amendments will be issued and filed as required and as detailed in enclosure (1). TAFs shall be transmitted via supporting networks insuring worldwide dissemination. Requirements for local dissemination of the TAF shall be established by the supporting METOC activity.

6. Effective Date. This instruction becomes effective at 1800Z on 30 June 2011.

7. Concurrence. This instruction has the concurrence of the Commandant of the Marine Corps (CMC). Marine Corps METOC Activities shall take those actions prescribed in this instruction, which are not contradictory to specifically expressed policies of the Commandant of the Marine Corps.

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Distribution:
Electronic only, via the Naval Oceanography Administrative Portal at https://www.portal.navy.mil/cnmoc/default.aspx

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TERMINAL AERODOME FORECAST (TAF) and FM51-XII (TAF) Encoding

COMNAVMETOCCOMINST 3143.1H

This publication prescribes procedures for use by all Navy and Marine Corps METOC personnel when developing Terminal Aerodrome Forecast (TAF). It is considered the governing instruction for the TAF. Personnel responsible for aviation weather support shall be familiar with its provisions. Supersedes COMNAVMETOCCOM INST 3143.1G released 04 May 2006

Commander, Naval Meteorology and Oceanography Command
1100 Balch Boulevard
Stennis Space Center, MS 39522-5001

June 2011

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Chapter 1 – General

1.1. Authority. The United States, as a member of the World Meteorological Organization (WMO), is obligated to follow general coding procedures and to advise the WMO of differences in national coding practices. The WMO Manual on Codes, No. 306 Vol. II Part A, is the basic document outlining Terminal Aerodrome Forecast (TAF) codes. Similarly, the U. S., as a contracting state of the International Civil Aviation Organization (ICAO), has agreed to provide weather service per ICAO standards, and to abide by the provision for notification of any differences between U. S. and ICAO standards. In support of these agreements, the Naval Meteorological and Oceanography Command (NAVMETOCCOM) and Marine Corps METOC activities shall prepare and distribute TAFs to meet the needs of the Department of Defense as required by the United States Aviation Authority and the Federal Aviation Authority, and to issue these forecasts in the code format designated by the WMO.

1.2. Applicability. The procedures outlined in this manual apply to all aviation weather forecasters supporting Navy and Marine Corps and all TAFs originated by these forecasters whether at shore stations (garrison) or while deployed.

1.3. Wording. The terms below are used in this instruction to specify the degree of obligation with reference to stated procedures.

1.3.1. Shall – the procedure is mandatory

1.3.2. Should – the procedures is recommended

1.3.3. May – the procedure is optional

1.3.4. Will - means futurity, and never indicates any degree of requirement for application of a procedure.

1.3.5. TAF - The contraction "TAF" is the acronym applied to the FM51-XII code. Terminal Aviation Forecast is the complete name for this forecast however some documents use the terms Terminal Forecast or Aerodrome Forecast.

1.4. Time References. All times in the TAF are stated in Coordinated Universal Time (UTC) or Zulu time.

1.5. Abbreviations, Contractions, Acronyms. Contractions used in Navy/Marine Corps TAFs shall be those derived from the WMO Codes Manual and from the ICAO Abbreviations and Codes. A partial list of contractions, abbreviations and acronyms is included as Appendix A.

Chapter 2 – Terminal Aerodrome Forecast Development

This Chapter describes the considerations and process required for the development of a TAF. These forecasts are developed and distributed worldwide in support of civilian and military interests. Although used primarily by aviation forecasters for flight briefing, these forecasts also support a variety of other customers including base or airport operations personnel, major control hubs, and mission planners.

2.1. Area. The forecast elements of a TAF apply to the airfield control zone as delineated in the base operations manual or local forecaster's handbook. This is usually a relatively small area, averaging 75 square miles. Nearby auxiliary airfield are usually considered to be a separate forecasting area. If a forecaster is unsure of the control zone area, or if the zone is not clearly defined, the forecasters should consider the "on station" forecast area to within a five (5) statute mile radius of the control tower. For an element to be in the "vicinity", consider the area between five (5) miles and ten (10) miles of the control tower. An important consideration for many Navy and Marine Corps stations is the fact that some of the control zone may be over water. This may be a major consideration under certain weather conditions. The TAF is a forecast for the most probable conditions expected for that small area during the forecast period; this is not the same as the probability for an event over a large area. For example, an area forecast for southeast Virginia may give a thunderstorm probability of 40 percent; this does not necessarily translate to a 40 percent chance of thunderstorms for the much smaller area of an aerodrome.

2.2. Time Considerations. Because a TAF covers a relatively small area and short time span (up to 30 hours), it is by nature a micro scale forecast. The forecaster must consider several time issues.

2.2.1. Resolution. The normal time resolution for a TAF is one hour; however, there are occasions when a resolution to the minutes is expected and possible. The forecaster shall make every effort to define all significant aviation forecast elements to the finest resolution possible. Mesoscale models, Doppler Radar Data, and High-Resolution Satellite Imagery (time and area) make this task feasible. Forecasters today are expected to provide operational commanders with details such as "the storm line will be over the northern portion of the county by 1500, begin affecting the base at 1530, and clear the area by

1610.” Even if this resolution is not available when the forecast is originally issued, it can be provided via an amendment. This level of forecast resolution can not only offer proper warning but save training time and fuel.

2.2.2. Cyclic Events. Several cyclic events exist at airfields that are critical to an accurate TAF. First the forecaster must be aware of the effects sunrise and sunset can have on forecasts and on the level of traffic. This is especially important if the forecast is generated remotely. Numerous weather elements including temperature, visibility, and wind direction can be affected. Forecasters should have sunrise/sunset data available for all stations for which a forecast is being generated. Some fields have industrial activity that routinely affects visibility in the area. Finally, most air stations have peak takeoff and landing times. The forecaster should be aware of these events also, checking to ensure the accuracy of the forecast prior to peak times.

2.2.3. Distant Launch. Long distance flights may launch many hours before the destination field is open. For instance, a flight arriving in Norfolk at 11Z may have left Rota Spain at 02Z. In other cases a field may be selected as an emergency divert and have traffic at unexpected times. It is important to ensure each air station always has an accurate up to date forecast even though the station may not be currently open.

2.2.4. Preparation Time. Preparation time for a TAF will vary greatly depending on the complexity of the environmental situation and the number of forecasts an individual forecaster is preparing. In any event, the forecaster shall begin data evaluation sufficiently early so as to meet the issuance window time, preferably the early part of the window. A comprehensive forecaster turnover at watch relief is also an integral part of the initial preparation.

2.2.5. Transmission Times. Scheduled Navy and Marine Corps TAFs are issued three (3) times a day every eight (8) hours or four (4) times a day every six (6) hours. The issuance window is from 20-minutes prior to the hour to the actual transmission time.

2.3. Weather Data Evaluation. Detailed evaluation of all available data is necessary to an accurate TAF. These micro scale forecasts shall be prepared by integrating many data types and sources, guidance material, and the forecaster’s experience.

2.3.1. Requirement for Preparation of Standard Operating Procedures. Each activity having the responsibility for issuing TAFs shall have a Standard Operating Procedure (SOP) providing details specific to each airfield on available data sources, evaluation of the weather data and development of this forecast.

2.3.2. Data Sources. Forecasters shall use guidance products from the following sources in the priority listed:

- Navy/Marine Corps Aviation Hubs
- Fleet Numerical Meteorology and Oceanography Center (FLENUMMETOCCEN)
- Air Force Weather Agency (AFWA)
- National Oceanic and Atmospheric Administration Offices
- National Center for Environmental Prediction (NCEP)
- Aviation Weather Center (AWC)
- Storm Prediction Center (SPC)
- Other U.S. Government sources
- Foreign governmental agencies
- Collegiate and private sources may be used but only as a secondary source to substantiate other sources.

2.3.3. Data Sets. The Aerodrome local policies and Standard Operating Procedures for development of TAFs shall list specific data that the Aviation Forecaster shall evaluate for any given station. The forecaster can add additional sets as needed. Specific elements from the following data sets shall be included: Global and Mesoscale model data (both area and point), alphanumeric data to include PIREPS, area aviation forecasts, forecast discussions, observations, and other TAFs, Doppler Radar (local station as well as area animations for reflectivity and velocity), satellite imagery to include special enhancements for fog, ground temperature, severe weather, movement of features, etc., and lightning data.

2.3.4. Warning Considerations. Forecasters shall review all warnings (WW, SIGMET, AIRMET, winter storm, tropical, etc.) issued for their forecast area prior to the issuance of any TAF and shall resolve any differences. Although these warnings should receive strong consideration in preparing or amending TAFs, they are by nature area forecasts and the forecaster is preparing a micro scale forecast; therefore, in reviewing all available guidance, the forecaster may determine that the warning does not apply to the specific aerodrome.

2.3.5. Non-Convective Low Level Wind Shear (LLWS). Non-convective Low Level Wind Shear is not the same as Low Level Turbulence, which occurs when low-level winds mix down to the surface. Wind shear is defined as a rapid change in horizontal or vertical wind speed and/or direction, over a short distance. It is a vector difference composed of wind direction and speed between two wind velocities. A sufficient difference in wind speed and direction can produce hazardous problems for aircraft on take-off and approach and can, under certain conditions, result in catastrophic consequences. For TAF purposes, it is forecasted up to and including 2,000 feet above ground level (AGL). Non-convective low level wind shear may be associated with frontal passage, inversions, low level jets, lee side mountain effects, sea breezes, and Santa Ana winds. Wind shear cannot be calculated by simple scalar subtraction of wind speeds, except in specific cases where the directions of the two winds concerned are exactly the same direction or the reciprocals. The scalar shear is always less or equal to the vector shear and thus for most cases underestimates the actual shear. NOAA technical memo (NWS FCST-23) "Low-Level Wind Shear, A Critical Review" is a good reference for forecasting this phenomenon. Expect LLWS if pressure gradients support winds of 40 kts or more and surface winds are 'light'. Besides a critical analysis of model data, other data sources useful for forecasting this phenomenon include monitoring of observations upstream including RAOBS, PIREPS, and the WSR-88D Velocity Azimuth Display (VAD) profiles.

2.3.6. Icing. Forecasting the occurrence of super cooled water droplets or freezing precipitation in the vicinity of the aerodrome is of vital importance to flight operations. The difference between a 0.1 of an inch of rain and a 0.1 of an inch of freezing rain determines whether a field is operational or not. Similarly the accumulation of significant icing on approach can be the difference between an uneventful landing and a Class-A mishap. Aids for forecasting icing include a variety of model products, the neural-net displays by the NOAA NWS

Aviation Weather Center, and new satellite image enhancements. Icing forecasting also includes tried and true methods such as evaluations of atmospheric vertical profiles, analysis of upstream data and Doppler Radar data, and an understanding of cold-air damming.

2.3.7. Turbulence. Turbulence, especially during takeoff and landing, can also be a critical parameter. Every effort should be made to forecast this phenomenon for the entire aerodrome. The evaluation process begins with a thorough knowledge of the station's topography as well as a good mental picture of the synoptic pattern time scale. An evaluation of the available mesoscale model data, especially the Low-Level Winds Sounding, VAD profiles, and available PIREPS are critical for determining the probability of turbulence. Many models are producing turbulence products derived from algorithms that consider changes in wind speed and direction over distance. The forecaster should also view the latest satellite image analysis for transverse wave clouds.

2.4. Controlling Weather Elements. Although all elements of the TAF are considered important, there are specific ones that control flight operations. The FAA as well as the Navy and Marine Corps consider only the following elements when determining observation service standards: low visibility, thunderstorms, and freezing precipitation. For forecasting purposes and actual determination of the field operations, low ceiling and wind shear are added to that list. Forecasters shall be especially diligent of these parameters since they often determine whether a field is available or a mission is feasible.

2.5. Station Considerations. Point forecasting such as a TAF, requires the forecaster to consider and give more attention to external factors than synoptic or area forecasting.

2.5.1. Topography. The topography of an area can significantly modify any synoptic feature. Examples include: Winds diverted 180 degrees from the synoptic pattern by mountains, fog forming in what would appear to be a dry area if a portion of the station is near a swamp and snow showers in clear air if there is an extended trajectory of cold air over water. Aviation Forecasters should have a local-area topography map for any forecasted station. Unique features are usually addressed in the station's forecasting handbook; however, a 3-D relief map is invaluable for the day-to-day forecasting.

2.5.2. Climatology. Station Climatology is also addressed in the individual local area forecaster's handbook. Forecasters shall also be familiar with this data as it can prevent forecasting events that do not occur at the station.

2.5.3. Runways. Communication between the forecaster and ATC is imperative. The active runway (direction of takeoff) is a determination made by ATC personnel, generally based on current winds, but may also be dependent on the type of aircraft and other conditions present. Forecasters shall be aware of special runway restrictions and the current active runway.

2.5.4. Minimums. Besides the standard minimums listed in NATOPS 3710.7, every airfield has specific minimum weather requirements for takeoff and landing. These are also subdivided according to day/night, runway, and available equipment and in some cases type of aircraft. These minimums are listed in the Flight Information Publications (FLIP). Although not a determining factor for development of the forecast, the forecaster shall be aware when a forecast would shut down operations at a particular field.

2.5.5. Severe Weather Policies. Most stations have a variety of policies relating to significant aviation weather. Examples include:

- Fly away in the event of winds of a speed greater than a specified amount

- Hanger aircraft in the event of freezing precipitation

- Notification of maintenance crews in the event of snow

- Suspension of operations when winds exceed a Threshold. Many of these actions require considerable lead-time. Although not a determining factor for development of the forecast, the forecaster shall be aware when a forecast would cause these actions.

2.6. Amending. Forecasters shall maintain an awareness of how well TAFs are verifying and insure necessary amendments and corrections are issued promptly. Because of the critical nature of TAFs, specific amendment criteria have been established.

These criteria are based primarily on the critical elements as defined in paragraph 2.4 and requirements outlined in NATOPS 3710.7.

2.6.1. When to Amend. An amendment to a TAF shall be issued anytime the forecaster considers it advisable in the interest of safety, efficiency of operations, flight planning, operational control, or flight assistance to aircraft. In determining the need for an amendment, the first consideration shall always be safety. This means providing adequate advance warning on the development of hazardous conditions bearing on the safety of aircraft including those enroute. Modifying the forecast after notification of the occurrence of the hazard is not the desired sequence of events.

2.6.2. Criteria. Because TAFs can directly affect safety of flight, Navy/Marine Corp universal criteria for amendment have been established. All forecasters shall use these minimum criteria when determining the need for an amendment. Operations personnel may establish more stringent criteria for an individual air station and include in local policy and will be included in local SOPs. The responsibility and authority for issuing amendments shall rest with the forecaster.

2.6.3. Visibility. Visibilities not predicted in the most recent forecast are observed, or are later forecasted to increase to equal, or exceed or decrease to less than:

- 3 miles — 4,800 meters
- 1 mile — 1,600 meters
- 1/2 mile — 800 meters
- Those values designated operationally significant by the field

2.6.4. Ceiling. Ceilings not predicted in the most recent forecast are observed, or are later forecasted to increase to equal, or exceed or decrease to less than:

- 3,000 feet
- 1,000 feet
- 200 feet

- Those values designated operationally significant by the field.

2.6.5. Thunderstorms. A thunderstorm was not predicted in the previous forecast, but is occurring or is forecasted to occur. A thunderstorm was predicted, but is now not expected to occur. Because of the generally brief nature of tornadoes, the near impossibility to predict their occurrence beyond a few minutes, and the time required to generate and transmit a TAF, the forecasts are not usually modified for the occurrence of this phenomena. Rather, a forecaster shall rely on the timely dissemination of an observation marking the occurrence of a tornado.

2.6.6. Precipitation. Precipitation not predicted in the previous forecast is occurring or forecast to occur. Precipitation predicted in the previous forecast that will affect the safety of flight including runway breaking action is now forecasted to not occur. All freezing precipitation, hail, and ice pellets regardless of intensity are considered to meet this criterion.

2.6.7. Surface Winds. Any of the following wind changes not predicted in the previous forecast:

- Sustained speed change of 10 knots or more.

- Directional change of 30 degrees or more when the mean speed or gusts are forecasted to be in excess of 15 knots.

- Wind speed or directional change that causes a change in active runway.

2.6.8. Non-Convective Low Level Shear. Non-convective Low Level Shear not predicted in the previous forecast is occurring or is forecast to occur. Non-convective Low Level Shear was predicted, but is now not forecasted to occur.

2.6.9. Minimum Altimeter. Whenever the observed altimeter falls below or is forecast to fall below the forecasted minimum value on the previous forecast.

2.7. Coordination and Consistency. Forecasters shall coordinate their TAF with other nearby Navy and Marine Corps Aviation Weather activities and their supporting Aviation Weather Hubs.

2.8. Quality Control and Verification. Activities with the responsibility to produce TAFs shall monitor these products and their preparation using their best professional judgment to optimize the forecast timeliness and relevance. Forecasters shall perform consistency, logic and continuity checks prior to the release of any individual forecast. These checks shall include evaluation against other area forecasts, warnings and previously issued TAFs observations against the issued TAF and amending as per paragraph 2.6. Additionally, all activities issuing TAFs shall have an objective post-forecast verification program. This shall be maintained at a central site; however, if this is not possible, the individual issuing activity shall maintain a suitable program. The issuing activity shall review this verification report monthly and incorporate it into their forecaster training program.

2.9. Aviation Weather Regional Forecasting Operations. There are additional considerations and responsibilities for aviation forecasters supporting remote air stations. Aviation Weather Regional Forecasting Hubs supporting remote stations through Regional Forecasting Operations shall develop additional governing SOPs incorporating the concepts referenced below:

2.9.1. Continuous Weather Watch. Because the aviation forecasting team is located remote from the supported air stations and they are not present to observe the on-scene weather, there is a need to maintain a continuous weather watch over the entire forecast area. Aviation forecasters responsible for remote stations shall:

2.9.1.1. Be familiar with the topography, geography and all associated local effects for each remotely supported activity.

2.9.1.2. Evaluate Doppler radar data for all supported stations as well as area radar composites.

2.9.1.3. Monitor the supported station’s observations and ASOS.

2.9.1.4. Evaluate and enhance satellite imagery for the formation and progress of significant weather.

2.9.1.5. Make every effort to determine the presence of thunderstorm activity and freezing precipitation.

2.9.2. Non-availability of On-Scene Observation. Aviation Weather Hubs should not issue a TAF without at least two consecutive on-scene observations over the previous 90 minutes with all required elements (wind, visibility, weather and obscuration, sky condition, temperature, dew point, and altimeter). In the event it is necessary to issue a forecast without proper observations, contact with the remote operations personnel and evaluation of nearby observations may mitigate this risk.

2.9.3. Elements not reported by ASOS. ASOS is limited in range of cloud and visibility values and the weather and obscurations reported. Forecasts for sites with unmanned observations shall still contain all the elements, types, intensities and values that the forecaster actually expects regardless of whether the ASOS can report or differentiate between those conditions.

2.9.4. Continuous Generation of Forecasts. Flights may launch long before a destination field is actually open; i.e. flight leaves Rota at 1900 local - arrives in Norfolk at 0700 local. To insure all flights have a current TAF, Aviation Weather activities shall produce forecasts for all assigned stations 24/7, even when the actual station may be closed. Exception: if a field is closed for greater than 24 hours, no TAF needs to be generated. The next TAF shall be generated at least 3 hours prior to the reopening of the station.

2.9.5. Aviation Weather Watch Supervisor. The Aviation Duty Officer (ADO) at Aviation Forecast locations shall be especially mindful of ensuring consistency, logic, and continuity of issued forecasts. Particular attention shall be paid to consistency with other broad-scale aviation forecast products such as WWs, SIGMETS, Aviation Area Forecasts, AIRMETS, etc. This individual shall also monitor the overall real time verification of issued forecasts.

2.9.6. Communication with Supported Stations. Aviation Hubs shall maintain communication throughout the watch with the remote station weather personnel when present. The ADO shall resolve differences of professional opinion between the remote forecaster and the on-scene forecaster.

2.10. Final Authority. The detail demanded in the TAF and the influence of the local effects requires the use of the forecaster’s judgment, experience, and expertise to prepare this highly definitive micro scale forecast. The forecaster or in the case of Regional Forecasting Operations, the ADO is the final authority and is ultimately responsible for the forecast issued.

CHAPTER 3 - ENCODING AN AERODOME FORECAST INTO THE FM51-XII TAF.

3.1. Navy/Marine Corps FM51-XII Format and General Rules

3.1.1. FM51-XII TAF Format

CCCC TAF (AMD OR COR OR RTD) $Y_1Y_1G_1G_1/Y_2Y_2G_2G_2$ $dddffGf_mf_m$ KT

VVVV w´w´ $N_sN_sN_sh_sh_sh_s$ OR SKC OR $VVh_sh_sh_s$ ($WSh_{ws}h_{ws}h_{ws}$/dddffKT OR

WSCONDS) ($6I_ch_ih_ih_it_L$) ($5Bh_bh_bh_bt_L$) $QNHP_IP_IP_I$INS (REMARKS) TTTTT

GGG_eG_e OR TTGGgg

($TT_FT_F/D_1D_1G_FG_FZ$) (AMD or COR GGgg)

3.1.2. TAF Formulation. When formatting a TAF every effort shall be made to present a representative outlook of the forecast elements for the valid period and in as fine a resolution as possible. On the other hand, the forecaster should avoid redundancy, ambiguity and the inclusion of additional groups that illustrate changes but have no operational impact on flight operations. Forecast elements apply for the airfield control zone. Generally, this is not more than a five (5) statute mile radius of the center of the aerodrome.

3.1.3. Optional Groups. Groups in parentheses are used only if the condition exists or is forecast.

3.1.4. International TAF Code. The international TAF code format is provided in Chapter 4. It includes a brief explanation of the groups not used by the Navy and Marine Corps.

3.1.5. Bulletin Heading. All TAFs are disseminated via long line (national and international networks) usually grouped together by area. They are identified by a WMO bulletin heading. Format for this heading is FTXXxx. “FT” identifies a terminal forecast bulletin; the XX is a two-letter identification for the country and the xx is used to identify a particular area of the country. This header may be followed by the four-letter ICAO identifier of the activity issuing the terminal forecast and a six-digit group indicating the day of the month and the full hour that the bulletin was transmitted. This header is usually added automatically by the communication facility and is not the same as the individual message header.

3.1.6. Time. Most elements in the TAF use whole hour time increments; however, this should not preclude a forecaster from providing a more precise time in hours and minutes, for especially significant changes in the elements.

3.2. Encoding the Elements. The initial line for the TAF shall contain all the required elements describing the prevailing conditions forecasted to occur at the beginning of the forecast period. This initial line is often reflective of the current observation. These conditions prevail until the end of the forecast period or until modified by a change line (BECMG or another FM line).

3.2.1. Message Header CCCC TAF (AMD or COR or RTD) $Y_1Y_1G_1G_1/Y_2Y_2G_2G_2$. The message header is not to be confused with the bulletin header. The former identifies the exact message for a specific aerodrome; whereas the later is the identification for a bulletin added by a central communication station and in most cases containing data for several aerodromes.

3.2.1.1. CCCC is the four-letter ICAO identifier for the aerodrome.

3.2.1.2. TAF is the message identifier.

3.2.1.3. AMD/COR/RTD. AMD included when the TAF is an amended TAF; COR included when the TAF is a correction of a previously issued TAF; RTD include when the TAF is transmitted later than its scheduled time.

3.2.1.4. Valid Period $Y_1Y_1G_1G_1/Y_2Y_2G_2G_2$. Enter the valid time for the forecast period where Y_1Y_1 is the day of the month, G_1G_1 is beginning hour of the forecast and Y_2Y_2 is the day of the month and G_2G_2 is the ending hour up to 24 hours later. Example: 0303 or 1010. Amended TAFs are valid from the current hour to the ending hour of the original TAF. For example, if the 0315/0415Z TAF is amended at 1831Z, the valid time on the amendment would be 0318/0415Z. The time of an amended forecast beginning at midnight is "00". The exact time of any amendment is indicated in the remarks.

3.2.2. Wind Group $dddffGf_mf_m$ KT. Encode the expected mean wind direction, speed, and gusts, if any, for the initial forecast period and any subsequent FM or BECMG lines.

3.2.2.1. ddd. Forecast the true wind direction to the nearest 10 degrees but expressed in three digits. If direction will vary by more than 60 degrees, encode the prevailing direction for ddd and append the limits of variability to the remarks (WND 270V350). Encode the contraction VRB only when the wind speed is forecast to be 6 knots or less or in rare occasions when it is impossible to forecast a single direction at higher speeds (e.g. air-mass thunderstorms, etc). Wind direction from due North is encoded as 360.

3.2.2.2. ff. Forecast the mean wind speed in whole knots. On rare occasions when the wind speed is expected to exceed 99 kts. use three digits. Calm conditions are encoded as "00000KT"

3.2.2.3. Gf_mf_m. Enter the letter "G" and the speed (in kts.) of any gusts forecast. Gusts are forecast when rapid fluctuations in wind speed with a variation of 10 knots between peaks and lulls are expected. When gusts are expected to exceed 99 knots use three digits.

3.2.2.4. Enter "KT" immediately following the last entry of the wind group to represent knots.

3.2.2.5. Squalls. Squalls are not forecasted in the wind group; if expected, they shall be included in the significant weather group (see para 3.2.4). There is no means available to encode the expected speed of the squall in the TAF other than using a TEMPO group for wind.

3.2.3. Visibility Group VVVV. Encode the forecasted prevailing visibility for the initial forecast period and in any subsequent FM group or BECMG group that includes an expected change. Visibility is reported in meters rounded down to the nearest reportable value (Figure 3-1). Include a weather group immediately following the visibility group whenever forecasting a visibility of 9000 meters or less. If the visibility will alternate between significant values, describe the situation in a TEMPO group. Do not use variable visibility remarks.

STATUTE MILES	METERS	STATUTE MILES	METERS
0	0000	1 ¼	2000
1/16	0100	1 3/8	2200
1/8	0200	1 ½	2400
3/16	0300	1 5/8	2600
¼	0400	1 ¾	2800
5/16	0500	1 7/8	3000
3/8	0600	2	3200
½	0800	2 ¼	3600
5/8	1000	2 ½	4000
¾	1200	3	4800
7/8	1400	4	6000 (rounded)
1	1600	5	8000
1 1/8	1800	6	9000 (rounded)
		7 or higher	9999

Table 3-1 Reportable Visibility Values

3.2.4. Weather Group w'w'. Encode the forecasted weather and obstructions to vision, if any, for the initial forecast period and any subsequent FM or BECMG lines. Use the standard abbreviations in sequence as given in Figure 3-2. If no significant weather is expected in the initial time period or additional FM lines, omit the line. Although a weather group can be included anytime significant weather is forecast, if visibility is forecast to be 9000 meters or less, a weather group must be included.

3.2.4.1. Selection Criteria. Utilizing the standard abbreviations, choose the best combination to describe the forecast condition. The order of precedence for entry is thunderstorms (TS); precipitation type(s) with predominate first (intensity applies only to the first, most predominant type of precipitation), and obstructions to vision (left to right in figure 3-2). Although funnel cloud can be technically encoded, the likelihood of a forecaster being able to forecast a tornado within 5 miles is remote. If forecasted, it is encoded first. Normally, first consider the need for intensity, followed by a descriptor, then precipitation and/or obstruction. No space is placed between the qualifier and the type. Only one intensity and one descriptor shall be used for each weather group. Limit “ww” to three groups; however multiple precipitation types are combined into one group with no space between; (e.g.: heavy rain and light snow with mist would be encoded as +RASN BR - two ‘‘ww” groups). The predominate precipitation type is encoded first. Non-precipitation weather elements are encoded after any precipitation in a separate group (e.g. snow showers and ice pellets with mist would be encoded SHSNPL BR).

3.2.4.2. Freezing Precipitation. A forecast of freezing precipitation is an exception to the above rule. When one or more types of precipitation are forecasted and one is freezing (e.g. FZRA or FZDZ), that type shall be encoded first regardless of the intensity. Intensity shall not be encoded with a second or third precipitation. For instance if heavy snow and light freezing rain are forecast, the proper encoded is –FZRASN.

3.2.4.3. Thunderstorm. Thunderstorm (TS) is the only descriptor that may be encoded without any associated precipitation. Whenever a thunderstorm is included in the weather group, even if in the vicinity, the cloud group shall include a forecast cloud type of cumulonimbus. Intensity indicators refer only to the intensity of the precipitation associated with a thunderstorm, not the intensity of the thunderstorm. There is no way to explicitly forecast a severe thunderstorm; however, a severe thunderstorm can be indicated on the basis of the forecast winds, i.e. wind gusts of 50 knots or greater or forecast hail size of ¾ inch or greater.

3.2.4.4. Special Criteria for Obstructions. When fog is forecast, use BR (mist) if the prevailing visibility is expected to be 5/8 of a statute mile (1000 meters) or more. Use FG (fog) when the prevailing visibility is expected to be less than 5/8 of a statute mile (1000 meters). With the exceptions of Volcanic Ash (VA), low drifting snow, (DRSN), shallow fog (MIFG), partial fog (PRFG), patchy fog (BCFG), drifting dust (DRDU) and drifting sand (DRSA), obscurations are forecast only when the prevailing visibility is 9000 meters of less. Shallow ground fog, MIFG, shall be encoded when the fog depth is less than six (6) feet and not expected to obscure any part of the sky. Descriptors, PR and BC, can be used in the TAF to describe fog "covering part of the aerodrome", PRFG, and "patches of fog", BCFG. Volcanic Ash, VA, shall always be forecasted regardless of restrictions to visibility. Obscurations of the sky are all encoded in the sky cover group.

3.2.4.5. Vicinity Qualifier (VC). This qualifier is used to forecast weather phenomena between 5 to 10 miles of the aerodrome only; if the weather is expected to be within five (5) miles, it is considered to be at the activity. VC may be encoded in combination with thunderstorms (TS), showers (SH) or fog (FG) only. VC shall be placed before the weather phenomena entry (i.e. VCSH). VCFG is used for all fog in the vicinity, regardless of visibility or whether frozen or liquid. Intensity qualifiers are not encoded with VC. Weather forecasted to be "in the vicinity" shall be the last weather entry if there are more than one weather groups.

3.2.4.6. NSW - No Significant Weather. When a predominate forecast condition has an encoded w'w' it is followed by a change line (BECMG or a TEMPO) in which no significant weather is expected, the w'w' in the change group shall be encoded as "NSW" to indicate that significant weather is no longer expected. This includes weather that was forecast to be in the vicinity. The "NSW" term is not used in the initial or subsequent FM lines since these lines always contain all groups of the TAF. The "NSW" group neither conveys any information about, nor replaces the cloud and obstruction group or the visibility group. 9999 NSW shall be used in BECMG or TEMPO lines when the significant weather is forecast to end and the visibility improve to above six (6) miles. No two consecutive BECMG or TEMPO lines shall contain "NSW".

QUALIFIER		**WEATHER PHENOMENON**		
INTENSITY OR PROXIMITEY	**DESCRIPTOR**	**PRECIPITATION**	**OBSCURATION**	**OTHER**
1	2	3	4	5
- Light	**MI** Shallow	**DZ** Drizzle	**BR** Mist	**PO** Well developed Dust/Sand Whirls
Moderate (No Symbol)	**PR** Partial	**RA** Rain	**FG** Fog	
+ Heavy	**BC** Patches	**SN** Snow	**FU** Smoke	**SQ**
VC In the Vicinity	**DR** Low Drifting	**SG** Snow Grains	**VA** Volcanic Ash	**FC** Funnel Cloud, Tornado, Waterspout
	BL Blowing	**IC** Ice Crystals	**DU** Widespread Dust	
	SH Showers	**PL** Ice Pellets	**SA** Sand	**SS** Sandstorm
	TS Thunderstorm	**GR** Hail	**HZ** Haze	**DS** Duststorm
	FZ Freezing	**GS** Small Hail and/or Snow Pellets	**PY** Spray	

1. The w'w' groups shall be constructed by considering columns 1 to 5 in the above table in sequence, i.e. intensity, descriptor, then weather phenomenon.

2. Refer to the observation manual for complete definitions of the phenomena.

3. The ASOS term UP shall not be used. Forecasts shall define the type of precipitation.

Table 3-2 Weather and Obstructions to Vision Identifiers.

3.2.5. Sky Cover Group $N_sN_sN_sh_sh_sh_s$ or SKC or $VVh_sh_sh_s$. This group will be reported as often as necessary to indicate all forecast sky cover layers to the first overcast 8/8 sky cover layer. The group shall be in the initial time period line, all subsequent FM lines, and other change lines as necessary. Arrange the sky cover layers in ascending order of cloud bases (i.e., lowest layer first) using the summation principle. All clouds are considered opaque. Forecasts prepared for sites using only ASOS shall contain the cloud amount and all obscurations that the forecaster expects, not just what is expected to be reported by ASOS.

3.2.5.1. $N_sN_sN_s$. The sky cover amount shall be encoded as sky clear, SKC - (no clouds), FEW - (1 to 2 oktas), SCT - (3 to 4 oktas), BKN - (5 to 7 oktas), or OVC - (8 oktas). Height information is not included when encoding SKC. The summation principle applies. The contraction CLR, which is used in the METAR code, is not used in the TAF code. The lowest level aloft at which the cumulative cloud cover equals 5/8 or more of the celestial dome is understood to be the forecast ceiling. If the sky condition is predicted to be alternating between two amounts, describe this condition in a TEMPO group. Do not use variable sky condition remarks.

3.2.5.2. $h_sh_sh_s$. Encode the height of the base of each sky cover layer in hundreds of feet AGL. This entry follows the amount without a space. Express the height to the nearest 100 feet from the surface to 5,000 feet, to the nearest 500 feet from 5,000 feet to 10,000 feet; and to the nearest 1,000 feet above 10,000 feet. Layers from the surface to 50 feet are considered to be surface based and encoded as 000.

3.2.5.3. Cloud Type. The only cloud type included in the TAF is cumulonimbus (CB). Cumulonimbus is identified by adding the contraction CB following the height in a cloud group without a space, (i.e. BKN020CB). CB may be forecast without the forecast of a thunderstorm; however, if a thunderstorm is forecasted, even if just in the vicinity, CBs will be forecasted.

3.2.5.4. Partial Obscurations. Surface-based partial obscurations shall be encoded as other layers except the height will be encoded as “000” and as such will be the first layer reported. Additionally encode in the remarks section, the obscuring phenomena and applicable layer. For example, if the cloud group was BKN000, and the obscuring phenomenon was fog, the remarks entry would be FG BKN000. Surface-based partial obscurations are not considered a ceiling, but are considered in the summation principle when combined with cloud layers to determine a ceiling.

3.2.5.5. Total Obscurations $VVh_sh_sh_s$. When the sky is forecast to be totally obscured, the vertical visibility is forecast and the obscuration group is encoded. VV is the indicator for the group and is followed by the predicted vertical visibility in hundreds of feet above mean sea level, i.e. VV005. No remark is necessary.

3.2.6. Non-Convective Low Level Wind Shear (LLWS) Group $WSh_{ws}h_{ws}h_{ws}$/dddffKT or WSCONDS. This group shall be included in the TAF whenever the LLWS conditions are expected to exist. It is used only to forecast wind shear not associated with convective activity from the surface to 2,000 ft AGL. A brief summary of forecasting techniques is given in paragraph 2.3.5. A rough guide to the occurrence of LLWS is to expect LLWS whenever a vector sum difference from the surface to the wind shear height of >20 KTs is forecast (i.e., 12 KTs from 270 at the surface and 15 KTs from 090 at 1,600 ft would be forecast as WS016/09015). To indicate wind shear when complete information cannot be reliably forecast with high confidence use WSCONDS. Omit this group when no low-level wind shear is forecast. LLWS shall not be included in BECMG or TEMPO groups. The non-convective low-level shear group shall be included in the initial period or a FM group whenever:

- One or more PIREPS of the phenomenon within 2,000 feet of the surface at or in the vicinity of the aerodrome causing an indicated air speed loss or gain of 20 knots or more are received, and the forecaster determines that the report reflects a valid occurrence of a shear event rather than mechanical turbulence.

- When vertical non-convective wind shears of 10 knots or more per 100 feet in a layer more than 200 feet thick are expected or reliably reported within 2,000 feet of the surface at or in the vicinity of the aerodrome.

- If meteorological conditions are such that LLWS of intensities similar to those above and/or could be inferred from less detailed PIREPS or other sources.

- If meteorological conditions exist similar to those in the past that have caused incidences of LLWS.

3.2.6.1. WS is the identifier for the LLWS group.

3.2.6.2. $h_{ws}h_{ws}h_{ws}$. Enter the height of the wind shear in hundreds of feet above ground level.

3.2.6.3. ddd. Enter the true direction of the forecast wind above the indicated height.

3.2.6.4. ffKT. Enter the speed of the forecast wind above the indicated height followed by the units' indicator KT.

3.2.7. Icing Group ($6I_ch_ih_ih_it_L$). This group is used to forecast icing at and in the vicinity of the aerodrome, but not associated with thunderstorms. A brief summary of forecasting techniques is given in paragraph 2.3.6. Include this group in each FM and BECMG line and repeat this group as often as necessary to indicate multiple icing layers. Omit when no icing is forecast. When icing has been forecasted and is not forecasted during the period of a subsequent predominant group, enter a 600000 group.

3.2.7.1. "6" is the indicator for this group.

3.2.7.2. I_c. Encode the type of icing predicted using the code figure from Figure 3-3.

I_C	TYPE OF FORECAST ICE ACCRETION ON THE EXTERNAL PARTS OF AIRCRAFT
0	No Icing
1	Light Icing
2	Light Icing in Cloud
3	Light Icing in Precipitation
4	Moderate Icing
5	Moderate Icing in Cloud
6	Moderate Icing in Precipitation
7	Severe Icing
8	Severe Icing in Cloud
9	Severe Icing in Precipitation

Table 3-3 Icing Type and Intensity

3.2.7.3. $h_ih_Ih_i$. Enter the height of the base of the icing layer in hundreds of feet above ground level.

3.2.7.4. t_L. Encode the thickness of the icing layer in thousands of feet using table 3-4. When the layer is forecast to be thicker than 9,000 feet, repeat the icing group so that the base of the layer expressed by the second group coincides with the top of the first layer. When multiple layers are forecast which are not related, encode the layers in ascending order.

T_L CODE #	Thickness Ft
0	Up to top of cloud
1	1000
2	2000
3	3000
4	4000
5	5000
6	6000
7	7000
8	8000
9	9000

Table 3-4 Thickness of Layer (Icing or Turbulence)

3.2.8. Turbulence Group (5 $Bh_bh_bh_bt_L$). This group is used to forecast turbulence at and in the vicinity of the aerodrome but not associated with a thunderstorm. A brief summary of forecasting techniques is given in paragraph 2.3.7. Include this group in each FM and BECMG line. Omit when no turbulence is forecast. When turbulence has been forecasted and is not forecasted during the period of a subsequent predominant group, enter a 500000 group.

3.2.8.1. "5" is the indicator for this group.

3.2.8.2. B. Encode the type of turbulence predicted using the code figure from table 3-5.

B	Type of Turbulence Forecast
0	None
1	Light Turbulence
2	Moderate Turbulence in clear air, occasional
3	Moderate Turbulence in clear air, frequent
4	Moderate Turbulence in cloud, occasional
5	Moderate Turbulence in cloud, frequent
6	Severe Turbulence in clear air, occasional
7	Severe Turbulence in clear air, frequent
8	Severe Turbulence in cloud, occasional
9	Severe Turbulence in cloud, frequent
X	Extreme Turbulence

Table 3-5
Turbulence (Type and Intensity)

3.2.8.3. $h_bh_bh_b$. Enter the height of the base of the turbulence layer in hundreds of feet above ground level.

3.2.8.4. t_L. Encode the thickness of the turbulence level in thousands of feet using figure 3-4. When the layer is forecast to be thicker than 9,000 feet, repeat the turbulence group so that the base of the layer expressed by the second group coincides with the top of the first layer. When multiple layers are forecast which are not related, encode the layers in ascending order.

3.2.9. Predicted Lowest Altimeter Setting QNH$P_IP_IP_I$INS Group. Enter the lowest expected altimeter setting during the initial forecast period and for each BECMG and FM period. Do not encode for any TEMPO period.

3.2.9.1. QNH Altimeter Setting Indicator.

3.2.9.2. $P_IP_IP_IP_I$. Enter ten, units, tenths and hundredths of an inch omitting the period.

3.2.9.3. INS. Units of Measure

3.2.10. Remarks. The need for remarks in the TAF should be infrequent and relate to operationally significant forecast elements, i.e. FG OVR APPCH END RWY23. For weather and obstructions to vision use the contractions given in Table 3-2. Use FAA General Use Contractions for those not contained in the Figure. Remarks shall not be used as a substitute for BECMG or TEMPO groups. For instance, a change in wind after a specific time shall be encoded as a BECMG or FM group, not a remark.

3.2.10.1. Partial Obscurations. In addition to the forecast of a surface layer in the sky cover group, partial obscurations shall be further explained by entering the type of obscuring phenomena and applicable layer in the remarks section. For example if the cloud group was BKN000, and the obscuring phenomenon was fog, the remarks entry would be FG BKN000.

3.2.10.2. Time of AMD or COR Remark. If a TAF is amended or corrected the last line of the TAF shall have a remark indicating the time of the amendment or correction. Encode this remark by entering AMD or COR followed by the time in UTC but without the “Z”. (COR 1935). If the TAF is both a correction and an amendment include both contractions. (Which is listed first AMD or COR if both a correction and amendment occur?)

3.2.10.3. Limited Duty Location Remarks. Although Aviation Weather Center operations should minimize the occasions when TAFS will not be generated for any station; there may be times when TAFs are not generated for locations not operating 24/7 and not being supported by an Aviation Weather Forecast Center. TAFS for these locations shall include a limited duty remark. YY is the day of the month; GG is the whole hour. Examples include:

- LAST NO AMDS AFT YYGG, NEXT YYGG – for a station not having an Aviation Forecast Center activity to issue a TAF for the hours when the activity is closed.

- AUTOMATED SENSOR METWATCH YYGG TIL YYGG – for a station having no observational personnel on duty but an Aviation Forecast Center issuing TAFs during the time it is closed.

3.2.11. Temperature Group $TT_FT_F/D_1D_1G_FG_FZ$. The temperature group provides a mechanism for including the forecast temperature in whole degrees Celsius for specific times. This is an optional group; however, its usage is highly encouraged and should be included to meet the needs of the forecasting activity. Helicopter and VSTOL aircraft often require arrival density altitude. The forecasting activity is best suited to provide the maximum and minimum temperatures and their time of occurrence. Normally two temperature groups will be included: one for maximum, another for minimum. These will be the last information of a TAF unless the TAF is an AMD, COR or RTD.

3.2.11.1. T is the indicator for the group.

3.2.11.2. T_FT_F. Enter the forecast maximum or minimum temperature as applicable in whole degrees Celsius. Prefix minus temperature with an "M".

3.2.11.3. $D_1D_1G_FG_FZ$. Enter the day and time (whole hour) for the forecast temperature followed by "Z". Examples: T31/1520Z, TM04/1612Z

3.2.11.4. Repeat the group for the other temperature prediction (either maximum or minimum). If the first temperature event in the forecast period is a maximum, enter the max first; on the other hand if the first temperature event is the minimum, enter that group first.

3.3. Encoding the Change Lines TTDDGGgg or TTTTTDDGG/$D_eD_eG_eG_e$. Use change lines when an operationally significant change from the initial forecast conditions is forecast at some intermediate hour within the 24-hour forecast period. These lines enable the forecaster to fully convey the expected weather over the entire period. Start a new line of text for each change line. To keep forecasts clear and unambiguous, the use of change indicators should be carefully considered and kept to a minimum. Although several change lines may be required to accurately describe the full 24-hour forecast period, overlapping of change periods to include multiple TEMPO or BECMG groups shall be avoided.

Additionally, no more than two consecutive BECMG and TEMPO (combined) modifications shall be used during the initial and/or subsequent FM line. NATOPS requires that BECMG and TEMPO lines be used when considering the need for alternates and field minimums frequently making these lines operationally significant. For example, a FM line with a visibility of one (1) mile, but a TEMPO 1204/1208 line with a visibility of 1/8 mile essentially closes the field for 4 hours.

3.3.1. FMDDGGgg. The FM group is the primary change group of the TAF code; it is used to describe a significant change from the previous prevailing conditions. Forecasters are encouraged to sub-divide the forecast using FMDDGGgg lines as often as possible rather than the other change indicators since this change indicator is more definitive and precise. The date and time indicator DDGGgg in the form of "FMDDGGgg" shall be used to indicate the beginning time with day in hours and minutes of a self-contained part of the forecast indicated by the day and four-digit time "DDGGgg". When the group FMDDGGgg is used, all forecast conditions preceding this group is superseded by the conditions forecast in this group. This forecast line shall contain all elements (wind, visibility, weather, sky and any other conditional groups) of a predominate forecast line. For example, if a change is forecast on the 12th at 1420 UTC, the entry "FM121420" shall be encoded and all elements entered on this line are in effect from 1420 UTC to the end of the forecast period or until the time of another FM or BECMG line. While the use of a four-digit time in whole hours, e.g., 1600, remains acceptable, a forecast and amending events may require a higher time resolution.

3.3.2. BECMG DDGG/$D_eD_eG_eG_e$.. The change group BECMG DDGG/$D_eD_eG_eG_e$ shall be used to indicate a change to the predominate forecast meteorological conditions expected to occur at either a regular or irregular rate at an unspecified time within the period identified in DDGG to $D_eD_eG_eG_e$ where DDGG represents the beginning date and hour or the change and $D_eD_eG_eG_e$ is the date and hour the change is complete. The duration of the change shall not exceed two (2) hours. This change to the predominate conditions shall be followed by all groups for which the change is forecast. A group omitted from this change line would indicate that the group from the previous predominate line remains valid. As an exception, if Icing or Turbulence is forecasted, it will be included in every FM or BECMG line until forecasted 600000 or 500000. The forecast conditions encoded after the BECMG D_1D_1GG/$D_2D_2G_eG_e$ group are those elements expected to prevail from the ending time of this change group ($D_2D_2G_eG_e$) to the ending time of the forecast period or until the next FM or BECMG line. When using the BECMG line to forecast a change in one or more groups, the group(s) must be repeated. For example, if the BECMG line was utilized to forecast a decrease in the ceiling and all other forecast layers were expected to remain the same, the entire cloud code group must be repeated, not just the ceiling layer. Because of its imprecision and the impact on operations, forecasters should avoid using the BECMG group to forecast conditions below field minimums. Additionally BECMG lines shall not include forecasts for non-convective low-level wind shear.

3.3.3. TEMPO $D_1D_1GG/D_2D_2G_eG_e$. The change group TEMPO $D_1D_1GG/D_2D_2G_eG_e$ shall be used to indicate temporary fluctuations significantly differing from the previously indicated predominate conditions. The temporary conditions are expected to occur during the time defined by the four-digit beginning day and time in whole hours and the four-digit ending day time also in whole hours. These temporary conditions are expected to last less than one hour in each instance and in the aggregate cover less than half of the period indicated by the time $D_1D_1GG/D_2D_2G_eG_e$. When the temporary conditions do not conform to the aforementioned criteria, the change group BECMG $D_1D_1GG/D_2D_2G_eG_e$ or FMDDGGgg shall be used to call for conditions different from the forecast prior to the time DDGGgg. In general, the period of time covered by a TEMPO group shall not exceed six hours. A TEMPO forecast that is in effect for more than two (2) hours without the occurrence of the stated conditions should be reviewed for amending. The actual TEMPO group shall be followed by all groups for which the temporary change is forecast. A group omitted from this change line would indicate that the group from the previous predominate line remains valid. However, when a significant change in one group is caused by another element, the group pertaining to the causal element will be included also. TEMPO lines shall not include forecasts of significant weather in the vicinity, non-convective low-level wind shear, icing or turbulence.

3.3.4. Change Lines and the use of NSW. The no significant weather entry “NSW” shall be encoded in BECMG and TEMPO lines whenever the predominate forecast condition has significant weather encoded and NO significant weather is expected during the BECMG or TEMPO period. This includes weather that was forecast to be in the vicinity. The “NSW” group neither conveys any information about, nor replaces the cloud and obscuration group or the visibility group. 9999 NSW shall be used in BECMG or TEMPO lines when the significant weather is forecast to end and the visibility improve to above six (6) miles. No two consecutive BECMG or TEMPO lines shall contain “NSW”.

EXAMPLE:

```
KNGU 1315/1415 15005KT 9999 SCT030 BKN060 OVC120 QNH2977INS
BECMG 1316/1318 08012G18KT 9999 VCSH BKN030 OVC060 QNH2975INS
TEMPO 1316/1320 8000 -SHRA
FM 132200 12015KT 8000 -SHRA VCTS BKN030CB OVC060 QNH2968INS
TEMPO 1322/1403 VRB15G25KT 6000 -TSRA BKN020CB OVC060
BECMG 1403/1405 36015G25KT 8000 BR SCT020 BKN060 QNH2968INS
BECMG 1411/1413 27008KT 9999 NSW SCT050 SCT120 QNH2972INS
T27/1322Z T20/1409Z
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3.4. Modifying the TAF. There are several reasons for modifying an existing TAF. The forecasted weather may be significantly different from that forecast in the TAF in which case an amendment (AMD) shall be issued. The forecaster may discover an error in the TAF and in that case a correction (COR) must be transmitted. Finally, although not technically a modification of the forecast, the TAF may be issued after the designated transmission time and in this case the TAF must be considered delayed data (RTD).

3.4.1. Amended TAF. Activities including Aviation Forecast Centers shall keep the current weather and forecasts under continuous review to ensure that necessary amendments are issued. Minimum criteria for TAF amendments are given in paragraphs 2.6.2 through 2.6.9. Forecasters shall strive to amend prior to the occurrence of the changes that meet the criteria. If an observed condition meeting criteria for amendment is not expected to persist (last longer than 30 minutes), there is little need to amend since pilots en route will be receiving current observations and radar information. The automatic transmission of ASOS observation may increase the frequency of the above situation. The forecaster should not just be chasing the observation but should apply good judgment as to when the newly observed conditions are likely to persist long enough to actually represent a significant change. Conversely, if a TEMPO situation is determined to actually be the predominate condition, an amendment shall be issued. When constructing an amended TAF the time of the forecast beginning will be the hour the forecast amendment is written. The ending time for the amended forecast shall be the same ending time as standard TAF that is being amended. For example, if it is necessary to amend the 21Z TAF at 0145Z, the valid time of the amendment is 1401/1421. All weather groups shall be forecasted in the amendment and the TAF shall cover the entire time out to the ending time of the original TAF. The abbreviation "AMD" shall be entered between the letters "TAF' and the time group. (KNGU TAF AMD 1401/1421) The actual time of the amendment is entered as a remark at the end of the TAF; paragraph 3.2.10.2 applies.

3.4.2. Corrected TAF. If the forecaster discovers a formatting or transmission error in the TAF after transmission, a correction shall be transmitted as soon as possible. Corrections shall not be used to amend forecasts even if the forecast weather has unexpectedly changed only a short time after issuance of the TAF. The abbreviation "COR" shall be entered between the letters "TAF" and the time group. The actual time of the correction is entered as a remark at the end of the TAF, paragraph 3.2.10.2 applies.

3.4.3. Delayed TAF. A scheduled TAF that misses the issuance window shall be considered delayed; and shall be transmitted as soon as possible after the correction of the problem that caused the delay (electrical, communication, etc.) It shall be transmitted as routine delayed data with the abbreviation "RTD" entered between the letters "TAF" and the time group. The delayed forecast shall be valid from the time of the actual forecast origin until the end of the previously scheduled TAF; e.g. the 21Z TAF is delayed until 22Z, is transmitted with an initial forecast line of 1322/1421.

3.4.4. Combinations. Combinations of these TAF modifications may occur; in which case multiple abbreviations may be placed in the TAF. (KNGU TAF AMD COR 1401/1421). (State order of precedence for AMD, COR, RTD in the event that all occur during a given TAF transmission).

3.5. Dissemination Format. The exact spacing of the TAF header and any other data required to enter the forecast into the network are defined in USAF Instruction AFMAN 15-124 (Reference (c)).

Chapter 4 – TAF Variations

4.1. General. The FM51 XII TAF has considerable flexibility to allow nations to include or exclude weather phenomena and other data that will best serve their nation's aviation community. Although there is general agreement between DOD agencies, there are also some minor variances in the code use between DOD and the National Weather Service. The terminology and forecast groups listed in this chapter are not used by the Navy and Marine Corps; however, the forecaster must be familiar with them in order to support all national and international flights. Most of the differences are a matter of the degree of detail contained in the TAF. Military activities generally provide more detail than civilian activities.

4.2. National Weather Service TAF Differences. The NWS is responsible for issuing all TAFS for civilian aerodromes in the U. S. The below listed unique practices, groups and terminology are routinely used in these TAFS.

4.2.1. Suspension of TAFS. The National Weather Service may suspend issuance of TAFS for any given station if the absence of observational data will lead to a degradation of the forecast quality. In this case, the word NIL shall be transmitted.

4.2.2. Elements/Groups not used. The NWS does not forecast:

- Variable Winds
- Partial Obscurations
- Altimeter Group
- Icing Group
- Turbulence Group
- Temperature Group

4.2.3. Elements/Groups forecast differently:

- NWS forecasts visibility in statute miles.
  - If visibility is forecast to be greater than 6 miles it is encoded as P6SM.

- Normally NWS encodes only three cloud layers and a third cloud layer above 15,000 feet is not normally encoded if a ceiling is already forecast below this height.

4.2.4. PROB Line PROBC_2C_2DDGG/$D_eD_eG_eG_e$. The NWS uses a PROB change line to forecast low probability of occurrence for thunderstorm and precipitation (30 or 40 percent). Other elements associated with these conditions (clouds, visibility, etc.) are included. This differs from a TEMPO group that generally has a probability of occurrence of 50 percent or more. It is a modifier of a FM line. PROB is followed by the percent, then the beginning and ending date and time (hours) for the conditions and finally the conditions.

4.2.5. NWS Amendment Criteria. Like the Navy and Marine Corps, the NWS requires TAF amendment for the occurrence or non-occurrence of thunderstorms, freezing precipitation, ice pellets, non-convective low level wind shear as well as variances for ceiling, visibility, wind speed and direction. The exact values for NWS TAF amendment are slightly different from the Navy/USMC. (Since the NWS does not forecast altimeter settings, they do not amend the TAF for this element.)

4.3. Common International TAF Terms and Usage. Besides the above differences, the U. S. TAF differs from the International usage in the following significant ways.

4.3.1. CAVOK. The WMO manual on Codes states that the contraction CAVOK shall be used in place of visibility, significant weather, and cloud/obscuration groups when the following conditions are expected to exist simultaneously:

- Visibility 10KM or more

- No clouds below 1,500 meters (5,000 FT) or below the highest minimum sector altitude, whichever is greater, and no cumulonimbus

- No significant weather

4.3.2. NSC (No Significant Clouds). The contraction NSC indicates no clouds are forecast below 1,500 meters (5,000FT) or below the highest minimum sector altitude, whichever is greater, and no cumulonimbus are forecast at any height.

4.3.3. Cloud Height. Internationally, the height of clouds or vertical visibility can be expressed to the nearest 100 feet at all levels.

4.3.4. BECMG $D_1D_1GG/D_eD_eG_eG_e$ Line Differences. The International TAF code allows the duration of a change period covered by a BECMG line to cover up to four hours with the caveat of it should not normally exceed two hours.

4.3.5. Probability Line $PROBC_2C_2DDGG/D_eD_eG_eG_e$ Differences. WMO regulations allow the use of this group in combination with the TEMPO line. These regulations state that when used, the PROB line is to be placed immediately before the TEMPO and that the $DDGGD_eD_eG_eG_e$ group is to be placed after the TEMPO, for example PROB30 TEMPO1212/1214. Additionally, internationally the PROB group can be used to forecast conditions other than the thunderstorm and precipitation.

4.3.6. Visibility is expressed in meters internationally, surface based obscurations are listed, and the icing and turbulence groups are optional.

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Chapter 5 Records

5.1. Record Keeping. Activities responsible for the production of terminal forecasts shall have a system in place to locally maintain these TAFS for a minimum of 31-days. Any forecast that involves an aircraft incident along with any data supporting the creation of the TAF shall be maintained until no longer required.

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Appendix A - Common Abbreviations, Contractions and Acronyms

AC	Aircraft or Severe Weather Outlook Bulletin
AFWA	Air Force Weather Agency
AGL	Above Ground Level
AIRMET	Airman's Meteorological Information Bulletin
ALTN	Alternate (Field)
AOR	Area of Responsibility
ASOS	Automated Surface Observing System
ATC	Air Traffic Control
ARTCC	Air Route Traffic Control Center
AVWX	Aviation Weather
AWC	Aviation Weather Center
AWWS	Aviation Weather Watch Supervisor
CAVOK	Ceiling and Visibility OK
CMC	Commandant of the Marine Corps
CNATRA	Chief of Naval Air Training
CONUS	Contiguous United States
CNMOC	Commander Naval Meteorological and Oceanography Command
DoD	Department of Defense
FA	Area Forecast Bulletin (AVWX)
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
FDO	Forecast Duty Officer
FL	Flight Level
FLIP	Flight Information Publication
FLP	Field Landing Pattern
FMH-1	Federal Meteorological Handbook No.1, Surface Weather Observations & Reports
FSS	Flight Service Station (operated by FAA)
IAW	In Accordance With
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules
IMC	Instrument Meteorological Conditions
LIFR	Low Instrument Flight Rules
LLWS	Low Level Wind Shear

MCAS	Marine Corps Air Station
METAR	Aviation routine weather report. Also refers to the international hourly surface observation code format.
METOC	Meteorology and Oceanography
MSL	Mean Sea Level
MVFR	Marginal Visual Flight Rules
NAS	Naval Air Station
NATOPS	Naval Air Training & Operating Procedures & Standardization
NAVMET OCCOM	Naval Meteorological and Oceanography Command
NCEP	National Centers for Environmental Prediction
NEXRAD	Next Generation Weather Radar
FWB	Flight Weather Briefer (Software)
NOAA	National Oceanic and Atmospheric Administration
NOTAM	Notice to Airmen
NWS	National Weather Service
OFCM	Office of the Federal Coordinator for Meteorology
OPAREA	Operating Area
PIREP	Pilot Report
PROB	Probability of occurrence of a phenomena expressed as a percent
RMC	Regional METOC Center (USMC)
RAOB	Radiosonde Observation
RSC / RCR	Runway Surface Condition / Runway Condition Reading
RWY	Runway
RVR	Runway Visual Range
SIGMET	Significant Meteorological Information Bulletin
SOP	Standard Operating Procedure
SPC	Storm Prediction Center
SPECI	Aviation Selected Special Weather Report
TAF	Terminal Aerodrome Forecast code format. The international standard for the TAF code, FM 51-X Ext. TAF, is included in WMO Manual on Codes, WMO No. 306, Volume I.l, Part A.

TWR	Tower
UTC	Coordinated Universal Time
VAD	Velocity Azimuth Display
VMC	Visual Meteorological Conditions
VFR	Visual Flight Rules
WMO	World Meteorological Organization
WSR-88D	Weather Surveillance Radar - 1988 Doppler
WW	Weather Watch Bulletin (refers to severe thunderstorm watch or tornado watch)

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